

CLEANER COOKSTOVES: Combating Indoor Air Pollution

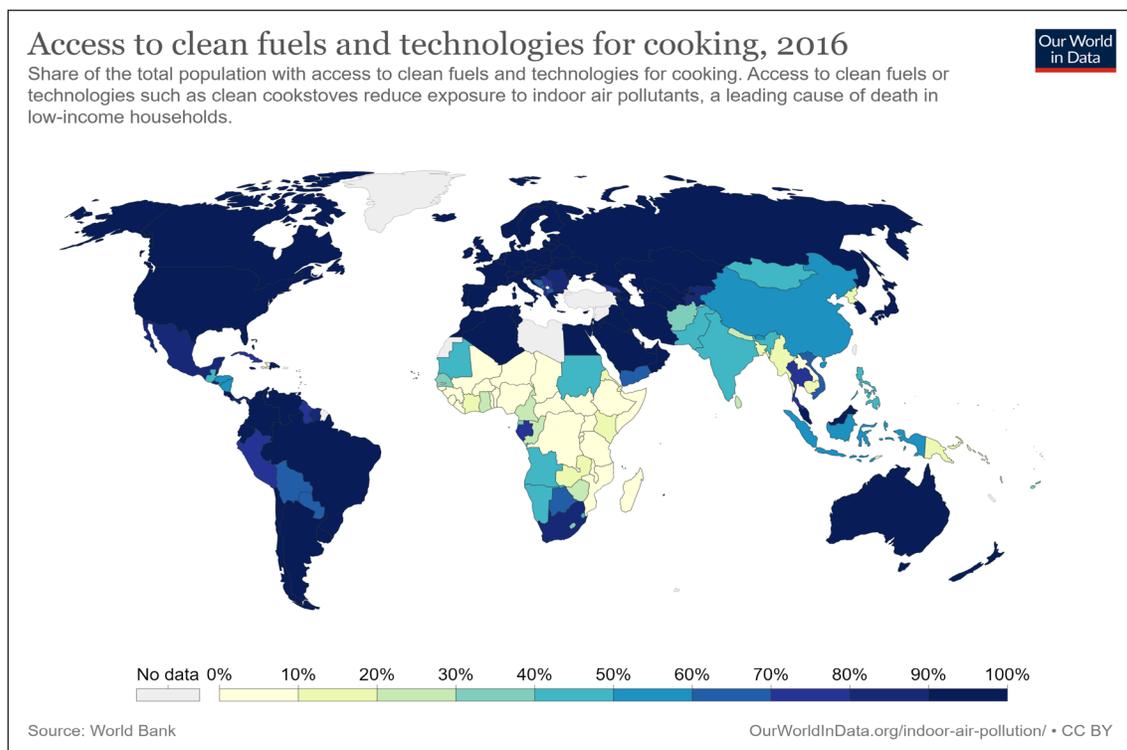
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Imagine if one of the most dangerous things you did each day was to cook your family a meal. For close to half the global population, this scenario is not so far-fetched. Over 3 billion people worldwide, about 40 percent of the world's population, rely on wood, charcoal, dung, or crop remnants for cooking, burning the fuels in traditional stoves or open fires inside the home, which exposes families to dangerous air pollution. The World Health Organization estimates that household air pollution contributes to 3.8 million premature deaths each year, mostly of women and children who spend the most time inside the home.¹

Fortunately, there are alternatives. Improved cookstoves burn fuel more efficiently and emit fewer dangerous particles and gases into the home. They offer what researchers call a triple dividend: improvements to health, environmental quality, and climate.² LPG (liquefied petroleum gas) stoves are one of the most common clean cooking stoves. Over the last 40 years, aid programs have delivered millions of cleaner cookstoves to low-income people in countries around the world. So why aren't more people using them? The answer is complicated.

