

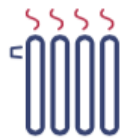
# Household Energy Use

**DRAFT** Catalogue of Cooking, Heating and  
Lighting Fuels and Technologies

September 2016



Cooking



Heating



Lighting



## Contents

Contents.....	1
Acronyms .....	2
Introduction to the catalogue.....	3
How to read this catalogue.....	4
Cooking	
I. Cooking Technologies.....	5
II. Cooking Fuels .....	11
Heating	
III. Heating Technologies .....	16
IV. Heating Fuels.....	22
Lighting	
V. Light sources .....	30
VI. Kitchen Locations .....	37
Acknowledgements.....	39
Photo Credits .....	40

## Acronyms

COPD – Chronic Obstructive Pulmonary Disease

HAP – Household Air Pollution

IAQ – Indoor Air Quality

LED – Light-emitting Diode

LPG – Liquefied Petroleum Gas

SDG – Sustainable Development Goal

WHO – World Health Organization

## Introduction to the catalogue

### Household Energy: A Global Health Crisis in the Home

Lack of clean energy access and use lie at the heart of many pressing issues currently facing people around the planet. Many families, particularly in low income countries, rely on solid, polluting and dangerous fuels—such as wood, dung, charcoal and kerosene—to meet their energy needs for cooking, heating and lighting. According to new analysis from the WHO Global Household Energy Database, around **3.1 billion people living in low and middle-income countries rely on polluting fuels and technologies for cooking**<sup>1</sup>. The use of these fuels in inefficient stoves results in the emission of harmful pollutants which contributes to household air pollution (HAP) and leads to a large and avoidable burden of disease and countless deaths. Household reliance on inefficient and unsafe fuels also has significant adverse livelihood impacts, in addition to the negative health outcomes related to HAP. Energy collection presents a significant time burden for households that rely on polluting fuels for energy.

In light of these heavy costs, it is important that data are available to accurately monitor the use of diverse fuels and technologies to meet energy needs at the household level. Current data lack information about fuels and technologies used for purposes other than cooking, such as heating and lighting. Polluting heating and lighting fuels (e.g., kerosene lamps) can have many of the same health and time costs as polluting cooking fuels. Most current surveys ask only about the primary fuel used in the household and fail to account for fuel stacking, or the use of multiple fuels and devices in parallel for multiple purposes. To account for fuel stacking and more accurately measure exposure to air pollution at the household level, surveys need to include questions about **all types of fuel used** in the home.

This catalogue was designed primarily to accompany the **Household Energy Use Questions for Surveys**, which have been developed by the World Health Organization (WHO), in coordination with the World Bank, the Global Alliance for Clean Cookstoves and in consultation with a group of experts. These questions will be used to monitor progress towards achieving Sustainable Development Goal (SDG) 7, “Ensure access to affordable, reliable, sustainable and modern energy for all,” and to close the gaps in current data discussed above.

This catalogue primarily serves to assist researchers and agencies implementing these survey questions. It is most useful as a tool for **interviewer trainings**. It is vital that all individuals involved in implementing surveys related to household energy use have a thorough and common understanding of the different types of fuels and technologies available in each context and categorize the fuels and technologies found in the households in a similar manner across all interviews. To facilitate this understanding, it is important for trainers and interviewers, in each locality where survey questions are being implemented, to compile a list of the fuels and technologies used in that locality and ensure that all interviewers, trainers, data processors and other survey staff have a common understanding of the categories into which each of these location-specific fuels and technologies fall.

This catalogue can also be used to support the design of future surveys and questionnaires to monitor household energy use. The use of the fuel and technology categories presented in this document will promote comparability of data across time and localities. These resources were referenced during the development of this catalogue, and can serve as other useful resources for information regarding fuels and technologies used at the household level: The Global Alliance for Clean Cookstoves’ [Clean Cooking Catalog](#) and the GIZ/HERA [Cooking Energy Compendium](#). The categories in this catalogue are meant to be mutually exclusive and collectively exhaustive, so that any cooking, heating or lighting technology and/or fuel found in a household will fit into one—and only one—category. However, the examples and images presented here to help clarify the category definitions are not an exhaustive list of all devices, brands, and/or models available on the market or used by households in all localities.

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<sup>1</sup> WHO Household Energy Database. 2016. [http://www.who.int/indoorair/health\\_impacts/he\\_database/en/](http://www.who.int/indoorair/health_impacts/he_database/en/).

## How to read this catalogue

This catalogue is divided into four sections: **Cooking, Heating, Lighting, and Kitchen Location.**

- Within the cooking and heating sections, technologies and fuels are categorized separately.
- In the lighting section, light sources are categorized as combinations of technology and fuel.
- The Kitchen Location section defines areas in which households cook based on factors related to proximity to main living area and ventilation. Kitchen location can effect exposure of household individuals to HAP.

For each category, the given type of fuel(s) or technology(ies) is listed. The subsequent columns present alternative terms that may be used to describe technologies or fuels in a given category, a detailed definition of the category, and, finally, images of fuels or technologies that fit into the given category. The terms and pictures presented for each category are not an exhaustive list of items that may fall into that category. The information presented in the definition should be consulted to determine if a fuel or device not pictured or explicitly named falls into a given category.

