UNIVERSITY OF CAMBRIDGE

shelterproject.org

report title

analysis of heating and cooking fuels and stoves in refugee, IDP and local settlements, Kabul, Herat, Afghanistan march 2002

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1 month, March-April 2002

who undertook the work

The mission was undertaken by Joseph Ashmore. Joseph is part of the **shelterproject**.org group:

shelterproject.org is associated with the University of Cambridge in undertaking two projects to:

(1) develop, with the aid community, the first detailed field guidelines for the physical planning and shelter sector (funded by DFID); and

(2) develop, with the aid community, a full understanding of shelter in cold climates (funded by EPSRC).

Organisations participating with **shelterproject**.org in the review and implementation of these projects include DFID, UNHCR, UNICEF, UNDP, The Sphere Project, IOM, ICRC, IFRC, CARE, MSF, LWF, and CRS, with Oxfam GB acting as lead collaboration agency.

See **www.shelterproject**.org for more information on these and other projects.

acknowledgements

ICRC ● EPSRC ● Fulcrum Consultants ● Buro Happold ● University of Cambridge ● Tom Corsellis ● Peter Manfield ● Kate Crawford ● Rachel Battilana ● Ilan Kelman ● Allan McRobie ● Robin Spence ● shelterproject.org

1 executive summary

1.1 introduction

Investigations were carried out in March 2002 into the prices of fuel in Herat and Kabul as well as the means commonly used for cooking and heating in IDP camps. The objective of the field tests were to

- Identify the appropriateness of agency provided stoves and prototype stoves to IDP populations
- Identify the fuel availability and fuel usage for Afghan IDPs
- Investigate stove usage inside temporary shelter by IDPs

1.2 findings

The stoves and burners found in the markets of Kabul and Herat as well as in IDP camps were recorded. The resulting stove classification is visible in sections 7.2 and 7.3, below is a summary.

	stove type	Approx Cost AFG	USD**	Useage*	Comments
2.1	**firepit** – ojah	0	0	C,H,W	smoke problems
2.2	**bread oven** – tanur	0		C	outdoor cooking
2.3	**Sandeli**	<100,000	3	H	cultural use, Carbon monoxide and saftety for small children
2.4	**bukhari** – **local** – rectangular	150,000-200,000	5-8	C,H,W	good appropriate, local solution
2.5	**Bukhari** – **ICRC** procured – Kabul	170,000	7	H,W	too large for use in tents
2.6	**Bukhari** – **multi-fuel**	400,000	10-15	C,H,W	like rectangular bukhari but burns deisel as well. "Too good" for IDP camp use
2.7	**Bukhari** – **UNICEF** – agency donated	170,000	7	C,H,W	Too large as distributed. IDP alterations make this useable
2.8	**Redi Calc II** (prototype)	NA		H,W	Durable and safe, but expensive and hard to fix as fabrication involves welding
2.9	**Bukhari** – AREA version	200,000 – 300,000	8-12	C,H,W	as local rectangular bukhari with integral water heater but no oven
2.1	**Bukhari** – self made	0	0	C,H,W	lacks flue
2.1	**Bukhari** – domestic version	400,000 - 1,000,000	15-40	H	diesel heaters for permanent structures only
2.1	**solar cooker**			C,W	cultural issues for use. Energy saving
2.1	**Samovar**	150-300,000	5-12	W	can be improved by use of conical firebox
2.1	**Hypocaust** under floor heating	NA		C,H	permanent structures only.
3.1	**gas stove**	150,000	6	C, (H)	gas expensive and hard to obtain in camps
3.2	**Paraffin stove**	200,000	8	C	paraffin expensive in camps

***Key** for usage column:
C – cooking H – heating W – water boiling
**For cost comparisons, note the severe variations of the Afghani, dollar exchange rates.

Stove usage and aprroximate costs for Herat and Kabul, Afghanistan, March 2002

The domestic cooking and heating fuels available in Afghanistan are covered in section 7.2 and are summarised in annexes d1 and d2.

1.3 key conclusions

The primary message learned is that small, multipurpose stoves tend to be better suited to use in Afghan IDP temporary settlements. These small stoves increase the amount of heat given to the cooking pot by bringing it closer to the centre of the fire. Increasing cooking efficiency is essential with the extremely small quantities of fuel that are available to Afghan IDPs. Figure 1 below shows the sizes of various stove types available in Afghanistan

The locally procurable rectangular stoves used by IDPs were deemed to be particularly successful solutions due to their flexibility. They can be used to heat the tents in cold weather, water could be heated simultaneously as food could be cooked and they had a warm internal oven. In addition, its rectangular shape favours stacking for mass transportation. This stove type should be seen as the basic model and other to be developed upon.

Practically fabrication of stoves should not include welding as this significantly increases production cost and makes repair costly and difficult for IDPs.

The time at which stove distributions occur is essential. Distribution or delayed distribution when the weather is getting hot in many cases will lead to immediate resale, often at a very low cost, even in the order of twenty times less than the procurement and delivery cost as was seen in Maslack and Shaidai camps, Herat.