Society and culture is key

What did you eat for dinner last night? For most of humanity throughout history, this question was answered based on what was readily available, affordable, and, importantly, what your mother fed you and what her mother fed her, going back generations. Food is cultural. If you grew up in India eating roti flatbread cooked in a clay oven heated by dung and firewood, it is likely the type of food your children will eat as well. Same with a Nepali family eating boiled rice in a large metal pot. The mothers in the Peruvian Andes who boil potatoes over wood burning in a clay-walled pit will teach their daughters to cook the same way. And these traditional meal preparation methods will look very different from the Guatemalan mother toasting tortillas over an open flame or the Kenyan mother preparing ugali (maize meal) in a pot.



There is no single stove that will work for all of these families. Yet early stove distribution aid efforts failed to account for varying social and cultural contexts. The result: the new stoves sat unused. Or in some cases home cooks did use the new stoves but also continued to use their old stoves anyway and, thus, did not benefit from improved air quality. Successful implementation of cleaner stove programs requires a deep understanding of the social and cultural factors that influence cooking behaviors in different parts of the world, and households' preferences and needs for the cookstoves within different communities.³ For example, are the new stoves seen as efficient and convenient to use for larger families? Is the clean fuel affordable and accessible? Some studies have also shown that the decision to adopt cleaner cookstoves or fuel is influenced strongly by word-of-mouth among peer groups and whether neighbors and family are using them.⁴



Source: Chebyshev1983 on Wikipedia

A woman in Entoto, Ethiopia carries a bundle of wood, a common biomass energy source in Ethiopia

The cost barrier

Concern about high fuel costs is another factor that prevents many households from switching to cleaner fuel or more efficient stoves.⁵ One woman in rural Maharashtra, India explained to researchers in an interview: “Look, our financial condition is not good, so we don’t have much options. Right from the beginning I am using the clay cook stove; in my maternal home also we had that clay stove. We don’t have options, so we use that. Also, we have abundant firewood, cow dung, [and] agricultural waste which can easily be used as fuel, so we are using them. Even though we have LPG, we still are using the clay stove. [Because of all these factors] we are much comfortable with our clay stove.”⁶

Another study found that rural areas were less likely to adopt LPG stoves because of the easier access to cheaper fuel sources, such as firewood.⁷

The burden of dirty fuels

Indoor air pollution from cooking fires is a major killer. It is the number one environmental cause of death and disability, “causing more premature deaths than HIV/AIDS, malaria, and tuberculosis combined,” according to the World Bank.⁸ Exposure to the smoke and small **particulate matter** from cooking fires increases the chance of cardiovascular disease, respiratory illnesses, and lung cancer. It also can lead to cataracts and blindness. Even exposure to the emissions before birth is harmful, linked to higher risk of stillbirth, lower birthweight, and hampered cognitive development.⁹

Burns from the hot stoves or open fires are common; small children are highly at risk. Children in households cooking with polluting fuel also bear a large part of the burden of fuel collection, spending over 2.5 hours each day, on average, gathering fuel. In some countries, children spend closer to 5 hours each day collecting fuel and water, with most of the work falling to girls. This is time taken away from school, studying, work, and play.¹⁰ It also leaves the collectors, who often leave home in pre-dawn hours and travel miles alone, vulnerable to violence and rape. For both children and adults, hauling large quantities of firewood and water can lead to physical injuries and fatigue.¹¹

In urban areas, charcoal (which is derived from wood) may be more common than self-harvested fuelwood. Monthly expenditures can be high, reaching up to 25 percent of monthly income in urban **slums**.¹²

Environmental concerns

Traditional cooking methods also damage the environment. **Biomass** burning increases localized outdoor, or ambient, air pollution. Wood stoves and open cooking fires emit **black carbon** which contributes to **global warming**. The emissions also include **greenhouse gases** like **carbon dioxide**, which resides in the atmosphere for decades, trapping heat from the sun.¹³