The following symbols are used to indicate if a given fuel or technology is considered clean or polluting, based on the WHO's "Guidelines for Indoor Air Quality: Household Fuel Combustion."<sup>2</sup> If there is no symbol printed next a given category name, please consult the applicable footnote for a detailed description of how to determine whether or not the listed technology and/or fuel is considered clean or polluting.



Clean Fuels and  
Technologies



Polluting Fuels  
and Technologies

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<sup>2</sup> WHO, "WHO Guidelines for Indoor Air Quality: Household Fuel Combustion," Geneva, Switzerland, 2014, <http://www.who.int/indoorair/guidelines/hhfc/en/>.



## Cooking

### Cooking Technologies



#### 1. Electric Stove

##### *Other terms*

Induction stove, coil stove

##### *Category description*

Electric stoves convert electrical energy into heat for cooking. Electricity is a form of energy that is carried through wires. The electricity to power these stoves can be generated outside of the home and distributed to the home through a grid or micro-grid. It can also be generated at the home by, for example, a fixed or portable generator or a solar home system.

##### *Possible types of fuel*

Electricity from any source (e.g., solar, coal, etc.)

##### *Images*

Electric coil stove:



Induction stove:



#### 2. Solar Cooker

##### *Other terms*

Parabolic cooker, box cooker, panel cooker

##### *Category description*

Solar cookers directly capture the sun's thermal rays, convert them to heat and, in some models, retain that heat for cooking. Solar cookers come in many shapes, including parabolic cookers, box cookers, and panel cookers.

##### *Possible types of fuel*

Solar energy

##### *Images*

Solar box cooker:



Parabolic solar cooker:





### 3. Liquid petroleum gas/cooking gas stove

#### *Other terms*

#### *Category description*

Liquid petroleum gas (LPG) stoves exclusively burn LPG, which is a gaseous fuel obtained during petroleum refining and consists mainly of butane or propane. LPG is gaseous at normal ambient temperatures and pressures, but becomes liquid when compressed. For the distribution to the end-user, LPG is bottled in individual gas-cylinders of various sizes (between 3 kg and 50 kg or larger). These empty containers usually need to be returned to a bottling station to be refilled. The LPG stove includes multiple parts including the stove burner(s), hose, and regulator (in addition to the cylinder).

This category only includes stoves using LPG cylinders. If the LPG is piped into the household from a central distributor, it falls into the piped natural gas stove category below.

#### *Possible types of fuel*

Liquid petroleum gas, cooking gas, propane, butane

#### *Images*

One-burner, LPG stove:



Two-burner, LPG stove:



### 4. Piped natural gas stove

#### *Other terms*

#### *Category description*

Piped natural gas stoves exclusively burn natural gas, a fossil fuel that consists primarily of methane. The natural gas is piped from a centralized distributor or public utility into the home (they do not use a gas canister like LPG stoves).

#### *Possible types of fuel*

Natural gas, piped LPG

#### *Images*

Piped natural gas stove:







## 5. Biogas stove

### *Other terms*

#### *Category description*

Biogas stoves burn biogas that is produced in local biogas digesters. A single digester can serve one or multiple households. The digester converts organic wastes and dung into combustible methane gas called biogas, which is piped from the digester to the cookstove. Biogas stoves contain a valve to premix the biogas with the right amount of oxygen and a burner to combust the mixture. Stoves and ovens for biogas application are similar to those of conventional appliances running on commercial gas-fuels. Most of these conventional appliances can be adapted for use with biogas by special measures (particularly the modification of the burners) to ensure proper combustion and efficient use of energy.

#### *Possible types of fuel*

Biogas from biomass (animal manure, human waste, and crop residues)

### *Images*

Stove for biogas application:



Floating-dome biogas digester:



Balloon biogas digester:





## 6. Liquid fuel stove<sup>3</sup>

### Other terms

Kerosene wick stove, gravity stove

### Category description

Liquid fuel stoves can be pressurized or unpressurized. Pressurized liquid fuel stoves can be used with pre-pressurized fuels or can be equipped with self-pressurizing technology, like a hand pump. One type of unpressurized stoves uses wicks to draw fuel from the tank or reservoir. Other, unpressurized liquid fuel stoves use gravity or capillary action, i.e. moving liquid through small passages, to deliver fuel directly to the flame.

### Possible types of fuel

Clean fuel options: Alcohol, ethanol or methanol, including biofuel

Polluting fuel options: plant oils, liquid paraffin, kerosene, petrol

### Images

Pressurized stove:



Unpressurized wick stove:



Unpressurized gravity stove (fuel is suspended in a bottle above the stove, with a hose connecting the reservoir and stove):



## 7. Manufactured solid fuel stove:

### Other terms

Ceramic jiko (Kenya)

### Category description

Manufactured stoves are produced in a centralized location and sold or distributed to the end user or household as a finished product. It is possible that, especially in the case of large stoves, specialized technicians come to the household to install the stove. Manufactured stoves are constructed from prefabricated materials or materials not easily available in the immediate community.

