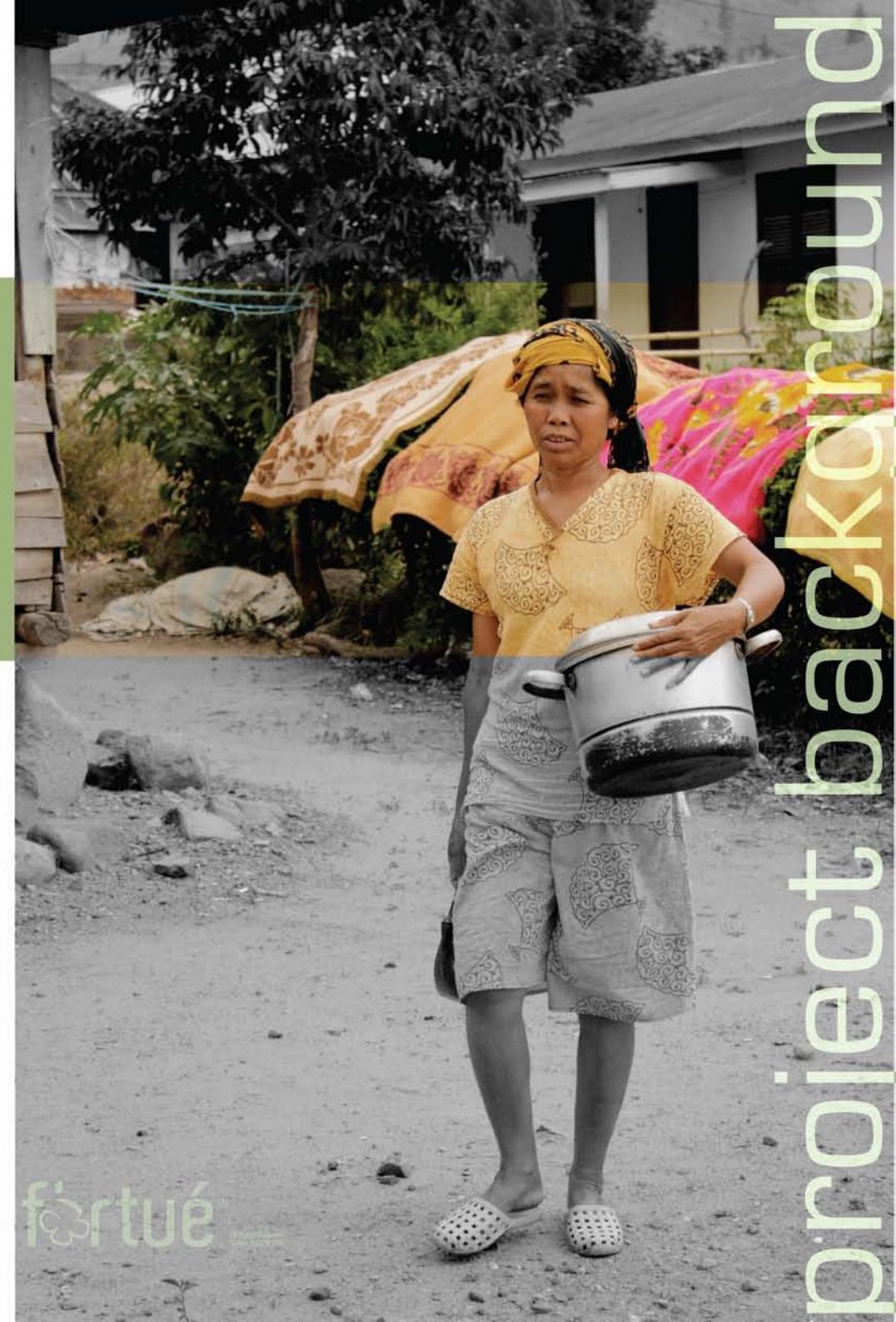