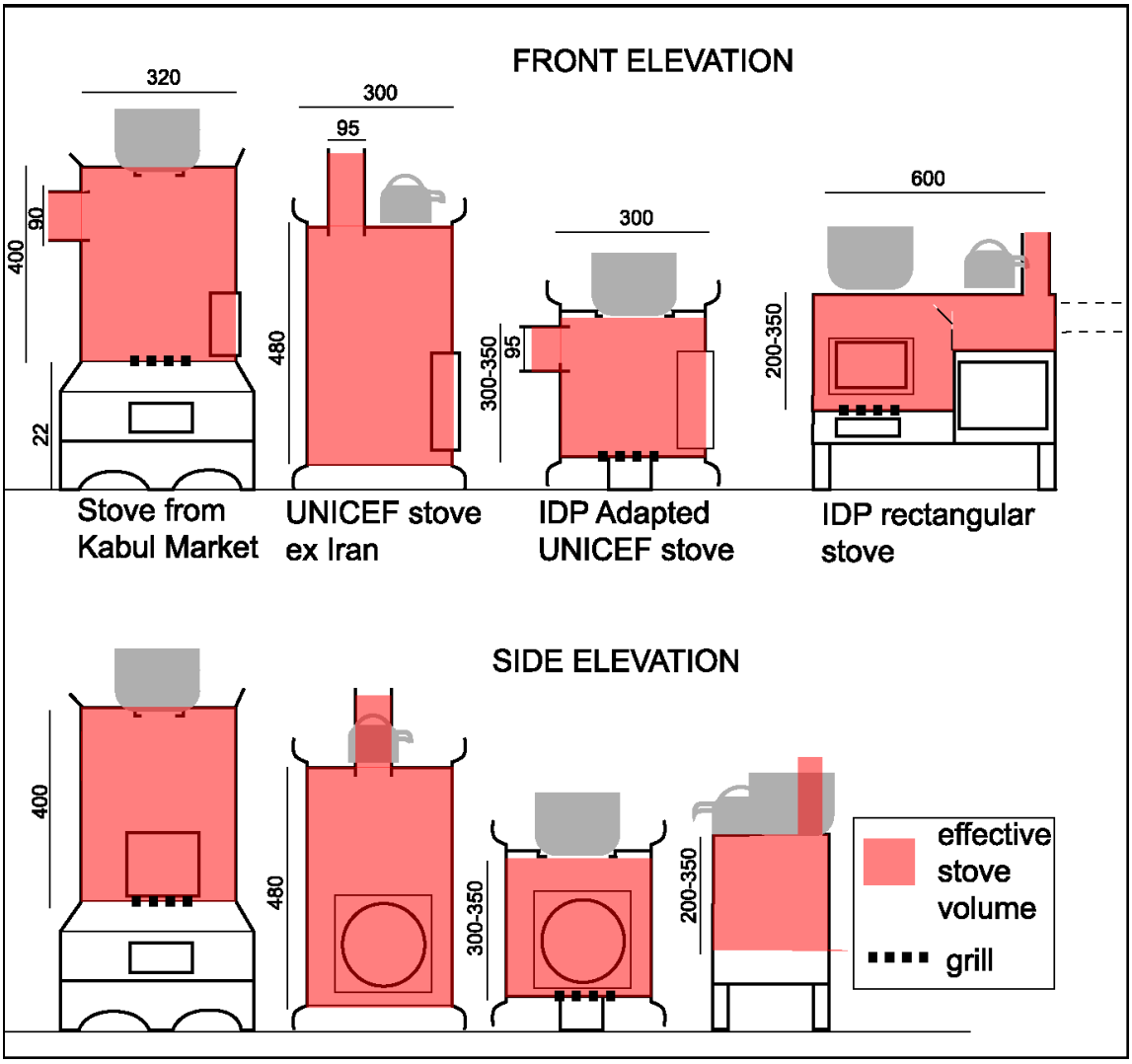


Figure 1. Scale drawings of Bukhari designs in IDP camps around Herat as well as ICRC prototypes

2 table of contents

3 introduction

3.1 introduction

Afghanistan currently has one of the largest displaced populations in the world following years of drought and twenty years of war. Inaddition to the obvious need of fuel for cooking, there is also a large need for fuel for heating in winter, when it gets very cold in most regions, and especially at altitude where it gets even colder. In order to effectively provide this fuel, aid agencies must consider not only the efficiency, availability and sustainability of the fuels, but also must consider the stoves and means of cooking being used as well as whether the IDPs have the means to burn it. This report takes Kabul and Herat as case studies for the fuel consumption and stove use in Afghanistan.

4 objectives and purpose

4.1 Overall project objectives

This report is part of a wider research project investigating cold weather shelter perfomance. The aims of this are to

4.2 stoves and fuel analysis objectives

The purpose of this investigation is to identify the most relief appropriate means of heating and cooking for families in Afghan IDP and refugee settlements. This takes into account

- health impact
- safety
- fuel cost
- fuel availablilty
- environmental impact
- stove cost
- stove efficiency
- stove availability
- ability of IDPs to repair and maintain stove
- culturally acceptable practice

4.2 purpose

the purpose of this study is to assist the aid community in specifying and procuring stoves.

5 methodology and standards

5.1 introduction

5.2 methodology

Current fuel costs were obtained by both visiting the relevant sections of the local markets and by talking to Afghan staff. Fuel availability was also estimated through market visits and private discussions. Some sample stoves were also purchased and the fuel was used to boil water on local stoves.