### Possible types of fuel

Coal/lignite, charcoal, wood, crop residue, grass, straw, shrubs, animal dung or waste, processed biomass (pellets) or woodchips, garbage/plastic, sawdust

### Images

Ceramic charcoal stove:



Rice husk, top-lift updraft stove with forced air:



<sup>3</sup> Liquid fuel stoves are only considered clean if used in combination with a fuel that falls into the Alcohol category, as presented in II. Cooking Fuels.



## 8. Traditional solid fuel stove:

### Other terms

Chulha (India)

### Category description

Traditional stoves are produced locally. They are made in the household by household members or by a local artisan. It is possible that traditional cookstoves are made by an artisan outside of the household, but that artisan must work and source materials locally. Traditional stoves are made with local materials, such as ceramics, clay, bricks, stone or scrap metal, that are either collected by household members themselves or procured from easily available accessible sources in the community.

Traditional cookstoves are designed to improve on three-stone stoves and open fires by being more user-friendly. This can include features that allow cooking pots to rest on the stove with more stability or, in some cases, enclosed combustion spaces for more efficient or safer fuel use. The design of traditional cookstoves often depends on local cooking practices and available fuel sources.

### Possible types of fuel

Coal/lignite, charcoal, wood, crop residues/grass/straw/shrubs, animal dung/waste, processed biomass (pellets) or woodchips, garbage/plastic, sawdust

### Images

Traditional rocket stove:



Traditional chulha:



Traditional cookstove with grate:



## 9. Three-stone stove/open fire

### Other terms

Tripod

### Category description

Three stone cooking fires have the cooking vessel placed very close to the fire itself. Sometimes, a circle of stones is placed besides the fire itself, to keep the fire from spreading into the environment, and to keep wind away from the fire. An open fire is not contained in an oven or stove. It is exposed to the air on at least three sides. Three-stone stoves and open fires are not accompanied by any ventilation system, such as a chimney.

### Possible types of fuel

Coal/lignite, charcoal, wood, crop residues/grass/straw/shrubs, animal dung/waste, processed biomass (pellets) or woodchips, garbage/plastic, sawdust

### Images

Three-stone stove:



Open fire:





## 10. Fan

### Other terms

### Category description

Fans aid in more complete combustion of fuel by blowing high velocity, low volume jets of air into the cookstove combustion chamber. Fans can be powered by a battery or thermoelectric device that captures heat from the stove and converts it to electricity.

### Images

A manufactured, solid fuel cookstove with externally visible fan housing:



A fan attached to a cookstove:



## 11. Chimney

### Other terms

Flue, vent

### Category description

Chimneys are structural additions that ventilate gas and smoke from the cookstove to the outside of the home or cooking area. Chimneys can be made from clay pipes, sheet metal, cast iron, masonry, concrete pipes, bamboo, and many other materials. For the purposes of the categories presented in this catalogue, chimneys include all ventilation systems that carry pollutants or combustion byproducts outside of the home.

### Images

Cookstove with chimney:



Installation of chimney to vent smoke to the outside:



## Cooking Fuels



### 1. Alcohol/ethanol

#### Other terms

#### Category description

Alcohol as a cooking fuel is produced by fermentation of sugars from various crops, such as maize, sorghum, wheat, cassava and sugarcane. Types used for cooking include ethanol, butanol, methanol, and isopropanol. The majority of alcohol used for cooking comes in liquid form. Some cooking ethanol comes in gel form, which has been thickened and contains coloring and flavoring agents for safety reasons.

#### Images

Alcohol fuel:



Ethanol gel:



### 2. Gasoline/diesel

#### Other terms

Petrol

#### Category description

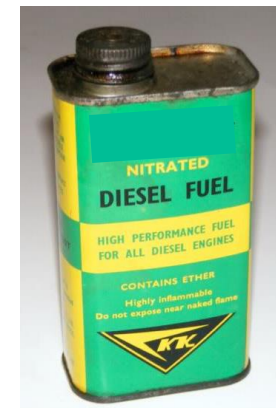
Gasoline is a transparent, petroleum-derived liquid used mainly as fuel for internal combustion engines. Gasoline is primarily made up of organic compounds and often contains additives. Some gasoline contains varied amounts of ethanol as an alternative fuel for economic or environmental reasons.

#### Images

Gasoline:



Diesel fuel:







### 3. Kerosene/paraffin

#### Other terms

#### Category description

Kerosene is a product of crude oil, and mainly consists of a mixture of hydrocarbons. It has a high energy density. Kerosene is, naturally, a colorless liquid, though can yellow over time. In some areas, colored dye is added to the fuel for safety or pricing reasons. Kerosene can easily be transported in bulk and does not need to be transported in special containers. Thus, the logistics of distribution and retail are simpler than LPG and access to kerosene in rural areas is often widespread.

#### Images



### 4. Coal/lignite

#### Other terms

#### Category description

Coal is a black, solid, carbon-rich material found underground. It is not to be confused with charcoal. Coal is a mineral, while charcoal is the ultimate form of burnt wood. The major classes of coal are lignite (brown coal), bituminous (black coal), and anthracite. Coal is used in different forms for household cooking and lighting. Some examples are bee-nest coal briquettes (also called “bee-hive”), coal cakes, coal balls, and raw coal.

