

Safe Access to Firewood and alternative Energy in Kenya: An Appraisal Report



17 – 31 July 2010

Author:

Mariangela Bizzarri, *Independent Consultant – Protection and Gender*

Team:

Catherine Bellamy, *WFP Humanitarian Policy and Transition Unit, Rome*

Mariangela Bizzarri, *Independent Consultant – Protection and Gender*

Maria Katajisto, *WFP Climate Change and Disaster Risk Reduction Unit, Rome*

Erin Patrick, *Women's Refugee Commission, New York*



Acknowledgements

The team is grateful to all those who contributed their inputs and experiences to the SAFE feasibility study in Kenya. The leadership of Kristoffer Welsien, and his enthusiasm for this project, were crucial to the conduction of the study. In addition, invaluable support was provided by WFP staff in the country office, and in the sub-offices in Kakuma and Dadaab, who have given generously of their time, expertise and experience.

Finally, the team would like to convey special thanks to all the men and women who openly shared their experiences, concerns and needs with us, for their warmth in welcoming us in their houses, without them this report would have not been possible.

The author wishes to acknowledge the contributions made by Maria Katajisto and Erin Patrick. More specifically, Maria's expertise on climate change and disaster risk reduction contributed to a more comprehensive analysis of the impacts of lack of access to cooking fuel on the environment in Kenya. Erin provided an analysis of the potentials for briquetting using *prosopis juliflora* (annex 3), which may inform future programming.



Table of Contents

Acknowledgements.....	2
Table of Contents.....	3
List of Acronyms	5
Executive Summary.....	7
1.1 Main Findings.....	7
1.1.1 Protection.....	7
1.1.2 Environment and climate change.....	7
1.1.3 Food and nutrition, and health.....	8
1.2 Existing fuel-related responses.....	9
1.2.1 Protection: GBV and firewood provision	9
1.2.2 Fuel-efficient stoves in schools	10
1.2.3 Fuel-efficient stoves at the household level in refugee camps.....	11
1.2.4 Alternative sources of household energy.....	11
1.2.5 Environmental and Climate Change Interventions.....	11
1.3 Proposed approach	12
2 Introduction	13
2.1 Background	13
2.2 Methodology	14
2.3 Situation analysis	15
2.3.1 Kakuma Refugee Camp.....	16
2.3.2 Dadaab Refugee Camps.....	17
2.4 Overview of WFP's assistance	19
3 An overview of the current situation with regard to cooking fuel in Kenya	19
3.1 Biomass: firewood and charcoal.....	20
3.2 Liquefied Petroleum Gas (LPG)and other sources of cooking fuel.....	21
4 Implications of the collection, supply and use of cooking fuel in Kenya	22
4.1 Protection risks during firewood collection	22
4.2 Environmental and Climate Change Impact	24
4.2.1 Kakuma.....	25
4.2.2 Dadaab.....	25
4.3 Implications for food, nutrition and health.....	26
5 Existing fuel-related responses	28
5.1 Protection.....	28
5.1.1 Prevention and response to GBV.....	28
5.1.2 Firewood provision.....	29
5.2 FES and alternative energy.....	30
5.2.1 Fuel-efficient stoves in WFP-assisted schools.....	31
5.2.2 Fuel-efficient stoves at the household level.....	33
5.2.3 Alternative sources of household energy.....	35
5.3 Environmental protection, regeneration and climate change.....	38
5.3.1 WFP and Adaptation to Climate Change.....	Error! Bookmark not defined.



5.3.2	GTZ.....	38
5.3.3	FAO Junior Farmer Field and Life Schools (JFFLS).....	39
5.3.4	UNDP/GEF Energy Access Programme Kenya (outside refugee camps).....	40
5.3.5	UNEP.....	40
6	Conclusions and ways forward: options for an integrated approach to safe access to firewood and alternative energy in Kenya.....	40
6.1	Why WFP?.....	40
6.2	Proposed approach.....	41
	Annex 1: Itinerary.....	43
	Annex 2: Pilot testing of cooking technologies in Kenya refugee camps.....	44
	Annex 3: Bio-coal/fuel and ethanol.....	46
	Annex 4: Charcoal briquette production from <i>prosopis juliflora</i>.....	48
	Annex 5: Climate Change Impacts in Kenya.....	51



List of Acronyms

AAF	African Adaptation Programme
AIDS	Acquired Immune Deficiency Syndrome
ASAL	Arid and Semi Arid Land
BMZ	Federal Ministry for Economic Cooperation and Development
CP	Country Programme
DRC	Danish Refugee Council
EDP	Energias de Portugal
EFSA	Emergency Food Security Assessment (WFP)
FAO	Food and Agriculture Organization
FFA	Food for Asset (WFP)
FFT	Food for Training (WFP)
FFW	Food for Work (WFP)
FGD	Focus Group Discussion
GBV	Gender Based Violence
GFD	General Food Distribution
GoK	Government of Kenya
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HGSF	Home Grown School Feeding Programme
HIV	Human Immunodeficiency Virus
IASC	Inter Agency Standing Committee
IDP	Internally Displaced People
IOM	International Organization for Migration
IRC	International Rescue Committee
JFFLS	Junior Farmer Field and Life School
LWF	Lutheran World Federation
LPG	Liquefied Petroleum Gas
NCKK	National Council of the Churches of Kenya
NEMA	National Environment Management Authority
NFI	Non-Food Item
NGO	Non-Governmental Organization
NRC	Norwegian Refugee Council
OEDP	Humanitarian Policy and Transition (WFP)
PISCES	Policy Innovation Systems for Clean Energy Security
PRRO	Protracted Relief and Recovery Operations (WFP)
PSEA	Protection from Sexual Exploitation and Abuse
SAFE	Safe Access to Firewood and alternative Energy
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme



UNFPA
UNHCR
USAID
VAT
WFP

United Nations Population Fund
United Nations High Commissioner for Refugees
United States Agency For International Development
Value Added Tax
World Food Programme





Executive Summary

In 2007 WFP agreed to co-chair the Inter-Agency Standing Committee (IASC) Task Force on Safe Access to Firewood and alternative Energy in Humanitarian Settings (SAFE) together with UNHCR and the Women's Refugee Commission (which worked under the authority of InterAction).

Following the launch of the SAFE guidance material in April 2009, WFP decided to undertake a series of feasibility studies to better understand how beneficiaries, particularly displaced populations, are coping with fuel scarcity and the related consequences, to take stock of existing responses by both WFP and partners, and to propose a comprehensive approach, based on the SAFE guidance, that addresses human and environmental protection, livelihoods, food and nutrition. To date, missions have been conducted in North Darfur (Sudan), Uganda, Haiti and Sri Lanka and Kenya, while another mission will take place in Ethiopia in the fall of 2010.

1.1 Main Findings

Below it is a brief summary of the main findings of the report. Following a request from WFP colleagues in Dadaab, the summary has been kept to the essentials for ease of consultation and reading, while further elaboration can be found in the respective sections of this report.

1.1.1 Protection

Protection risks associated with firewood collection appear higher in Dadaab than in Kakuma mainly due to higher population density and movement of the refugee population outside the camp. Risks include donkey carts being confiscated by the locals to avoid refugees accessing their resources, cart-loads of wood being burnt for retribution, refugees being intimidated and/or violently attacked during the collection process and incidents of gender-based violence (GBV).

While a recent report from the Danish and Norwegian Refugee Councils (DRC/NRC) as well as some humanitarian staff suggests a significant reduction in the number of GBV incidents associated with firewood collection, the information gathered during household interviews and focus group discussions with refugee women indicate that fear of and actual incidents of GBV are still present. It is, however, difficult to gauge the exact extent of these incidents, as admittedly many survivors do not report because of fear of stigma and abandonment by their families, retaliation by the perpetrators and lack of trust in the existing justice system.

1.1.2 Environment and climate change

Dadaab and Kakuma are located in environmentally fragile arid areas vulnerable to shifts in climate, where the high and increasing density of the population is adding pressure on already rapidly degrading land. Ten years of drought further add to the environmental stress. Tension is increasing between the host populations and refugees



over the use of scarce environmental resources. As a consequence, the availability of fuelwood for cooking has become a major challenge in the camps.

The findings of the SAFE mission suggest that environmental degradation in Kakuma is less severe than in Dadaab, mainly due to a smaller refugee population and a stricter encampment policy. However, a survey conducted in 2008 to assess the status of woodland degradation and fuelwood demand in **Kakuma** area found that the presence of refugees has negatively affected the environment.¹ There has been a reduction in both densities of trees and other plants and, species diversity, the closer one gets to the camp. Satellite imagery before and after the establishment of the camp supports the findings on the ground. While refugees are not allowed to collect firewood, demand for fuelwood by refugees led to the proliferation of trade in charcoal and firewood between refugees and the local community in both camp areas. Besides the firewood provided by GTZ, which covers about 20 percent of the refugees needs, locals also source and sell the balance. Unsustainable and inefficient charcoal production is another major contributor to depletion of natural resources, eventually leading to deforestation, which in turn is both a cause and effect of climate change.

Similarly in **Dadaab**, the protracted presence of a high number of refugees has placed a considerable strain on the natural resources of the surrounding area. Within a 0-20 km range, degradation of the woody biomass is very significant.² Moreover, conflict with local communities over access to and exploitation of natural resources is on the rise. At the time the SAFE mission took place, GTZ was just able to resume firewood collection and distribution after nearly two years' hiatus resulting from a dispute with local suppliers on the price of firewood.

1.1.3 Food and nutrition, and health

Interestingly, women in refugee camps in Kenya did not mention smoke and related health problems as a key issue of concern during focus group discussions. Cooking is done both indoors and outdoors, which explains the high value placed by refugee women on portability of the cooking device. In addition, most of the households visited both in Kakuma and Dadaab have a cooking space separate from the rest of the homestead, which reduces the amount of time spent in proximity to cooking smoke and ash. This arrangement, combined with the use of the *Mandeleo* stove can contribute to a reduction of the level of indoor air pollution. However, this issue may need to be further investigated, specifically looking into ventilation in existing cooking spaces and rates of respiratory diseases among women and children.

Food bartering and selling for complementary foods and/or firewood, skipping meals or reducing the meal size are common mechanisms adopted by refugee women to cope with scarcity of cooking fuel. In the absence of livelihoods options, food is one of the

¹ Kariuki J.G., Machua J.M., Luvanda A.M. and Kigomo J.N. (2008), *Baseline Survey of Woodland Utilization and Degradation Around Kakuma Refugee Camp*, Kenya Forestry Research Institute; Nairobi.
<http://www.kefri.org/jofka%20report%20finale.pdf>

² Danish Refugee Council (DRC) & Norwegian Refugee Council (NRC) (2010), *Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities*.



only sources of income that refugees have access to. This is not only negatively affecting the absorption and nutritional intake of WFP food, but may also lead to additional negative coping strategies, such as survival sex.

Negative survival strategies are more common in smaller households, as larger households benefit from economies of scale and varying individual food needs.

Food bartering seems more common in Kakuma than in Dadaab, as movement of refugees is more restricted in the former, and refugees have fewer alternative livelihood strategies.

While sensitization on fuel-saving food preparation practices and fuel-efficient cooking techniques were reportedly being conducted by WFP and partners, findings from the focus group discussions suggest the need for a more systematic and rigorous approach, and the need to target new arrivals.

1.2 Existing fuel-related responses

1.2.1 Protection: GBV and firewood provision

Following reports of incidents of gender-based violence in and outside the refugee camps in the early 1990s, numerous efforts have been placed by UNHCR, CARE, the National Council of the Churches of Kenya (NCCK) and others to prevent and respond to GBV cases. These include awareness raising on the risks among the refugee population, in schools, the establishment of reporting mechanisms, and income-generating opportunities for survivors of GBV. More recently, NGOs staff as well as incentive workers in the camps have been trained on protection from sexual exploitation and abuse (PSEA), also in the framework of WFP food distribution (for e.g. scoopers).

Although the feeling among humanitarian workers in Dadaab is that of an overall reduction in the number of GBV cases compared to the 1990s, the actual situation is not clear (see section 4.1 for a more comprehensive discussion over the current situation on GBV). Underreporting remains an issue of concern, particularly in relation to rape and female genital mutilation. Hence the need for further investigation and analysis of the current extent of GBV in the camps.

GTZ, with funds from UNHCR and BMZ, has been responsible for the provision of firewood to refugees in both Kakuma and Dadaab since 1998. The activity started primarily to address rape and violence against women and girls searching for and collecting firewood for cooking, and in later stages were environmental concerns added to the project's justifications. Only members of the host community are hired to collect the firewood, while a combination of refugees and community members are engaged in distribution.

Currently, distribution in Kakuma occurs roughly every two months and consists of an average of 10 kg of firewood per person (based on a family curve), which covers about 20 percent of the needs. As noted above, in Dadaab, distributions recently resumed after nearly two years' hiatus.



Provision of firewood as a means of responding to the cooking needs of the refugee population has been criticised by many for its inherently unsustainable nature. While at the moment rigorous monitoring on the use of dead wood only is taking place, there are still concerns about the risk of deforestation and environmental degradation this may contribute to. On the other hand, many argue that it is far better to regulate the firewood distribution and, as in the case of Kenya, work with the Government to monitor the availability of firewood rather than leaving the business to unauthorised actors to further exacerbating the environmental problems.

1.2.2 Fuel-efficient stoves in schools

WFP Kenya has been implementing energy-saving stoves in schools since 2004, but it was only in 2009 that stoves became an integral component of the school meals programme.

In 2010, US\$ 1 million from the UNDP-led African Adaptation Programme (AAP) was secured by WFP for the production and installation of 500 energy-saving stoves in 400 schools. Priority has been given to schools in urban centres, and districts neighbouring indigenous forests such as the Mau forest, which is the largest water catchment area in Kenya and where deforestation is reaching a critical point.

However, more funds are needed to support an additional 1,500 WFP-assisted schools as well as 1,700 Government-run schools under the Home Grown School Feeding Programme.

Schools using the Bellerive stoves mentioned the following benefits: Saving on firewood (up to 70 percent, depending on how the stove is used); cost savings; reduced cooking time; and less smoky kitchens. The firewood requirement for schools also poses an increasing challenge for the environment. Correct usage of the stove is critical in achieving higher efficiency. For example, one practice observed by the team throughout the mission was the tendency for cooks to not close the door of the stove's combustion chamber, as the firewood sticks they were using are often quite long, and are continually pushed further into the chamber as they burn.³ Leaving the door open throughout the cooking period causes dispersion of heat reduces the stove's efficiency rate. Additional sensitization of school cooks on the use of the stove may be needed to ensure proper efficiency and reduction in firewood consumption.