5.3 standards and indicators employed

All stoves and fuel types were compared relative to each other. Many stoves that would not be acceptable on the European market due to issues of durability and quality of fabrication were found to be acceptable to afghan people. Similarly many of the stoves that could be found in Europe would not be appropriate for the afghan market due to difficulty of repair and efficiency of use with the limited fuel supply found in IDP camps.

In comparing stoves, it was decided to compare the cost recorded in afghanis and translated into US dollars at the exchange rate at the time of the survey. It should be noted that the exchange rate fluctuates wildly.
Comments on health issues follow conversations with MDM (Medicins du Monde) in Herat. MDM ran half of the clinics in Maslack camp.

Comments on environmental sustainability are made from a combination of personal comment and experience, discussions with national and international staff and discussions with AREA, (Agency for Rehabilitation and Energy Conservation in Afghanistan.

5.4 constraints and limitations

Tthis survey represents a snapshot in time of two cities in Afghanistan. The political and economic situation is changing rapidly, and for this reason fuel availability and costs will be changing. Furthermore in the long term it is possible that newer fabrication methods and higher quality materials will become available for stove fabrication. Regarding fuel, it is clear that the availability of firewood is decreasing, and so both to safeguard the environment for the future, and to maintain fuel availability in the long term, alternative sources of fuel need to be identified.

7 results

7.1 introduction

The results are split into three sections, the first (section 7.2) is an analysis of the fuel cost, sustainability and availability, the second (section 7.3), is a survey of existing stove types and stoves under development in Afghanistan. The third (section 7.4) touches on burners – these burn liquid fuel and gas and are designed solely for cooking – although in some cases they are used to a limited extent for heating.

7.2 fuel types - overview

In Afghan IDP camps, fuel availability is generally very low. In the long term there is the potential for significant wind and solar power generation systems in most regions of Afghanistan. Some solar cookers have been distributed (section 7.3.16), although they have not as yet been widely accepted by the population. Annexes d1 and d2 contain fuel costs as of march 2002 in Herat and Kabul. It should be noted that the exchange rate fluctuates wildly and so the fuel costs are subject to change. There is also a significant seasonal variation of fuel costs of up to 50% on some fuels. The following fuels are commonly used in Afghanistan:

7.2.1 wood

usage
wood is used for heating and cooking

availability
In Kabul, wood comes from the forests to the south and Paktio to the North. There is no clear data about deforestation rates but there is undoubtedly a sustainability issue with burning wood. Surveys carried out by a German survey team in the late 1970s indicated that approximately 2% of Afghanistan was forested. A survey carried out at the University of Kabul in 1999 put this figure at a little over 1% (source AREA - Kabul), with 70 – 80% of natural forests being damaged. A large proportion of deforestation is due to the need for wood for construction and the illegal timber trade with Pakistan. For example it is estimated that the 200,000 returnees from Pakistan will require 600,000 trees for construction alone (source AREA, Kabul). Trees for roofing take approximately 30 years to grow, whilst other construction timber can take up to 100 years to grow. AREA and Madeira are involved in tree replanting projects, although on a small scale compared to the size of the problem.

comments
Wood burns slowly with relatively constant heat. The wood that is burned generally has a high calorific value and is fairly dense slow growing wood.

wood purchased in herat

7.2.2 charcoal

usage
charcoal is mainly used for heating and for boiling water.

availability
In Kabul the majority of the Charcoal comes from the southern forests. There are not significant quantities available in Herat.

comments
Where charcoal is available, structures are traditionally heated using a
sandeli – a small metal pan containing the charcoal covered by a low table and blankets
In Herat, there are several qualities of charcoal available, the better of which is from Turkmenistan. In march 2002, a significant distribution of charcoal was under way in Maslack IDP camps, Herat.

Turkmen charcoal for distribution to IDPs Maslack camp 20/03/02

7.2.3 bushes

usage
these bushes are used for heating and cooking

cost
free to collect.

availability
local and naturally growing bushes are a major fuel supply both in the IDP camps and in Herat itself. Currently the nearest source to Maslack camp is 4 hours walk approximately 15km away due to localised over use. This problem is clearly not confined to the vicinity of this one camp. Over use of these bushes will lead to soil degradation and erosion problems over the long term.

comments
The bushes burn very quickly with a high heat output over the short term. The release a lot of smoke when first burned. They are traditionally burned in holes in the ground (or *ojaghs*) for heating and for cooking. The sustainability of their intensive use near areas of high population is an issue. These bushes propagate relatively easily and are good for soil stabilisation and the halt of desertification. It is estimated that it would take 2-10 years (AREA - Kabul) to cover an area with bushes, although the long term effects of local overuse will be in a general degradation of soil quality.

bushes for sale, Maslack camp, Herat, 20/03/02

7.2.4 sawdust

usage
Sawdust is slow burning and used in *bukaris* (stoves), mainly for heating

cost
It is deemed by Afghanis as relatively expensive

availability
Sawdust has low availability.

comments
Sawdust burning stoves have been distributed to schools by UNICEF on safety grounds as they do not create sparks.