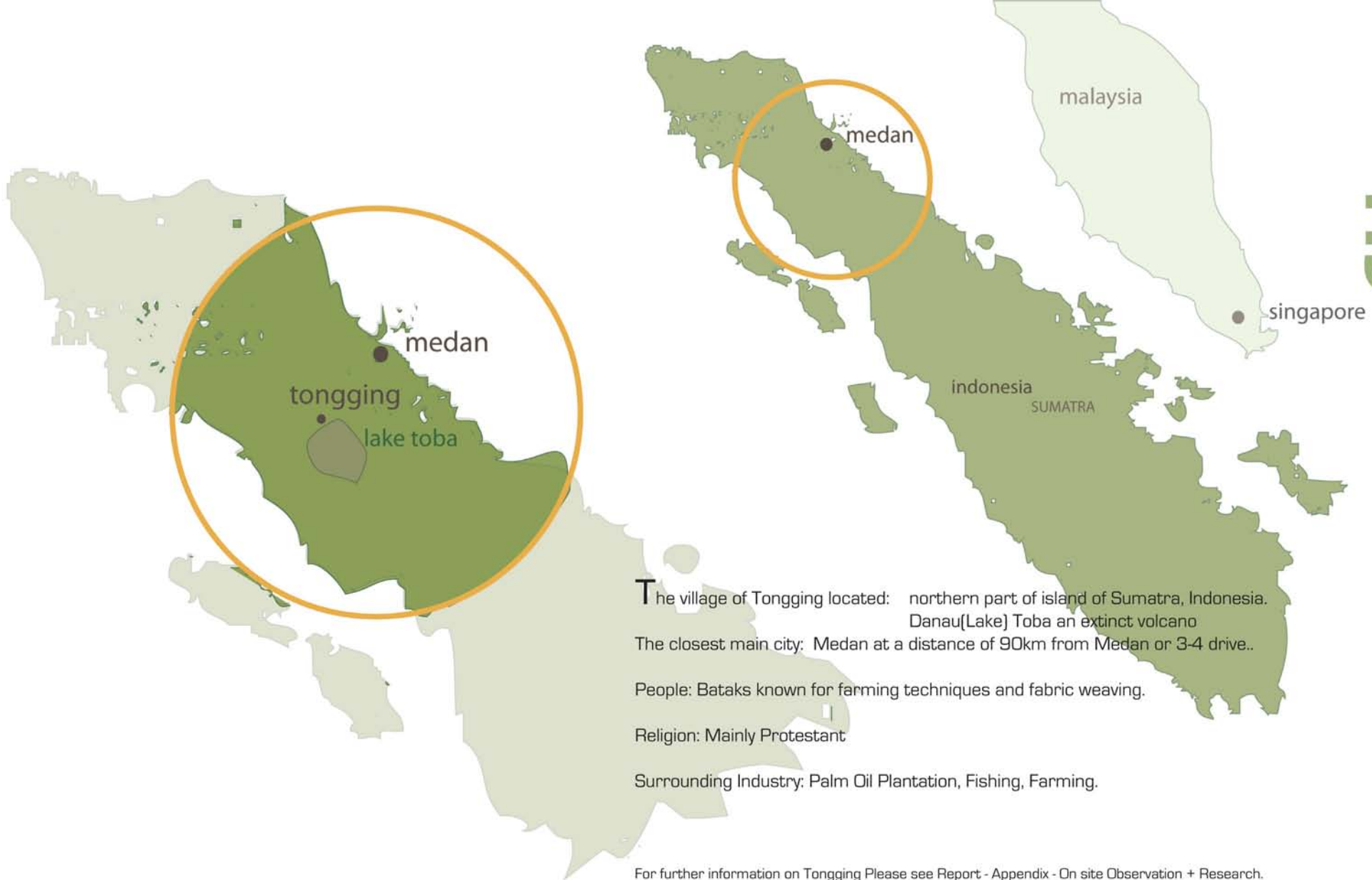