A cost-sharing arrangement has been agreed upon with the participating schools will serve to maximize the use of available resources and to ensure community ownership and care of the new cooking apparatus. In conjunction with the purchase of the energy-saving stoves, WFP is in the process of applying for a carbon credit project as the purchase would decrease CO₂ emission. If approved, WFP will utilize the credits to purchase more energy-saving stoves.

³ The more efficient method would be to chop the wood into smaller pieces that would allow the door to be closed during cooking, and only opened periodically when the fire needed to be tended.



1.2.3 Fuel-efficient stoves at the household level in refugee camps

GTZ is responsible for the production and distribution of energy-efficient stoves in both Kakuma and Dadaab camps.

The *Mandeleo* portable stove is very popular and widely accepted by women in the camps, for the following reasons: 1. It is not necessary to constantly attend to the fire, thus saving on time to do other chores; 2. Firewood saving; 3. Safety; 4. Portability.

At the time of the visit, GTZ reported that 55 percent of the population in Kakuma and 60 percent in Dadaab had received a stove.

In addition, some new stove models (Envirofit, JikoPoa, and Save80) were recently tested in Dadaab. Overall, preliminary feedback revealed users' preference for the *Mandeleo* portable stove. Besides familiarity with the existing stove (a fact which should not be discounted), other aspects that may have contributed to this preference are the need to chop the wood into small pieces to feed the fire in the other stove models, a practice which takes time and increases the amount of fire tending required.

All the above suggests that, introduction of new stove types must be accompanied by vigorous training and behaviour change sensitization.

1.2.4 Alternative sources of household energy

Alternative sources of household energy that were discussed during the mission include solar energy, ethanol, briquettes, and production of charcoal and bio-fuel from organic waste incineration.

Of particular relevance were the potentials of introducing ethanol gel and ethanol cooking devices, and briquetting from the *prosopis juliflora* that is widely available in the refugee areas (see also annexes 3 and 4 for details on alternative sources of fuel).

1.2.5 Environmental and Climate Change Interventions

A number of different environmental projects have been supported by agencies, including: distribution of tree seedlings, woodlots, establishment of greenbelts, kitchen gardening and irrigated horticulture, water harvesting and water source development, environmental working groups and awareness-raising. However, the harsh climate, poor soils and unreliable rainfall in the arid areas in question limit what these programmes can achieve in terms of environmental rehabilitation outside settlements.

Of particular interest to the current study are:

- WFP's food-for-asset activities to improve water systems to allow for horticulture, tree planting for fuelwood; and an integrated drought recovery programme through water harvesting (ponds and bunds), soil conservation, water resource development for human and animal consumption, irrigation, afforestation and support to livelihoods.



- WFP / Kenya Food Security Steering Group, a government-led inter-agency coordination body - integration of food security and climate outlooks into assessments and early warning efforts.
- GTZ's "trees for stoves" initiative; establishment of afforestation nurseries and green belts.
- FAO's Junior Field Farmer Schools to provide youth in refugee areas with livelihood opportunities.
- UNDP's Energy Access programme to enhance access to clean and sustainable energy services while supporting its environmental management for accelerated economic growth.

1.3 Proposed approach

The focus of the current SAFE project will be on energy efficient technologies and fuels to reduce the adverse impacts on the environment, and on the creation of livelihood opportunities to alleviate the economic burden of purchasing fuel and to reduce the likelihood of having to barter food rations.

Building on existing initiatives, the SAFE approach in Kenya seeks to: 1) reduce the cooking fuel needs of the refugee population through support to the production and distribution of energy-efficient stoves in camps; 2) apply innovative technologies to meet basic fuel needs in a less risky and more environmentally friendly way; 3) support livelihoods through engagement of women in stove production, piloting of fuel technologies and tree planting; and 4) ease the economic burden on families by continuing the introduction of energy-efficient stoves in WFP-assisted schools.

Activities will include:

- Pilot testing of briquetting using *prosopis juliflora* and ethanol gel and stoves in the refugee areas.
- Adequate testing of new energy-saving stoves (Envirofit, JikoPoa) with additional support from WFP, i.e. additional stoves, sensitization, and provision of tools for wood chopping.
- Support GTZ's efforts to target the remaining 40-50 percent of the population in the camps with an energy-saving stove.
- Enhance WFP, GTZ and partners tree planting, homestead and school gardening and other environmental initiatives and climate change efforts both with refugee and host communities.
- Continue discussion with CARE on the potential for production of bio-energy from waste.
- Explore opportunities for alternative financing resources, including carbon financing.



2 Introduction

2.1 Background

The World Food Programme (WFP), the Women's Refugee Commission (working under the authority of InterAction), and the UN High Commissioner for Refugees (UNHCR) co-chaired the InterAgency Standing Committee Task Force on Safe Access to Firewood and alternative Energy in Humanitarian Settings (IASC Task Force SAFE) from 2007 to 2009. Its purpose was *"to reduce exposure to violence, contribute to the protection of and ease the burden on those populations collecting wood in humanitarian settings worldwide, through solutions which will promote safe access to appropriate energy and reduce environmental impacts while ensuring accountability."*

During its time as co-chair of the Task Force, WFP conducted a survey of more than 20 countries across Africa, Asia and the Americas to map out how access (and lack thereof) to cooking fuel impacts beneficiaries' food and nutritional status. The survey revealed that beneficiaries often resort to negative coping mechanisms to cook WFP food. Such negative coping mechanisms include women being forced to collect firewood in dangerous environments, exposing them to rape and other forms of gender based violence (GBV); under-cooking food to save on fuel; and bartering or selling part of their rations for cooking fuel.

In addition to exposing beneficiaries to violence – especially women and young girls, who are most often responsible for procuring cooking fuel – these coping mechanisms are in many cases limiting the intake and nutritional absorption of WFP rations, reducing the impact of food assistance on relieving hunger and fighting under-nutrition.

Firewood harvesting also contributes to deforestation and the loss of important natural resources. In addition to the increased distance women and children have to travel to find available firewood and the increased exposure to risk of attack, the depletion of natural resources significantly limits populations' livelihood opportunities. As the linkages between climate change and food insecurity become more evident, the sustainable use of forests and natural resources becomes more critical.

WFP's interest and involvement in ensuring safe access to appropriate cooking fuel has many facets: protection and safety of beneficiaries; effectiveness of food and nutrition interventions; environmental protection including natural resource management and climate change adaptation; and creation of livelihood opportunities.

To address these challenges, WFP decided to undertake a series of feasibility studies in countries where fuel scarcity is negatively affecting WFP beneficiaries. The purpose of these studies is to understand how beneficiaries are coping with fuel scarcity and the multiple implications on their lives and livelihoods; to take stock of existing responses by both WFP and partners; and to propose a comprehensive multi-sectoral strategy to cooking fuel needs that addresses human and environmental protection, livelihoods,



food and nutrition as well as the health problems that derive from the use of solid fuel for cooking.

This report provides the basis for a WFP-led project on safe access to firewood and alternative energy in Kenya.

2.2 Methodology

Prior to the mission to Kenya, the team⁴ undertook a preliminary review of relevant literature, including situational reports and analyses, food security and household energy assessments and relevant WFP project documents. The SAFE framework of analysis and related set of questions (developed and used in previous studies) were also adapted to the Kenya context.

During the mission, meetings were conducted with WFP country and sub-office staff as well with a wide range of relevant stakeholders such as UN agencies, NGOs and government representatives. The study further involved extensive consultations with beneficiaries in both Kakuma and Dadaab. More specifically, focus group discussions and household level interviews were conducted in Kakuma camp 1⁵ with Somali, Congolese and Sudanese women, and in Hagadera, Ifo, and Dagahaley refugee camps in Dadaab. Finally, this report was complemented by additional studies, reports and technical data gathered during the mission.⁶

The specific focus of the mission was to better understand the situation with regard to access to cooking fuel in the two refugee-hosting areas in Kenya, Dadaab and Kakuma, as well in WFP-assisted schools in Nairobi. Timing of the mission was particularly crucial as WFP implementation of fuel-efficient stoves under the school meals programme already started in 2009⁷ and it was possible to gather some information on the impacts this program is having on the schools.

Findings from this study are intended to inform a WFP strategy for addressing the cooking fuel needs of refugees and the surrounding host communities that are affected by environmental degradation. In addition, the strategy will support the WFP country office in its efforts to cover all assisted schools, including those under the home grown school feeding (HGSF)⁸ programme, with fuel-efficient stoves.

⁴ The team comprised Catherine Bellamy and Maria Katajisto from WFP HQ in Rome, Mariangela Bizzarri, independent consultant who served as team leader, and Erin Patrick from the Women's Refugee Commission in New York. Various representatives of WFP Kenya office accompanied the team during the field visits.

⁵ The refugee camp in Kakuma is currently divided in three zones. Kakuma 1 is the oldest, dating back to 1992, while 2 and 3 were subsequently added.

⁶ These include project documents from UNDP and UNEP on the environment and access to energy as well as primary data from WFP and other relevant organizations in refugee areas.

⁷ More information on this will be provided in the section on existing responses below.

⁸ Home grown school feeding programme is a school meals programme that, to the extent possible, provides food that is produced and purchased within the country. More specifically, it links school feeding with local small-scale farmers, creating an ongoing market for their agricultural products. Kenya is one of twelve countries that piloted the new approach. For more information on HGSF refer to: <http://www.wfp.org/content/home-grown-school-feeding>, retrieved 15.07.2010.



2.3 Situation analysis

Kenya is a low-income, food-deficit country that ranks 147th of 182 countries on the human development index.⁹ The Kenyan climate varies from arid and semi-arid (80%) in the northern and eastern parts of the country to tropical along the coast. The terrain in Kenya features low plains along the coast; central highlands bisected by the Great Rift Valley; Africa's second highest peak: Mount Kenya; and desert-like conditions in the north, including Kakuma and Dadaab refugee camps, where climatic shocks, food insecurity and poverty are pervasive.

The majority of the populations in the marginal agricultural areas in the north are pastoralists and agro-pastoralists. Of Kenya's 37.2 million people, 80 percent live in rural areas, 70 percent in arid lands and 51 percent in semi-arid lands and are unable to meet daily food requirements.¹⁰

Kenya is seriously affected by climate change. Over the last decade, climate shocks in Kenya, such as droughts and floods, have increased in frequency and the two rainy seasons, which used to start within the same weeks every year, are now unpredictable.¹¹ These extreme events have had negative socio-economic impacts on almost all sectors such as health, agriculture, livestock, environment, hydropower generation and tourism.¹² After an extended period of drought in Kenya, improved short rains towards the end of 2009 and early 2010 brought some improvement in the food situation in the country. However, after a succession of poor or failed rains since 2007, the recovery process is slow, and there is still a need to help drought-affected populations while they build up their food reserves and savings.

Over the last 50 years, Kenya's forest cover has reduced from 12% to 1.7% today.¹³ Coupled with the effects of climate change, this forest depletion has led to increased evaporation, soil erosion, floods, drought and food insecurity. Numerous formerly permanent rivers are now only seasonal, which has decreased output from irrigation-based agriculture and significantly reduced electricity output for hydropower plants. The re-current droughts have forced many marginal farmers to resort to charcoal or firewood selling as a source of income.¹⁴ The increased illegal logging in Kenya's forests is currently leading to further deterioration of the environment. However, the Government of Kenya (GoK) is putting significant effort into curbing illegal logging by imposing heavy penalties and creating a licence system. While the focus from the Government of Kenya and partners has been on tree planting, reducing the demand of firewood in Kenya has not been receiving equal attention.¹⁵

⁹ <http://hdr.undp.org/en/statistics/>.

¹⁰ Kenya National Bureau of Statistics. (2009), *Basic Report on Well-Being in Kenya*. Nairobi. A "food-poor" household is one that is unable to purchase basic food providing 2,250 kcal.

¹¹ Meeting with WFP Kenya, 19.07.2010.

¹² Kenya Meteorological Department: <http://www.climateadaptation.net/docs/papers/muchemi.pdf>.

¹³ Meeting with UNEP, Nairobi, 30.07.2010.

¹⁴ Meeting with WFP Kenya, Nairobi, 19.07.2010.

¹⁵ Ibid.



Kenya has hosted refugees since 1991. Most of them are confined in designated camps, with no or limited freedom of movement.¹⁶ Another significant restriction that applies to refugees in Kenya is in relation to employment. Refugees are restricted from engaging in meaningful agriculture or economic activities outside the camps.¹⁷

Only humanitarian organizations are allowed to employ refugees as “incentive” or “extension” workers to support their daily operations. In Kakuma, for example, extension workers receive a set salary of 3,500 Kshs per month (US\$ 43.61) for full-time work, while members of the local Turkana community are paid 5,000 Kshs (US\$ 62.31).¹⁸ In Dadaab, refugees are paid 5,500 Kshs (US\$ 68.54), while locals earn 6,800 Kshs (US\$ 84.74).¹⁹ Differences between refugees and hosts are due to the fact that minimum wage standards for nationals exist in Kenya and should be respected. In general terms, however, the number of extension workers is so low and alternative livelihood options so limited, that refugees are overwhelmingly - if not entirely - dependent on aid.

Food bartering and selling are major sources of household income for refugees in Kenya, with the money being used to buy complementary foods (particularly milk for children), school supplies and firewood.

Garissa (Dadaab) and Turkana (Kakuma) are arid areas where environmental vulnerability is compounded by the protracted presence and high density of refugees, pressure on rapidly degrading land, increasingly erratic rainfall and poor roads that constrain service delivery. Host populations are concerned about the protracted use of ancestral lands for refugee camps and about environmental degradation, which has a negative effect on their livelihoods.²⁰

2.3.1 Kakuma Refugee Camp

Kakuma refugee camp (“kakuma” in Swahili means *nowhere*) is located in Turkana West District, in the north-western region of Kenya, about 130 km east of the Kenya-Sudan border. The climate in Kakuma is semi-arid, characterized by long dry spells, high temperatures and two limited rainy seasons.

The camp was first established in 1992 to serve refugees fleeing the North-South conflict in Sudan, and has since expanded to accommodate refugees from other nationalities.