Collecting wood to burn directly or to turn into charcoal can also contribute to forest degradation or loss. Fuelwood gatherers generally target dead and dried wood, which can be important wildlife habitat. For charcoal production, live trees, often from public land, are cut to stumps and turned into charcoal in kilns. However, the most popular kilns have an efficiency of only 10 to 15 percent, whereas modern kilns are 35 percent or more efficient at converting wood into charcoal. Upgrading to highly efficient kilns could reduce greenhouse gas emissions from kilns by 80 percent.¹⁴ Places where wood collecting pressures are particularly high tend to be densely populated, for instance in Ethiopia, Nigeria, Pakistan, Sri Lanka, and Uganda. Charcoal is a major cooking and heating fuel in many sub-Saharan African countries, as well as in Haiti, Myanmar, the Philippines, Cambodia, Bangladesh, Pakistan, Indonesia, and parts of Central America. In some of these countries, communities are surrounded by a growing ring of degraded woodlands, increasing the traveling distance to find fuel.¹⁵

Better alternatives

Fortunately, there are alternatives. Improved cookstoves may use **biofuels** that communities are used to, but are designed to get the same amount of heat with less fuel. For example, the Jikokoa stove produced in Kenya by the U.S.-based organization BURN can cut charcoal use by 45 percent over a local competitor, saving users about \$200 USD over a year, five times the \$40 purchase price. By 2016, over 90 percent of improved stoves sold in Kenya were this model.¹⁶

An older U.S.-based company, Envirofit, has sold over 1.6 million cleaner cookstoves in 45 countries. Its facilities in China, India, Nigeria, Kenya, Honduras, and Mexico can together churn out 100,000 stoves each month. They reduce fuel inputs, whether wood, crop waste, or other biomass, by 60 percent and produce 80 percent less smoke and harmful gases, and cut cooking times by up to 50 percent compared to traditional cooking stoves.¹⁷



Source: Romana Manpreet for Global Alliance for Clean Cookstoves

A woman in India uses a clean cookstove in her home.

Governments taking action

Helping households transition to cleaner stoves and fuel also comes down to money. Because the higher price tag of sustainable fuel can prevent lower-income households from making the switch, some governments have stepped in with subsidies. In 2007, Indonesia's government began providing LPG fuel subsidies to its citizens, in

efforts to help people move away from using kerosene fuel. By 2011, over 50 million people, about 40 percent of the population, had switched to LPG fuel.¹⁸ Then in 2012, the government launched a clean stoves initiative which not only took into account financial barriers, but focused on understanding consumer preferences. This was successful because it used social and cultural insights to convince stove suppliers to create technology to meet household needs.¹⁹

Making sure subsidies reach the poorest households is key. To address this, India's government launched the #GiveItUp campaign in 2015, to motivate more financially-well off households to voluntarily "give up" their available subsidy to a household in greater need. By 2019, over 10 million households, about 4 percent of LPG users, had surrendered their subsidy to a poorer household.²⁰

Future challenges and opportunities

Most improved cookstoves, like the models described above, are much cleaner than their traditional alternatives but still fail to meet **World Health Organization** standards for indoor air emissions. To get there, stoves would likely need to burn gas or run on electricity, both of which are out of financial reach for many poor households and can be difficult to come by in many rural areas. Even if cost and access were surmountable, programs must also consider social and cultural needs for the households they intend to partner with and serve.

Solar cookers, which have zero fuel needs and zero emissions, are another option. Though there are models that can cook some foods well, most current designs are not practical for serving large groups of people, cooking inside, at night, or for certain food items.

Moving from open fires or inefficient stoves to cleaner cookstoves is seen as an important step toward achievement of a number of the **United Nations Sustainable Development Goals**. One of the global goals (SDG 7) aims to "ensure universal access to affordable, reliable and modern energy services" by 2030. While there is still much progress to be made, the world is on the right path. "Access to clean cooking fuels and technologies increased to 63 percent in 2018, from 60 percent in 2015 and 56 percent in 2010" the UN reports.²¹ Improved stoves can help reduce poverty and hunger and improve health and well-being. Using less wood is better for forests and for economic development. Less time spent harvesting wood leaves more time for productive activities, such as employment for women and schooling for children, both of which help to reduce gender inequality. And cutting the black carbon emissions from dirty cooking methods is a relatively cheap and rapid climate mitigation win. Clean cookstoves might be that needed stepping stone on the way toward affordable and clean energy for all.²²

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