Indoor Air Pollution:

IAP is a major health concern around the developing world and, through designers work the detrimental effects of this issue have become more apparent to the world. Some schemes, which have been implemented to solve this problem, have influenced the development of this product such as the ceramic Jiko stove in Kenya. Which has provided both a solution to IAP and a source of income for the communities who have implemented it. .





The village of Tongging located: northern part of island of Sumatra, Indonesia.

Danu(Lake) Toba an extinct volcano

The closest main city: Medan at a distance of 90km from Medan or 3-4 drive..

People: Bataks known for farming techniques and fabric weaving.

Religion: Mainly Protestant

Surrounding Industry: Palm Oil Plantation, Fishing, Farming.

For further information on Tongging Please see Report - Appendix - On site Observation + Research.



Location:

Tongging is located on Danau (Lake) Toba, at the foot of a dead volcano. Because of this the land in this area is very fertile and the Batak people the inhabitants of the area around the lake have been known for their farming techniques for centuries.

Farming:

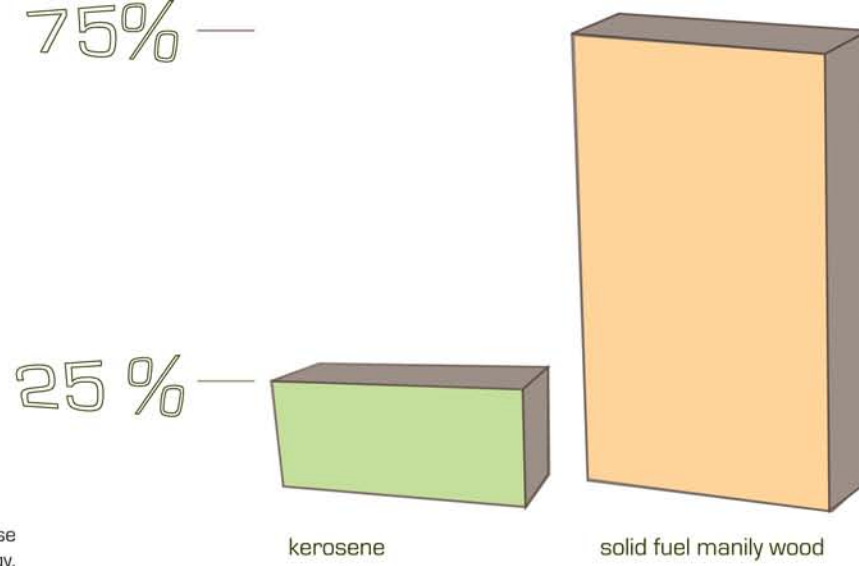
The people of Tongging have crops ranging from small household garden or crop growth to large fields which stretch all the way to the hills surrounding.

This part of Danau Toba is well known for the quality of fish and Tongging is a perfect example of a fishing town and fish farms placed in the lake itself.

The end users of the fortué™ sustainable stove will be developing communities, globally. Because the fuel component is adaptable, the product can be applied in many different situations depending on fuel availability. Within this demographic the main users will be women or girls who are in charge of running the household and purchasing or gathering fuel for cooking as well as cooking the food itself.

People in developing communities are concerned with day to day living, having enough money to buy wood or fuel for cooking of food, boiling water, to provide lighting and heating. Once there is enough money it is then the women who are in charge of running the household, raising the children, cooking meals, collecting firewood, carrying tanks of water and fuels.

For the purpose of accurate profiling, the village of Tongging is again used here as an example.



the graph on the right here shows the percentage of Tongging villagers who use kerosene and who use solid fuels for cooking energy.

Current Fuel Use:

In Tongging the main fuel used for energy for cooking is firewood and other solid materials which bur easily, leaves, food scraps etc.

Current Stoves:

Currently the main stoves in use are the three-stone stove, the two-brick and griddle stove and the kerosene stove.

What do they do?

Their income comes from what they can make and then sell, for example growing and selling vegetable, fishing etc.

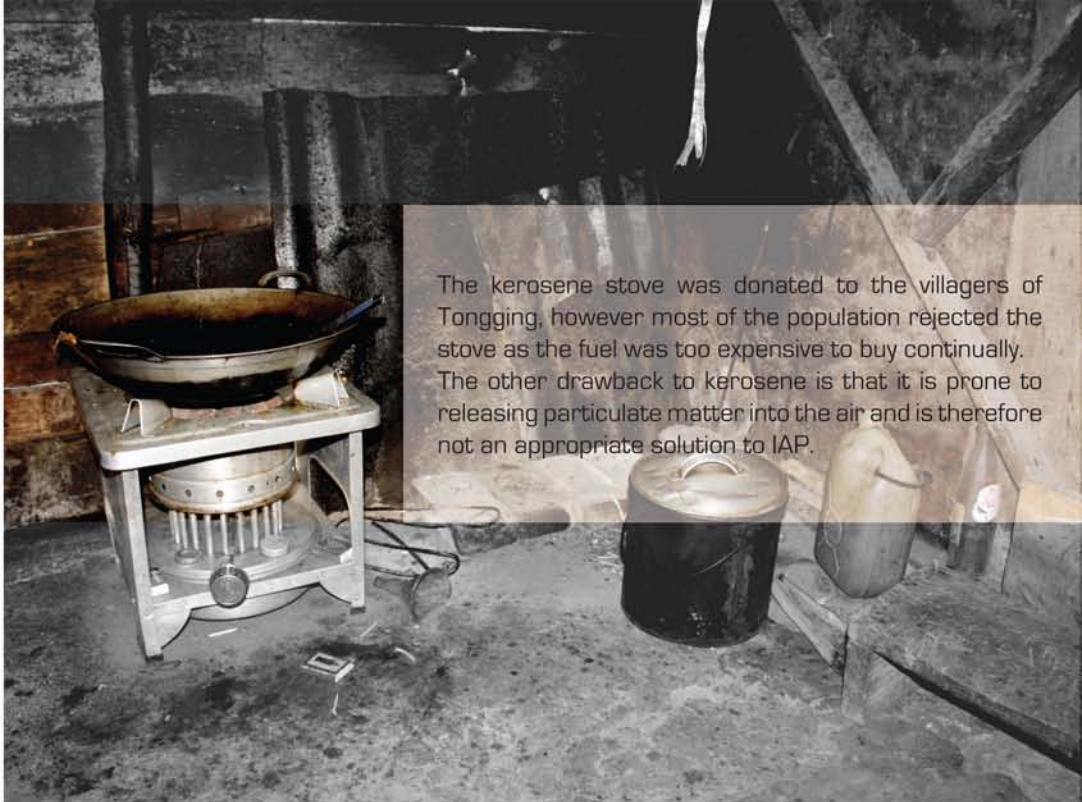
	electricity	LPG	kerosene	solid fuel
high - income household	SAC	SAC		
medium - income household		AC	AHC	
low - income household			EAHC	AHC