At the time of the mission, the camp hosted a total of 72,295 refugees, of which 41,594 are Somalis (55% of the total refugee population in the camp), 20,638 are Sudanese

¹⁶ According to the 2006 Refugee Act, a travel document should be co-issued by UNHCR and the District Refugee Authority (DRA) to any refugee wishing to go outside the camp. Art. 17 (f).

¹⁷ Ibid, art. 16 (4).

¹⁸ Meeting with GTZ, Kakuma, 21.07.2010. These payment rates were negotiated by humanitarian agencies and the local authorities, and nearly all agencies follow them.

¹⁹ Meeting with GTZ, Dadaab, 26.07.2010.

²⁰ WFP Protracted Relief and Recovery Operations (PRRO) 10666.0.



and the remaining 10,063 are of various nationalities, including Eritreans, Ethiopians, Rwandese, Congolese, Ugandans and Burundians.²¹

The camp's terrain is dry, flat and barren and dust storms are a daily occurrence. Water is scarce and rain is occasional and frequently leads to flooding. The Turkana pastoralists inhabit the surrounding of the camp.²² The population density is reportedly quite low, however, the mobility of the local population makes estimates difficult. Both refugees and the host community depend on the same natural resources, hence conflict between the two groups is not uncommon.

The camp is administered by UNHCR with the support of a wide range of organizations, including WFP.²³ Since the Government's Refugee Act was instituted in 2006, a national camp manager has been appointed by the GoK to oversee camp affairs and liaise with humanitarian organizations.

At first sight, the camp is a "small city" of thatched roof huts, tents and mud abodes. Boundaries in Kakuma are very well defined, to the point that permission is needed to enter by car into the camp. There is also a seasonal river that delimits the eastern border of the camp. In addition, refugees and the host population do not share the same ethnicity and differences in their appearance are very evident. All in all, it is particularly difficult for refugees to venture outside the camp without being noticed.

The camp hosts a total of 14 schools, which serve 15,138 children (8,865 boys and 6,273 girls), both refugees and locals. There is also one girls-only boarding school that was established with funds from Angelina Jolie.

In terms of intra-camp socio-economic dynamics, according to informants Somalis tend to be better off because they are perceived as being more entrepreneurial/business oriented than other nationalities. Sudanese, on the other hand are often better educated than other populations as they have been in the camp longer.²⁴

Informal labour is common within the camp and takes the form of domestic work (washing clothes, dishes, etc.), providing transport for food and other goods and selling firewood and charcoal. Interestingly, in all of these instances, it is the Turkana people being hired by Somalis and Sudanese refugees to perform these duties. According to informants, food is often the main 'currency' used to compensate labour activities or to buy goods from the Turkana population.

2.3.2 Dadaab Refugee Camps

The Dadaab refugee camps are about 70 Km away from the Somali border, making it easily accessible to refugees from Somalia. Large influxes of refugees since the collapse

²¹ Data from WFP Sub-Office Kakuma, 21.07.2010.

²² The Turkana people are an ethnic group inhabiting the Turkana District in northwest Kenya. They are mainly nomadic pastoralists and they are widely known for their clothing, wraps made of woven material, and multiple beads necklaces.

²³ Others are the International Organization for Migration (IOM), the Lutheran World Federation (LWF), the International Rescue Committee (IRC), the National Council of Churches in Kenya (NCCCK), FilmAid International, and the Salesians of Don Bosco in Kenya.

²⁴ Meeting with WFP staff Kakuma, 21.07.2010.



of the Somali government in 1991 led to the establishment of Ifo, Dagahaley and Hagadera camps situated within an area of 13 sq km around Dadaab town.

The Dadaab camps are located in ecologically fragile, arid and semi-arid lands (ASAL) that are characterized by low rainfall, poor soils and low productivity, hence scarce natural resources. Nomadic pastoralism is the traditional land use system. The rise in population and increased livestock density that has accompanied the arrival of the refugees has caused significant strain on the local natural resources. The *de facto* confinement of refugees in the camps, coupled with the very poor resource base in and around the camps, implies that refugees must be provided with most basic needs including water, food, housing and household energy. When some basic needs, especially firewood and shelter construction materials, are not provided, it creates conflict with the host community as the refugees go to the surrounding environment to fetch such items for themselves.

Population in the camps fluctuates significantly. At the time of the mission, the camps hosted a total of 279,250 refugees, the majority of whom are Somalis, with a monthly influx of 4,500 new arrivals.²⁵

The host community population has also been increasing, from 5,000 in 1991 to a current estimate of 125,000. Hosts are also targeted with services and assistance by humanitarian organizations, in part to mitigate tensions with refugees. However, the development of the region has not matched the rest of the country. Social amenities and infrastructure are limited which leaves the host community dependant on the refugee programme.

Contrary to Kakuma, host communities and refugees in Dadaab share the same ethnicity. Despite this fact, however, relationships between the two groups tend to be tenuous. This is the result of a series of factors. First of all, camp congestion and dimension is higher in Dadaab than in Kakuma. Secondly, control over population movement in and out of the camps tends to be more difficult, as boundaries in Dadaab are less clearly defined and the distinction between refugees and locals is harder to make. Finally, movement of refugees outside the camp for firewood collection and other activities is higher in Dadaab than in Kakuma, thus fuelling competition with locals over access to and control over existing resources.

This situation has raised the concerns of host community in several ways:

- (i) **Environmental degradation:** The unsustainable high abstraction of water, biomass materials for shelter constructions and domestic energy, grazing, loss of biodiversity due to overuse of certain plant species and wildlife displacement/poaching has been compounded by camp congestion and limited mitigation measures.
- (ii) **Disparity in accessing social services and economic opportunities** between the refugee camps and neighbouring host communities.

²⁵ Meeting with WFP Refugee Unit, Nairobi, 19.07.2010.



- (iii) **Tension precipitated by competition for natural resources:** e.g. firewood and construction materials.
- (iv) **Inappropriate location/ site of the camps:** Camps are located in the flood plain of Ewaso Nyiro, which is traditionally a dry season grazing area.²⁶

2.4 Overview of WFP's assistance

WFP's operations in Kenya include supporting the education of vulnerable children in food-insecure areas and support to populations affected by HIV and AIDS; protection and recovery of livelihoods in the arid and semi-arid areas of the country; and food assistance to refugees.²⁷

WFP is currently feeding nearly 1 million children across Kenya. Under its country programme, assistance is provided to pre- and primary school children in arid and semi-arid districts and poor urban settlements in Nairobi and to 75,000 people infected or affected by HIV and AIDS.

WFP has been assisting refugees since camps inception in 1991. At present, a total of more than 350,000 refugees live on WFP's food assistance. Food for asset (FFA), school feeding and selective feeding for malnourished children under five are amongst the activities implemented in the camps besides general food distribution (GFD), also at the benefit of host populations. More specifically, recovery activities build communities' (both refugees and hosts) resilience to climate change and include food-supporting working activities on distribution of tree seedlings, woodlots, establishment of greenbelts, kitchen gardening and irrigated horticulture, water harvesting and water source development, environmental working groups and awareness-raising. 819 projects have been completed in 2010 only (as of April) with a total of 723,000 people benefiting.

Despite these activities, the Government's encampment policy severely limits refugees' self-reliance, thus dependency on aid is high.

3 An overview of the current situation with regard to cooking fuel in Kenya

This section analyses the main sources of cooking fuel, their availability and accessibility, including trade and prices in Kenya.

²⁶ UNEP, GoK, NETFUND (2010), *Dadaab Integrated Environmental Management programme', A partnership framework for sustainable environmental management of refugee hosting areas of Dadaab*. Nairobi.

²⁷ Country Programme (CP) 10668.0; Protracted Relief and Recovery Operations (PRRO) 10666.0; and PRRO 10258.3 respectively.



3.1 Biomass: firewood and charcoal

According to UNEP, charcoal and firewood meet about 70 percent of the total energy needs in Kenya, fourth-fifth of which is consumed by households.²⁸ Firewood is the key source of energy in rural areas, providing over 89 percent of household energy requirements.²⁹ The time spent gathering firewood is an important factor in the welfare of rural households. Increased scarcity and inadequate access to firewood resulting from unsustainable and protracted use of natural resources significantly reduces the time available for other activities. Additional information on firewood provision to refugees in camps is provided in section 5.1.2 below.

Charcoal seems to be more commonly used in urban settings. For example, the majority of women (13) in a focus group discussion in Kibera, Nairobi, reported using charcoal, while only a few used firewood, and many used both. Many agree that charcoal is well suited for simmering, but less so for rapid boiling. For example, since maize requires long cooking time, it would be too expensive to use charcoal only, thus some women may use a combination of firewood and charcoal.

Annual charcoal production in Kenya is estimated to be around 1.6 million tons and households are consuming between 350 and 600 kg annually. The charcoal industry contributes an estimated US\$ 400 million to the Kenyan economy, making it a significant economic factor.³⁰ An estimated 100,000 people are involved in the production and trade of charcoal, making it number four in employment generation after agriculture and forestry, manufacturing, the public sector, and the service industry. It is estimated that a total of about 2 million people in Kenya are dependent on the charcoal industry directly or indirectly.³¹

The current Energy Policy in Kenya contains a series of provisions on charcoal:

- Increasing the adoption rate of energy saving charcoal stoves to 100 percent by 2020 in urban areas
- Increasing the adoption rate of energy saving charcoal stoves to 60 percent by 2020 in rural areas
- Increasing efficiency of energy-saving charcoal stoves to 45-50 percent by 2020
- Promote fuel alternatives, including LPG.³²

Although charcoal meets a significant proportion of energy needs, its production and distribution remains a risky and highly inefficient undertaking. Over the last two decades, official decrees put various bans and restrictions on the production and

²⁸ UNEP (2006), *Kenya: Integrated Assessment of the Energy Policy – With a Focus on the Transport and Household Energy Sector*, Nairobi: UNEP. Also, meeting with UNEP, Nairobi, 30.07.2010.

²⁹ Ibid. p. 51.

³⁰ Mutimba, Stephen (2005), *National Charcoal Survey: Summary Report*, ESDA: Nairobi.

³¹ GTZ (02008), *Charcoal in Africa Importance, Problems and Possible Solution Strategies*.
<http://www.gtz.de/de/dokumente/gtz2008-en-charcoal-in-africa.pdf>.

³² UNEP (2006), *Kenya: Integrated Assessment of the Energy Policy – With a Focus on the Transport and Household Energy Sector*, Nairobi: UNEP, p. 55.



transportation of charcoal. For example, the Energy Act of 2006 established a licence system to ensure sustainable charcoal production in Kenya.³³ While charcoal production and use is not encouraged, the license system is intended to better regulate and monitor a market that *de facto* exists. Despite these efforts, however, reality shows that policies are rarely implemented and illegal charcoal production and commercialization exists.

Charcoal production uses vast amounts of live wood, thus contributing to depletion of natural resources and eventually leading to deforestation, which in turn is both a cause and effect of climate change. One cause of the problem is the use of traditional kilns with very low efficiency, which require as much as 10 kg of wood to produce 1 kg of charcoal. These types of kilns are widespread in many parts of Kenya. In addition, traditional kilns release large amounts of greenhouse gases during carbonisation contributing to climate change. On the consumption side, burning charcoal in traditional stoves is very inefficient and results in increased demand. Existing restrictions on charcoal production and commercialization have led to producers burning charcoal in secrecy, which has halted investment in improved technologies.³⁴

Cooking fuel is relatively expensive in Kenya. For example, a large sack of charcoal in the outskirts of Nairobi costs between 1,200-1,500 Kshs (US\$ 15-19). Women in Kibera slum (Nairobi) reported using 90 Kshs (US\$ 1.12) worth of charcoal to cook three meals a day, while they would need to spend 100 Kshs for the same amount of firewood, while in Dadaab one donkey cart of firewood costs about US\$ 30. Considering an average reported daily earning of 170 Kshs (US\$ 2.12), the cost of cooking fuel (whatever it may be) appears prohibitive to most.³⁵

3.2 Liquefied Petroleum Gas (LPG)³⁶ and other sources of cooking fuel

Other important sources of cooking fuel in Kenya include electricity, kerosene and LPG. Access to LPG is estimated to be 7.8 percent annually, of which 23 percent of users are in urban areas and only 1.8 percent in rural settings.³⁷ Refilling a 13 kg cylinder costs 2,000 Kshs (US\$ 25), while a new one costs 7,000 Kshs (US\$ 87.23). The LPG stove itself costs is 28,000 Kshs (US\$ 349) for a 4 burner model and 3,000 Kshs (US\$ 187) for a 2 burner model, making LPG a very expensive option.

³³ Ministry of Energy (2006), *Energy Act*, Nairobi.

³⁴ GTZ (02008), *Charcoal in Africa Importance, Problems and Possible Solution Strategies*.
<http://www.gtz.de/de/dokumente/gtz2008-en-charcoal-in-africa.pdf>.

³⁵ Meeting with HIV infected/affected people in Niatoto centre, Kibera (Nairobi), 20.07.2010.

³⁶ LPG is a hydrocarbon gas popularly used as cooking fuel in many rural areas and developing countries. It comes in portable canisters of varying size, which can be re-filled from a main tank or at a refill station. LPG is typically well liked by its users, as it burns very cleanly (much more so than kerosene) and the temperature can be easily adjusted. In many areas, LPG is considered a high-status fuel. However, it is a pressurized gas and as such can be dangerous if improperly stored or used. Significantly safety and usage trainings and awareness-raising on risks associated with the use of gas-based fuels are required if LPG is to be introduced to populations that are not familiar with them. In areas where LPG is not locally produced, it is quite expensive. Transportation, storage and distribution costs can add to the total price. Source: SAFE TOT Trainers' Guide, www.fuelnetwork.org. For additional information on LPG's origin, production and uses refer to: http://en.wikipedia.org/wiki/Liquefied_petroleum_gas.

³⁷ UNEP (2006), *Kenya: Integrated Assessment of the Energy Policy – With a Focus on the Transport and Household Energy Sector*, Nairobi: UNEP, p. 57.



Production of ethanol as fuel has recently restarted after an unsuccessful attempt in 1993.³⁸ Ethanol is currently supplied in Kenya at 125 Kshs (US\$ 1.56) per litre.

Kerosene is the other source of energy that was variously discussed during the mission. The few women in Kibera who used kerosene reported spending 140 Kshs (US\$ 1.75) for a day of cooking, while the stove costs between 400 and 800 Kshs (US\$ 5-10), depending on the number of burners.

