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PROBLEMATIC OF ACCESS TO ENERGY IN EMERGENCIES: DIFFICULTIES AND SOLUTIONS

SPECIALIZED MASTER IN HUMANITARIAN WASH

(Water, Sanitation & Hygiene)

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Epigraph

The world is divided into two categories: there are those who see things and ask themselves “why?”, but there are also those who imagine things and ask themselves "why not?”; it is better to be part of the second category

DNL

Dedication

To all those who have a place in my heart and all my family,

I dedicate this work

In memoriam

All my loved ones who the divine destiny wrested my affection;

Peace to your souls

Acknowledgments

It is always nice to be thankful for the benefits of others towards oneself: we say our gratitude to all those, in one way or another, gave us their assistance throughout this program and those who made it possible; they find here the expression of our appreciation.

ABSTRACT

In emergency context humanitarian face various challenges that need a quick response to avoid death and risk of epidemics: provide food, safe water, medicines, toilet, psychological care … Access to energy in this context remains a complex issue given the unpredictability of the causes (war, natural disaster, epidemic), while the lack of energy in quantity and quality hinders the proper functioning of activities and to the flowering of the displaced. This problem is one of the major concerns of the UNHCR as the number of refugees is increasing as worldwide. In this study we made an assessment of this situation to face the difficulties and to find appropriate solutions. It also allowed us to make an inventory of environmental and health risks within the camps.

To achieve our goal we have come a litany of literature to highlight the evolution of this issue over the years and to raise the efforts that have been undertaken in order to build on the achievements and provide improved solutions for better performance. After study and analysis we realized that energy is essential in the lives of refugees for their daily needs (preparation, heating, lighting), but they are exposed to various health and safety risks to cover this need, in particularly respiratory diseases due to regular intake of smoke and the environmental degradation by regularly cutting of trees and shrubs. Electric power also enables humanitarian work well.

The major difficulties encountered in the camps are: lack of modern environmentally braziers for cooking and heating, large number of refugees in some cases, stay duration in the camps(especially for long stay), lack of lighting, the state of shelters does not meet the electricity standards, geographical location, climatic conditions, categorization of priorities for humanitarian action (budget).

Among the solutions we plan to solve the problem of cooking and heating by providing braziers running an eco-fuel or solar radiation for environmental sanitation, light public places using solar panels or any other form of clean energy depending on the area. Distribute autonomous systems of electric power generators for light inside the housing, radio, phone charging to allow refugees to flourish and not to fall into depression, to connect the camp to the electrical grid if possible. Consider real energy need in the global budget and sensitize people about environment protection.

Keywords

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1. Emergency
2. Energy
3. Access difficulties
4. Responses
5. Sanitation
6. Environment

RESUME

En contexte d'urgence les humanitaires font face à divers challenges auxquels il faudra répondre immédiatement pour limiter les pertes en vies humaines ainsi que les épidémies: fournir la nourriture, l'eau, les médicaments, les toilettes…
L'accès à l'énergie dans ce contexte demeure un problème complexe vu l'imprévisibilité des causes (guerre, calamité naturelle, épidémie), alors que l'absence de l'énergie en quantité et en qualité constitue un frein au bon fonctionnement des activités ainsi qu'à l'épanouissement des déplacés. Ce problème fait partie des préoccupations majeures du HCNUR vu que le nombre de réfugiés n'est que croissant à travers le monde.
Dans cette étude nous avons fait l'état des lieux de cette situation pour en relever les difficultés ainsi que les solutions appropriées. Elle nous a également permis de faire un inventaire des risques environnementaux et sanitaires au sein des camps.

Pour atteindre notre objectif nous avons parcouru une litanie de littératures pour en ressortir l'évolution de cette question au fil des années afin et relever les efforts qui ont été menées pour pouvoir capitaliser les acquis et proposer des solutions améliorées pour un meilleur rendement.
Apres études et analyses nous avons réalisé que l'énergie est indispensable dans la vie des refugiés pour leur besoins quotidiens (préparer, se chauffer, s'éclairer), mais ces derniers s'exposent à divers risques sanitaires et sécuritaires pour couvrir cette nécessité notamment les maladies respiratoires dues à l'aspiration régulière de la fumé ainsi que la dégradation de l'environnement par la coupe intempestive des arbres et arbustes. L'énergie électrique permet aux humanitaires de bien travailler.

Les difficultés majeures rencontrées dans les camps sont : manque de braseros modernes respectueux de l'environnement pour la cuisson et le chauffage, le nombre important des réfugiés dans certains cas, la durée du séjour dans les camps(surtout pour le cas de longue durée), manque d'éclairage, l'état des abris ne répondant pas aux normes de l'électricité, la situation géographique, les conditions climatiques, la catégorisation des priorités de l'action humanitaire (budget limité).

Parmi les solutions nous envisageons de résoudre le problème de cuisson et chauffage en fournissant les braseros fonctionnant avec un éco-combustible ou le rayonnement solaire pour l'assainissement du milieu, éclairer les places publiques à l'aide les panneaux solaires ou toute autre forme d'énergie propre selon la zone où l'on se trouve. Distribuer des systèmes autonomes générateurs d'énergie électrique pour la lumière à l'intérieur des logements, la radio, charge de téléphone afin de permettre aux réfugiés de s'épanouir et ne pas tomber dans la dépression. Connecter le camp au réseau électrique si possible. Tenir compte du besoin réel en énergie dans le budget global et sensibiliser la population par rapport à la protection de l'environnement.

Mots clés

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1. Urgences
2. Energie
3. Difficultés d'accès
4. Réponses
5. Assainissement
6. Environnement

ABBREVIATIONS

ACF: Action Contre la Faim

CFUGs: Community Forest User Groups

IASC: Inter-Agency Standing Committee

IDP: Internally displaced persons

NGHAs: Non-governmental humanitarian agencies

NGO: Non-government organization

OCHA: Office for the Coordination of Humanitarian Affairs

RC: International Red Cross and Red Crescent

SAFE: Access to Firewood and Alternative Energy in Humanitarian Settings

SGBV: Sexual and gender-based violence

TBBC: Thailand Burma Border Consortium

UNHCR: United Nations High Commissioner for Refugees

UNICEF: United Nations Children's Fund

US ($): American dollar

WFP: World Food Program

WHO: World Health Organization

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I. GENERAL INTRODUCTION

I.1. INTRODUCTION

A humanitarian emergency situation is unpredictable most of the time. It can be due to war, natural disaster, epidemic disease…

All the enumerated elements can deeply disturb people life conditions because they have suddenly to abandon they own houses and activities for a precarious life.

The main concern humanitarian action is to save lives by providing shelters, food, water, drugs, and toilets. But there are some essential needs to optimize this work, such as energy.

Parameters like duration, scale and the area are taking in account when a strategy is developing.

According to data from the UNHCR, the current numbers of people being forcibly displaced by conflict are the highest in 2014 and it seem that data of 2015 will be waste because of news crisis. Over 60 million people have been forced to leave their homes because of war, violence or persecution. Of these, almost 20 million are refugees, over half are children and 86% of them are being hosted in some of the poorest countries in the world. In 2014, an average of 42,500 people were forcibly displaced every day. That statistic is four times higher than just four years ago.

Many of these refugees are housed in camps, where access to the electricity grid is either very limited, in poor condition or simply non-existent. Burning biomass is the usual choice for meeting daily needs such as cooking, heating or lighting. This practice causes environmental degradation and in some cases also causes health problems. Diesel generators are used in the best of cases, but the maintenance costs are very high.

While millions of refugees receive food from humanitarian agencies, the food still needs to be cooked before it can be eaten. Yet without access to modern cook stoves and fuels, women and children must risk their safety, health, and sometimes their lives, to search for and collect firewood in order to cook over smoky, polluting open fires that damage health. Now is the time to raise awareness about this critical issue and to encourage decision makers to address the urgent need for increased access to cleaner and more efficient cook stoves and fuels and to help ensure the dignity and safety of refugees around the world.

Displaced women often must walk for hours to find firewood and carry loads of 20 kg or more back to camp, which puts them at risk for physical and sexual attack, dehydration, and physical injury. In fact, a 2014 UNHCR assessment in Chad found that 42% of refugee households experienced incidents of assault, attempted rape, rape, or other forms of sexual gender based violence during firewood collection over a six month period. At night, lack of access to lighting further increases women's vulnerability when navigating camps to use latrines and other services.

Women and children in refugee camps are also exposed to health risks, including respiratory infections from smoke produced by inefficient stoves and fuels. A review in the Journal of Conflict and Health in 2010 stated that acute respiratory infections such as pneumonia are the leading cause of mortality among children under 5 worldwide. Yet they receive comparatively little attention in humanitarian relief policies despite the fact that in crisis settings the burden of diseases tends to be exponentially greater than in non-crisis settings. In Nepal, for example, acute respiratory infection mortality rates were roughly 10-17 times higher among refugee populations than among those in non-crisis settings. In Burundi, mortality rates from the same disease were four times higher among refugees than their non-displaced peers (Bellos et al., Journal of Conflict and Health, 2010).

We notice that there is a big issue of air sanitation in most of the refugee camps.

Lack of access to cleaner and more fuel-efficient cooking technologies also has direct consequences on food security in crisis settings. In camps in North Darfur, 80% of people interviewed reported selling food from their World Food Program ration to buy firewood, and on average they missed three meals a week when they had food but lacked cooking fuel (University of California, 2006). Lack or inefficiency of energy is also restricting humanitarian assistance work in distributing food, water, medical care, investigation, data collection….