S = Safety of Fuel A = Accessibility of fuel
 E = Expensive fuel H = Health Consequences
 C = Larger scale effects economy + environment

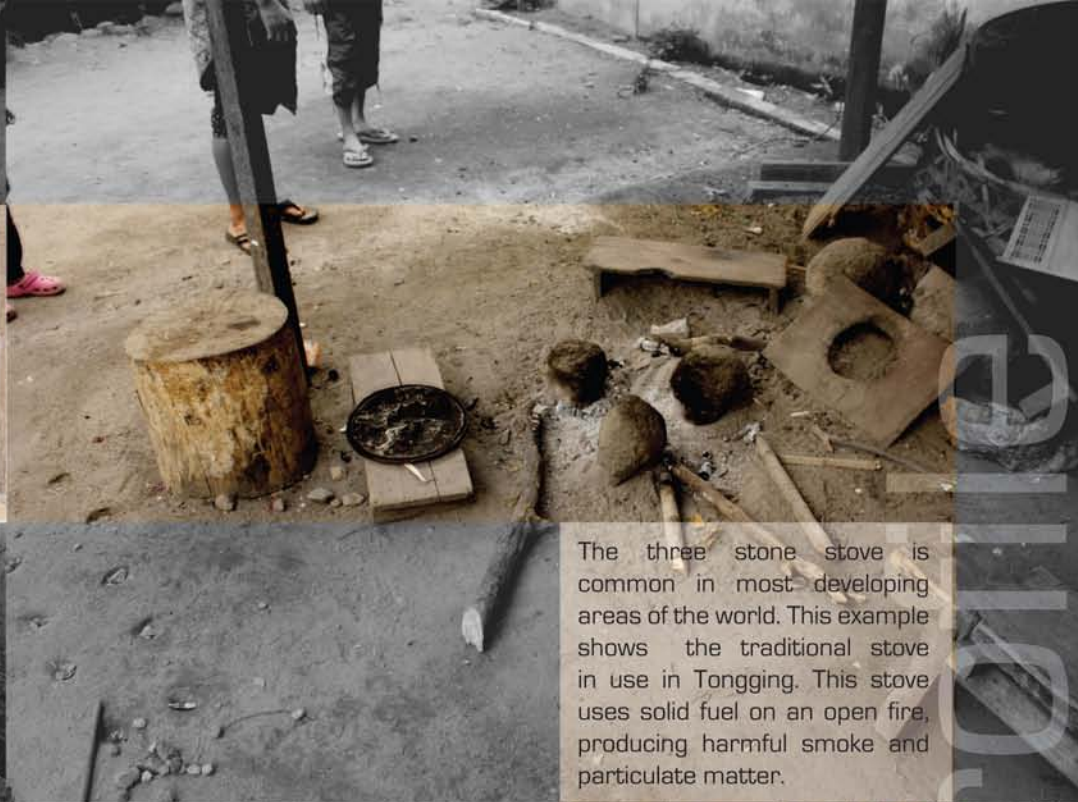
From the end users perspective the benefit of using solid fuel such as firewood, is that it is easily accessible and is free. However the current method of cooking is a major health concern. The other fuel option is kerosene, it is relatively cheap and readily available, but dangerous and produces harmful particulate matter when burnt. The alternative offered by the fortué™ stove solution provides a far healthier, more sustainable solution which is still cost effective long term.

The table to the right shows a comparison of available fuels in developing communities. The lower end of the economic scale cannot afford the cleaner energy and therefore rely on fuels which are easily accessible but harmful.

On the right is an overview of the stoves currently used in developing communities such as Tongging, from top left clockwise: kerosene stove, three stone stove, shelter stove, two stone griddle stove.