Other alternative sources of cooking fuel are explored in section 5.2.3 below.

4 Implications of the collection, supply and use of cooking fuel in Kenya

This section explores the concerns associated with the collection, supply and use of cooking fuel in Kenya. More specifically, emphasis has been placed on the following aspects: protection and safety of beneficiaries while searching for and using firewood; the impact of lack of access to cooking fuel on food and nutrition, with particular focus on the refugee population; and the regeneration and management of natural resources. These aspects have been selected for their relevance to WFP's programming and as entry points for possible future interventions by the organization.

Contrary to other settings, in Kenya firewood collection and selling does not appear to be a major livelihood option for refugees. Restrictions on refugees' engagement in employment opportunities and movement outside the designated camp areas are the major stumbling blocks to collection and sale of firewood for income. Only Kenyan nationals are hired by GTZ for firewood collection.

4.1 Protection risks during firewood collection

UNHCR representatives confirmed the existence of protection risks associated with the search for and collection of firewood, particularly in **Dadaab**. Some examples of these risks include donkey carts being confiscated by the locals to avoid refugees accessing their resources, cart loads being burnt for retribution, refugees being intimidated and/or violently attacked during the collection process and incidents of gender-based violence (GBV).

All informants indicated that firewood collection is an important risk factor for GBV in the camps. The current extent of GBV, however, is not clear. While women in focus group discussions recognized that GBV during firewood collection was considerably higher in the 1990s than it is today,³⁹ they are still vocally concerned about it. This is somehow in contrast with the significant decrease in GBV incidents that was reported by some organizations working in the camps. According to these informants, firewood provision by GTZ, coupled with awareness raising on GBV in schools and the

³⁸ UNDP/Ministry of Energy/PISCES/Practical Action (2009), *Piloting Bioethanol as an Alternative Household Fuel in Western Kenya*. Nairobi, p. 4. More information on the potential of ethanol as cooking fuel can be found in section 5.2.3 below.

³⁹ Up to 200 cases per month were recorded in the 1990s. Meeting with women leaders, Ifo, Dadaab, 27.07.2010.



establishment of adequate reporting and support mechanisms in the last two decades has contributed to a significant decrease in the number of GBV incidents in the camps.⁴⁰ This apparent decrease was also confirmed by a recent report of the Danish and Norwegian Refugee Councils (DRC/NRC).⁴¹

However, prior to the recent distribution (July 2010; during the SAFE mission) firewood had not been provided in the Dadaab camp for more than a year. If firewood provision is indeed a key reason for the decrease in incidents of GBV, one would have reasonably expected to see an increase in the number of cases during this nearly two-year gap in distribution, since without the distribution, refugees were forced to fetch firewood for themselves. Part of the reason for the decrease may be that as informants highlighted, it is now mostly men who fetch firewood since the distances to collection sites are now too far to be covered by women (men typically collect firewood using donkey carts and are therefore able to travel longer distances and stay overnight or longer in the bush, whereas women typically collect only what they can carry on their backs).

It is moreover important to make the distinction between commercial and household consumption-related firewood collection. While in fact men are those engaged in commercial firewood collection, women do continue venturing outside the camps to cater for their daily cooking needs. For example, women leaders in Ifo camp reported needing to collect firewood 3 times a week if they use an energy-saving stove, and 5 times per week if cooking with a three stone fire. They normally leave early in the morning and come back at 4-5 in the afternoon. It takes about 4 hours to reach the collection site. Men, on the other hand, venture farther away with their donkeys (up to 50 km) and normally spend 1-2 nights in the bush to collect firewood.

When asked about their main concerns during firewood collection, women mentioned distance, children being left behind unattended at the household, exposure to rape and other types of assaults, fear of snakes and scorpions, and the physical burden of carrying heavy wood back home. When asked if they had ever experienced sexual assault during firewood collection, however, most women indicated they had not⁴², though given their experiences in the 1990s, they still feared the possibility.

It is also possible that refugee women are reluctant to report. Some colleagues from WFP, for example, observed that refugees may not feel comfortable reporting on protection issues that are happening outside the camps, as in principle movement outside the camp is not allowed. Likewise, protection mechanisms for refugees outside the camps are more difficult to implement. Moreover, many of the children born out of rape in the past were stigmatized, and many survivors do not want to report for fear of being stigmatized and/or abandoned by their families and communities. Lack of trust in

⁴⁰ Meeting with CARE and UNHCR, 26 and 27.07.2010.

⁴¹ Danish Refugee Council (DRC) & Norwegian Refugee Council (NRC) (2010), *Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities*.

⁴² There were however a few notable examples. According to some women in Hagadera, in May two school-age girls (17 and 18 years old) were raped and genitally mutilated while collecting firewood. The case was reported to the police, but the perpetrator was soon released after payment of a bill. Focus group discussion with women in Hagadera, 27.07.2010.



the legal system and a feeling that their complaints were not sufficiently addressed, were also pervasive. Finally, fear of retaliation is another hindering factor.

According to women interviewed during the mission, perpetrators often flee to the bush, and even if they are brought to the police, they are very often released in exchange for money.⁴³ Some women reported fearing being harassed or threatened by their attackers once they were released; or that they had been intimidated by the perpetrators into not reporting in the first place. Drawing on these varied and serious concerns, it may be reasonable to conclude that reported incidents alone are not enough to gauge the current extent of GBV in the camps.

All the above suggests the need for further scrutiny of GBV issues in and outside the camps and more rigorous monitoring of the situation, especially in relation to firewood collection and new arrivals.

A different situation was found in **Kakuma**, where movement outside the camp is very limited. Refugees rely primarily on GTZ-distributed firewood, which lasts for about 7-15 days depending on the family size. Once that rather limited supply is exhausted, women resort to negative coping strategies such as bartering food for fuel, skipping meals, borrowing and using fencing sticks.⁴⁴ In addition, some Congolese and Sudanese women reported having to collect their own wood and facing some risks while doing so, especially if they go in the evening. However, while risks of GBV during firewood collection were reportedly high in the early 1990s, now concerns appear to have been significantly reduced. According to UNHCR, only 4 cases of GBV in association with firewood distribution were reported since January 2010. Moreover, the few women that still do go outside the camp to fetch firewood are mainly new arrivals, as they lack family support that would allow them to do otherwise, and single women.

Finally, other general negative coping strategies adopted by people in the camp include survival sex and child labour.

4.2 Environmental Impacts

Environmental degradation due to collection of firewood, fodder and shelter materials can result in soil erosion, surface water pollution, flash-flooding, and loss of natural habitats, which limits livelihoods opportunities and can negatively impact food security.

Studies show that excessive use of firewood and charcoal has contributed to environmental degradation throughout Kenya. One of the most significant impacts of unsustainable use of natural resources is **deforestation**. Between 1990 and 2005, Kenya lost 5%, or around 186,000 hectares, of its forest cover.⁴⁵

Over the last 50 years Kenya's forest cover has reduced from 12% to 1.7% today.⁴⁶ Deforestation is leading to an increase in greenhouse gas emissions and a consequent

⁴³ Though it was noted that the concept of bail is not well-understood among the Somalis, and may result in misunderstandings.

⁴⁴ Focus group discussion and household interviews, Kakuma, 21-22.07.2010.

⁴⁵ Meeting with WFP Kenya, 19.07.2010.

⁴⁶ Meeting with UNEP, Nairobi, 30.07.2010.



acceleration of climate change impacts.⁴⁷ Both Kakuma and Dadaab camps are located in environmentally fragile arid area where signs of desertification were present long before the arrival of refugees. Ten years of drought add to the environmental stress. However, protracted unsustainable use of tree resources has made woodlands degradation a problem for both locals and refugees. Tension is increasing between the host populations and refugees over the use of scarce environmental resources, and among locals as only some are actually benefiting from firewood collection arrangements. As a consequence, the availability of fuelwood for cooking has become a major challenge in the camps.

Unless alternative, more sustainable solutions are found, it can be expected that the future will bring:

- ever-increasing firewood harvesting distances;
- a continued rise in prices of both charcoal and firewood;
- increased cutting of live trees;
- further weakening of clan-based firewood access arrangements, leading to more conflict;
- greater economic benefits accruing to a small number of individuals;
- probable introduction of lorries in fully privatised operations for transporting fuelwood to the camps as distances to the source areas increase and access become more difficult.⁴⁸

Information on existing environmental interventions is provided in section 5.3 below.

4.2.1 Kakuma

A survey conducted in 2008 to assess the status of woodland degradation and fuelwood demand in the Kakuma area found that the presence of refugees has negatively affected the environment.⁴⁹

While refugees are not allowed to collect firewood, demand for fuelwood by refugees has led to the proliferation of trade in charcoal and firewood between refugees and the local community. Besides the firewood provided by GTZ, which covers about 20 percent of the refugees needs, locals also source and sell the balance.

Unsustainable and inefficient charcoal production is another contributor to depletion of natural resources eventually leading to deforestation, which in turn is both a cause and effect of climate change.

4.2.2 Dadaab

The existence of the Dadaab camps has placed a considerable strain on the natural resources of the surrounding area. A recent study carried out by the Danish and

⁴⁷ Please see a Summary of the Climate Change Impacts in Kenya in Annex 4

⁴⁸ Danish Refugee Council (DRC) & Norwegian Refugee Council (NRC) (2010), *Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities*.

⁴⁹ Kariuki J.G., Machua J.M., Luvanda A.M. and Kigomo J.N. (2008), *Baseline Survey of Woodland Utilization and Degradation Around Kakuma Refugee Camp*, Kenya Forestry Research Institute; Nairobi.



Norwegian Refugee Councils (DRC/NRC) confirms a general trend of environmental degradation, which has been ongoing since the early 1990s. Within the 0-20 km range, degradation of the woody biomass is very significant. Moreover, the differentiation between local people and refugees in Dadaab is blurred, making definitive attribution of responsibility impossible.

The DRC/NRC survey of rangeland plots suggests a general trend of environmental degradation, which continues to spread outwards from the camps. The pattern varies in different directions depending on the richness of resources. The number of trees, species variety, standing volume and dead wood availability all increase further away, while evidence of human damage progressively reduces.

However, very few of the trees that remain within a 50 km radius of the camps are considered acceptable as commercial fuel or pole-wood. These resources might be of sufficient quality for household-level consumption, but with the supply chain now highly commercialised, donkey cart operators must bring back wood that will attract the highest price, not wood that is merely acceptable. So while there may be a large amount of biomass in the surrounding area and a sustainable yield apparently well in excess of consumption, harvesters cannot find the species they seek without going at least 45 km away or by harvesting the few remaining live specimens closer to the camp.⁵⁰ **This creates the most significant environmental and protection risks.**

Other environmental concerns include excavation of topsoil for brick making and plastic litter that harms humans and animals.

4.3 Implications for food, nutrition and health

Use of biomass fuels is known for having adverse effects on health, including chronic obstructive pulmonary disease, nasopharyngeal cancer and other respiratory diseases. When infants and children are exposed to indoor cooking smoke, acute bronchitis and pneumonia can occur because their respiratory defences are impaired. According to a World Health Organization (WHO) study, indoor air pollution was responsible for more than 1.5 million deaths worldwide in 2006 making it the second largest environmental contributor to ill health, behind unsafe water and sanitation.⁵¹

Interestingly, women in refugee camps did not mention smoke and related health problems as a key issue of concern during focus group discussions. Cooking is reportedly done both indoors and outdoors, which explains the high value placed by refugee women on portability of the cooking device. Contrary to other refugee settings however, most households both in Kakuma and Dadaab have a separate cooking space, at times shared by the families living within the same household. This arrangement, which reduces the amount of time spent in proximity to cooking smoke and ash, as well as the use of the *Mandeleo* stove provided by GTZ, can contribute to a reduction of the level of indoor air pollution. However, this issue may need to be further investigated,

⁵⁰ Ibid.

⁵¹ WHO (2006), Fuel for Life, Geneva: WHO. Available at: <http://www.who.int/indoorair/publications/fuelforlife/en/index.html>



specifically looking into ventilation in existing cooking spaces and rates of respiratory diseases among women and children.

As already noted, food bartering and selling for complementary foods and/or firewood are common coping mechanisms adopted by refugees in camps. According to the last WFP post-distribution monitoring (PDM) report in **Dadaab**, refugees sell about 7.6 percent of their food to purchase preferred food commodities, to transport food back to their blocks and to buy non-food items, including cooking fuel. There is no specific indication in the report of precisely how much food is spent on each of these different types of items.⁵²

Moreover, on average 4.25 percent of household members in the three camps are still not formally registered, as some refugees spontaneously joined relatives or friends before pursuing registration with UNHCR. This negatively affects availability and utilization of food at the household level, as new arrivals rely on the resources of registered refugees. This issue, coupled with food selling or bartering, results in the exhaustion of food rations a few days before the next distribution cycle (every 15 days).⁵³ Hence, skipping meals - typically lunch - and reduction of the meal sizes are the most practiced (54.9%) coping strategies adopted by refugees, followed by the purchase food on credit and borrowing from neighbours and relatives.⁵⁴ These practices were widely corroborated by the team during focus group discussions and household-level interviews with refugees in both Dadaab and Kakuma.

The nutritional ramifications of skipping meals and/or reducing the meal size may be various depending on the amount and type of food people are deprived of, and the overall vulnerability and nutritional status of the affected population. Generally speaking however, negative impacts of these practices on nutrition are more likely to be seen in children, elders, pregnant and lactating women as well as adolescents as they have special/higher nutritional needs than others.⁵⁵ This aspect needs to be looked at more specifically, also in relation to the context.

Negative survival strategies are more common in smaller households as larger sizes benefit from economies of scale and varying individual food needs.⁵⁶ UNHCR's distribution of complementary foods in Dadaab (started in March 2010) is expected to partially address some of these issues.

Food bartering seems more common in **Kakuma** as movement of refugees is more restricted and people do not have as many alternative livelihood options as they have in Dadaab.⁵⁷ Wheat flour is the most traded commodity due to availability and demand by the local population. Among the factors that affect the amount of food bartered in

⁵² WFP, *Post Distribution Monitoring Report January-March 2010*, Dadaab Sub Office, p. 1.

⁵³ *Ibid.*, p. 4.

⁵⁴ *Ibid.*, p. 8.

⁵⁵ Meeting with Nutrition, WFP HQ, May 2010.

⁵⁶ *Ibid.*, p. 7.