Water supply need always energy when pumps are using.

So what can be done to address these issues?

In the following lines we are trying to assess the energy needs in humanitarian context, difficulties to access to energy and possible solutions

I.2. PROBLEMATIC

The number of displaced people due to several causes became more and more important that the humanitarian action becomes complex to implement efficiency to achieve the goals.
There is also a concern of public health because of lack of sanitation. In fact, poor conditions of access to energy can cause disease at a big scale by using bad energy resources when there is lack or deficiency of pure energy; especially in Africa where there is electricity problem even in normal situations.
The concern is so big that studies had been done to get a best way of solving this issue.
It is why we find that this issue need deeply to be focused for better result.

I.3. OBJECTIVE

The goal of this topic is to make an evaluation of access to energy management in emergency context all over the world. To assess difficulties according to areas and try to find ways to get good responses to this issue.

I.4. WEAKNESS

The weakness of this work is that we did not go to the field to touch the facts on the ground, we only did a bibliographic data collection but we focused on large scale of studies and documents in various emergency context all over the world to be close to the reality and to contribute to the amelioration of refugees' conditions.

I.5. SIMILAR WORKS – BIBLIOGRAPHY

Many studies had been done on this big issue to find out effective and sustainable answers. Then we particularly focused on that to understand more the topic, the problematic and the concern;
We also wanted to know how far various studies arrived, what are the criteria of work, the priorities, people behaviors, climatic conditions, potential sources of energy available, methodology used in research, investigations.

Many documents and authors have been consulted to get the overall idea of our study;

-UHCNR reports and studies

- UNICEF quids
- The International Red Cross and Red Crescent Movement documents
- ACF articles
- WHO pounds
- WFP books
- OXFAM documents
- Documentation on different causes of diseases and consequences
- Renewal and alternative energy publications
- Many hard and soft copy books
- Several websites

I.6. OUTLINE

In this work we first make use some notions about the humanitarian context and emergency, energy concepts and the operational principles of various components. Then we focused on access to Energy.

In addition to the introduction and conclusion, our work is divided into three chapters that are:

- Generalities,
- Poor access to energy in emergencies,
- Solutions for better access to energy in emergencies.

CHAPITERE I: GENERALITIES

I.1. HUMANITARIAN CONCEPTS

- **Emergency**: A serious situation or occurrence that happens unexpectedly and demands immediate action. A condition of urgent need for action or assistance (oxford)
- **Humanitarian**: There are a number of meanings for the term humanitarian. Here humanitarian pertains to the practice of saving lives and alleviating suffering. It is usually related to emergency response (also called humanitarian response) whether in the case of a natural disaster or a man-made disaster such as war or other armed conflict. Humanitarian principles govern the way humanitarian response is carried out.
- **Humanitarian Action**: Action that aims without discrimination and with peaceful means to preserve life in the spirit of dignity and restore man in his ability to choose (oxford)
- **Humanity:** The principle of humanity means that humankind shall be treated humanely in all circumstances by saving lives and alleviating suffering, while ensuring respect for the individual. It is the fundamental principle of humanitarian response
- **Humanitarian Imperative**: The Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief (RC/NGO Code) introduces the concept of the humanitarian imperative which expands the principle of humanity to include the right to receive and to give humanitarian assistance. It states the obligation of the international community "to provide humanitarian assistance wherever it is needed."
- **Impartiality**: Provision of humanitarian assistance must be impartial and not based on nationality, race, religion, or political point of view. It must be based on need alone.

  For most non-governmental humanitarian agencies (NGHAs), the principle of impartiality is unambiguous even if it is sometimes difficult to apply, especially in rapidly changing situations.
- **Independence**: Humanitarian agencies must formulate and implement their own policies independently of government policies or actions.

  Problems may arise because most NGHAs rely in varying degrees on government donors. Thus for some organizations it is difficult to maintain independence from their donors and not be confused in the field with governments who may be involved in the hostilities. The ICRC, has set the example for maintaining its independence (and

neutrality) by raising its funds from governments through the use of separate annual appeals for headquarters costs and field operations.

- **Neutrality**: The International Red Cross and Red Crescent Movement follows, in addition to the above core principles, the principle of neutrality. For the Red Cross, neutrality means not to take sides in hostilities or engage at any time in controversies of a political, racial, religious or ideological nature.

  The principle of neutrality was specifically addressed to the Red Cross Movement to prevent it from not only taking sides in a conflict, but not to "engage at any time in controversies of a political, racial, religious or ideological nature." The principle of neutrality was left out of the Red Cross/NGO code because some of the NGHAs, while committed to giving impartial assistance, were not ready to forget their lobbying on justice issues related to political and ideological questions.
- **Proselytism**: The provision of aid must not exploit the vulnerability of victims and be used to further political or religious creeds. All of the major non-governmental humanitarian agencies (NGHAs) by signing up to the RC/NGO Code of Conduct have committed themselves not to use humanitarian response to further political or religious creeds.
- **Principles based on field experience in emergencies**: All of the above principles are important requirements for effective field operations. They are based on widespread field experience of agencies engaged in humanitarian response. In conflict situations, their breach may drastically affect the ability of agencies to respond to the needs of the victims.

  If a warring party believes, for example, that an agency is favoring the other side, or that it is an agent of the enemy, access to the victims may be blocked and the lives of humanitarian workers may be put in danger. If one of the parties perceives that an agency is trying to spread another religious faith, there may be a hostile reaction to their activities
- **Additional principles**: The RC/NGO Code also lists a number of more aspirational principles which are derived from experience with development assistance. Agencies should operate with respect to culture and custom. Humanitarian response should use local resources and capacities as much as possible. The participation of the beneficiaries should be encouraged. Emergency response should strive to reduce future vulnerabilities. Agencies should be accountable to both donors and beneficiaries.

Humanitarian agencies should use information activities to portray victims as dignified human beings, not hopeless objects.

- **The right to life with dignity**: The Sphere Project Humanitarian Charter uses the language of human rights to remind that the right to life which is proclaimed in both the Universal Declaration of Human Rights and the International Convention on Civil and Political Rights is related to human dignity.
- **Vulnerability and behavioral issues**: Humanitarian principles are mainly focused on the behavior of organizations. However a humane response implies that humanitarian workers are not to take advantage of the vulnerabilities of those affected by war and violence. Agencies have the responsibility for developing rules of staff conduct which prevent abuse of the beneficiaries**.**

I.2. ENERGY

Energy is involved in all life cycles, and it is essential in all productive activities. An elementary food chain already shows the need for energy: crops need energy from solar radiation to grow, harvesting needs energy from the human body in work, and cooking needs energy from biomass in a fire. The food, in its turn, provides the human body with energy.

Intensifying food production for higher output per hectare, and any other advancement in agricultural production, imply additional operations which all require energy. For instance: land preparation and cultivation, fertilizing, irrigation, transport, and processing of crops. In order to support these operations, tools and equipment are used, the production of which also requires energy (in sawmills, metallurgical processes, workshops and factories, etc.).
Major changes in agriculture, like mechanization and what is called the "green revolution", imply major changes with respect to energy. Mechanization means a change of energy sources, and often a net increase of the use of energy. The green revolution has provided us with high yield varieties. But these could also be called low residue varieties. And it is exactly the residue which matters as an energy source for large groups of rural populations.

Other sectors of rural life require energy as well. The provision of shelter, space heating, water lifting, and the construction of roads, schools and hospitals, are examples. Furthermore, social life needs energy for lighting, entertainment, communication, etc. We observe that development often implies additional energy, and also different forms of energy, like electricity.

Energy is a scarce resource, at least for some groups of people in some places and, maybe, for the world as a whole. A rational use of energy is then necessary for economic and environmental reasons. This applies to all sectors of the economy. A key to the rational use of energy is the understanding of the role of it. The following sections aim to help understand energy in several ways.

I.2.1. Forms of energy

Energy can exist in various forms such as;

- **Radiation energy**: the radiation from the sun contains energy, and also the radiation from a light or a fire. More solar energy is available when the radiation is more intense and when it is collected over a larger area. Light is the visible part of radiation;
- **Chemical energy**: wood and oil contain energy in a chemical form. The same is true for all other material that can burn. The content of chemical energy is larger the larger the heating value (calorific value) of the material is and, of course, the more material we have. Also animate energy (delivered by bodies of human beings and animals) is, in essence, chemical energy. Furthermore, batteries contain chemical energy;
- **Potential energy**: this is, for example, the energy of a water reservoir at a certain height. The water has the potential to fall, and therefore contains a certain amount of energy. More potential energy is available when there is more water and when it is at a higher height;
- **Kinetic energy**: this is energy of movement, as in wind or in a water stream. The faster the stream flows and the more water it has, the more energy it can deliver. Similarly, more wind energy is available at higher wind speeds, and more of it can be tapped by bigger windmill rotors;
- **Thermal energy or heat**: this is indicated by temperature. The higher the temperature, the more energy is present in the form of heat. Also, a larger body contains more heat;
- **Mechanical energy**, or rotational energy, also called shaft power: this is the energy of a rotating shaft. The amount of energy available depends on the flywheel of the shaft, i.e.: on the power which makes the shaft rotate;
- **Electrical energy**: a dynamo or generator and a battery can deliver electrical energy. The higher the voltage and the current, the more electrical energy is made available.
  Note that sometimes by "energy form" an energy source, or even a particular fuel like oil or coal, is meant.