7.2.5 kerosene

usage
cooking

availability
Kerosene is significantly used in Herat for cooking. It requires specialist stoves

comments
Kerosene is not commonly available to IDPs

7.2.6 diesel

usage
Diesel is used in domestic heating and in some burners.

availability
Diesel is readily available though the largest consumer appears to be in transportation.

comments
A large distribution in march of diesel for stoves in Shaidai camp near Herat lead to the immediate resale of large amounts of diesel at one third of the market rate due to lack of appropriate stoves and the fact that bushes and fuel wood could be collected for free although after a long walk.

7.2.8 gas

usage
gas is used for cooking

availability
Gas is readily available in Herat city. It comes in gas cylinders, and is not piped to homes.

comments
gas requires significant distribution networks to deliver and reclaim the empty cannisters. It is not advisable to distribute gas canisters in IDP camps as they will require constant refilling by NGOs

7.2.9 coal

usage
not currently used in Herat or Kabul

cost
no cost data is available

availability
According to AREA (Agency for Rehabilitation and Energy Coservation in Afghanistan) significant coal reserves exist within 150km of Herat. These have not as yet been commercially developed.
Comments coal is not currently an option

7.2.10 biogas

usage
cooking, heating

cost
there is relatively large setup cost to build a fermentation vat on a village basis.

availability
biogas production depends on significant animal stocks which do not exist in IDP camps.

comments
About 60 biogas projects supported by AREA are currently running in Afghanistan. Plants are constructed from metal, adobe and cement to convert dung into methane. Although not suitable for emergency use due to time, material investment and need for animals, they are an interesting energy solution for development projects and local self sufficiency.

7.2.11 dung

usage
heating and cooking

availability
In rural areas where livestock still exist, dried dung mixed with straw is common.

comments
This is a slow burning fuel and often requires additional wood to keep it alight. In cities it is treated with disdain as it is considered as a poor mans fuel and also it can give a particular flavour to bread that is cooked with it. It is an environmentally sustainable if animals are present.

dung purchased in Herat, 15/03/02

7.3 heater types

7.3.1 overview

Current agency heater models differ significantly in terms of size and metal thickness from those used by IDPs. As a result of their large surface areas, they tend to dissipate the heat away form the pan which is being used for cooking. They are less successful in terms of cooking and water heating where small quantities of fuel are used. Figure 1 shows a picture of the *bukharis* produced by agencies and those commonly used or adapted by IDPs. Of all designs seen, the rectangular IDP version has most uses and on preliminary inspection, appears to be relatively efficient for small quantities of wood. Its small volume and rectangular shape also improves transportation and minimises wastage.
For schools and hospitals larger stove types could be considered.

Locally procurable stoves tend to be made of very thin metal. This has the advantage that they are relatively easy to repair and are cheap. As it is relatively expensive to braze or weld metal, and it is not possible to do so outside of the larger cities, locally fabricated stoves are generally made by hammering and crimping the metal. It is also relatively difficult to arc weld thin metal that is commonly and cheaply available for stove manufacture. Stoves that are proposed by agencies are built to a higher specification with thicker steel and can only be made and repaired with welding/brazing equipment.
Afghan stove production is relatively small scale and is non-industrialised. The section of Kabul market fabricating stoves consists of about 20 stalls each of a handful of workers. Large procurements (up to 20,000 units) by agencies have been made in Iran and Pakistan.

7.3.2 distribution

Where heaters are distributed it is essential that they are distributed at the beginning of the winter. Late distribution (such as in Maslack camp – March, 2002) has lead to their immediate resale by refugees at very low prices (< $0.5 USD).

7.3.4 health

In Maslack camp, relatively few burns are reported directly from fires / stoves. The majority of burns are injuries from boiling water. (source MDM, Maslack camp). There is some concern about very small children with open firepits and covered fires (see section 7.3.7 and section 7.3.5). There have been no reported tent fires in Maslack camp (source IOM, camp managers), and the general consensus is that the Afghan IDPs are relatively well skilled at using stoves inside tents.

The scale of the respiratory health effects from smoky environments is unclear. There are undoubted issues of comfort as an open fire inside a tent leads to watery eyes and coughing.

Although there were no official casualties in Maslack camp last winter from carbon monoxide poisoning, although the danger of running stoves and burning charcoal in insufficiently ventilated spaces is recognised as an issue by occupants who are aware of its causing drowsiness.

7.3.5 firepit - ojagh

fuel
wood, bushes

usage
this is a simple firepit. It is possible to recover small anounts of charcoal for use in a sandeli (7.3.7)

cost
free

health issues
there are potential respiratory health issues where this occurs in tents

comments
this is a free, local solution. Digging a fire pit conserves energy to limited extent by warming the surrounding soil, which retains some heat. There are significant comfort issues from smoke in the eyes, especially when used inside tents.

photograph: inside IOM tent, Maslack 12/03/02

7.3.6 bread oven - tanur

fuel
wood, bushes

usage
these ovens are used for making bread

cost
free, although these ovens require some time and skill to construct

health issues
these ovens are used outside so have limited associated respiratory health problems.

comments
this is a free, local solution. It conserves heat by warming the surrounding soil which slowly releases heat. They are often shared by several families. Bread is not necessarily baked every day.

photograph: outside tent, Maslack 12/03/02

7.3.7 sandeli

fuel
charcoal

usage
charcoal is burned and then covered with ashes in a tray. Ashes are removed over time to release more heat. A small table covered in rugs placed above the burning charcoal.

cost
80,000-100,000 afg ($3USD)

health issues
carbon monoxide poisoning may occur when the room is poorly ventilated. It was reported by afghan staff near Kabul that sufferers of drowsiness are sometimes splashed with water to revive them. There is the danger of burns with very small children crawling into the *sandeli*. There was also the claim of problems due to different parts of the body being at different temperatures, although this was disputed by MDM, Herat.

comments
this is a low cost traditional heating solution for cold weather.