⁵⁷ Some examples of livelihood activities in Dadaab include: men going out to fetch firewood for selling, men being hired by locals, and few income generating activities targeted to women to increase their self-reliance. As limited as they are, in Kakuma there are not as many livelihood options as in Dadaab.



Kakuma are the availability of wheat and firewood (both of which are provided in the camp; though as indicated firewood is provided on an irregular basis), and cash flow. When host communities receive cash payments, for example under the Oxfam/DFID cash for work programme, they have less need to “purchase” food from the refugees and also have less need to make an income through charcoal/firewood selling, thus the value of food decreases and buying firewood or charcoal becomes more expensive due to the reduction in supply. Similarly, when firewood distributions have just occurred, refugees’ need for additional cooking fuel from the Turkana is less, and the price of charcoal therefore decreases.

During household interviews, refugee women in Kakuma reported exchanging on average 3 bowls of wheat flour in exchange for 1 basin of charcoal. According to WFP informants, the maximum that refugees could end up “paying” is 10 bowls of maize meal (5 kg) (about 50% of the cereal provision) in exchange for 2 basins of charcoal. This latter amount of charcoal is estimated to last for about two weeks for a family size five.

The team observed bartering of food for charcoal during household interviews. Turkana women are responsible for charcoal production and selling within the camps.⁵⁸

While WFP and partners were reportedly conducting sensitization on food preparation practices, findings from the focus group discussions suggest the need for a more systematic and rigorous approach, and the need to target new arrivals.

5 Existing fuel-related responses

This section analyses some key fuel-related interventions undertaken by various actors in response to the concerns outlined above. It is not intended to be an all-inclusive account of all fuel-related projects currently in place in Kenya, rather it provides an overview of the major initiatives, their opportunities and challenges, to determine options for future programming.

5.1 Protection

5.1.1 Prevention and response to GBV

Following reports of incidents of gender-based violence in and outside the refugee camps in the early 1990s, numerous efforts have been placed by UNHCR, CARE, the National Council of the Churches of Kenya (NCCK) and others to prevent and respond to GBV cases. These include awareness raising on the risks among the refugee population, in schools, as well as the establishment of reporting and support mechanisms for survivors of GBV. More recently, NGOs staff as well as incentive workers in the camps have been trained on protection from sexual exploitation and abuse (PSEA), also in the framework of WFP food distribution (for e.g. scoopers).

⁵⁸ Meeting with a Turkana man during household level interview, Kakuma, 22.07.2010.



According to CARE, support to GBV survivors include livelihood and income-generating activities through revolving fund mechanisms and life skills training targeted to women to increase their self-reliance and reduce their vulnerability to negative coping mechanisms such as survival sex. In addition, gender reporting desk have been established within the police to encourage reporting on GBV, while one gender recovery centre has been recently opened in the hospital to assist women survivor of GBV.

Although the feeling among humanitarian workers in Dadaab is that of an overall reduction in the number of GBV cases compared to the 1990s, the situation is not at all clear (see 4.1 for a more comprehensive discussion over the current situation on GBV). Underreporting remains an issue of concern, particularly in relation to rape and female genital mutilation. According to UNHCR, only 26 rape cases were reported in Dadaab since the beginning of 2010, while many others may have gone underreported.

As previously mentioned, the team felt there is a need for further clarity on the current extent of GBV in the camps and the impact of the existing prevention and response interventions on the safety of the refugee population, also in relation to firewood collection.

5.1.2 Firewood provision

GTZ, with funds from UNHCR and BMZ, is responsible for the provision of firewood to refugees in both Kakuma and Dadaab. This organized firewood collection and distribution programme started in 1998 primarily to address rape and violence against women and girls searching for and collecting firewood for cooking, and in a later stage were environmental concerns added as a justification for the project. Only members of the local community are hired to collect the firewood, while a combination of refugees and community members are engaged in distribution. Resource management committees, which include representatives from the government, have been established in each sourcing area to monitor harvesting sites and to ensure that live trees are not cut. According to regulations agreed to by GTZ and the firewood collectors, the aim is that if green wood is collected, it will be rejected at the distribution centre. Firewood arrives at the distribution centre in pre-bundles of 10 or 15kg each, to be re-weighed at the centre and then distributed.

While firewood distribution takes into consideration new arrivals, the actual firewood resources in harvesting areas are not necessarily adjusted accordingly. As a result, the total number of distribution cycles may be reduced. In Kakuma for example, while 10 distribution cycles were held in 2009, only 6 have been planned for 2010. Currently, distribution occurs every two months and consists of 10 kg of firewood per person, which covers about 20 percent of the needs.

On the contrary in Dadaab, distribution has just resumed after a hiatus that lasted for more than a year. The reason for the suspension of the firewood distribution programme originated from a request by the local community on behalf of the firewood collectors to triple the price they received for the firewood they collected,



from 5,000 Kshs/mt (US\$ 62.31) to 15,000 Kshs/mt (US\$ 186.92). After over a year's negotiation, the parties finally agreed on a new price of 8,000 Kshs/mt (US\$ 99.69) versus the 5,000 Kshs/mt that they were paying before. Another issue of concern for the firewood distribution programme is the distribution of contracts for firewood collection among districts and communities as some were complaining for not being contracted by GTZ, while claiming that their resources were being collected. According to informants, depletion of natural resources is less of a concern than the economic benefits deriving from their use.

Firewood is commonly collected from a 50 – 60km radius from the camps. GTZ, together with government representatives, carry out post-distribution monitoring visits in collection sites to monitor the availability of wood for the next distribution.⁵⁹

The first 2010 distribution took place at the time the SAFE team visited the camps in July. GTZ estimated that the combination of limited resources and high influx of refugees in Dadaab meant they would only be able to provide for 10 percent of the fuel needs in 2010.

At present, UNHCR reported spending US\$ 600,000 in Dadaab, and US\$ 400,000 in Kakuma for firewood collection and distribution.⁶⁰

Provision of firewood as a means of responding to the cooking needs of the refugee population has been criticised by many for its inherently unsustainable nature. While at the moment rigorous monitoring on the use of dead wood only is taking place, there are still concerns about the risk of deforestation and environmental degradation this may contribute to. On the other hand, many argue that it is far better to regulate the firewood distribution and, as in the case of Kenya, work with the Government to monitor the availability of firewood rather than leave the business to unauthorised actors, who may harvest greenwood, further exacerbating the environmental problems.

Supporters of the latter argument also claim that firewood provision is already riddled with inefficiencies and vested political interests where the wealthier and more dominant members of the (host) communities reap the benefits of firewood sale, while regulated firewood provision can attempt to diversify the targeting to also include the more vulnerable.

These are amongst the debates that are currently taking place in GTZ, UNHCR and other partner organisations involved in direct firewood provision, although there is no indication of any alternative being found so far.

5.2 FES and alternative energy

This section illustrates the various cooking technologies and energy sources that are either available or are in the process of being tested in Kenya. Time constraints did not

⁵⁹ Danish Refugee Council (DRC) & Norwegian Refugee Council (NRC) (2010), *Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities*.

⁶⁰ Meeting with UNHCR, Nairobi, 30.07.2010.



allow the team to directly investigate all of them, thus some are reported as described in reports and/or by responsible actors.

5.2.1 Fuel-efficient stoves in WFP-assisted schools

WFP Kenya has been implementing energy-saving stoves in schools since 2004, but it was only in 2009 that stoves became an integral component of the school meals programme thank to funds provided by WFP Ambassadors Against Hunger and other private donors.⁶¹ This support allowed WFP to establish a partnership with UNDP and a Kenyan NGO called RETAP⁶² for the scale-up the schools project initiated in 2009 for the production and distribution of energy-saving stoves in schools.

In 2010, US\$ 1 million from the African Adaptation Programme (AAP)⁶³ was secured by WFP for the production and installation of 500 energy-saving stoves in schools. Priority has been given to schools in urban centres, and districts neighbouring indigenous forests such as the Mau forest, which is the largest water catchment area in Kenya and where deforestation is reaching a critical point.

The current project aims to provide energy-saving stoves to all schools under the school meals programme in Kenya. This includes 1,500 WFP-assisted schools, and 1,700 Government-run schools under the Home Grown School Feeding Programme.⁶⁴

Urban schools in Kenya spend between 10,000-35,000 Kshs (US\$ 127-450)⁶⁵ per month on firewood to prepare school meals. The amount varies depending on the number of children and on the price of firewood in the place where the school is located. The need to pay for a portion of the cooks' salaries and for the cost of cooking fuel for school meals places a significant burden on parents who must also pay for uniforms and school equipment. The provision of energy-efficient stoves is meant to significantly reduce the amount of firewood needed for cooking, thus lessening the financial burden on parents and schools, reducing the pressure on land and forest resources and improving the air quality inside school kitchens by reducing smoke and other toxic emissions, which contribute to climate change.

⁶¹ More specifically, US\$ 66,000 was provided by Drew Barrymore (<http://www.wfp.org/stories/drew-barrymore-donation-nourishes-childrens-ambitions-kenya-slum-school>) and US\$ 50,000 by Oprah Winfrey, while the International Paper contributed an additional US\$ 27,000 (<http://www.wfp.org/stories/kenya-school-meals-featured-slum-children-art>). 50 energy-saving stoves were installed in 2009.

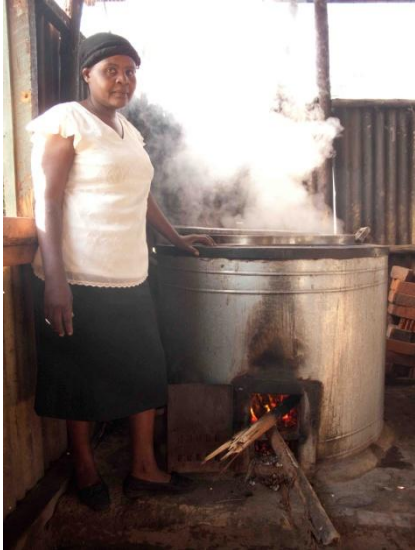
⁶² Retap is a Kenyan-based NGO promoting initiatives in renewable energy technologies. <http://www.retap-africa.org/>, retrieved 30.07.2010. The partnership with Retap is key to the cost-sharing arrangement established by WFP with the schools.

⁶³ UNDP, with funds from the Government of Japan, launched the African Adaptation Programme to assist 21 African countries to implement integrated and comprehensive adaptation actions and resilience plans that address climate change risks and opportunities. The Programme has an overall budget of US\$ 92.1 million over a three years period and is conducted in partnership with WFP, and UNIDO, under the overall coordination of UNDP. Additional information on the objectives of the programme in Kenya can be found at: <http://www.ke.undp.org/focusarea/4>.

⁶⁴ See footnote 9 above.

⁶⁵ WFP Kenya, *Concept Note: Energy-Saving Stoves Project*. In addition, information on schools' expenditures on firewood were gathered in few schools visited during the mission.

Schools using the stoves mentioned the following benefits: saving on firewood (up to 70 percent, depending on how the stove is used); cost savings; reduced cooking time; and less smoky kitchens.



The firewood requirement for schools also poses an increasing challenge for the environment as the firewood is provided through a combination of local suppliers who often carry out illegal large-scale logging in Kenya's national forests as well as families cutting down local forests. Correct usage of the stove is critical to achieving higher efficiency. For example, one practice observed by the team throughout the mission was the tendency for cooks to not close the door of the stove's combustion chamber as the firewood sticks they were using are often quite long, and are continually pushed further into the chamber as they burn (See the picture on the left). The more

efficient method would be to chop the wood into smaller pieces that would allow the door to be closed during cooking, and only opened periodically when the fire needed to be tended).

Leaving the door open throughout the cooking period – which is often several hours -- causes dispersion of heat, which reduces the stove's efficiency rate. Additional sensitization of school cooks on the use of the stove, including firewood preparation, may be needed to ensure proper efficiency and reduction in firewood consumption.

WFP-provided stoves are locally produced and are made of stainless steel, bricks and fireproof cement. The cost of the stoves varies between US\$ 1,200-2,700 depending on capacity, which can be up to 600 liters serving up to 1,200 children.⁶⁶ The stoves are estimated to be 40-70 percent more fuel-efficient than the traditional three stone open fire stove.⁶⁷

Of particular relevance is a cost-sharing arrangement that has been agreed upon with the targeted schools to maximize the use of available resources and to ensure community ownership and care of the new cooking apparatus. According to the cost-sharing scheme, one term after the receipt of the stove, the school will start paying back 50 percent of its cost. The payment is divided in six instalments spread over a period of two years. The idea is for the school to pay off the loan using the money saved on firewood. Payments will be reserved in a revolving fund and be will used to: 1. Target additional schools with energy-saving stoves; 2. Training cooks on stove use and maintenance thus ensuring maximum efficiency and long-term sustainability.

Through the revolving fund mechanism, WFP Kenya intends to cover approximately 300 additional schools in 2011, provided that the payment plans are respected. However,

⁶⁶ One school reported paying 120,000 Kshs (US\$ 1,500) for an institutional stove on the local market, which is in line with the price paid by WFP.

⁶⁷ WFP, *Comprehensive Energy Saving Stove Project – July 2010*. Nairobi: WFP.

existing funds are not sufficient to meet the target of about 3,000 schools,⁶⁸ hence the need to consider opportunities for the acquisition of additional funds, including funds generated through the carbon market.⁶⁹ WFP is in the process of applying for a carbon credit project as the purchase of fuel-efficient stoves decreases CO2 emissions. If approved, WFP will utilize the credits to purchase more energy-saving stoves. This is one of the ways WFP tackles climate change and hunger.

The long term strategy is to hand over the fuel-efficient school stove programme to the Government of Kenya, which will be able to continue implementation in additional schools through the revolving fund mechanism.

5.2.2 Fuel-efficient stoves at the household level

GTZ. GTZ is responsible for the production and distribution of energy-efficient stoves in both Kakuma and Dadaab camps. 10 percent of the current production in Dadaab is targeted to the local community.

Generally, each household qualifies for one stove, with the exception of family size above four, which receive two stoves. Targeting criteria include household size and lack of kitchen space, among others.



The *Mandeleo* portable stove (pictured at left – the *Mandeleo* is on the far left of the picture; the rocket stove is on the right of the picture) was first introduced in Dadaab in 1994, followed by the establishment of a production centre, while in Kakuma production started in the late 1990s.

Among the factors that influenced the selection of the *Mandeleo* were: portability, user uptake, the possibility of producing the stove locally, and fuel efficiency (which is estimated at about 30 percent).