#### Images

Lignite/brown coal:



Bituminous/black coal:



Anthracite coal:



Bee nest coal briquette:





## 5. Charcoal

### *Other terms*

### *Category description*

Charcoal is charred wood, which has lost all moisture and most volatile contents in the production process. Charcoal is usually produced by slowly heating wood in the absence of oxygen.

### *Images*



## 6. Wood

### *Other terms*

### *Category description*

Firewood is unprocessed wood that is burned for fuel. Firewood may be dried and/or chopped into smaller logs, pieces or sticks in preparation for use, but otherwise the fuel is unprocessed. Wood is collected from trees and large bushes directly or from sections that have died or fallen to the ground.

### *Images*

Logs of firewood:



Firewood collection:







## 7. Crop residue/grass/straw/shrubs

### Other terms

#### Category description

Crop residues are any non-timber, or non-wood, solid biomass, or plant generated material that is used as fuel. Fuels in this category are unprocessed. They can be grown specifically for fuel or can be a by-product of other productive, often agricultural, activities. Common types of crop residues are straw, stem, stalk, leaves, husk, shell, peel, lint, stones, pulp, stubble, etc, which come from cereals cotton, groundnut, jute, legumes, coffee, cacao, olive, tea, fruits, and palm oil.

### Images

Corn cobs:



Rice straw:



## 8. Animal dung/waste

### Other terms

#### Category description

Dung is the undigested waste excreted by plant-feeding animals, especially dung of cattle, goats, sheep, yak, elephant, llamas, etc. Fresh dung needs to be dried before using it as a fuel. It can be left in its natural shape or formed into round dung balls, flat dung cakes, or molded around a stick. In some regions dung is mixed with other kinds of fuel, like coal dust or agricultural residues, in order to enhance the burning performance (to increase the energy-density).

### Images

Cooking over a pile of dried dung cakes:



Coal dung cakes:





## 9. Processed biomass (pellets) or woodchips

### Other terms

Biomass briquette

### Category description

Processed biomass is timber or non-timber biomass that has been densified or compacted. This fuel can take the form of wood pellets, briquettes, and others. Biomass materials that can be used are wood, crop residue, pine needles, scrap paper, etc. Densification process options can be grouped into three broad categories: 1) the wet, ambient temperature, low-pressure process, 2) the moist-dry ambient temperature, low-medium pressure (10-50 bar) process, and 3) the dry high-pressure process.

### Images

Pellets:



Woodchips:



Briquette:



## 10. Garbage/plastic

### Other terms

Trash

### Category description

Garbage is non-biomass waste material, such as plastic or other synthetic materials.

### Images



## 11. Sawdust

### Other terms

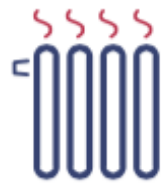
### Category description

Sawdust or wood dust is a by-product of cutting, grinding, drilling, sanding, or otherwise pulverizing wood or any other material with a saw or other tool. It is composed of fine particles of wood.

Sawdust is different from processed biomass in that it is not compressed or densified.

### Images





## Heating

### Heating Technologies

The clean or polluting status of many heating technologies is determined by the type of fuel used in combination with the technology. Refer to section IV for a list of clean and polluting heating fuels.



### 1. Central heating

#### Other terms

Furnace, boiler

#### Category description

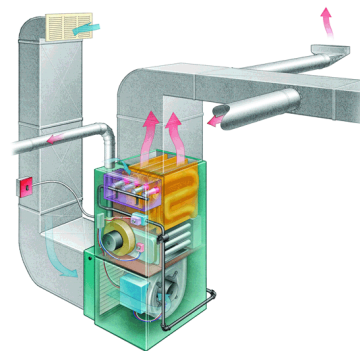
Central heating systems produce heat in a central location and, via a distribution network of ducts or pipes, distribute the heat to multiple, interconnected spaces. Heat can be distributed through warmed air, steam or liquid. Many central heaters are part of a larger heating, ventilation, and air conditioning (HVAC) system in the home.

#### Possible fuel types

Electricity from any source (e.g., solar, coal, etc.), solar, natural gas, wood pellets, heating oil, coal

#### Images

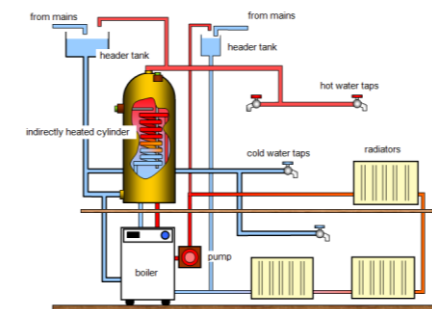
Central furnace with ducts for distribution:



In-room, central heat distribution vent:



Central boiler with pipes for distribution:



In-room, central heat distribution radiator:



## 2. Manufactured space heater<sup>4</sup>

### *Other terms*

#### *Category description*

Space heaters are devices for heating an enclosed space. They can be permanent (fixed) or portable. They either work by convection, i.e. circulation of air in a room, or radiant heating, i.e. emitting infrared radiation to directly heat objects or people.