Photograph – Sandeli in tent in Kabul region 11/03/02

7.3.8 bukhari – local box shaped stove

fuel
wood, bushes

usage
This stove can be used for both cooking and heating. Pans are placed on top directly above the fire box for cooking. Water can be heated to make tea on the lower heat ring to the side. There is a small oven to one side of the fire box. The stove can also be used to heat the room

cost
this stove is fabricated locally. It is made at relatively low cost to IDPs – 150,000- 200,000Afs. $6-8USD. They are sometimes self-made by occupants. It is not clear what the local production capacity is in Herat.

health issues
fire problems do not appear to be significant.

comments
Local fabrication. This stove works as a heater, an oven, a stove and a lower heat ring for making tea. This is a multi purpose and small volume stove.

Photograph – Bukharis in tent in Maslack camp. march 2002

7.3.9 bukhari – stove procured by ICRC in Kabul

fuel
wood/charcoal

usage
Used for cooking and heating. Pans are placed on top of the stove. There is a drawer which can be partially removed to regulate the rate at which the fuel burns.

cost
170,000 Afs - $7 USD

health issues
metal gets very hot and will cause burns if touched when burning stove alight.

comments
this stove is made from very thin metal, so the stove has a limited lifetime. This model of stove was distributed by ICRC in some schools in Kabul as part of its winterisation project. It is advisable to reduce the volume and height of the stove for use in IDP camps to cater for limited fuel use. There are also some feet on the bottom. This does not effect its operation when placed upon the earth but does have an associated cost of additional materials and additional volume for transportation.

Photograph – market in Kabul 11/03/02

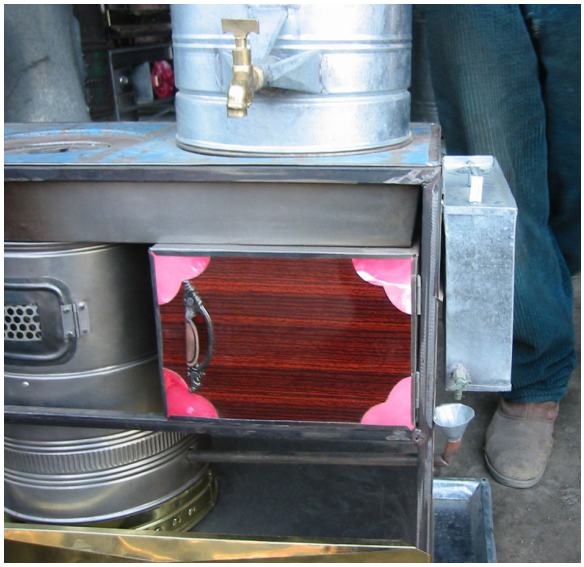
7.3.10 bukhari - combined fuel source in Kabul market

fuel
diesel/wood/charcoal

usage
this stove can be used for heating, cooking and making tea. It also has an oven and in some cases an integral tea urn. Diesel is supplied via a drip feed tap which gives manual control over the diesel feed.

cost
400,000 Afs, $15 in Kabul.

comments
this stove is about twice the cost of single fuel stoves, although it is adaptable to a diversity of fuels. It also has an integral water boiler.



Photograph – market in Kabul 11/03/02

7.3.11 bukhari – stove donated by UNICEF, Herat

fuel
wood/charcoal

usage
This stove is used for cooking and heating. Pans are placed on top of the stove.

cost
these stoves cost approximately $7USD and were purchased in Iran. This cost excludes transportation cost. Some of these stoves were distributed late and are were being resold in IDP camps for 13,000 to 20,000Afg ($0.5 USD)

health issues
problems from tents catching fire due to sparks from these stoves do not appear to be significant. Burns from the stove metal have not been reported as a significant problem.

comments
This stove is made from 1mm metal. There is a significant wastage due to damage during transport. A significant number of IDPs have paid around 20,000 AFG to have these stoves altered. These small alterations significantly increase fuel efficiency where small quantities of wood are used. These alterations include:

- Reducing internal volume by reducing height of stove by around 20 cm
- Cutting holes in the bottom to allow ventilation
- Removal of flue from top and reinsertion in side of stove.
- Making these changes at source would slightly reduce fabrication cost and would reduce transportation volume by approximately 30%, as well as improving usability for IDPs.

fabrication
This stove is fabricated in Iran by hand with locally available tools (no welding). These stoves are thus easy to fix and low cost to fabricate.



photograph: left and centre UNICEF stoves for distribution: Maslack camp 12//03/02
right: IDP amended UNICEFstove. Maslack camp 18//03/02