I.2.2. Energy conversion

"Using" energy always means converting energy from one form into another. For instance, in space heating, we use energy, that is, we convert chemical energy of wood into heat. Or, in lift irrigation, a diesel engine converts chemical energy of oil into mechanical energy for powering the shaft of a pump which, in its turn, converts shaft power into potential energy of water, for example bringing the water to a higher height.

"Generating" energy also means converting energy from one form into another. We can say that a diesel engine generates energy, which means that the engine converts chemical energy of oil into mechanical energy. Also, a wind turbine generates energy, which means it converts kinetic energy from wind into mechanical energy. And a solar photovoltaic cell generates energy by converting radiation energy into electricity.

The generation of energy, in fact, deals with a source of energy, whereas the utilisation of energy serves an end-use of energy. In between, the energy can flow through a number of conversion steps. The words "generation" and "utilisation" are a little confusing because, in fact, no energy can be created or destroyed. All we can do is transform or convert energy from one form into another. In generating energy, we make energy available from a source, by converting it into another form. In utilizing energy, we also convert energy, often from some intermediate form into a useful form. In all conversions, we find that part of the energy is lost. This does not mean that it is destroyed, but rather that it is lost for our purposes, through dissipation in the form of heat or otherwise.

I.2.3 Energy sources

Energy sources partly correspond to the energy forms of above, but not entirely. The following energy sources can be relevant for rural areas.

- **Biomass**: We distinguish between: woody biomass (stems, branches, shrubs, hedges, twigs), non-woody biomass (stalks, leaves, grass, etc.), and crop residues (bagasse, husks, stalks, shells, cobs, etc.). The energy is converted through combustion (burning), gasification (transformation into gas) or anaerobic digestion (biogas production). Combustion and gasification ideally require dry biomass, whereas anaerobic digestion can very well take wet biomass. Fuel preparations can include chopping, mixing, drying, carbonising (charcoal making) and briquetting (densification of residues of crops and other biomass).

- **Dung from animals and human excreta**: The energy is converted through direct combustion or through anaerobic digestion.
- **Animate energy**: This is the energy which can be delivered by human beings and animals by doing work.
- **Solar radiation, energy from the sun**: We distinguish between direct beam radiation and diffuse (reflected) radiation. Direct radiation is only collected when the collector faces the sun. Diffuse radiation is less intense, but comes from all directions, and is also present on a cloudy day. Solar energy can be converted through thermal solar devices (generating heat) or through photovoltaic cells (generating electricity). Direct beam solar devices (whether thermal or photovoltaic) would need a tracking mechanism to have the device continuously facing the sun.
- **Hydro resources, energy from water reservoirs and streams**: We distinguish between: lakes with storage dams, natural heads (waterfalls), weirs, and run-of-river systems. Hydro energy can be converted by waterwheels or hydro turbines.
- **Wind energy, energy from wind**: Wind machines can be designed either for electricity generating or for water lifting (for irrigation and drinking water).
- **Fossil fuels, like coal, oil and natural gas**: Unlike the previous energy sources, the fossil energy sources are non-renewable.
- **Geothermal energy**: that is the energy contained in the form of heat in the earth. A distinction is made between tectonic plates (in volcanic areas) and geopressed reservoirs (could be anywhere). Geothermal energy is, strictly speaking, non-renewable, but the amount of heat in the earth is so large that for practical reasons geothermal energy is generally ranked with the renewables. Geothermal energy can only be tapped at places where high earth temperatures come close to the earth's surface.

This list only contains primary energy sources. These are the energy sources which are present in our natural environment. Secondary energy sources, like batteries, are not included here.
We observe that the primary energy sources are not the ultimate sources of energy. For instance, animate energy comes from biomass, whereas biomass energy ultimately comes from the sun. Apart from geothermal and nuclear energy, all our so-called primary energy sources have ultimately got their energy from the sun.

I.2.4. Some notes on energy terminology

Energy sources are sometimes classified according to characteristics like: renewable, traditional, commercial, etc. The terminology is rather ambiguous, as the meaning of the words often depends on the context. Some connotations are given below.

Renewable is generally contrasted with fossil. Renewable are biomass, animate, solar, water and wind energy, as well as geothermal energy. Fossil energy is contained in coal, oil and natural gas.

Traditional energy is often contrasted with non-traditional energy, and also with new energy. However, what is considered as traditional depends on what one is used to. In industrialised societies which are used to fossil fuels, renewable energies like biomass and animate energy are often called traditional. At the same time, engineers working on "new" energies like wind or solar energy often consider fossil fuels as traditional. Apparently, what people call traditional are the forms they are actually not used to.

New and renewable energy sources are often put together. They exclude fossil and nuclear energy.

Commercial energy is contrasted with non-commercial energy, and sometimes with traditional energy. Commercial energy certainly includes energy from fossil fuels which have been monetarized, but also some forms of new and renewable energies which are part of the cash economy. Biomass and some other sources of renewable energy (thermal solar energy) are sometimes considered non-commercial, because they are thought to be freely available. However, in many areas, biomass fuels have to be paid for.

Figure 1 : overview of energy issue in refugee and IDPs camps

CHAPITERE II: POOR ACCESS TO ENERGY IN EMERGENCIES

II.1 INTRODUCTION

The aim of this chapter is to identify the current key challenges that humanitarian face at the operational level in relation to household energy and energy supply in refugee and IDP camps. While the operational level at refugee and IDP camps is the focus of this report, UNHCR's household energy policy is also explored. The paper aims to identify countries in which UNHCR is currently experiencing severe problems in terms of household energy issues. The approach to household energy challenges adopted in this paper is broad and comprehensive: the social, political, environmental and economic aspects of energy issues are addressed. A systematic review of several documents, as well as certain Country Operations Plans, identified many locations where UNHCR faces its most severe problems with household energy are African countries. But there is others countries out of Africa such as Nepal.

II.2. KEY HOUSEHOLD ENERGY CHALLENGES

The household energy needs of displaced people in camps are those related to cooking, heating and lighting. The amount of fuel – principally firewood – required to fulfil these needs is typically greater than that provided by aid agencies. Refugees and IDPs must therefore use local natural and human resources to supplement their fuel allowance. The review of the 2007Annual Protection Reports and other UNHCR country-specific reports identified the following five key challenges related to household energy: protection, relations between hosts and displaced people, environmental problems, household energy-related natural resource restrictions and livelihood- related challenges. These challenges are discussed in more detail in the following section, with reference to specific case studies.

In addition to these five key challenges, the Inter-Agency Standing Committee (IASC) Task Force on Safe Access to Firewood and Alternative Energy in Humanitarian Settings (SAFE) has identifies other issues related to household energy.

These include household energy questions that are linked to health and education. It is clear that different fuels and energy production methods can cause health problems and lead to both acute and chronic diseases. In addition, people don't bath in cold area when there is not warm water that brings sickness due to lack of hygiene. Because women and girls often bear the greatest burden of firewood collection, they are disproportionately affected by these energy-

related health problems. In addition, young girls may be affected in terms of education since providing enough firewood can be highly time-consuming and they may be unable to attend school.

II.3. PROTECTION-RELATED CHALLENGES

There are several protection risks related to the fulfilment of household energy needs.
The risks identified from the analysis of the UNHCR data include those related to the increased danger of arrest and refoulement, sexual and gender-based violence (SGBV) and the jeopardizing of the voluntary nature of return and the willingness of authorities to grant asylum to refugees. The first protection challenge is the increased risk of arrest for illegal firewood collection. In Bangladesh, some refugees were arrested in 2007 for firewood collection despite UNHCR efforts to reduce the need for this activity. Although UNHCR has distributed compressed rice husk as an alternative fuel, some refugees sell their allocation and continue to collect firewood. In Djibouti, the authorities have also threatened to detain those who are caught firewood collection in the forests. In the case of Ethiopia, refugees are officially forbidden to leave the camp to collect firewood. However, this regulation has been widely ignored as a consequence of inconsistencies in kerosene distribution.

The second protection concern, the increased risk of refoulement, was only identified in Tanzania, where incidences of refoulement were reported in 2007. Refugees left camps for various reasons, including fire wood collection, despite the known dangers of doing so without the required permission. Some of those found outside the camps were arrested and deported. The group of refouled refugees did not have any specific demographic characteristics: it appears that women or specific minority groups are no more vulnerable for refoulement in this context than others. The third protection issue is the jeopardizing of the profoundly voluntary nature of return. There is evidence that in Tanzanian camps, factors such as restrictions on movement and insufficient food and fire wood supplies were affecting refugees' decisions to return to their place of origin. This lack of basic resources puts the voluntary nature of return in doubt. In many cases, whether displaced people remain in the camps or decide to go back to their homes, they will still face severe household energy problem.

The fourth protection challenge is sexual and gender-based violence (SGBV). It is widely recorded that women and girls face particular risks during firewood collection. The review of UNHCR's Annual Protection Reports provides evidence that SGBV is still a major challenge,

despite the ongoing search for solutions. In Chad, competition for natural resources has resulted in the rape of refugee women who leave the camps in search of firewood. This has been identified as one of the most significant protection challenges for UNHCR in the country. In the Ethiopian refugee camps, the sexual harassment of unmarried women and women heads of households in particular also poses a serious protection problem.