For the past few years, GTZ in Kakuma has been promoting the production and dissemination of both the *Mandeleo* portable stove and the rocket clay stove. The rocket stove model produced in Dadaab is slightly different than that produced in Kakuma, as the Dadaab rocket model has metal outside and clay inside. According to GTZ staff the efficiency rate of both rocket stoves is estimated at 30 percent.

⁶⁸ WFP Kenya reported an estimated shortfall of US\$ 5-7 million to cover 3,000 additional schools in the following years.

⁶⁹ The WFP Kenya country office is now seeking an additional US\$ 5 million to reach 3,000 schools with a population of 1,000,000 children. WFP, *Comprehensive Energy Saving Stove Project – July 2010*. Nairobi: WFP. In addition, WFP Kenya has long been discussing the possibility of submitting carbon credit generating projects under either the Clean Development Mechanism (CDM) or the Voluntary Carbon Standard (VCS). In 2008/2009 a consulting company was hired to conduct an evaluation of the potential of WFP's carbon credit projects in the East, Central and southern Africa Bureaux. Kenya was one of the seven countries under analysis. Others included Burundi, Djibouti, Ethiopia, Rwanda, Tanzania, and Uganda. At the time of the evaluation, Kenya's fuel efficient cooking stove project was recommended to be given first priority together with a reforestation project in Rwanda. EcoSecurities (2009), *WFP Carbon Credit Projects Evaluation*, Dublin: EcoSecurities, p. 39.



A total of 33,568 stoves have been distributed to both refugees and host communities in Kakuma since the inception of the project. In 2010 alone, 17,500 stoves have been provided to far. At the time of the mission, GTZ reported that 55 percent of the population in Kakuma and 60 percent in Dadaab had received a stove.

According to GTZ, the longer-staying populations in Kakuma are given the rocket stove, since it requires more awareness on its use as well as more care in handling because it is made only of clay and does not have the metal cladding which makes the *Mandeleo* portable stove more durable. New arrivals are targeted with the *Mandeleo* stove, since it adapts more easily to the different size cooking pots that new arrivals have typically brought with them to the camp (the longer-stayers are likely to have received at least one distribution of non-food items, which include standard-size pots that fit more readily into the rocket stove).

According to some informants, GTZ-manufactured stoves have a life span of about 3 years.

Refugees in both Kakuma and Dadaab are hired as extension workers for the production of the stoves. None of the production centres visited by the team were operating at their full production capacity due to lack of funds. For example, the plan in Kakuma is to produce 1,000 *Mandeleo* and 1,000 rocket stoves in 2010, while at full capacity they would be able to produce 1,800 stoves per month. Production capacity in Dadaab is 2,000 a month.

The production costs in Kakuma are 500 Kshs (US\$ 6.28) for the rocket stove and 1,000 Kshs (US\$ 12.56) for the *Mandeleo*. The *Mandeleo* costs only 750 Kshs (US\$ 9.42) in Dadaab.⁷⁰

In 2010, UNHCR reported spending US\$ 20,000 on stove production in Dadaab, where the population is higher, and US\$ 15,000 in Kakuma.⁷¹

Throughout the camps, women reported the following advantages to the *Mandeleo* stove: 1. It is not necessary to constantly attend to the fire,⁷² thus saving on time for other chores; 2. Firewood saving; 3. Safety; 4. Portability.

At the time of the SAFE mission, some small pilot of alternative cooking technologies was taking place in the camp. A brief overview of the type of cooking devices being piloted and preliminary feedback from the users is reported in annex 2 below.

⁷⁰ Meeting with GTZ, Kakuma, 21.07.2010. Although the team was not able to gather specific information on why production costs are lower in Dadaab, some reasons may be that production there started earlier and may be more cost-efficient, and also that transport cost may be lower than in Kakuma.

⁷¹ Meeting with UNHCR, 30.07.2010.

⁷² The reason why the fire doesn't have to be constantly attended is because the door on the *Mandeleo* is large enough that cooks can shove a bunch of large pieces of wood in and just let it burn – which is not efficient - rather than more consistently putting in smaller pieces of wood and closing the door, which would greatly increase efficiency and reduce overall wood consumption. In other words, what is considered a benefit by the women in terms of their time/habits, is actually a drawback in terms of fuel efficiency – this apparently dichotomy is an important one for agencies interested in getting involved in the stove programs to address.



5.2.3 Alternative sources of household energy

The mission also provided the opportunity to gather information about a series of alternative sources of energy currently under consideration in Kenya. Some are already in their pilot phase, while additional assessment and analysis is still needed for others. These alternatives include – but are not limited to – solar energy, ethanol, briquettes, and production of charcoal and bio-fuel from organic waste incineration. The search for alternative fuels for cooking, lighting and heating is in line with the Ministry of Energy's strategy to promote alternative fuels as substitutes to primary biomass such as fuelwood.⁷³

Solar. There have been various attempts to test solar cookers in refugee camps in Kenya. According to informants, these pilots have resulted in lack of uptake by users,⁷⁴ abandonment of the provided technology and significant money loss. Despite this rather unsuccessful history, a Sustainable Energy and Environmental Solutions for Kakuma project has recently been launched by UNHCR and Energias de Portugal (EDP) for the implementation of 10 different energy-based pilot projects to improve energy and lighting access and sustainability. More specifically, project 7 will focus on testing box-type solar cookers (30 units) in small restaurants in Kakuma. If proven effective, the plan is to locally produce the cookers.

Ethanol. UNDP is about to start a pilot study to test the viability of ethanol stoves and a fuel market system in informal urban settlements in the Kisumu area of Western Kenya. The project, which is planned to start at the end of August, is a joint undertaking of UNDP, the Ministry of Energy, Policy Innovation Systems for Clean Energy Security (PISCES),⁷⁵ the NGO Practical Action and the largest ethanol producer in Kenya, Spectre International.⁷⁶ The Ethiopian NGO Gaia Association⁷⁷ will be responsible for the provision of the CleanCook⁷⁸ ethanol stoves as well as for providing technical expertise on their use, based on experience developed in Somali refugee camps in Ethiopia.

⁷³ The Ministry of Energy formulated the Bio-diesel Strategy 2008-2012 and the Bio-ethanol Strategy 2009-2012. UNDP agreed on supporting the government in further exploring the economic, technical, environmental, and social impacts of ethanol production and its use as cooking fuel at both household and institutional levels. UNDP, *Energy Access Programme 2010-2015*, p. 13.

⁷⁴ The most frequently cited barriers to solar cooker uptake are lengthy cooking time, lack of/different food taste, inability to cook in the mornings and the need to cooking outdoors, which is not necessarily culturally acceptable for all.

⁷⁵ PISCES is a five year initiative funded by the UK's Department for International Development (DfID) which aims to generate new knowledge on the use of bioenergy and its impacts on food, water, and energy security in poor communities. The initiative is currently active in Kenya, India, Sri Lanka, and Tanzania.

⁷⁶ Spectre International Ltd. is an ethanol production company with offices in both Kenya and South Africa. In 2005 a distillery was established in the Kisumu area of Western Kenya. <http://www.spectreinternational.co.za/>, retrieved 2.08.2010. To date, Spectre International Ltd. is Kenya's largest manufacture of ethanol, producing approximately 27,000 cubic metres of ethanol per year, followed by the Agrochemical and Food Company, which manufactures 21,600 cubic metres of ethanol per year. <http://allafrica.com/stories/201007210025.html>, retrieved 02.08.2010.

⁷⁷ Gaia Association is an Ethiopian-based NGO that has been promoting ethanol and ethanol fuelled cooking stoves in both urban and refugee settings in Ethiopia. The stove has been widely tested also in Nigeria and Brazil, while a new partnership has been recently established for the testing of the stove in Haiti. More information can be found at: <http://www.projectgaia.com/index.php>.

⁷⁸ More information on the CleanCook stove can be found at: <http://www.projectgaia.com/page.php?page=gallerycleancook#img/gallery/cleancook/01.jpg>.



The ethanol pilot is planned to run for a period of two years according to the following scheme: 1. A first group of 50 households will be targeted with free introduction of the CleanCook stove to monitor consumer acceptance - i.e. cooking time, access to fuel supply, ease of operation, etc. - and indoor air pollution levels; 2. An additional 50 stoves will be made available to those individuals who choose to buy it at a subsidized price.⁷⁹ This group will allow for testing of the commercial aspects of ethanol cooking, i.e. consumers' willingness to pay, economic and social impacts, etc. 3. A third phase of the project will then lead to the manufacturing of the stoves in Kenya to contribute to the development of a locally-driven market for ethanol appliances and fuel. Spectre International has agreed to supply VAT-exempted ethanol, and to establish distribution points to facilitate access to ethanol in the target areas.⁸⁰ Ethanol is currently supplied by Spectre in Kenya at 125 Kshs (US\$ 1.56) per litre.

Additional information on the potential for ethanol as a cooking fuel in refugee camps in Kenya are provided in annex 3 below.

Briquetting. Briquetting technology is based on the compacting of vegetative and agricultural waste to concentrate energy, thus making it more efficient than if the same biomass were burned without prior compaction and easier to transport. UNDP is supporting the Government of Kenya to advance briquetting technology as an alternative source of energy. Experiences so far have been minimal and mostly on a very small scale.⁸¹ For example, briquetting using coffee husks was reportedly attempted by UNHCR in the refugee camps with little results. According to informants, the main challenge encountered in this project was transport costs of the raw material from Nairobi to the camps.⁸²

Noticing the widespread presence of *prosopis juliflora* throughout the regions in which the refugee camps are located in Kenya, the SAFE team raised the possibility of using it as cooking fuel. *Prosopis*, also known as mesquite or *mathenge*, is a multipurpose tree that fits well in dryland agro forestry systems with positive impacts on soil erosion and fertility. It can be used as feed and forage for grazing animals, supplementing food for humans, furnishing construction timber and furniture, and fuel. More interestingly, it produces good quality fuel of high quality calorific value.

However, *Prosopis* is also an invasive species that the Kenyan government is attempting to eradicate.⁸³ Owing to its prolific seeding and extensive root networks, rapid growth and multiple dispersal agents, *Prosopis* is known for invading grazing and farmlands, tapping into groundwater reserves, discouraging the growth of grass for livestock and

⁷⁹ The stove costs US\$ 35 of which households would have to pay US\$ 20 upfront, while a subsidy of US\$ 15 would be paid by the project.

⁸⁰ UNDP/Ministry of Energy/PISCES/Practical Action (2009), *Piloting Bioethanol as an Alternative Household Fuel in Western Kenya*. Nairobi.

⁸¹ UNDP, *Energy Access Programme 2010-2015*, p. 22.

⁸² Meeting with UNHCR, Nairobi, 30.07.2010.

⁸³ *Prosopis* is one of the few plants on which the Government of Kenya has not placed any harvesting restrictions – in fact, harvesting of *Prosopis* is actively encouraged by the Government.



impeding farming, as well as for its strong and poisonous thorns, which make it difficult for individuals to harvest fuel.⁸⁴

Meeting with Government representatives⁸⁵ confirmed the official interest in eradicating *prosopis*, and the idea of using it for the production of briquettes, drawing on the experience in other countries, was well received.

Finally, it is interesting to note that UNHCR staff in Nairobi suggested focusing any planned *Prosopis* pilot in the Dadaab area, since host communities in Kakuma reportedly use *Prosopis* for their own purposes, and thus its use by and/or for refugees may create tension.⁸⁶ An agreement was signed by UNHCR and Energias de Portugal (EDP) in December 2009 for, among other planned projects, the testing of improved methods for *Prosopis* clearing and controlled regeneration in Kakuma. More clarity on the actual use of *Prosopis* and its potential in creating conflict with local communities should be sought.

Bio-coal and oil (see also annex 3 for additional reference). Expressing concerns about how quickly the capacity of the recently established landfill in Hagadera refugee camp (Dadaab) was reached, the international NGO CARE decided to undertake a survey on the composition of solid waste in the fill site to inform the exploration of possible alternative waste management mechanisms. The survey revealed production of 1.6 kg of solid fuel per person per day, which results in approximately 528 mt of solid waste per day if all three camps in Dadaab are considered. 75 percent of this waste consists of animal dung (primarily from donkeys, cows and goats), 10 percent comes from trees and leftover food waste, and the remaining from non-biodegradable waste.

Overall, according to CARE approximately 85 percent of the waste produced in the camps is biodegradable, and could be transformed in 2.1-2.3 kg of bio-coal per household per day.⁸⁷ However, for this to be done in an efficient and effective way it would require the acquisition of highly sophisticated and costly technologies.

Findings from the survey triggered CARE to conduct additional research on the potentials for bio energy production in the camps. A feasibility study will be conducted in autumn 2010, while donors' interest and opportunities for partnership with the private sector are currently being explored.

While at present it is not more than an idea, concerns were raised about the feasibility and sustainability of such a technologically sophisticated project in the context of Dadaab. Moreover, the potential for a small-scale pilot is still not clear (it is thought the pilot must be of a relatively large size in order to accommodate the proper machinery, but a large size pilot is costly and could therefore be difficult to justify for an as-yet unproven technology). Thus, further analysis will be needed before any programmatic consideration could be made on this potential energy project.

⁸⁴ Ibid., p. 40.

⁸⁵ Meeting with the Ministry of Energy, Renewable Energy Department, Nairobi, 29.07.2010.

⁸⁶ Meeting with UNHCR, Nairobi, 30.07.2010.

⁸⁷ Meeting with CARE country and sub-office representatives, Dadaab, 27.07.2010.