Manufactured heaters are produced in a centralized location and sold or distributed to the end user or household as a finished product. It is possible that, especially in the case of large space heaters, specialized technicians come to the household to install the heater. Manufactured stoves are constructed from prefabricated materials or materials not easily available in the immediate community.

#### *Possible fuel types*

Electricity from any source (e.g., solar, coal, etc.), piped natural gas, LPG, biogas, ethanol/alcohol, gasoline/diesel, Kerosene/paraffin, coal/lignite, charcoal, wood, crop residue/grass/straw/shrubs, animal waste/dung, processed biomass, garbage/plastic, sawdust

### *Images*

Oscillating halogen heater:



Wood heater with chimney:



Electric oil-filled radiant portable heater:



LPG space heater:



Kerosene space heater:



<sup>4</sup> Manufactured space heaters are only considered clean if used in combination with a clean heating fuel, as indicated in IV. Heating Fuels.



### 3. Traditional space heater

#### Other terms

Kang heater (China)

#### Category description

Space heaters are devices for heating an enclosed space. They can be permanent (fixed) or portable. They either work by convection, i.e. circulation of air in a room, or radiant heating, i.e. emitting infrared radiation to directly heat objects or people.

Traditional heaters are produced locally. They are made in the household by household members or by a local artisan. It is possible that traditional heaters are made by an artisan outside of the household, but that artisan must work and source materials locally. Traditional heaters are made with local materials, such as ceramics, clay, bricks or scrap metal, that are either collected by household members themselves or procured from easily available accessible sources in the community.

#### Possible fuel types

Kerosene/paraffin, coal/lignite, charcoal, wood, crop residue/grass/straw/shrubs, animal waste/dung, processed biomass, garbage/plastic, sawdust

#### Images

Bed heater/stove, also known as a *kang* heater:



A traditional heater, or *sagarh*, in India:





#### 4. Manufactured cookstove<sup>5</sup>

##### *Other terms*

##### *Category description*

Cookstoves are devices whose primary purpose and use is cooking. In some households, members also rely on cookstoves to provide heat during cold times. If a household relies on heat produced from a cookstove, even if it not the primary purpose of the appliance, it is considered a heating system.

Manufactured cookstoves are produced in a centralized location and sold or distributed to the end user or household as a finished product. It is possible that, especially in the case of large stoves, specialized technicians come to the household to install the stove. Manufactured cookstoves are constructed from prefabricated materials or materials not easily available in the immediate community.

##### *Possible fuel types*

Electricity from any source (e.g., solar, coal, etc.), piped natural gas, LPG, biogas, ethanol/alcohol, gasoline/diesel, Kerosene/paraffin, coal/lignite, charcoal, wood, crop residue/grass/straw/shrubs, animal waste/dung, processed biomass, garbage/plastic, sawdust

##### *Images*

Manufactured charcoal cookstove:



Manufactured ethanol cookstove:



Metal cookstove, often also used as heat source:



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<sup>5</sup> Manufactured cookstoves are only considered clean if used in combination with a clean fuel, as indicated in IV. Heating Fuels.





## 5. Traditional cookstove

### Other terms

#### Category description

Traditional cookstoves are produced locally. They are made in the household by household members or by a local artisan. It is also possible that traditional cookstoves are made by an artisan outside of the household, but that artisan must work and source materials locally. Traditional cookstoves are made with local materials, such as ceramics, clay, bricks or scrap metal, that are either collected by household members themselves or procured from easily available accessible sources in the community.

Traditional cookstoves are designed to improve on three-stone stoves and open fires by being more user-friendly. This can include features that allows pots to sit on the stove with more stability, improve fuel efficiency, or improve safety. The design of traditional cookstoves often depends on local cooking practices and available food sources.

If individuals in the household also rely on the traditional cookstove to provide heat when it is cold, as well as for cooking, it is considered as a source of space heating.

#### Possible fuel types

Kerosene/paraffin, coal/lignite, charcoal, wood, crop residue/grass/straw/shrubs, animal waste/dung, processed biomass, garbage/plastic, sawdust

### Images

Traditional rocket stove:



Traditional chulha:



Traditional mud and brick cookstove:





## 6. Three-stone stove/open fire

### Other terms

Tripod

### Category description

Three stone cooking fires, 3-stone cooking fires or 3-rock cooking fires are fires which, unlike open fires, have the cooking vessel placed very close to the fire itself. Sometimes, a circle of stones is placed besides the fire itself, to keep the fire from spreading into the environment, and to keep wind away from the fire.

An open fire is a fire which is not contained in an oven or stove. It is exposed to the air on at least three sides. Three-stone stoves and open fires are not accompanied by any ventilation system, such as a chimney.

If individuals in the household also rely on the three-stone stove or open fire to provide heat when it is cold, as well as for cooking, it is considered as a source of space heating.

### Possible fuel types

Coal/lignite, charcoal, wood, crop residue/grass/straw/shrubs, animal waste/dung, processed biomass, garbage/plastic, sawdust

### Images

Three-stone stove:



Open fire:



## 7. Chimney

### Other terms

Flue, vent

### Category description

Chimneys are structural additions that carry combustion byproducts like smoke out of the home or heated area. Chimneys can be made from clay pipes, sheet metal, cast iron, masonry, concrete pipes, bamboo, and many other materials. For the purposes of the categories presented in this catalogue, chimneys include all ventilation systems that carry pollutants or combustion byproducts outside of the home.