This harassment is particularly common when women collect firewood outside the camps. Because the lack of firewood is causing serious problems in most refugee camps in Ethiopia, meeting energy requirements is an important protection issue. In the Namibian case, too, refugee women have mentioned that they fear physical attack when they look for firewood. They continue to be exposed to this risk even though the amount of distributed kerosene has been increased. In Sudan, particularly in the IDP camps in Darfur, the incidence of SGBV – primarily linked to firewood collection – is also well known. In Nepal, Bhutanese refugee women and girls have been abused, detained and raped while collecting firewood. However, SGBV is less common in Nepal than in many other refugee and IDP situations. This may be partly due to UNHCR's long-standing fuel distribution scheme.

The fifth protection challenge is related to the potential impact of environmental degradation on the willingness of authorities to grant asylum to refugees. If refugee camps have severe problems in fulfilling household energy needs, and particularly if this jeopardizes relations between host and refugee populations, the authorities may restrict their asylum policies. It is essential that UNHCR supports and advocates for a sustainable energy supply and the mitigation of the environmental impact of the camps. Various attempts have been made to address household energy-related protection issues.

II.4 RELATIONS BETWEEN HOSTS AND DISPLACED PEOPLE

The scarcity of natural resources around many refugee and IDP camps has often been a cause of conflict between hosts and displaced people. In countries such as Chad, Ethiopia, Kenya, Nepal, Rwanda and Sudan, the shortage of household energy resources has been identified as a problem which significantly contributes to the degeneration of the relations between displaced people and host communities. Even where the relationship between displaced people and hosts is relatively good in terms of most aspects of cohabitation, the fight over natural resources has often led into open rivalry. For instance, in West Darfur the limited access to natural resources such as firewood, has caused inter-tribal conflict. It would be interesting to establish whether refugees and host communities experience more conflict over natural resources than IDPs and

their hosts, given the fact that IDPs are citizens of the same country as the hosts. However, no conclusion on this issue can be reached based on the review of the UNHCR documents. Various solutions have been tried to be implemented to enhance and improve mutually beneficial relations between host and displaced populations.

The Kakuma camp in Kenya has a policy discouraging refugees from using the limited natural resources; because these restrictions are well known by both refugees and locals they have contributed to a lack of conflict over resources. The policy of refugees buying additional firewood from the local community has also improved relations between the two parties. However, in order to be able to purchase this firewood, refugees have to sell part of their food rations. This has had a negative impact on the nutritional status of refugee children in particular and can therefore not be seen as a sustainable energy solution.

II.5 ENVIRONMENTAL PROBLEMS

In camp situations wood is often the only available source of energy. Traditionally, wood has been used for cooking and is therefore often also the most familiar source of energy. The demand for firewood depends on the type of wood and stove used and on the climate, as wood may also be used for household heating. It has been estimated that initial daily per capita consumption of firewood in camps is 3 kilograms per person. However, this can be reduced to 1-2 kilograms if wood-saving techniques are used and firewood collection is restricted.
Alternative energy sources, such as coal, kerosene, liquid propane gas and electricity, are used more often in situations of urban displacement than in rural camps.

Some of these energy methods cause environmental degradation and create health risks. It is therefore necessary to evaluate the environmental and other impacts of various energy sources carefully before deciding on the best option for a specific situation. Typically, the amount of fuel or firewood distributed by the aid agencies is not sufficient and displaced communities continue to use natural resources located close to the camps. For example, in Rwanda it was a serious challenge to provide sufficient amounts of fuel to all of the refugee camps. This is primarily because there was not enough wood to meet the energy needs of the population as a whole. Severe drought has meant that firewood has had to be transported from other districts to refugee camps. This has led to increased transportation costs and further jeopardized the regular distribution of firewood.

In Nepal, deforestation in the areas surrounding refugee camps has been increasing for many years and has created substantial environmental degradation as well as a lack of firewood.

In many mass influx situations, deforestation has been the most significant negative environmental impact on the hosting area. Although environmental issues are increasingly well addressed in refugee and IDP camps, problems still exist with regard to the actions and attitudes of both the authorities and displaced people. For instance, in West Darfur, Sudan, the activities of both groups demonstrated a lack of environmental awareness, particularly in terms of the extensive firewood collection taking place around the camps. When attempting to mitigate the negative environmental impacts of household energy use in camps, at least three things need to be considered. First and foremost, energy consumption should be reduced. Secondly, fuel wood must be harvested in a sustainable manner and thirdly, the supply of alternative fuels must be considered. Reducing consumption can be achieved by introducing fuel-efficient stoves, communal cooking alternatives and environmental education training. However, environmental education is not always available in camp situations.

For instance, in Sierra Leone, where refugee livelihood activities, including the increased use of firewood, have had negative impacts for the land and vegetation in host communities, no international agencies on the ground are advocating for sustained environmental performance. The introduction and use of alternative energy resources besides firewood are also important for mitigating environmental degradation and in particular the exploitation of forests. UNHCR has developed the concept of an 'energy ladder' of burnable fuels. Fuels such as charcoal, briquettes, kerosene and biogas have more energy value than firewood, and are therefore higher up the 'ladder', but are more expensive.

At the same time, the use of these fuels is usually practically feasible and culturally appropriate, although it does pose the problem of potential resale. Energy sources which fall below firewood on the energy ladder include dry peat, grass and loose waste and residues. These tend to be more labor-intensive and cheaper forms of energy production, but they also have lower cooking efficiency. They therefore tend not to be as socially acceptable as other, more efficient, fuels. Likewise, there are many cultural, logistical and social problems attached to the use of solar energy, which is therefore perceived to have a lower overall value than firewood as a fuel option. However, although there are initial obstacles to the use of alternative energy sources, they should be considered as part of attempts to promote and develop sustainable household energy use in refugee and IDP camps. In Nepal, the conflict has increased the price of kerosene

and affected the distribution of fuel and UNHCR has developed an alternative fuel program. However, refugees have been fairly reluctant to adopt new fuels such as biomass briquettes and compressed coal dust briquettes, or other new techniques, such as parabolic solar cookers and biogas.

II.6 NATURAL RESOURCE-RELATED RESTRICTIONS

National legislation may restrict the right of refugees' right to work, which limits their ability to generate income and purchase additional fuel. At the same time, national laws can also restrict the use of natural resources. These laws protect and regulate the exploitation of scarce resources and the environment, but may also constrain household energy supplies. Nevertheless, the UNHCR forestry guidelines clearly recognize the need to control wood gathering, stating that even when forest conditions are favorable enough to allow refugees to freely collect their wood requirements, extensive supervisory control, law enforcement and awareness raising measures will still have to be taken.
Organized wood supply is also an option for restricting wood gathering. Under this system, displaced people do not collect the wood themselves; instead, harvesting and distribution are conducted by an agency.

However, displaced people typically participate in the process at various levels. Even though it has many advantages, this method is still only rarely used, primarily in situations where wood resources are very limited, the freedom of movement of displaced people is restricted or where firewood collection poses a serious security risk to individuals. UNHCR guidelines recognize the implications of national environmental policies and laws and define access rights and benefit sharing as fundamental to sound environmental management. In relation to access to land and natural resources, they emphasize that decisiveness and clarity are essential. An ambiguous government policy or inconsistent application of laws relating to refugees' rights over local land is likely to be more environmentally damaging than the adoption of clear stance, even if that stance allows for full access and exploitation.

A weakly enforced prohibition of refugees' right to use resources is often a poor option in terms of the environment, as it can lead to the uncontrolled exploitation of natural resources and worsening relations between displaced people and host communities.

Under Nepalese law, the right to forest protection lies with local Community Forest User Groups (CFUGs), which are responsible for ensuring that the illegal harvesting of forest products does not take place. As a result, refugees are restricted from consuming natural resources. Both refugee and host communities are aware of this law, but the lack of other livelihood options has put refugees in danger of contravening it. Refugees who are compelled to collect firewood can be arrested or abused if caught.

Rwanda had established a culture of environmental protection and, generally speaking, refugees abide by its environmental policies. However, these policies have been highly contested with regard to the use of firewood. Government officials have accused refugees of misusing forest resources because of occasional increases in wood collection due to the lack of firewood distribution. In addition, women and children in camps are vulnerable to harassment and violence due to the lack of access to firewood in nearby areas. In 2005, the Government of Rwanda issued a law forbidding the use of wood for shelter construction and as an energy source in order to respond to increasing deforestation. This law has affected refugees and returnees alike. UNHCR has had to look into alternative energy sources, but replacing wood as a source of energy and for construction need considerable efforts and funds.

In Tanzania, the government has banned tree-harvesting in natural reserves, which has particularly affected the main refugee hosting areas. In addition, Tanzania continues to enforce an encampment policy. Although the authorities do not take measures against refugees who leave the camp for daily firewood collection, the encampment policy limits the potential for refugee self-reliance. Given these restrictions on natural resource use and freedom of movement, UNHCR has developed two approaches to household energy provision in Tanzanian camps. In some camps it continues to provide firewood, while in others refugees collect dead tree wood under the guidance of the authorities.

Solutions to the various national restrictions on the use of natural resources and freedom of movement are complicated. On the one hand, these restrictions are established to protect scarce resources; on the other, if no other sources of income and household energy are provided, they can seriously harm the well-being of displaced people by limiting their access to their most-often used means of employment.