7.3.12 RedI CALC II prototype stove – fabricated in Kabul

fuel
wood

usage
wood burning stove

cost
currently in prototype stage so approximately $150 USD. This is clearly much higher than the cost of the stove when mass produced in Pakistan or Iran, mass production (5000 units/week) may not be currently possible in Afghanistan.

health issues
this is a relatively smoke free stove and it is safe to touch, preventing burns.

comments
currently in prototype stage. This would be more suitable for use in schools /hospitals rather than IDP camps. Major issues with this manufacture prototype are

- Manufacture requires welding. This leads to high cost of manufacure and high cost to repair. The nearest welding apparatus to Maslack camp is about 10km away on road to Herat.
- The fire cradle is badly made so has limited ventilation.
- The stove currently does not come with a cooking pot to fit. This severely effects the efficiency of the stove and is an essential component.
- The stove is fabricated from high grade materials – far in excess of those used by IDPs. This creates social problems where the standards of IDPs become higher than those of the non-displaced population.
- High cost comparative to locally available stoves. This cost will be reduced in volume fabrication.
- Models received were brazed. This melted on heating.
- Large volume – this inapplicable in Afghan refugee context due to fuel scarcity. The fuel compartment needs to be made significantly smaller.

For many Afghan uses / fabrication, this stove should be redesigned so that fabrication requires no welding. This would reduce fabrication costs and would facilitate repair.

photograph: RedI CALC II, Herat 11//03/02

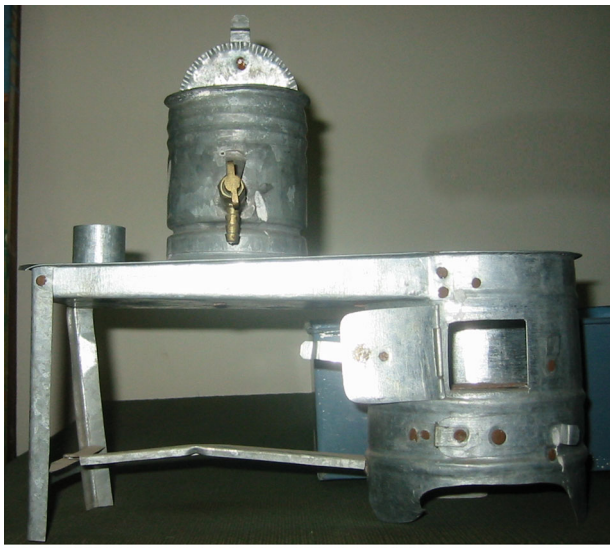
7.3.13 bukhari – stove designed by AREA (Agency For Rehabilitation and Energy Awareness)

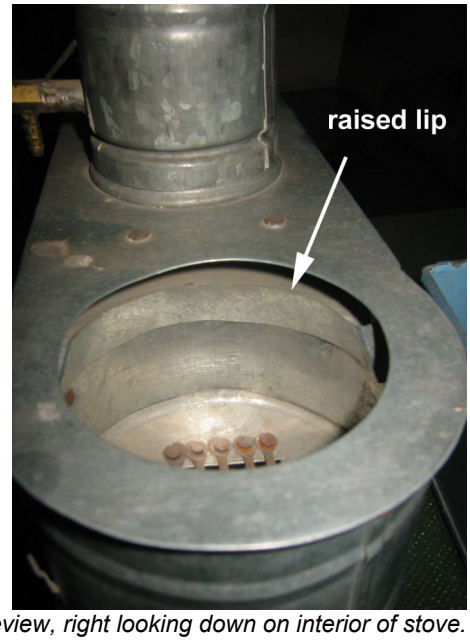
fuel
wood

usage
used in residences for heating

cost
200,000-400,000 AFG (estimate). $10 –15 USD

comments
approx dimensions 650(tall)x550(wide)x85(long). Fuel efficiency improved stove. Small size, heat rises in fire box. Exhaust forced over narrow lip and then runs under water container (20l) thereby heating it. ICRC ordered 1000 for distribution in Kabul 4 years ago. Similar design to locally used box type stove with integral water boiler but without oven. Made from thin steel apart from galvenised water tank. Water tank may be excessive for distribution to IDP camps.





Photograph: AREA bukhari – model in Peshawar left sideview, right looking down on interior of stove.

7.3.14 bukhari – stove made by IDPs

fuel
wood, bushes

usage
used in IDP camps for cooking/heating

cost
very low

health issues
the lack of chimney may lead to respiratory health problems and is uncomfortable.

comments
this is an extremely low cost solution and is made from an old tin. It has no flue and no proper ventilation for the fire.

photograph: domestic heating stove, Maslack 21/03/02

7.3.15 bukhari – Domestic heating stoves

fuel
diesel

usage
used in residences for heating

cost
400,000 - 1,000,000AFG, $15-30 USD

comments
these stove are over expensive and too large for use in tents. However they are potentially good solutions for use in schools and hospitals.

photograph: domestic heating stove, (left icrc offices, right Oxfam offices), Kabul 11/03/02