The kerosene stove was donated to the villagers of Tongging, however most of the population rejected the stove as the fuel was too expensive to buy continually. The other drawback to kerosene is that it is prone to releasing particulate matter into the air and is therefore not an appropriate solution to IAP.



The three stone stove is common in most developing areas of the world. This example shows the traditional stove in use in Tongging. This stove uses solid fuel on an open fire, producing harmful smoke and particulate matter.



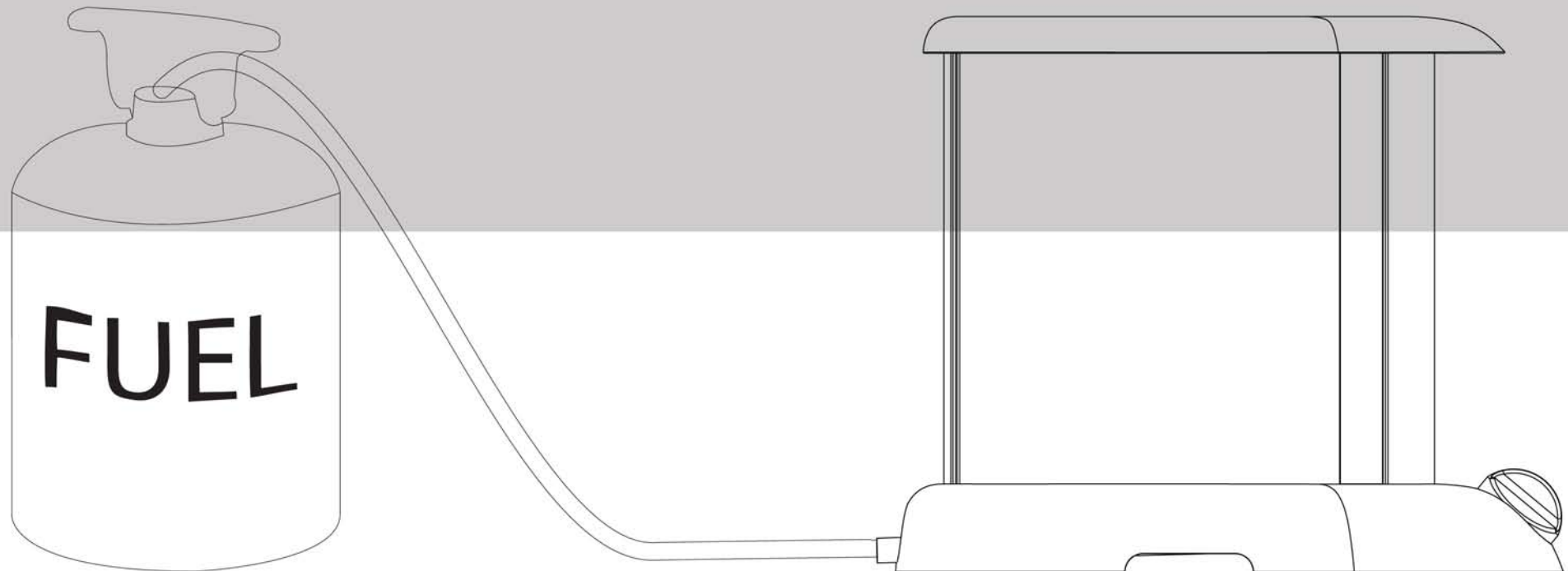
This is a two stone griddle stove where the griddle is suspended by two stones, and lit from underneath, also using open fire to be lit.



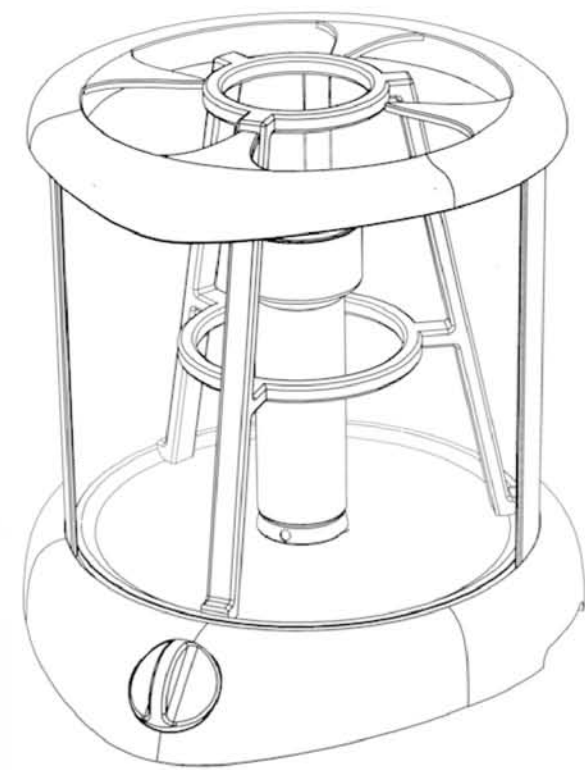
This stove uses a wind guard but and can be used with a two stone griddle or three stones. Also lit by open fire and produces a significant amount of smoke.