### Images

Wood heater with chimney:



Installation of chimney to vent smoke to the outside:



## Heating Fuels



### 1. Solar air heater

#### *Other terms*

#### *Category description*

Solar air heaters have a solar plate that absorbs the sun rays, which heats air held in the air collector. This warmed air is then distributed, sometimes by fan, into an enclosed space for heating. They can be installed on a roof, exterior wall or in a window. Solar air heaters do not heat water.

#### *Images*

Solar air heater, mounted on roof:



### 2. Electricity

#### *Other terms*

#### *Category description*

Electricity is a form of energy that is carried through wires. Electricity can be generated outside of the home and distributed to the home through a grid or micro-grid. It can also be generated at the home by, for example, a fixed or portable generator or a solar home system.

#### *Images*

Electric cord, plug, and outlet:





### 3. Piped natural gas

#### *Other terms*

#### *Category description*

Natural gas is a fossil fuel that consists primarily of methane. Piped natural gas is distributed from a centralized distributor or public utility, through pipes, and into homes.

#### *Images*

Piped natural gas meter, outside house:



### 4. Liquid petroleum gas/cooking gas

#### *Other terms*

#### *Category description*

Liquid petroleum gas (LPG) is a gaseous fuel obtained during petroleum refining and consists mainly of butane or propane. LPG is gaseous at normal ambient temperatures and pressures, but becomes liquid when compressed. For the distribution to the end-user, LPG is bottled in individual gas-cylinders of various sizes (between 3 kg and 50 kg or larger). These empty containers usually need to be returned to a bottling station to be refilled.

#### *Images*

LPG cylinders:



## 5. Biogas

### *Other terms*

### *Category description*

Biogas is produced in local biogas digesters. A single digester can serve one or multiple households. The digester converts organic wastes and dung into combustible methane gas called biogas, which is piped from the digester to the cookstove or heater. Biogas stoves contain a valve to premix the biogas with the right amount of oxygen and a burner to combust the mixture. Appliances used with biogas are similar to those of conventional appliances running on commercial gas-fuels. Most of these conventional appliances can be adapted for use with biogas by special measures to ensure proper combustion and efficient use of energy.

### *Images*

Floating-dome biogas digester:



Balloon biogas digester:



## 6. Ethanol/alcohol

### *Other terms*

### *Category description*

Alcohol as a fuel is produced by fermentation of sugars from various crops, such as maize, sorghum, wheat, cassava and sugarcane. Types used for cooking or heating include ethanol, butanol, methanol, and isopropanol. The majority of alcohol used for cooking and heating comes in liquid form.

### *Images*

Alcohol fuel:



Ethanol gel:







## 7. Gasoline/diesel

### *Other terms*

Petrol

### *Category description*

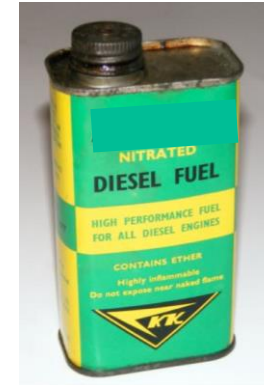
Gasoline is a transparent, petroleum-derived liquid used mainly as fuel for internal combustion engines. Gasoline is primarily made up of organic compounds and often contains additives. Some gasoline contains varied amounts of ethanol as an alternative fuel for economic or environmental reasons.

### *Images*

Gasoline:



Diesel fuel:



## 8. Kerosene/paraffin

### *Other terms*

### *Category description*

Kerosene is a product of crude oil, and mainly consists of a mixture of hydrocarbons. It has a high energy density. Kerosene is a colorless liquid, though can yellow over time. In some areas, colored dye is added to the fuel for safety or pricing reasons. Kerosene can easily be transported in bulk and does not need to be transported in special containers. Thus, the logistics of distribution and retail are simpler than LPG and access to kerosene in rural areas is often widespread.

### *Images*







## 9. Coal/lignite

### Other terms

#### Category description

Coal is a black, solid, carbon-rich material found underground. It is not to be confused with charcoal. Coal is a mineral, while charcoal is the ultimate form of burnt wood. The major classes of coal are lignite (brown coal), bituminous (black coal), and anthracite. Coal is used in different forms for household cooking and lighting. Some examples are bee-nest coal briquettes (also called “bee-hive”), coal cakes, coal balls, and raw coal.

### Images

Lignite/brown coal:



Bituminous/black coal:



Anthracite coal:



Bee-nest coal briquette:



## 10. Charcoal

### Other terms

#### Category description

Charcoal is charred wood, which has lost all moisture and most volatile contents in the production process. Charcoal is usually produced by slowly heating wood in the absence of oxygen.

### Images





## 11. Wood

### *Other terms*

### *Category description*

Firewood is unprocessed wood that is burned for fuel. Firewood may be dried and/or chopped into smaller logs, pieces or sticks in preparation for use, but otherwise the fuel is unprocessed. Wood is collected from trees and large bushes directly or from sections that have died or fallen to the ground.