5.3 Environmental protection, regeneration and climate change

A number of different environmental projects have been supported by humanitarian agencies working in the refugee areas of Kenya, including: distribution of tree seedlings, woodlots, establishment of greenbelts, kitchen gardening and irrigated horticulture, water resource development, water harvesting, environmental working groups and awareness-raising activities. However, the harsh climate, poor soils and unreliable rainfall limit what these programmes can achieve in terms of environmental rehabilitation outside settlements.⁸⁸

Clearly there is neither a shortage of attention to the environmental issues nor a lack of environmental actors in Dadaab, and significant amounts of work, time and resources have been spent to alleviate these problems. However, concerns have continued to be expressed in various forums on the impact of interventions in the environment and natural resources management (E&NRM) sector. This is an indication that there may be some weaknesses in interventions in the “environmental management and socio-economic development in the host community areas to address the twin concerns of the impact on environment and livelihoods”.⁸⁹

5.3.1 GTZ

‘Trees for stoves’ initiative (as part of the above stove project, see 5.2.2 above). GTZ used to provide free seedlings as an incentive through which the *Mandeleo* portable stove was distributed in the refugee camps (beneficiaries would receive ten tree seedlings and keep at least three of them alive in order to be eligible to receive a stove). This ‘trees for stoves’ initiative was successful in some communities, particularly in Kakuma, while in others (e.g. some Somali communities in Dadaab), cultural barriers hampered its implementation.⁹⁰ Other challenges reported by GTZ in the implementation of the ‘trees for stoves’ project include:

- Trees do not survive either due to misuse/lack of care or harsh climate conditions. The consequent decision not to distribute a stove as a ‘reward’ creates tension between the refugee community and GTZ.
- The benefit of the trees is often not understood: even if the tree survives the harsh climate it is cut when the refugees move
- Even if the benefit of trees is understood, water scarcity remains a challenge.

Hence, GTZ has moved away from ‘trees for stoves’ into more training and awareness-raising on energy-saving practices. Here as well, however, cultural beliefs, traditions and lack of education sometimes prevent proper uptake. For example, soaking of beans and grains is not widely practiced, the door of the stove is left open allowing heat to escape, and fires are put out with water after cooking.

⁸⁸ Danish Refugee Council (DRC) & Norwegian Refugee Council (NRC) (2010), *Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities*.

⁸⁹ UNHCR (2009), *Dadaab refugee complex “Stakeholders’ Forum on Host Community Concerns”*.

⁹⁰ Colleagues from WFP reported that digging may be considered humiliating by Somalis.



Establishment of afforestation nurseries and green belts. GTZ has established 'green belts', plots of land set aside as seed banks for tree regeneration, as a conservation measure around both Kakuma and Dadaab camps. The primary (immediate) objective of the green belts is environmental protection and introduction/maintenance of indigenous plant and tree species. The secondary (long term) objective is firewood provision.⁹¹

Greenbelts established with donor support are seen by the majority of the host community as a threat to pastoral production and its essential element of mobility, and contribute to privatisation of the grazing range for the benefit of only a few individuals.⁹²

According to the Danish and Norwegian Refugee Councils (DRC/ NRC), the overall environmental impact of fencing of greenbelts is limited. Branches are harvested selectively to allow the tree to continue growing and the impact is therefore extensive but not dramatic. There is concern, however, that the drawbacks of continued enclosure of land within greenbelts (now enclosing 898 ha according to GTZ) outweigh its benefits. The greenbelt programme began as an agency effort to set land aside as seed banks for regeneration if the camps should ever close. But significant additional hectares are being enclosed each year and the only apparent beneficiaries are the appointed caretakers, who are permitted to exploit the greenbelts for their own benefit. Local people have had conflicts with powerful individuals enclosing blocks of land for personal use (e.g. west of Ifo and north of Hagadera) and funds have been raised by community groups specifically to have live fences removed. The enclosure of land contributes to an undesirable process of resource alienation and undermines a pastoral mode of production reliant upon communality of resources.⁹³

5.3.2 FAO Junior Farmer Field and Life Schools (JFFLS)

In collaboration with WFP, GTZ and other partners, FAO is implementing Junior Farmer Field and Life Schools (JFFLS)⁹⁴ in Kakuma and Dadaab for both refugee and host communities, with a particular focus on pastoralists (which is the the majority of the population). JFFLS are designed to empower orphans and other vulnerable children aged 12 to 18 years who live in communities where GBV and HIV and AIDS have had a strong impact on food security. JFFLS seek to improve the livelihoods of vulnerable boys and girls and provide them with income-generating opportunities for the future, while minimizing the risk of adopting negative coping behaviours. To increase these childrens' self-esteem and livelihood prospects, JFFLS impart agricultural knowledge and life skills to their students. This knowledge and skills not only empower the children economically, but also help them to become responsible citizens with positive values regarding gender and human rights. JFFLS in Kenya also teach water harvesting and

⁹¹ Meeting with GTZ, 29.07.2010.

⁹² Danish Refugee Council (DRC) & Norwegian Refugee Council (NRC) (2010), *Socio-economic and Environmental Impacts of Dadaab Refugee Camps on Host Communities*.

⁹³ Ibid

⁹⁴ FAO (2007), *Getting started, Running a Junior Field Farmer and Life School*, Rome: FAO.
<ftp://ftp.fao.org/docrep/fao/010/a1111e/a1111e00.pdf>



conservation activities. Livelihoods are a topic of particular focus in Kakuma, where the movement of refugee communities is tightly restricted. A new phase of the JFFLS is scheduled to begin in September 2010. WFP's contribution to the JFFLS is envisaged to include for example multi-storey gardening⁹⁵.

5.3.3 UNDP/GEF Energy Access Programme Kenya (outside refugee camps)

The overall purpose of this UNDP Programme is to support Kenya Government to enhance access to clean and sustainable energy services while supporting its environmental management for accelerated economic growth. It is intended to promote and scale up production and access to modern energy services in a sustainable manner. The rationale for an energy access agenda is based principally on conceptual understanding firstly, that energy is a means, not an end, to achieving sustainable development. Secondly, the way in which energy services are produced and consumed affects all three pillars of sustainable development: economic, social and environment pillar. One of the priority themes of the programme is mobilizing and expanding opportunities for financing resources, including carbon finance options, global environment fund and other non-traditional sources of funds.

5.3.4 UNEP

Recognizing that environmental and natural resource degradation is not only a major problem but a leading contributor to many of the other challenges facing the region, representatives from UNEP, UNHCR, UNDP-GEF/SGP, (Small Grants Programme) MEMR, National Environmental Management Authority (NEMA) and National Environment Trust Fund (NETFUND) met in 2009 to discuss the challenges being experienced in Dadaab. As a follow-up, a framework document was drafted, which will review the past and current studies and interventions with a view to formulating an integrated environment management plan for the and restoration of Dadaab refugee hosting area⁹⁶.

6 Conclusions and ways forward: options for an integrated approach to safe access to firewood and alternative energy in Kenya

6.1 Why WFP?

WFP's comparative advantages in promoting a coordinated, multi-sectoral fuel strategy in Kenya include its mandate, the scale and reach of its operations, and a well-

⁹⁵ Multi-Storey Gardening (MSG) is a farming technology which needs little land space and water to produce vegetables. It contributes to the increased food security and self-reliance of women and girls from the refugee and host communities.

⁹⁶ UNEP, GoK, NETFUND 'Dadaab Integrated Environmental Management programme', *A partnership framework for sustainable environmental management of refugee hosting areas of Dadaab, July 2010*.



established outreach capacity through a long-standing partnership with the Government. WFP's commitment to the work of the SAFE Task Force stemmed from the recognition of the complexity and multi-faceted implications of access to fuel in emergency contexts. This is in the Strategic Plan, which calls for WFP operations to be carried out in ways that contribute to the safety and dignity of beneficiaries, including protection from gender-based and other forms of violence.

Moreover, WFP's Gender Policy sets forth a framework for the organization's work on addressing gender-related protection challenges, including those arising from firewood collection. More specifically, it commits WFP to mobilize resources to ensure safe access to cooking fuel, including the provision of fuel-efficient stoves, to the most vulnerable women.⁹⁷

WFP's nature as a food assistance agency provides a good opportunity for increased investment in a wide array of activities including food security and nutrition interventions, climate change adaptation and disaster risk reduction, livelihoods restoration through, for example, creation of water harvesting and conservation systems and tree planting, and support for the production and dissemination of energy-efficient stoves.

To date, WFP's efforts to address the cooking fuel needs of the assisted population in Kenya have mainly focused on the provision of energy-efficient stoves to schools. The SAFE mission was meant to explore possibilities for a more active role for WFP in the refugee areas.

6.2 Proposed approach

To address the above-mentioned issues, WFP will promote a comprehensive approach for ensuring safe access to cooking fuel among the refugee populations in Kakuma and Dadaab, while scaling up the production and dissemination of energy-saving stoves for schools in refugee settings. The focus of the current SAFE project will be on energy efficient technologies and fuels to reduce the adverse impacts on the environment, and on the creation of livelihood opportunities to alleviate the economic burden of purchasing fuel and to reduce the likelihood of having to barter food rations.

Building on existing initiatives, the SAFE approach in Kenya seeks to: 1) reduce the cooking fuel needs of the refugee population through support to the production and distribution of energy-efficient stoves in camps; 2) apply innovative technologies to meet basic fuel needs in a less risky and more environmentally friendly way; 3) support livelihoods through engagement of women in stove production, piloting of fuel technologies and increasing tree planting; and 4) ease the economic burden on families by continuing the introduction of energy-efficient stoves in WFP-assisted schools.

WFP support is meant to be in combination with and a complement to existing efforts by other stakeholders such as the UNHCR/GTZ energy-saving stove production and

⁹⁷ WFP (2009), *Promoting Gender Equality and the Empowerment of Women in Addressing Food and Nutrition Challenges*, Rome: WFP, p. 10. WFP/EB.1/2009/5-A



dissemination programme and UNDP and UNEP climate change adaptation and disaster risk reduction initiatives. Meanwhile, potentials for alternative, more sustainable cooking appliances and fuels will be sought by WFP, also in partnership with others.

More specifically, intended activities include: pilot testing of briquetting using *Prosopis juliflora* and ethanol gel and stoves in the refugee areas. Briquetting may be considered as an additional income generating activity targeted to vulnerable individuals in the camps. Meanwhile, adequate testing of new energy-saving stoves (Envirofit, JikoPoa) in the Dadaab camps will continue with additional support by WFP. WFP's support for this project will be focused on the production and dissemination of additional stoves, support for additional user sensitization activities, and provision of tools for wood chopping, among others. While testing more efficient technologies and fuels, WFP will support GTZ's efforts to target the remaining 40-50 percent of the population in the camps with energy-saving stoves. Increased stove production will also translate in a higher number of extension workers benefiting from employment by humanitarian agencies. Finally, WFP plans to further support and enhance GTZ's tree planting efforts both with refugees and local communities.

Targeted beneficiaries will be also sensitized on energy-saving practices, including food and wood preparation and cooking techniques; and sustainable use of natural resources, for example through water harvesting.

Finally, WFP will continue engaging experts and the private sector in both Kenya and in the region to further explore and pilot new financing mechanisms, for example carbon finance, and technologies such as the production of bio-energy from waste, as well as exploring the potential for wider distribution and use of ethanol (liquid or gel) for domestic cooking, to help both refugees and host communities meet their cooking fuel needs safely, while also reducing the negative impact on the environment.



Annex 1: Itinerary

19	Introduction, Meeting with CD, VAM, FFA, Refugee Unit	Nairobi
20	Visit Joy Springs Primary School; Focus group discussion with patients under WFP's HIV/AIDS programme in Nairobi (Kibera Slum) Visit Ayany Primary School and Kibera Nazarene Primary School (Kibera Slum); Visit to local stove supplier	Nairobi
21	Briefing with WFP staff; meeting with UNHCR, DRA, and DC; Visit to the firewood distribution centre/stove production centre, and tree nurseries; meeting with GTZ, UNHCR, LWF	Kakuma Refugee Camp
22	Focus group discussions; household interviews; debriefing with WFP SO	Kakuma Refugee Camp
23	Meetings with UNFPA; The Paradigm Project; National Gender and Development Commission	Nairobi
26	Briefing with WFP staff; meeting with UNHCR, DC office, and GTZ	Dadaab Refugee Camps
27	Visit to the stove production centre; focus group discussion in Hagadera camp; focus group discussion in Ifo camp	Dadaab Refugee Camps
28	Household interviews in Dagahaley camp	Dadaab Refugee Camps
29	Meeting with Ethanol Gel company, Practical Action, GTZ	Nairobi
30	Meeting with UNHCR, UNEP, WFP VAM Unit	Nairobi

Annex 2: Pilot testing of cooking technologies in Kenya refugee camps



The Paradigm Project. The low-profit limited liability company The Paradigm Project is currently working on the introduction of two stoves in Kenya: Envirofit and JikoPoa. The **Envirofit**⁹⁸ is manufactured on a large-scale basis at a centralized facility in India and commercialized throughout the world. According to the manufacturer, it reduces biomass fuel use by up to 60 percent, and cooking time by up to 50 percent.⁹⁹ The photo on the left shows the Envirofit stove model currently being promoted in Kenya, the G-3300. The

stove is available at Kshs 2,000 (US\$ 25).

JikoPoa, which in Swahili means “cool stove”, is locally manufactured in Kenya by Fine Engineering Ltd. It is a rocket stove, which is intended to provide an alternative to the Envirofit. The efficiency of the stove has yet to be tested, as the production is still in its initial stage. The stove will be commercialized at 1,200 Kshs (US\$ 15).

Of relevance is the fact that The Paradigm Project has established a mechanism whereby partnerships with carbon offset companies¹⁰⁰ on one side and with a series of NGOs on the other will ensure that the revenues from the carbon offsets are channelled back to communities.

Recent pilot testing of a small number of these new stove models in Hagadera camp revealed the following:

Envirofit: can only be suitable for a family size of 3 or fewer, as it does not allow for larger size pots. Moreover, it requires constant loading of small pieces of firewood, which means the cook must constantly tend to the fire, requiring additional time. Finally, because its relative small, highly centralized combustion chamber heats up very quickly, the EnviroFit stove cannot be used to cook *injera*,¹⁰¹ a staple food for Somalis which requires more even heat over a large surface.

JikoPoa: takes a long time to heat up and produces a lot of smoke. According to the women who tested it, the only advantage is that it is nice looking.

Finally, few information were provided by GTZ about the testing of another stove model called **Save80**. The Save80 is a whole metal stove that has an integrated pot suspended above the combustion chamber on the metal edge of the stove. According to some recent testing, although the Save80 has a fuel efficiency of 65 percent

⁹⁸ More information on the stove can be found at: <http://www.envirofit.org/?q=about-us/mission-background>.

⁹⁹ <http://www.envirofit.org/?q=our-products/clean-cookstoves/technology/G-3300>.

¹⁰⁰ The two companies with which partnerships have been established are Blue Source and Goldman Sachs.