When in use the stove is attached to a small methane gas fuel tank from the back of the base, shown in the bottom image. As it is connected by a flexible tube, there is also the option of building a cabinet and storing the fuel tank away from sight and out of reach of children. An example of this is shown in the image on the top right.

If an alternative fuel is used, such as oil, there would similarly be a small fuel tank containing the oil.



extra pot support



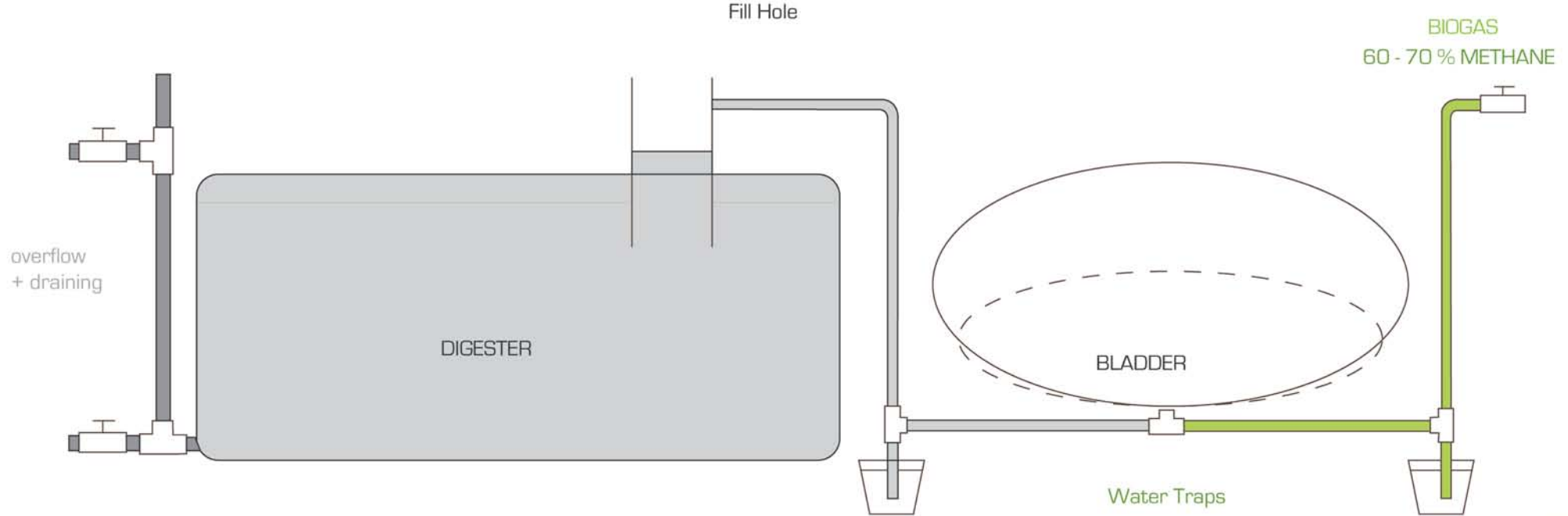
hole for burner

The diagram shown on the top here depicts the stove with the tripod accessory. This allows the user to use a pot heavier than 7L keeping it stable and structurally sound.

The tripod is suitable for use without the pot holder + windguards for small pots or kettles.

In case of an oil burner being adapted, the tripod accessory would remain appropriate to use.

features



The production of methane gas is relatively simple. First a methane digester is built (shown above) feedstock is then provided to digest which then creates methane gas for cooking. The installation of a methane digester is inexpensive, and the small investment of about USD \$450 (Baron 2003), which eliminates any future costs of fuel. Considering that many households spend the USD \$11 a month on LPG gas, a significant expense for families who's income is often no more than \$230 per household (Baron 2003).

The diagram above represents a simple methane digester design. It consist of a large chamber, called the digester. The digester is where the animal or human waste is placed, there are drainage pipes for extra liquid. From the top part of the digester a pipe feeds the methane gas out to a bladder, often made of a simple plastic bag. This bladder is physically compressed to increase flow of gas pressure. From there produced for the use of cooking energy is 60 -70% methane gas.