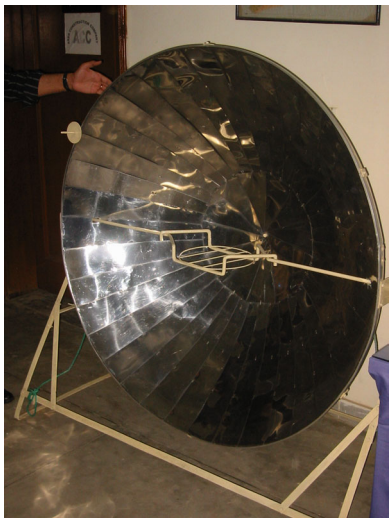
7.3.16 solar cooker

fuel
sunlight

usage
the food is placed at the focus of a parabolic reflector. The cooker is then directed towards the sun.

health issues
there are no significant health issues.

comments
this is a sustainable cooking solution although there are some difficulties involved in encouraging local populations to change their cooking habits. Under previous regimes, the agency involved in their distribution had many political difficulties as it was claimed that the stoves were being used as satellite dishes. Under the correct conditions and usage, 3 litres of water can be boiled in 40 minutes. 20,000 of these cookers have been distributed.



photograph: solar cooker 30/03/02

7.3.17 samovar – water boiler

fuel
charcoal

usage
charcoal is poured down the central tube and burned. There is a ventilation grill at the bottom. There are several sizes available in the market in Kabul, with capacities ranging from 15 to 200 litres. It is possible to boil 30 litres in 15 minutes.

cost
150,000- 300,000, £7-10USD-afg depending on size.

health issues
These are generally used outside. Due to their tall, thin shape there is a danger that small children may knock them over.

comments
These kettles are very common in towns and were not seen in IDP camps. These kettles are often seen wrapped in cloth and sacking for insulation. It is possible to improve the efficiency of these kettles by having a conical fire tube (which is thicker at the bottom) rather than a cylindrical one.

photograph: water heating kettle, kabul 11/03/02

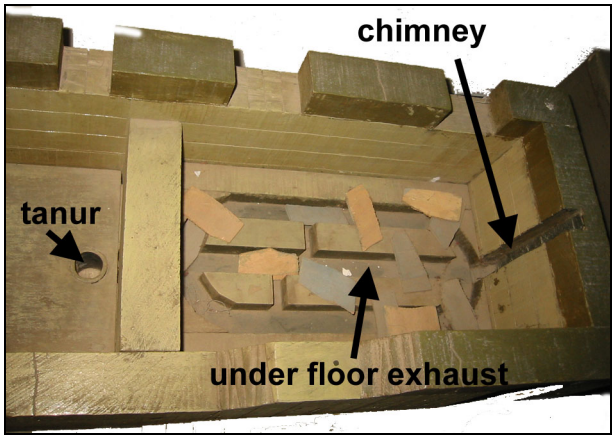
7.3.18 hypocaust – underfloor heating system

fuel
wood, dung.

Usage
underfloor heating system with heat source being a bread oven. The exhaust fumes from the oven pass under floor and heat room.

cost
na

comments
this system is commonly used in village houses for heating. It is a heating solution for long term settlements rather than temporary shelter in the relief context.



photograph: hypocaust –AREA model, Peshawar - under floor heating system 21/04/02

7.4 burners

7.4.1 overview

there are two main types of burner used in and around Herat, the gas burner and the multiwick paraffin stove.

7.4.2 gas burner

fuel
gas

usage
cooking stove

cost
150,000Afg. ($5 USD) Fuel = 10,000Afg/kg

comments
these burners are commonly used stove for cooking. They are sometimes briefly used for heating spaces to reduce chill. These stoves are not very common in IDP camps due to capital outlay and fuel cost.

photograph Maslack camp 28/03/02

7.4.3 parrafin burner

fuel
parrafin

usage
cooking stove

cost
200,000 – 250,000Afg.($6-$9USD). Fuel = 11,000Afg/kg

comments
these burners are made in China and Iran. They have multiple wicks dipped into the paraffin which burn fuel in an enclosed drum.They are commonly used stove for cooking, and sometimes used to reduce chill. They are less common in IDP camps due to capital outlay and fuel cost.

photograph Maslack camp 28/03/02

8 conclusions

8.1 introduction

Fuel types and stoves available on the market were investigated both in Kabul and in Herat in March 2002. It is clear from these two case studies that there is significant variation in fuel costs and availability both seasonally and regionally. The most important issue in IDP camps was found to be the lack of fuel due to both the poverty of the IDPs themselves and the lack of locally available wood.

8.2 fuel

The long term prognosis for wood availability in most of Afghanistan is not good with the limited forests rapidly being depleted for use as construction timber and for use as firewood. Many centres of habitation are several hundred kilometres from these sources, so firewood is both scarce and expensive. Similarly with bushes there is the need to replant the bushes that are used as firewood near areas of dense habitation. This will provide continued fuel for the future and help to stabilise the soil.

In the long term there is a serious need for the movement to more renewable fuel sources and the reforestation of many areas of Afghanistan.

Fuel distribution is difficult due to the weight and volume of the fuel as well as the difficulty of procurement of sufficiently large quantities without distorting the local market. Where it is done it is important that the IDPs have the means to burn the fuel given.