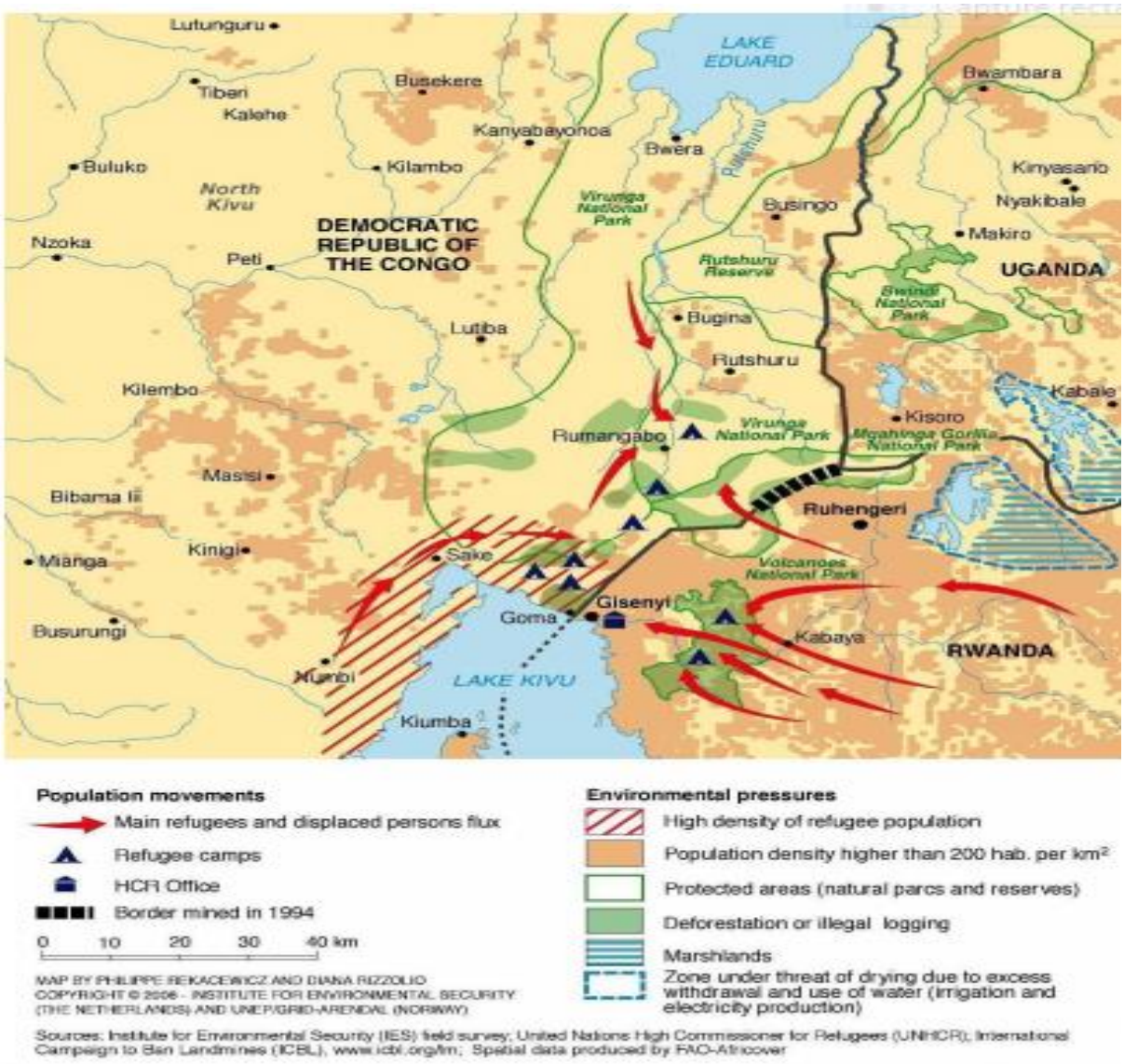

Figure 2: Impact of people displacement on natural resources in RWANDA and east DRC

II.7.LIVELIHOOD-RELATED CHALLENGES

The causes of various household energy challenges seem to be closely linked to a lack of livelihood options. Indeed, it can be argued that sustainable livelihood options and sustainable environmental behavior go hand in hand. The lack of income-generating opportunities in refugee and IDP camps significantly affects the use of firewood and other natural resources. Furthermore, it impacts on relations between displaced and host populations and on the protection of displaced persons.

In several refugee-hosting countries, refugees are not allowed to work. When the right to work is not recognized, refugees tend to work illegally and to use natural resources extensively in order to generate income. They may, for example, sell firewood or other natural resources. For

example, refugees in Ethiopia are prohibited from working and therefore participate in the informal sector, including work related to agricultural activities and selling firewood. Displaced people also sometimes place themselves at physical risk in order to collect firewood for sale. Refugees in the western region of Gambia were dependent on selling firewood and charcoal during the dry season, which places severe pressure on the environment and could inhibit the water cycle and thus prevent rain.

II.8. CONNECTION TO THE ELECTRICAL NETWORK

Electrical energy from the grid has also many barriers to be implemented such as the distance between the refugee camp and the electrical network: a long distance need material, time and a big fund to construct an electrical line. The stay duration in the refugee camp is another problem: some camps are for a short time then it is not rational to invest money for electrical installations. The dimension of the camps (refugee number) is also a factor: no way to spend billions of money for few persons in the camp. The last concern is the quality of shelter: most of the time shelters are built in weak material that can not satisfy grid electrical standards for house electrical installations, in addition to the climate (especially rain season).

Sometimes they can light the camp where the grid is closer but it is most of the time done just outside the camp to enlighten only around camps and public places because of poor quality of shelters.

However, if the stay is long and shelters are improved they can connect the camp to the electrical grid under certain conditions.

CHAPITER .III. SOLUTIONS FOR BETTER ACCESS TO ENERGY IN EMERGENCIES

III.1 POTENTIAL ALTERNATIVE ENERGY SOURCES AND TECHNOLOGIES

Overview of alternative energy sources and technologies

Traditional: Three-stone fire traditionally, many people in developing countries, including refugees, use open wood fires for cooking. The traditional 3-stone fire is also used as a source for heat and light. However, the method is wasteful of energy and produces a lot of smoke that negatively affects people's health. Energy efficiency of the traditional three-stone fires is typically about 15% – meaning that only 15% of the energy released from the fuel actually enters the water or food inside the pot. The use of the traditional wood fire is a major cause for the current fuelwood crisis in many parts of the world as we said above.

Improved or Fuel-Efficient Stoves to increase fuel-efficiency, improved stoves or fuel-efficient stoves (FES) have been in use for a long time. Improved stoves are the most common fuel-saving measures in refugee situations. Depending on the quality of the stoves produced and the way they are being used, improved stoves can achieve efficiencies of at least 20%, which is an energy efficiency gain of 5% compared to open fires. The following stove designs are most common: x Mud stoves: hand-made stove, combination of clay, sand straw/grass, ash and/or animal dung. A well-known example is the "Jiko sanifu" (improved stove) of Mwanza, or the "Kilakala" stove from Morogoro (both in Tanzania). In Uganda people use the 2-pot "Lorena" stove, while in Central America the "Apprevecho" is well known.

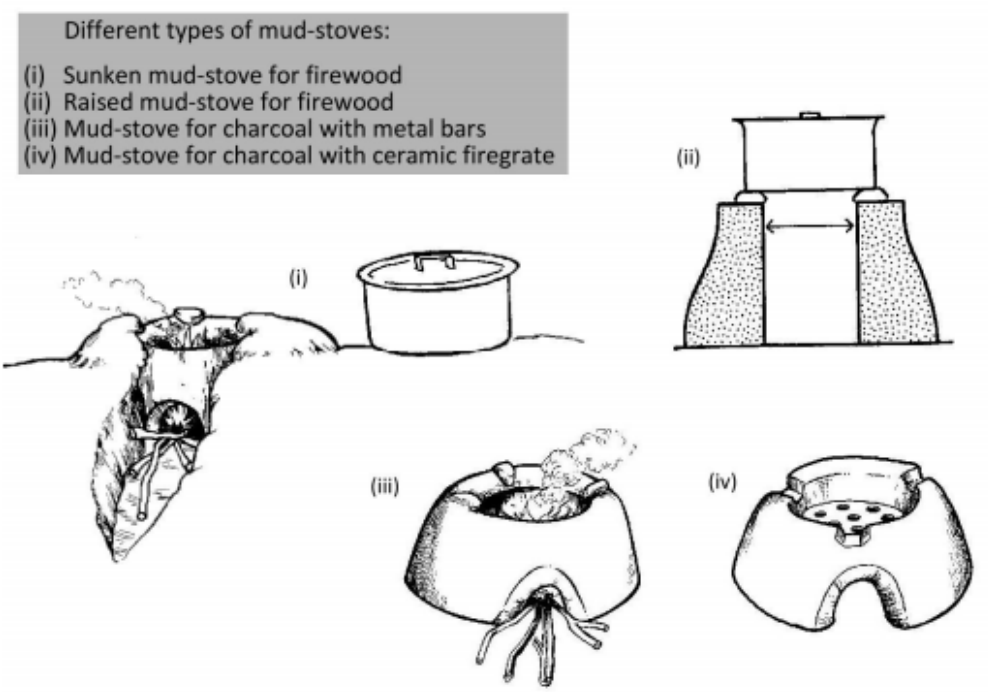

Figure 3 . Overview of energy issue in refugee and IDPs camps

Prefabricated stoves: more sophisticated cooking devices that can be fabricated locally. Examples include "all-metal stoves" (made from scrap metal – Tara stove or Berkeley Darfur stove), "fired clay stoves" (made from fired clay – Rocket stove) or "combined clay/metal stoves" (made from a clay liner with an external metal cladding). Well-known examples of the clay/metal stoves include the Thai bucket and the Kenya Ceramic Jiko. Another example is the UPESI (maendeleo) stove, a ceramic liner stove set in a mud platform or clad in metal for portability. Another example is an improved woodstove designed by multinational Philips.
It contains a long-life, brushless fan that forces a controllable flow of air through the stove from below. A field trial in India in late 2005 showed that, when used properly, the Philips woodstove typically reduces fuel consumption to 1/3 of that used by traditional, three-stone fires.