### *Images*

Logs of firewood:



Firewood collection:



## 12. Crop residue/grass/straw/shrubs

### *Other terms*

### *Category description*

Crop residues are any non-timber, or non-wood, solid biomass, or plant generated material, that is used as fuel. Fuels in this category are unprocessed. They can be grown specifically for fuel or can be a by-product of other productive, often agricultural, activities. Common types of crop residues are straw, stem, stalk, leaves, husk, shell, peel, lint, stones, pulp, stubble, etc., which come from cereals cotton, groundnut, jute, legumes, coffee, cacao, olive, tea, fruits, and palm oil.

### *Images*

Corn cobs:



Rice straw:





### 13. Animal waste/dung

#### Other terms

#### Category description

Dung is the undigested waste excreted by plant-feeding animals, especially dung of cattle, goats, sheep, yak, elephant, llamas, etc. Fresh dung needs to be dried before using it as a fuel. It can be left in its natural shape or formed into round dung balls, flat dung cakes, or molded around a stick. In some regions dung is mixed with other kinds of fuel, like coal dust or agricultural residues, in order to enhance the burning performance (to increase the energy-density).

#### Images

Dung cakes mixed with coal dust:



Cooking over a pile of dried dung cakes:



### 14. Processed biomass (pellets) or woodchips

#### Other terms

Briquette

#### Category description

Processed biomass is timber or non-timber biomass that has been densified or compacted. This fuel can take the form of wood pellets, briquettes, and others. Biomass materials that can be used are wood, crop residue, pine needles, scrap paper, etc. Densification process options can be grouped into three broad categories: 1) the wet, ambient temperature, low-pressure process, 2) the moist-dry ambient temperature, low-medium pressure (10-50 bar) process, and 3) the dry high-pressure process.

#### Images

Pellets:



Woodchips:



Briquette:





## 15. Garbage/plastic

### *Other terms*

Trash

### *Category description*

Garbage is non-biomass waste material, such as plastic or other synthetic materials.

### *Images*



## 16. Sawdust

### *Other terms*

### *Category description*

Sawdust or wood dust is a by-product of cutting, grinding, drilling, sanding, or otherwise pulverizing wood or any other material with a saw or other tool. It is composed of fine particles of wood.

Sawdust is different from processed biomass in that it is not compressed or densified.

### *Images*







## Lighting

### Light sources



#### 1. Electricity

##### Other terms

##### Category description

Electricity is a form of energy that is carried through wires. Electricity can be generated outside of the home and distributed to the home through a grid or micro-grid. It can also be generated at the home by, for example, a fixed or portable generator or a solar home system.

Light bulbs used with electricity include incandescent bulbs, halogen incandescent bulbs, fluorescent bulbs, and light-emitting diodes (LEDs).

##### Images

Incandescent bulb and electrical cord:



Flourescent tube lamp:



LED bulb:



#### 2. Solar lantern

##### Other terms

Pico PV, Solar Pico System (SPS)

##### Category description

A solar lantern uses photovoltaic (solar-electric or PV) cells and rechargeable batteries to provide power for a single light. Solar lanterns differ from solar home systems in that they are portable, as opposed to the PV panel of a solar home system, and only produce enough power for the lantern and, in some cases, phone charging. These systems are typically below 10 watt-peak and most have a voltage of 12 volts or lower.

##### Images





### 3. Rechargeable flashlight, torch or lantern (no batteries)

#### Other terms

#### Category description

A flashlight is a handheld, portable electronic device. The light source is usually a small incandescent light bulb or light-emitting diode (LED).

Flashlights in this category can be recharged either by a hand-crank or other external power source such as electricity. They may use batteries for power but only rechargeable and not disposable batteries.

This category does not include lanterns that are recharged using solar power, which would fall into the solar lantern, if portable, or electricity category.

#### Images

Rechargeable crank flashlight:



Rechargeable lantern:



### 4. Battery powered flashlight, torch or lantern

#### Other terms

#### Category description

A flashlight is a handheld, portable electronic device. The light source is usually a small incandescent light bulb or light-emitting diode (LED).

Flashlights in this category are powered by one or more disposable batteries.

#### Images

Batteries powering an LED light:



Battery-powered flashlight/torch:



Battery-powered lantern:







## 5. Biogas lamp

### *Other terms*

### *Category description*

A biogas lamp is an appliance that uses biogas, or the gas produced from an anaerobic digester, to produce light. The digester converts organic wastes and dung into combustible methane gas called biogas, which is piped from the digester to the lamp.

Most biogas lamps require a mantle, or cloth-like material containing mineral elements, to produce light via incandescence.

### *Images*



## 6. Gasoline lamp

### *Other terms*

Diesel lamp

### *Category description*

A gasoline lamp is an appliance that uses gasoline to produce light. The majority of gas lamps require that the gasoline is in a pressurized container.

Most gas lamps require a mantle, or cloth-like material containing mineral elements, to produce light via incandescence.

Gasoline is a transparent, petroleum-derived liquid used mainly as fuel for internal combustion engines. Gasoline is primarily made up of organic compounds and often contains additives. Some gasoline contains varied amounts of ethanol as an alternative fuel for economic or environmental reasons.