¹⁰¹ *Injera* is a traditional yeast-risen flat bread eastern in Ethiopia, Eritrea and Somalia.
<http://en.wikipedia.org/wiki/Injera>, retrieved 4.07.2010.



compared to the open fire (also thanks to the sunken pot, while others were tested using the available UNHCR-provided pot), users said it was difficult to fuel. Compared to other stoves in fact, the Save80 has a small fuelling port, which could fit only very small pieces of wood (GTZ staff reported using the left-over from the firewood distribution, similar to the sawdust), which women were not accustomed to and were able to provide.¹⁰² Moreover, the women did not deem the height of the stove comfortable. Finally, another concern that was highlighted by GTZ representatives at the stove production centre in Dadaab was the fact that the stove comes in bulk, and if one small piece of it is lost, the whole stove cannot be used.

The team had the opportunity to meet with some of the women involved in the testing a month after it started and further discuss their feedback.

Comparisons were made primarily with the *Mandeleo* portable stove, which just over a majority of women in the camps have. Thus familiarity with the existing stove and instinctive resistance to change may have played a role in the considerations women made regarding the new stoves. Generally speaking, technologies that require more behaviour change on the part of the end user will also require more significant training and guidance on proper use than those that are more similar to current practices. Thus testing time and sampling are still too small for any final conclusions to be reached.

However, though preliminary, these findings reflect users' preferences for the *Mandeleo* portable stove, and that fuel efficiency - which may be higher with JikoPoa and Envirofit - is not the sole determinant of user preferences. Indeed, user behaviour can have a significant impact on the stove performance and should not be underestimated. Careful stove operation coupled with proper fuel preparation (i.e. chopping of wood sticks) likely results in higher efficiency. For instance, observations by the team throughout the camps (as well as in schools) reveal that women tend to use thin but long sticks of wood for cooking, even though this practice may result in heat loss and reduced fuel efficiency. Women therefore were less enthusiastic about chopping the wood into small pieces to fuel the other stoves. The main reasons they stated for the preference for larger pieces of wood were the fact that most lacked any wood chopping tools and the additional time required to regularly feed the chamber the smaller pieces of wood. These findings are consistent with results of a recent evaluation of five highly efficient stove models - including the Envirofit - in Dadaab.¹⁰³

All the above suggests that, besides fuel efficiency, implementers should also base their decision on any new stove model selection on the time and resources that agencies have available to adequately support changes in user behaviour required to ensure acceptability and efficient use.

¹⁰² USAID (2010), *Evaluation of Manufactured Wood-Burning Stoves in Dadaab Refugee Camp, Kenya*. Berkeley Air Monitoring Group.

¹⁰³ Ibid.



Annex 3: Bio-coal/fuel and ethanol

Traditional biomass such as fuelwood, charcoal and animal dung, provide important sources of energy in many parts of the world. Bio energy for cooking remains the dominant energy source for populations in extreme poverty.

More advanced and efficient conversion technologies allow extraction of bio fuels – in liquid, solid and gaseous forms - from biomass material such as wood, crops and organic waste.

Bio fuels can be solid such as charcoal, and wood pellet; liquid such as ethanol, biodiesel, or gaseous such as biomass. Another important distinction concerns the processing, whereby fuelwood is considered a primary bio fuel as the organic material is essentially used in its natural form, while the others are referred to as secondary as they required processing. Currently, around 85 percent of the global production of liquid bio fuels is in the form of ethanol.¹⁰⁴

Of particular relevance to the current report are ethanol and pyrolysis fuels. While a comprehensive overview and analysis of the above mentioned biofuels is beyond the scope of this report, some essential information can still be mentioned as prerequisite for further investigation on the potentials for production and use as cooking fuels in the country under concern. Moreover, it is important to mention that the main focus of the current report is on cooking fuel and that the below is by no means intended to suggest the need to pursue any of these as alternatives to traditional biomass currently used in Kenya.

Pyrolysis is a process for thermal conversion of solid fuels in the complete absence of oxidizing agent (air/oxygen), or with such limited supply that gasification does not occur to any appreciable extent. Commercial applications are either focused on the production of charcoal or of a liquid product such as bio-oil/diesel.

Slow pyrolysis at temperatures 400-800°C and long residence times maximizes the charcoal yield and gives about 30% of the dry biomass weight as charcoal. The energy rate of the products depends highly on the energy content of the biomass.

Ethanol is a liquid bio fuel produced using agricultural and food commodities as feedstocks. Most of the ethanol produced nowadays is based on either sugar or starch. Common sugar crops used as feedstocks are sugar cane, sugar beet, and sweet sorghum, while common starchy feedstocks are wheat, maize and cassava.¹⁰⁵

Ethanol production in Kenya - as in other countries - is not free of controversies. In 2008, the Government decision of converting 20,000 ha of ecologically sensitive wetlands into a sugar cane plantation for ethanol production was strongly criticized by environmentalists and wildlife activists.

¹⁰⁴ FAO (2008), *The State of Food and Agriculture 2008 – Biofuels: prospects, risks and opportunities*. Rome: FAO, p. 15. For an analysis of the impacts of biofuels on greenhouse gas emissions and on food security refer to chapter 5. Environmental Impacts of Biofuels and 6. Impacts on Poverty and Food Security.

¹⁰⁵ *Ibid*, p. 11.

In addition to the UNDP/Practical Action ethanol initiative mentioned in section 5.2.3 above, while in Nairobi the SAFE team facilitated a meeting with an ethanol gel and stove manufacturer based in Tanzania. The company, Moto Poa, imports all of its ethanol in liquid form from South Africa and has a daily production capacity in Kenya of approximately 2,000 tons of ethanol gel for cooking. The liquid ethanol is imported at a rate of 18,000-20,000 tonnes a month.



Ethanol gel is by definition denser than the liquid fuel from which it originates, thus according to the company's representatives reducing the risks (though apparently minimal) of spill over and explosion during transport and use. The gel stove (see image on the left) works similarly to the CleanCook stove promoted by the Gaia Association, but with a less sophisticated look and technology since, according to the manufacturer,

no particular safety mechanisms are needed for the gel. Stoves may be made available in Kenya at about US\$ 5-10 for one and two burner models, respectively.¹⁰⁶

¹⁰⁶ Meeting with Moto Poa representatives, Nairobi, 29.07.2010.



Annex 4: Charcoal briquette production from *prosopis juliflora*

(by Erin Patrick, Women's Refugee Commission)

Prosopis (also known as mesquite or mathenge) is a large, thorny bush introduced to Kenya and other arid and semi-arid regions of Africa (and elsewhere) beginning early in the 20th century as a means of slowing desertification and stabilizing sandy soils, among other qualities. *Prosopis* is drought- and salt-tolerant and can survive and thrive in environments where other vegetation cannot.

However, *Prosopis* has no natural enemies in the region and as such has taken over wide swathes of land, eventually becoming classified by the Government of Kenya's National Environment Management Authority (NEMA) as an invasive weed. Its low, dense growing pattern and large thorns cause grazing routes to be disturbed, animals and people can be injured if cut, and there are even reports of goats being harmed from ingesting the bush's sweet pods. Once established, *Prosopis* can crowd out native species, and due to its extensive root systems, can tap into a variety of groundwater reserves. Eradication is difficult and the ingestion and dispersal of whole seeds by grazing animals causes it to spread rapidly.

The myriad of negative characteristics associated with *Prosopis* have caused many governments in affected countries, including Kenya, to actively encourage populations to dig up the plant wherever they encounter it. Thus *Prosopis* is nearly unique among vegetation in Kenya in that there are no restrictions on its cutting or harvesting.

Despite its negative reputation, however, *Prosopis* does have several good qualities, including but not limited to the fact that its trunks and stems provide an excellent source for charcoal. Whereas only the largest pieces of *Prosopis* can be efficiently used directly as firewood or lump charcoal, nearly *all* woody pieces of the plant can be collected and used to manufacture briquettes. *Prosopis* is a hard wood that burns steadily for a long time, with a pleasing smell and taste and is therefore highly valued as charcoal in locations throughout the world. Moreover, the fact that *Prosopis* spreads quickly and is difficult to eradicate means that briquette production from this source could likely be considered sustainable (additional research would be needed to determine the precise rate of regeneration).

It is not clear if or how extensively briquette production from *Prosopis* has already been tried in Kenya. However, a series of interviews with key refugee and environmental stakeholders in refugee-hosting regions in Kenya found interest and knowledge of the potential for using *Prosopis* as a source of fuelwood and/or charcoal, but no knowledge of current or previous projects.

It is therefore suggested that additional research be undertaken into the potential for the use of *Prosopis* for charcoal briquetting in refugee-hosting regions of Kenya, for use by both refugee and host populations.

Besides addressing the critical shortage of household energy resources for both groups, such a project would have positive environmental ramifications (reducing the impact of



the *Prosopis* invasion) and livelihoods implications (refugees and/or hosts could be hired for harvesting and manufacture, and the negative economic impact of the *Prosopis* – restrictions on grazing land; illness and death of livestock caused by eating *Prosopis* pods – could also be reduced).

Recognizing that host communities suffer from many of the same environmental and household energy concerns as do refugees, it is further recommended that a *Prosopis* briquette project involve the participation of both communities in the harvesting and briquette manufacture process (similar to the GTZ fuel-efficient stove production centres already established) as well as in distribution and use of the briquettes themselves.

It is also understood that specifically in the Kakuma area, the host population (the Turkana) is already engaged in the use of *Prosopis* as either fuelwood and/or charcoal. It is unclear, however, if the wood being harvested is being converted into briquettes, which not only burn for a longer period of time and with a more regular temperature, but make use of a much larger portion of the tree than is possible with either fuelwood or lump charcoal. More investigation is needed into the use of *Prosopis* by the Turkana population, as it is conceivable that they could benefit economically from more efficient use of the resource.

The fuel-efficient stove models currently in use in the refugee camps in Kenya are designed to use firewood, not charcoal briquettes. However, during the recent field mission some refugees were observed using charcoal in the wood stoves after making some minor modifications on their own initiative. Though these particular household-level modifications may not be the most efficient, it is thought that in the short term, metal grates could be distributed to users of existing firewood stoves to allow those stoves to use *Prosopis* briquettes in a more efficient manner. However, it is also clear that there is a strong need for additional stoves throughout the camps (current stove coverage is only roughly 55-60 per cent; the average stoves lasts approximately three years), and therefore new, briquette-burning stoves could be distributed to those households that currently lack stoves as well as to households in need of a stove replacement, allowing for complete replacement of firewood stoves – provided the *Prosopis* pilot proved successful – in less than three years (again, with a minor modification to existing stoves in the interim period).

With support from the United States Agency for International Development (USAID), the Women's Refugee Commission (a partner in the current Kenya feasibility study) commissioned a study by Dr. Ahmed Hassan Hood of Practical Action-Sudan on the potential for the manufacture of *Prosopis* briquettes in eastern Sudan¹⁰⁷ – another region of Africa suffering from *Prosopis* invasion. The full report is available at www.fuelnetwork.org.

The project proposed for Sudan, outlined in the full report, assumes large-scale (private) investment in a commercial briquetting plant. However, there are myriad

¹⁰⁷ Dr. Ahmed Hassan Hood (2010), *Biomass Briquetting in Sudan: A Feasibility Study*, USAID.
http://www.fuelnetwork.org/index.php?option=com_docman&task=cat_view&gid=29&Itemid=57



examples from around the world (including in other refugee-hosting regions such as the Thailand-Burma border and eastern Nepal, among others), of the use of much more basic, less expensive technology for manufacturing briquettes. It is recommended that these more basic models be piloted as a first step in the Kenyan refugee context. See also <http://www.youtube.com/watch?v=LqI63IEg3MM&NR=1> for a full demonstration of a low-tech charcoal briquette-making process by the Massachusetts Institute of Technology's D-Lab. This small-scale demonstration uses an oil drum to carbonize the raw materials. However, the underlying principle could be used with the improved metal kiln detailed in Figure 2 above or perhaps with a traditional "earth mound" charcoal kiln to carbonize larger amounts of *Prosopis* at once.



Annex 5: Climate Change Impacts in Kenya

(by Maria Katajisto, Maria Katajisto, *WFP Climate Change and Disaster Risk Reduction Unit*, Rome)

Summary of key findings from the First National Communication to the UNFCCC (2002)

Climate context

Climate variability is not uniform across the country due to the variations in topography: some areas show significant changes in temperature and precipitation patterns while others show less variation. Temperatures are expected to increase between 0.5°C and 3.0°C. The most intense upward trend in temperature is felt in the highlands and the arid areas including the Turkana and Garissa districts, where the Kakuma and Dadaab refugee camps are located. Rainfall trends are highly variable across Kenya, with a maximum change of 20%: generally, agroecological zones with little precipitation averages have become increasingly drought-prone whereas humid agroecological zones have experienced increased drought frequency.

As disasters are a part of the Kenyan climate, global warming is likely to increase the likelihood of natural disasters. In particular, serious droughts have occurred at least 13 times in the past 50 years, including several droughts in recent decades.

Impacts of climate change

Projections of climate change indicate a pronounced incidence of extreme weather events (particularly droughts). Such climate variability will have adverse impacts on agricultural activities and water availability (especially in districts where water is already scarce). Increased frequency of extreme weather events is likely to cause a yield reduction of 20-30%. Consequently, changing rainfall patterns are likely to affect water resource availability in the arid areas of Kenya (particularly the Turkana and Garissa districts).

Energy, deforestation and climate change

Energy in Kenya is harnessed from a variety of resources—the effects of climate change can be viewed from the financial implications for generation and production of energy. Biomass energy is obtained from a variety of sources including wood and other combustible products such as crop residuals and animal fuels. Over 74% of the rural population rely on biomass energy for cooking and heating; wood fuel provides the bulk of primary energy consumption of about 70% and provides 93% of the total energy requirements in an average rural household. Biomass will continue to be the major source of energy for rural communities for the foreseeable future.

In the past two decades, demand for fuel wood alone has exceeded supply, rising from 18.7 million tonnes in 1980 to 38.6 in 1995—and demand is expected to increase. To a large extent, the decrease in wood supply can be explained by rapid deforestation rates. According to the Kenyan Ministry of Environment, the forest cover has declined



both in area and quality over the past two decades. This decline is likely to continue with population pressures. Additionally, forest cover is an important carbon sink contributing to an emissions reduction of 28, 262 GtCO₂e (using 1994 as the base year). Deforestation is leading to an increase in greenhouse gas emissions and a consequent acceleration of climate change impacts. In other words, demand for wood fuel accelerates deforestation, which in turn accelerates climate change impacts