There are a number of preconditions for the promotion of improved stoves, including: - Users should be in a situation of fuel shortage, so there is an incentive to conserve energy. - Fuel should be a market commodity, so that buying an improved stove will save them money. - The stoves should have multiple benefits and be locally adapted to suit cultural preferences and needs, including family size, cooking habits/staple foods, etc. - In situations where the stove is made from materials other than mud, there should not be a strong re-sale market for the raw materials, or else the stoves may be sold for their scrap value.

A key consideration when choosing a stove model is availability – the stove should either be locally producible, from locally available materials or easily, cheaply and quickly transported. Stainless steel models can cost upwards of US$ 50 per stove and must be transported long distances, making them an impractical choice in remote, insecure regions such as Darfur. In comparison, basic mud stoves can cost less than US$ 1 per stove

III.2 DEALING WITH ENERGY NEEDS IN HUMANITARIAN CRISIS RESPONSE OPERATIONS

III.2.1 stoves

"Save80" stove

A pilot by UNHCR of the "Save80" stove (small stainless steel stoves) with refugee and host populations in Chad started in 2005. The name of the stove comes from its goal of saving 80% of firewood needed for a traditional three-stone fire. However, the stoves are partly manufactured in Germany, resulting in high costs per stove (US$ 57). With support of USAID/OFDA, an improved stove called the "Berkeley Tara stove" was designed and tested in 2005 and 2006. This stove is based on the Indian-made multi-fuel, metal fuel-efficient Tara stove. It has promising potential because it can be produced locally from sheet metal at low cost (US$ 10). It was demonstrated to save 50% fuel over a 3-stone fire. Burmese refugees in Thailand adapted the Thai bucket charcoal stove to suit their tradition of burning firewood by cutting a hole in one side and adding a protruding shelf for feeding firewood. This meant that it could be widely used as a multi-fuel stove instead of being rejected as a technology suitable only for those who could afford charcoal.

Apart from firewood and charcoal based stoves, a number of alternative biomass fuel options are available, which are presented below.

Fuel Briquettes Residues can also be compacted into more energy-rich and user-friendly briquettes. Plant waste or sawdust can be turned into fuel pellets or compressed fuel blocks by a process of compaction, charring and/or carbonization. Three well-known types are: Densified briquettes: compressed fuel blocks combined with a binding material such as molasses or resin. A well-known example is the "honeycomb" or "beehive" briquette, currently used in Nepal. They are made from a combination of forest products (weeds or scrub bushes) or agricultural waste (rice husks), soil or sand and a binding material. They can be made locally, or in a more industrialized way using charring drums and screw-press machines. Charred briquettes: e.g.

briquettes from rice husks used by Burmese refugees in Bangladesh in the mid-1990s. Charcoal briquettes: fuel pellets of higher energy content that have been carbonised prior to compaction, or compacted first then carbonised.

The experience from Thailand suggests that refugees previously accustomed to firewood are generally willing to accept briquettes as alternatives. Briquettes can be handled in a similar manner to firewood, so no major behavioral changes are required. Charcoaled briquettes are actually somewhat superior to firewood, because of their higher energy content and longer burning time. Thus, they may be a viable alternative to firewood if long-term funding is obtained and if re-sale can be effectively restricted and if they can be sourced and manufactured in an environmentally sustainable manner. Charcoal typically takes more energy to manufacture than it actually gives off during use. Charcoal should not be promoted without clear attention being paid to its potential environmental ramifications.

III.2.2 Fuel briquette supply

An interesting initiative is a fuel supply program in Thailand. An estimated 140,000 Burmese refugees have been staying in Thailand for more than 25 years. This led to serious environmental damage by refugees gathering wood from the surrounding forest, as many of them were settled inside forest reserves. The Thailand Burma Border Consortium (TBBC) initiated fuel supply on a small scale in 1995 by using charred briquettes made from sawdust. The charred briquettes were not very popular with refugees, who found them smoky and difficult to light, and a switch was made to charcoal briquettes.

TBBC supplied refugees with carbonized briquettes derived from sawdust, produced by a number of Thai private companies. Other briquettes were derived from raw material already carbonised before being transformed into briquettes, e.g. charcoaled bamboo waste from industrial operations in central Thailand. Both types of briquette had a much higher value than firewood and hence cooked more quickly and conveniently. They were popular with the refugees, who adapted their traditional stoves to use the briquettes alongside firewood that they were already gathering.

More and more camps in Thailand were supplied with cooking fuel each year with different types of charcoal being tested. Since 2000, all camps have been provided with ‘full’ rations. The current ratio is set at about 8 kg per person per month depending on family size. By this time, over 8,500 tons of briquettes were being supplied, at an annual cost of US$ 2.1 million. However, because of the high costs and the need for constant monitoring of suppliers and prices,

it was decided to switch again in 2001, this time to firewood from eucalyptus plantations. It is unknown whether this has led to an improvement in fuel efficiency or not.

The TBBC experience is interesting because it is one of the few examples worldwide of projects distributing charcoal briquettes. It also includes the distribution of fuel saving "bucket" stoves, the so-called Thai buckets. TBBC conducted a survey in all camps in November 2005 which established that approximately 90% of households were using bucket stoves.

Briquettes distributed in refugee camps in Burundi.

Figure 4.Briquettes distributed in refugee camps in Burundi

III.2.3 Wastes & residues

In case of firewood shortage, some refugees turn to loose wastes and residues collected around the camps or in agricultural plots. This may include maize cobs, rice husks, cotton stalks, cow dung, twigs and leaves. Most of these materials are considered inferior to wood and charcoal because they have much lower energy content and are harder to burn. Another disadvantage is that some of them are normally used as soil improvers. Their use as a fuel may disturb the nutrient balance of the soil. They are considered as supplementary energy options, useful as a fallback option in times of firewood shortage.

Grass-burning stoves in situations of shortage of trees, it makes sense to look at other plant resources that can serve as a source of energy, one of which is grass. Two refugee-hosting areas with an abundance of grass are northern Uganda and western Tanzania. This prompted the introduction of a new type of cooking stove in the mid-1990s designed to burn bundles of

locally cut grass. The original grass stove was a free-standing, portable device made from sheet metal. It became known as the “peko pe”, meaning “no problem” in the Acholi language of Uganda. The stove involves significant labor on the part of the user for harvesting, drying and bundling before it can be used. It also has a short burning time and needs a change in cooking habits. Grass is an inferior fuel to firewood and charcoal with a 20% lower energy content per unit of weight. As a result, the introduction of the grass stove by several agencies in Tanzania and Uganda was unsuccessful, and it is now no longer considered a viable alternative.

III.2.4 Peat Stoves

Peat is a form of organic matter that develops as a result of incomplete decomposition of wetland vegetation under conditions of excess moisture and oxygen deficiency. Its energy value exceeds that of firewood. It has been a traditional fuel in high altitude regions for centuries. One refugee program in which peat has been tested was in Kagera region in Tanzania. It involved peat extraction from swamps along the river, for which refugees received daily incentive rates. Peat appeared to be an acceptable fuel supplement to firewood, with an adoption rate by Rwandese refugees of 98% in 1996. The sustainability of this program can be doubted, since it was completely dependent on cash incentives. Based on tests in Rwanda and Tanzania, it was determined to be both unsustainable and environmentally degrading.

III.2.5 Kerosene

Kerosene is a high-quality cooking fuel with a much higher energy value compared to firewood and charcoal. However, kerosene is not an affordable option for refugees using their own resources. It has been introduced in the 1990s for use by Bhutanese refugees in Nepal, but this has been abandoned in 2006 due to the doubling of kerosene prices. Its use carries a number of risks, including the re-sale by refugees for cash. It can also be dangerous to users without prior experience. A kerosene supply testing program in Darfur in 2004 was quickly stopped after a series of fires and explosions.

LPG Liquid Propane Gas (LPG) has been discussed as a possible fuel source for refugees, particularly in countries with large natural gas resources and/or gas pipelines. However, it is typically too expensive for large-scale distribution and cannot be considered a viable alternative in refugee situations.

III.2.6 Biogas

Biogas is a methane based fuel created from the fermentation of human or animal waste (manure, sewage, green waste, landfill waste) which can be used for cooking or lighting/heating purposes. The leftover slurry can be used as fertilizer. If human waste is used, ten families are needed to supply the gas needs of one beneficiary family. Bio-digesters can cost up to US$ 1,700 depending on their size and materials used. There are also plastic bio-digesters that cost only US$ 45 per unit. Worldwide, there is considerable experience with biogas for local communities, especially in India, China and Nepal. In some countries, cultural barriers have prevented biogas from being used as a cooking fuel, as people consider the use of biogas to be unclean. This is particularly the case in some parts of Africa.