### *Images*





## 7. Kerosene/paraffin Lamp

### *Other terms*

Hurricane lamp

### *Category description*

A kerosene lamp is an appliance that uses kerosene to produce light. Many use a wick to draw the fuel from the reservoir to the flame.

Kerosene is a product of crude oil, and mainly consists of a mixture of hydrocarbons. It has a high energy density. Kerosene is a colorless liquid, though can yellow over time. In some areas, colored dye is added to the fuel for safety or pricing reasons. Kerosene can easily be transported in bulk and does not need to be transported in special containers.

### *Images*

Kerosene lamp with wick (hurricane lamp):



Kerosene lamp with wick, made from a tin can:



## 8. Charcoal

### *Other terms*

### *Category description*

Charcoal is charred wood, which has lost all moisture and most volatile contents in the production process. Charcoal is usually produced by slowly heating wood in the absence of oxygen.

### *Images*





## 9. Wood

### Other terms

Firewood

### Category description

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### Images

Logs of firewood:



Firewood collection:



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### Other terms

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### Images

Corn cobs:



Rice straw:





## 11. Animal waste/dung

### Other terms

#### Category description

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### Images

Dung cakes mixed with coal dust:



Cooking over a pile of dried dung cakes:



## 12. Oil lamp

### Other terms

#### Category description

An oil lamp is an appliance that uses lamp oil to produce light. Many use a wick to draw the fuel from the reservoir to the flame.

Lamp oil is a liquid fuel that burns with less odor than kerosene. Lamp oil can be purchased in a variety of scents for aesthetic or ceremonial purposes. Oil lamps are usually unpressurized.

### Images

Chimney oil lamp with wick:



Traditional Diwali oil lamp:





### 13. Candle

#### *Other terms*

#### *Category description*

A candle is made up of an ignitable wick embedded in wax or another flammable solid substance, such as tallow, that provides light.

#### *Images*





## Kitchen Locations



indicates the location of the stove or cooking area.



indicates a door or doorway for access.



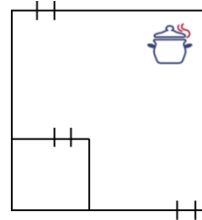
indicates a covered porch or veranda.

### 1. In main house: no separate room

#### Category description

The kitchen is considered to be in the same room as the main living area if the cooking area is open to the main living area on one or more sides. Low walls and temporary dividers such as plastic, folding curtains or fabric curtains are not considered dividers between the cooking area and main living area.

#### Images

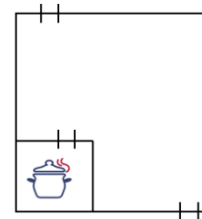


### 2. In main house: separate room

#### Category description

A separate room is a room that is separated from the main house with a permanent wall that extends all the way or almost all of the way to the ceiling or roof. Separate rooms are accessible from the main living area through a door or doorway. If the room is only accessible from the main living area through an opening like a window, it is considered a separate room as opposed to a separate building. Temporary dividers such as plastic, folding curtains or fabric curtains do not count as walls.

#### Images

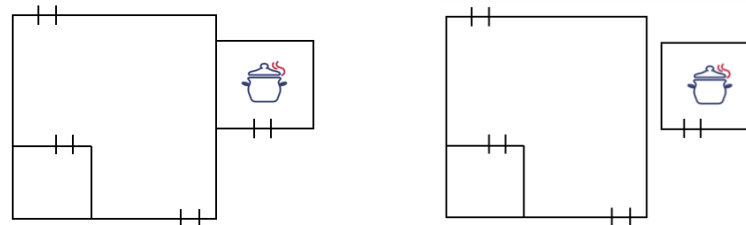


### 3. Outside of main house: in a separate room

#### *Category description*

A separate room outside of the main house is a room or building that is not connected in any way to the main house. I.e. a person must walk outside, even if under a covered walkway, to go between the separate building/room and main living house. This separate building/room may share a wall with the main living space, but is completely separated from the main living space by a solid, permanent wall.

#### *Images*



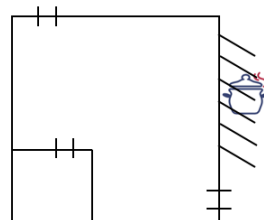
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### 4. On veranda/covered porch

#### *Category description*

A veranda is a covered porch, open to the outside, but which abuts the house or dwelling on at least one side. An inner courtyard constitutes a veranda if it is partially covered; if completely open, it is considered outside.

#### *Images*



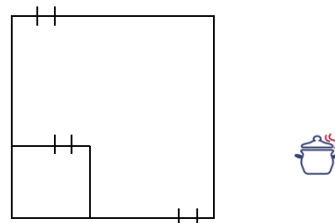
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### 5. Outdoors/open air

#### *Category description*

Outdoors or open air constitutes an area not connected to the house and protected by permanent walls on two or fewer sides. Open air kitchens can have a roof to protect against rain.

#### *Images*



## Acknowledgements

This guide was prepared by Heather Adair-Rohani (WHO), Jessica Lewis (WHO Consultant), and Erin Litzow (WHO Intern).

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