The gas can then either be fed straight into the home and attached to a methane gas appropriate stove, the fortue stove, or stored in a gas tank. The gas tank can then fill small portable gas tanks for each household and then attached for use with the fortue stove.

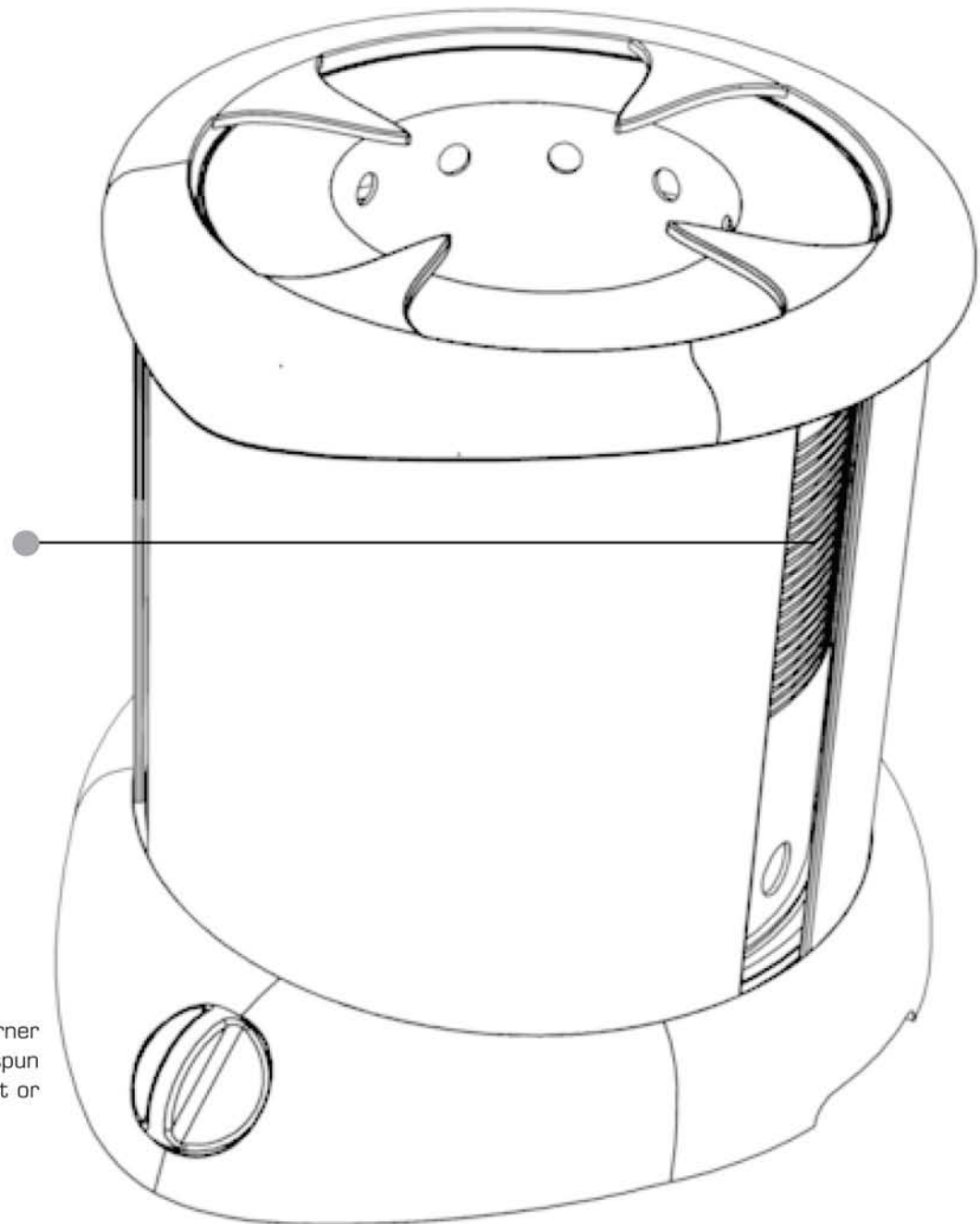
This diagram shows the wood gas burner option, used instead of the gas burner. This technology will be discussed in further detail in the technology section of this report.

Attaching the wood gas burner component is simple, it fits straight into the circumference of the base and is the correct height.

It is important to note that this accessory is only to be used as an addition to the gas or in situations where user is getting accustomed to new technologies.

However if it was a completely more appropriate solution for a community then the structural components could be provided without the gas components, but could rather be fitted at a later time when it is deemed more appropriate.