UNHCR has mixed experiences with biogas projects in refugee situations. A biogas project in Nepal was prompted by a communal health problem. It took off well because it acknowledged the community based nature of the sanitation problem. However, it produced only small amounts of gas and fertilizer for the benefit of a few people. In a biogas project in eastern Afghanistan, a saving on firewood of 2.5 tones per household per year was attained, implying a total saving of 250 tones across all beneficiaries. The biogas technology was well accepted and widely taken up, mainly due to a family-focused approach and cost-sharing mechanism, and by ensuring that user rights and responsibilities were well defined.

Given the high investment costs and the need to build permanent structures, the use of biogas would only make sense in protracted situations. If host populations would benefit from the installations, the chances of success would strongly increase. Another important advantage is that biogas is a cleaner source of energy that does not degrade the environment or health, and that it produces fertilizer. It would be useful to do more research on the development of cheaper underground biogas digesters and to explore possibilities for household level biogas production. Another option is to link up to the Biogas for Better Life program, an African initiative supported by a range of partners including the Dutch Ministry of Foreign Affairs, SNV, HIVOS and the Shell Foundation.

III.2.7 Solar energy

Solar energy is captured in many ways, such as solar cooking, Solar Photovoltaic (PV) power and Concentrated Solar Power (CSP). There are basically three types of solar cooking devices: panel cookers, box cookers and parabolic/dish cookers.

1. **Panel cookers**: they consist of a large piece of cardboard, covered with aluminum foil, and can often be made on site, including in camp settings. Well-known examples include the Cookit panel cooker, which is promoted by Solar Cookers International. They are relatively inexpensive (US$ 10-12 per unit), they rarely burn food and can be made locally. However, CooKit panel cookers are fragile, especially in a windy environment, and must be frequently replaced. They also cook slowly and can not be used to fry food. The CooKits have been used on a larger scale in Kakuma Camp in Kenya and Aisha Camp in Ethiopia, and have been introduced successfully in Chad.

2**. Box cookers**: they consist of a wooden box lined with a reflective mat on the bottom, insulated sides and an adjustable glass top. A black-painted pot is placed inside the box. Disadvantages include the facts that they are large and cumbersome to move and store, and the cookers are prone to breakage. They also cook food slowly and are more expensive than the panel cookers (between US$ 30-70 per unit).

3. **Parabolic/Dish cookers**: they are made up of large interlocking reflective plates, mounted on a rotating frame. A black-painted pot is suspended in the Centre of the dish in order to absorb the maximum amount of solar energy. Parabolic devices cook much quicker than the Panel or Box cooker models – a full family meal can be prepared in roughly 45 to 60 minutes. In addition, they can fry food. Disadvantages include the fact that they are labour-intensive in use (they must be turned every 5-10 minutes) and the high price (US$ 150-200 per unit). They are difficult to transport because of their large size and are often shared by several families because of the high cost. Parabolic cookers have been successfully used in Nepal for many years. The Dutch-Nepali Vajra Foundation has supported the use of solar cookers in a Bhutanese refugee camp in Nepal since 1998, covering more than 75% of the camp population in 2006.

4. **Solar cooking for Darfur refugees in Chad:** Since 2005, Solar Cookers International has introduced CooKits in refugee camps in Chad in cooperation with Dutch NGO KoZon and local NGO Tchad Solaire. Solar cooking training and materials were provided to Darfur refugees living in Irimidi camp since 2005. In 2008, 85% of the 12,000 refugees prepared their meals using the CooKit. In the nearby Touloum camp, where Tchad Solaire has been working since July 2007, 55% of the refugees use solar cookers.

Solar cookers have many advantages and could provide an environmentally friendly alternative to firewood and other biomass fuels. In some cases, it makes sense to promote panel cookers in a camp setting. Since solar cookers always need to be combined with at least one additional fuel source, it may be wise to choose the least expensive solar cooker model. However, there are mixed experiences with the acceptance of panel cookers by refugees. The most common

complaint is the slow cooking time. Parabolic cookers seem to address the speed of cooking, but they are very expensive. Even though parabolic cookers cost more up front, over the long run - if they are highly valued and used consistently - they might be more effective than panel cookers. Generally, solar cooking is only an option in areas with regular sunshine, which also limits its application. For these and other reasons, it is always very important to discuss with the potential beneficiaries before starting up any solar project.

There is significant private support for solar energy, channeled by NGOs such as Solar Cookers International and Solar Household Energy Inc. This means that in situations where these private funds are available, solar cookers should be considered for use in combination with other fuels or fuel technologies, such as improved stoves or briquettes. A possible solution would be the development of a solar cooker model "in between" the large and expensive, yet flexible and fast cooking parabolic model and the small and cheaper, yet inflexible and very-slow cooking cardboard solar cooker model.

5. **Solar light and panels**: solar light is an ecological alternative source of energy for security and safety of displaced people. They can easily go out for toilet or something else. They can also be comfortable during the night before they sleep.

With small additional devices they can listen to the radio, charge phones, watch TV ……

Figure 5: Solar cookers

Figure 6 : Solar lamp

III.2.8 Biofuels

Biofuels are increasingly promoted as an alternative to fossil fuels. In refugee settings, there have been some small-scale efforts to introduce biofuels for cooking. This includes:

Ethanol stoves: in Ethiopia, the CleanCook Stove is distributed by the Gaia Association, an Ethiopian NGO. This Swedish designed stove runs on ethanol produced from molasses, a by-product of the local sugar industry. UNHCR and Gaia distribute ethanol fuel to some 17,000 users of the stoves in several Somali refugee camps throughout eastern Ethiopia. The stoves are healthier and more efficient than traditional wood stoves or open fires. Local manufacture is important to implement in all this cases so that they produce locally and spray at a cheap price. According to UNHCR, the use of this new stove has led to a reduction of 90-95% of environmental pressure in this arid and semi-arid region, reducing local tensions between refugees and host communities.

Jatropha oil: Jatropha curcas is planted throughout the tropics as a source of biodiesel. Jatropha oil can be used to generate energy in biogas installations, and it can be used directly to power diesel engines. The presscake can be used as fertilizer. So far, Jatropha has never been tested in humanitarian settings. It is inappropriate for use in crisis settings that are relatively quickly resolved, such as natural disasters. However, Jatropha would be worth exploring in protracted settings, since the plant requires at least two years to give seed. The potential of other biofuels (second generation) could also be explored as a long term option.

III.2.9 Grid electrical energy

The last and important point as others is electrical energy access for light, radio, television, charging phones……

It is neglected because of difficulties for implementation and the cost. Then humanitarian can sometimes use generators or solar panel to run program but nothing for refugees, however electricity is important in this context for full-blowing and it can reduce depression. The best is solar system (photovoltaic) because it is easy to set thought it is a little expensive it is free apart from small maintenance work. People can also receive smallest system just for primary use. This system can fit in most of the situations but we can valorize other electrical resources such as wind according to areas and easiness.

Table 1 : Overview of Dutch organisations' involvement in fuel-related policies

Organisation	Mission	Policy on fuel-related issues	Examples of projects related to fuel
1. IMPLEMENTING ORGANISATIONS			
MSF Holland http://www.artsenzondergrenzen.nl/	Independent, medical, emergency relief organisation that provides assistance to people worldwide. The Dutch organisation 'Artsen zonder Grenzen' (MSF-Holland) is a member of the international organisation 'Médecins Sans Frontières'; a network of 19 sections, each based in a different country.	No specific policy on fuel, but actively lobbying other organizations working in the same regions to work on improving fuel efficiency and alternative fuel. MSF is well aware of environmental impacts, indirectly through the security and health risks associated with fuelwood collection, and directly through the lack of construction materials for latrines and other facilities in the camps.	-
ZOA Refugee Care http://www.zoa.nl/worldwide	International NGO, operating in more than 10 countries worldwide. ZOA Refugee Care supports (former) refugees, internally displaced persons (IDPs), returnees and others who are affected by conflict or natural disasters in their transition from instability and lack of basic needs towards a situation in which conditions enabling a process of structural development have been (re-) established.	On a country level, there are fuel-related programmes. ZOA Refugee Care acknowledges that fuelwood is a major problem in refugee and IDP camps. Therefore ZOA is actively involved in this, by exploring alternative energy technologies and promoting fuel-efficient cooking.	Ethiopia: • Fuel-efficient stoves programme • Pilot programme on solar cooking (with Dutch Solar Cooking Foundation) • Exploration of potential of biogas (with SNV)
Red Cross NL http://www.rodekruis.nl	The Netherlands Red Cross helps, protects and takes care of people that are victims of war, conflict and disaster, and those who need assistance because of other circumstances. It is part of the international Red Cross and Red Crescent Movement	In the Red Cross/Red Crescent Code of Conduct, there is specific mentioning of environmental concerns in the design and management of relief programmes. Unfortunately, no interview could be held to find out more about the Netherlands Red Cross' policy on fuel-related issues.	-