In addition to the other logistic and distributional savings, the movement towards distribution of bread rather than raw flour in the camps surrounding Herat has positive implications in terms of fuel consumption. These community level cooking facilities should provide certain economies of scale, and may well help to reduce fuel consumption of the camp as a whole.

8.3 stoves

There are many types of stoves available in Afghanistan, burning a diversity of fuels. These are generally fabricated in Afghanistan, Iran, China and Pakistan. There appears to be no factory scale production of stoves in Afghanistan. The critical issue with stoves is fuel availability, both in terms of fuel type and in terms of quantity. Generally stoves made and used by IDPs tend to have a small internal volume and small external surface area so that they can be used most efficiently for cooking. They are also generally made from very thin metal. This both reduces production and material costs as well as allowing for easy repair. However this thin metal has the associated issues of durability and potentially slightly reduced thermal performance.

Stoves designs that allowed for mud and stone infill to preserve heat as with a storage heater and accompanied training would potentially be an advance, although more work needs to be made in this area.

annex a initialisations and abbreviations

AREA – Agency for Rehabilitation and Energy Awareness In Afghanistan.
bukhari – stove.
EPSRC - The Engineering and Physical Sciences Research Council,UK
ICRC - International Committee of the Red Cross, Geneva
Ojagh – fire pit
Sandeli – charcoal burning pan covered by small table which in turn is coveed in blankets to keep people warm
Samovar – charcoal burning kettle
Tanur – bread oven

annex c map of the region

annex d

d1 prices Herat

	price / kg					
Fuel	**af/kg**	**USD/kg**	**Usage**	**source**	**Short term avail**	**long term avail**
Wood	1500-2500	.04-.065	Heating/ cooking		Good	non-sustainable
charcoal	5,000-12,000	0.13-0.32	Cooking	Turkmen	Low	non-sustainable
sawdust			Heating		Poor	non-sustainable
bushes	1250	0.034	Heating/ cooking		High	non-sustainable in locally high volume
diesel	9,000-10,000	0.25	Heating		Good	
kerosene	11,000	0.3	cooking		Low	
Gas	12,000-25,000	0.67	Cooking	Iran	Medium	
electricity	NA		NA		Low	
Dung	1250	0.34	Heating/ cooking	local	Low in camps, variable elsewhere	Sustainable. Though dependent on livestock

d2 Prices: Kabul

	Price / kg					
Fuel	**af/kg**	**USD/kg**	**Usage**	**source**	**short term avail**	**long term avail**
Wood	1,800	0.05	Heating/ cooking			non-sustainable
Charcoal	3,000-3,400	0.1	Heating/ cooking		Good	non-sustainable
Sawdust	3,700		Heating/ cooking			non-sustainable
Bushes	-	-	-		Low	non-sustainable
Diesel	8,000	0.21	Heating/ cooking			
kerosene	10,000	0.27			Low	
Gas			cooking		OK	
electricity	NA	NA			Low	
Dung					Low in city	

Prices quoted with dollar exchange rate of 1USD = 37 000 Afghanis. Please note that the exchange rate varies significantly
(high: june 2001 1usd=70,000Afs, low December 2001 1USD=11,000Afs)

annex e mission itinerary and people met

Peshawar 08/03/02

Kabul 10/03/02

Ghulam Destagier ICRC winterisation project engineer and architect, Kabul
Peter Banks, IOM, Programme manager Kabul
Josefa Ojona, UNHCR Assistant chief of mission, Kabul
Farheed, CARE programme manager, Kabul
Wardagiya, IRC, Kabul
Douglas Osmond, Senior purchasing officer, STS, Kabul
Ingrid, ICRC. FRC cooperation, Kabul

Herat 12/03/02

Hubert, IOM camp manager, Maslack
Marc Petzoldt IOM operations officer, Maslack
Cael Coleman, Shelter For Life, progaramme manager, Herat
Thomas Davin, Unicef Emergency Officer, Herat
Gary Bruce, Simon Brudett, Feed the children, Herat
Danny Gill, IOM
Dr. David, Medicins Du Monde, Doctor, Maslack camp
Christophe Coeckelbergh, ICRC, Head of Sub delegation, Herat
Pierre cortesi, ICRC, watsan engineer, Herat
Dr. Adle IRC, Herat.
Dusco UNHCR assistant programme officer, Herat.

Kabul 30/03/02

Andy Bastable, OXFAM
Aminul Haq Mayel, Deputy managing director, AREA

Peshawar 02/04/02

Sayed Farid, ICRC Logistics Peshawar
Habib-Urahman qaderdan Alternative technology coordinator, AREA

Islamabad 04/04/02

Sasa Longcherich, IOM procurement officer, Islamabad

Lahore 05/04/02

Naxir Peracha, chairman shahpur textile mill
Tariq Rashid Muggo, Chief executive officer Shaikh combined industries
Furqan Sarwar and Farhan Sarwar, H.Sheikh Noor-ud-Din and sons

Karachi 06/04/02

Khubab Ahmed, partner National tent house
Naveed Ahmad Managing director H. Nizam Din and sons.

Peshawar 07/04/02

annex f distribution list

Open Document, released at the first Peer Review of the University of Cambridge **shelterproject**.org peer review, Geneva, June 2002. Available online at www.**shelterproject**.org