This diagram shows the woodgas burner option, used instead of the gas burner. This technology will be discussed in further detail in the technology section of this report.



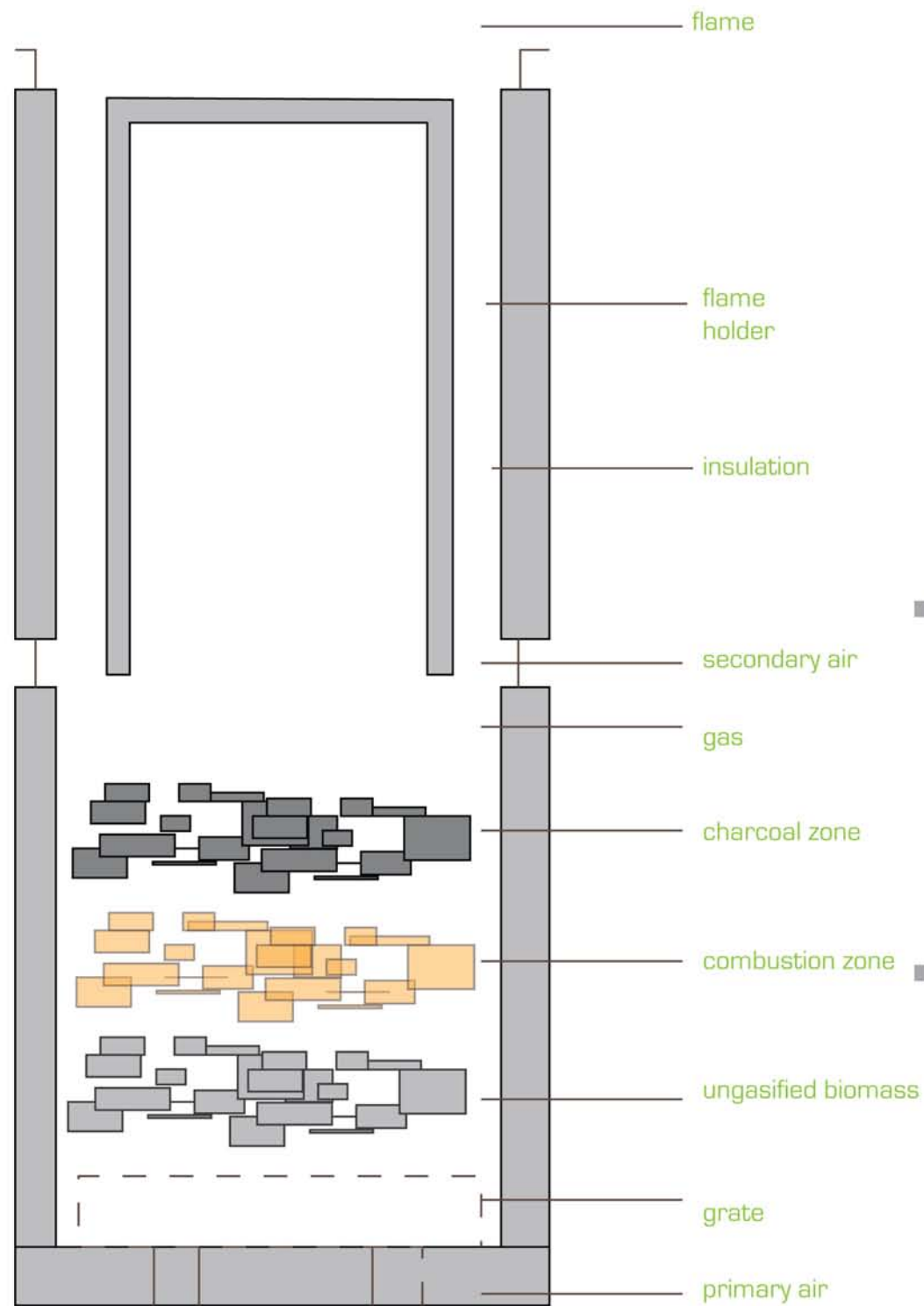
woodgas burner made of spun aluminium sheet or simply tin cans

The diagram on the right shows the biomass fuel option.

The woodgas burner uses dried biomass which can be made from dried organic matter or simply by using wood offcuts. This technology means that 50% less fuel is used than with open fire cooking and it effectively reduces the release of particulate matter by 50 - 70 %.

The advantage of having this type of burner as an accessory is that organic matter which is otherwise burnt as waste in many developing communities can instead be used for cooking energy fuel.

It also provides an appropriate adaptation to more advanced cooking technology.



technology