Organisation	Mission	Policy on fuel-related issues	Examples of projects related to fuel
2. ORGANISATIONS WORKING THROUGH LOCAL OR INTERNATIONAL PARTNER ORGANIZATIONS			
Cordaid http://www.cordaid.nl/	International development organisation with a network of almost a thousand partner organisations in 36 countries in Africa, Asia and Latin America. Its counterpart organisations work on various themes, including participation, emergency aid and reconstruction, health and well-being and entrepreneurship.	In relation to the Emergency phase, Cordaid's policy is to help people relocate as quickly as possible to their home communities. There is some attention for fuel-related issues in the Emergency Unit. In the Reconstruction Unit, especially in the context of the African Great Lakes region, there has been a lot of attention for fuel issues. Cordaid is using the Sphere Handbook in its operations. Coordination with other NGOs has much improved over the last years, e.g. in response to the tsunami.	• Provision of fuel-efficient stoves in DRC and Sri Lanka • Supply of combustibles and forest management in Ngara, Tanzania
Oxfam Novib http://www.oxfamnovib.nl/	Oxfam Novib, a member of Oxfam International, is fighting for a just world without poverty. Oxfam Novib works with 830 counterparts in 60 countries worldwide.	Oxfam Novib is aware of the problems related to firewood and charcoal, but indicates that it is not directly working on fuel-related projects. This is mainly due to the fact that Oxfam Novib is not directly involved in the management of large refugee camps (cases in which dealing with fuel needs and the pressure on the environment are most urgent.) Some of Oxfam Novib's sister organisations, e.g. Oxfam GB, are working on fuel-related issues.	-

Organisation	Mission	Policy on fuel-related issues	Examples of projects related to fuel
ICCO & Kerk in Actie www.icco.nl	The mission of ICCO & Kerk in Actie is to work towards a world in which people live in dignity and prosperity, a world where poverty and injustice are no longer present. ICCO & Kerk in Actie is committed to providing access to basic social services, bringing about fair economic development and promoting peace and democracy. ICCO & Kerk in Actie is active in 55 countries in Africa, Asia, Latin America and Eastern Europe.	ICCO & Kerk in Actie is not implementing its own emergency aid projects in developing countries, but is always working with local partner organisations and, in case of an emergency, also through the ACT International Network (Action by Churches Together). At this moment, ICCO & Kerk in Actie is not involved in fuel-related projects, but underlines the importance to pay attention to fuel and energy strategies in emergency projects. In the regular development projects, attention is paid to aspects of climate change as part of the programme Fair Climate. ICCO & Kerk in Actie has adopted the Red Cross Code of Conduct and is using the Sphere Handbook.	• Darfur Emergency Relief Operation (DERO) programme, implemented by Norwegian Church Aid and local ACT partners, is involved in a tree planting programme in and around refugee camps. • ICCO & Kerk in Actie is supporting the Thailand Burma Border Consortium (TBBC) programme in Thailand. The TBBC programme includes fuel-related activities (supplying cooking fuel and fuel-efficient stoves) to lessen environmental damage caused by refugees gathering wood from the surrounding forests.
CARE Netherlands http://www.carenederland.org/	CARE is one of the world's top three aid agencies, fighting poverty and injustice in over 70 countries around the world and helping 55 million people each year to find routes out of poverty. Its mission is to create lasting change in poor communities, putting money where it is most needed.	CARE Netherlands, focusing on disaster risk reduction and peace building, is very interested in this topic. Unfortunately, no interview could be held to learn more about CARE Netherlands' policy on fuel-related issues in emergency response operations.	-

CONCLUSIONS & SUGGESTIONS

From the above we find that access to energy in emergencies is a big concern of WASH, especially in term of sanitation and hygiene because most of the fuels refugees are using daily are causing pollution of atmospheric air, then there is a big sanitation issue of air people are breathing creating a real risk of diseases at a large scale, especially respiratory ones, and in cold areas people don't bath because they need warm water, this causes also sickness due to lack of hygiene. Water supply needs energy to provide regularly water to refugees.

There is as well environmental degradation issue when threes are cut without regulation.

There is a tremendous amount of information on the use of fuelwood and other energy sources, and how to improve fuel-efficiency. At an international conference on alternative fuels and energy technologies in humanitarian settings, held in December 2008, many useful insights were generated from which this work has benefited. It was concluded that firewood is the default choice not because it is the best choice, but because it is often easiest or most obvious and often the one with which the beneficiaries are most familiar. If other, safer and more effective fuels or energy technologies are easily accessible to humanitarian aid agencies, firewood will not remain the default option.

It is striking that some emergency situations have become testing grounds for new and innovative technologies. In Darfur and Chad for instance, many efforts are ongoing to find a solution to the increasing firewood scarcity, including successful efforts with solar cooking in Chad. Refugee camps in Nepal have become a "cooking fuel laboratory" because of the need to find alternatives for kerosene. In Ethiopia, promising pilots have started around ethanol stoves, while the full potential of biofuels is yet to be explored in humanitarian settings.

In general, fuel scarcity is less of a problem in forest rich areas; as a consequence most fuel-related projects are undertaken in dry and forest poor regions. Fuel-related projects are also initiated in situations where refugees are nearby or inside areas of high conservation value. The appropriateness of energy sources and alternative technologies depends very much on the climatic and ecological conditions. In savannah or desert land, solar energy has high potential, but in a more humid environment, solar cooking does not make sense.

A significant improvement in answering the question on the most appropriate fuel source or technology has come in April 2009, when the "Decision Tree Diagram for Choosing a Cooking Fuel Strategy in Acute Emergencies" was published by the IASC Task Force SAFE. a number of fundamental questions were raised, which are intended to help camp managers and project

staff to determine which fuel type is best used under which circumstances. However, it remains to be seen whether this will always practically be applicable, and how helpful it is to field staff, given its complex nature and the limited time available during humanitarian crisis response situations.

We suggest prioritizing facilities according to the advantages case to case. Also it will be very important to sensitize refugees on risk of diseases caused by using of bad source of energy and on skills of using devices with good energy efficiency and also to sensitize them about environment protection.

We also think that as it is said in humanitarian laws, refugees have the right, as far as possible, to get light that can increase security, especially for vulnerable persons, electricity for daily need such as access to information and communication to help them to be comfortable.

However, the proposed responses can also be used in development environment to enhance the living standards of our citizens, especially in Africa because we are far behind in term of energy coverage in our daily life.

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ANNEXES

ANNEX 1 : Key energy challenges and solutions in selected country operations

Main energy problem	Sub-problems	Countries with the problem	Attempted solutions
Protection	Increased risk of arrest Increased risk of refoulement Jeopardizing of the voluntary nature of return Sexual and gender-based violence (SGBV) Jeopardizing of the institution of asylum	Bangladesh, Djibouti, Ethiopia, Tanzania, Chad, Namibia, Sudan, Nepal	Group firewood collection Reinforcement of women's participation and leadership Workshops on SGBV Solar street lights in the camp
Relations between host and displaced populations	Competition over natural resources	Chad, Ethiopia, Kenya, Nepal, Rwanda, Sudan	Energy strategies Energy-efficient stoves Stakeholder collaboration Environmental working groups Restrictions on the use of natural resources Purchase of some fuel from the local population
Environment	Degradation Deforestation Desertification Exploitation of natural resources	Chad, Nepal, Rwanda, Sudan, Sierra Leone	Reduction of consumption (techniques and restrictions) Sustainable harvesting of wood Alternative environmentally friendly energy sources Transportation of firewood from other areas Environmental education and sensitization campaigns
National resource restrictions	Discriminatory regulations relating to the use of energy resources Increased risk of harm if regulations are not followed due to lack of alternatives	Nepal, Rwanda, Tanzania	Organized wood supply and collection Advocacy for access rights and benefit-sharing Introduction of alternative fuels and livelihood options
Livelihoods	Restrictions on the right to work Lack of formal income-generating activities Excessive (and illegal) use of energy sources in order to generate income Increased protection and environmental risks Resale of distributed energy resources Lack of self-reliance and integration as a consequence of the lack of livelihood opportunities Potential dependency on fuel distribution	Chad, Ethiopia, Gambia, Kenya, Sudan, Nepal	Projects that reinforce self-reliance and created income-generating activities Low resale value of distributed fuels Advocacy for the right to work Mitigating environmental and protection risks Innovative projects that address both livelihoods and environmental protection Sustainable forestry-related livelihood options

ANNEX 2 : UNHCR's responsibilities in the inter-agency fuel strategy

Key activities	**Global cluster leads**	**Primarily responsible agencies**	**Relevant expertise**
Camp Coordination and Camp Management (CCCM)	**UNHCR** (conflicts), IOM (natural disasters)	**UNHCR**, IOM	NGOs
Emergency Shelter	**UNHCR** (conflicts), IFRC (natural disasters)	**UNHCR**, IFRC	UN-Habitat, WHO, UNEP, OCHA
Environment/Natural Resource Management	UNEP	**UNHCR**, FAO	UNEP, UNDP
Food/Nutrition	UNICEF	WFP	UNICEF, FAO, **UNHCR**, WHO
Health	WHO	WHO, UNFPA	**UNHCR,** WFP, UNICEF, NGOs
Information, Education and Communication (IEC)	UNICEF, SCF	OCHA, **UNHCR**	UNICEF, WFP, INEE
Livelihoods/Development/Food Security	FAO, UNDP	FAO, UNDP	**UNHCR**, WFP, NGOs
Protection	**UNHCR**	**UNHCR**, UNFPA, UNICEF	WFP, OCHA, NGOs

(Source: Modified from IASC Task Forced SAFE, 2008)