Sustaining Culture with Sustainable Stoves: The Role of Tradition in Providing Clean-Burning Stoves to Developing Countries

Britta Victor

Department of Anthropology Princeton University, Princeton, NJ brittavictor@gmail.com

Abstract

The focus of climate change mitigation is on greenhouse gases such as carbon dioxide, but there is another form of carbon that contributes greatly to climate change and that, if cleaned up, seems to be a quick and easy way to slow climate change. This is black carbon, or soot, and the majority of the world's black carbon comes from the basic cooking stoves of poor people in developing countries. These same stoves also pose significant health risks to their users, and many researchers and philanthropists are working to put cleaner stoves in their kitchens. This quick fix is not so easy, though. In the quest for the perfect stove, a key detail is left out: the cooks do not want to give up their old stoves. This study juxtaposes the research of stove engineers with ethnographies of rural communities, writings on women's rights, and theories of imperialism, to explore the complex cultural obstacles to the success of clean stove programs in developing countries.

Author's Note

Britta graduated in 2010 from Princeton University's Anthropology and Environmental Studies departments, for which a version of this piece was written as her senior thesis. She currently works for the International Waters Cluster of the United Nations Office for Project Services in Copenhagen, Denmark, protecting the world's oceans and missing the water back home in St. Croix, U.S. Virgin Islands.

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1. Black Carbon

"How to Slow Climate Change for Just \$15 Billion" boasts the title of an article in Wired Science. It sounds tempting: the solution is to donate stoves to the poor. They cannot use the stoves they already have, say the stove engineers, because they emit incredible amounts of black carbon into the atmosphere.

While all of the climate change talk has centered on greenhouse gases like carbon dioxide, there is another kind of carbon in our atmosphere that deserves attention. Black carbon, commonly known as soot, also contributes to climate change and may be much easier to control. Scientists are calling it a "low-hanging fruit," a cheap and easy solution that will not provide a permanent solution to climate change but can, if addressed, have an immediate and significant effect on global temperatures. "We know how to cook without smoke," explains V. Ramanathan, a leading stove expert from the University of San Diego. "A clean stove costs \$30. Multiply that by 500 million households, and it's only \$15 billion. This is a solvable problem" (Keim 2009:1). In comparison with other tactics for climate change abatement, stoves represent relatively basic, affordable technology. And the best part, enthusiasts claim, is that they represent a solution to a serious global health problem—they can save the world in two ways at once.

It is not that these promising new stoves represent any groundbreaking technological developments. In fact, they are simple, cheap versions of the stoves we use every day in developed countries. But for approximately half the world's population, almost all from developing countries, these modern stoves can be lifechanging, even life-saving.

"I am unable to breathe properly whenever I use the chula," a rural housewife in Abdalpur, India, says of her traditional stove. "But I have been using it for over 20 years. It is the only thing I have with which to cook" (Bhattasali 2005:1). Difficulty breathing is just one of the consequences of working over traditional stoves, such as the chula, or open fires. It may also be a sign of a serious illness. Traditional stoves such as the chula spew black carbon (better known as soot) into the air in the home, producing indoor air pollution. The World Health Organization (WHO) has named indoor air pollution one of the top ten health risks facing our world today, "responsible for an estimated 2.7 percent of the global burden of disease" (Jetter and Kariher 2009:1).

While Carbon Dioxide, or CO2, is still the leading cause of climate change, black carbon has surprisingly emerged in second place. Methane and nitrous oxide receive much attention, yet black carbon poses a much more serious threat than these gases. As much as 20 percent of the Earth's current warming can be attributed to black carbon, even though it is not a greenhouse gas.

Black carbon consists of tiny airborne particles emitted when fossil fuels, biofuels and biomass are burned. Once in the atmosphere, these particles convert the sun's rays into infrared or heat radiation and warm the air around them, explains Dr. Mark Jacobson, co-founder and director of the Atmospheric Energy Program at Stanford University. He adds that greenhouse gases, in contrast, trap this infrared radiation while still allowing sunlight to pass through (H.R. Rep 2007:12). Thus, Jacobson says, while black carbon may only cause up to 20 percent of the earth's warming, controlling black carbon from the atmosphere will produce less infrared radiation to be absorbed by steady levels of greenhouse gases (H.R. Rep 2007:12-13).

When the particles of black carbon age in the atmosphere, they grow in size, which allows them to absorb and convert even more sunlight, but also allows them to form clouds. While these clouds block sunlight, cooling the earth to an extent, they can also contribute considerably to climate change, Jacobson explains. When the clouds of black carbon, which only remain in the atmosphere for a few weeks, settle on snow or sea ice, they darken the white surfaces. This inhibits the ability of the snow and sea ice to reflect sunlight, a process called albedo. The light is instead absorbed by the dark ice and snow, which then warms and melts, raising sea levels (H.R. Rep 2007:12).

Ramanathan describes the extent of black carbon's effect: it may have as much as 60 percent the warming effect as that of CO2 and the particles originally produce a haze around the area in which they were emitted travel fast, covering an entire ocean or subcontinent in as little as a week. (H.R. Rep 2007:49).

One of the most exciting characteristics of black carbon, as compared with greenhouse gases, is this short lifetime: one to four weeks. Carbon dioxide, on the other hand, has a lifetime of 30 to 43 years and methane 8 to 12 years. Because of this short lifetime, reductions in black carbon emissions can have immediate results in combating climate change.

"Yet," Representative Waxman warns, "controlling black carbon has not been seriously examined at the federal level as a way of possibly mitigating climate change" (H.R. Rep 2007: 2). This is unsurprising, though, as the United States is only responsible for 6.1 percent of black carbon emissions (H.R. Rep 2009:7). It is actually the developing countries—especially India and China—that emit the most black carbon into the atmosphere (H.R. Rep 2007:7). This is because black carbon, unlike other gases contributing to climate change, is not a byproduct of modern industry. Open fires and basic stoves in developing countries, especially within rural communities with limited access to newer technology, are to blame for the majority of the black carbon in our atmosphere. Better stoves are the solution.

2. Sustainable Stoves

Cooks in developing countries use one of three different methods for cooking their food: the open fire, an upgrade to the open fire, and a basic stove. Open fires usually consist of three stones, and this method of cooking can be found in at least some communities of every country, according to Gerald Foley, author of "Improved Cooking stoves in Developing Countries" (1983). Foley describes the upgraded open fire as one in which shielding has been provided for the fire or a platform has been built for convenience. The third cooking system in developing countries is the actual stove—though the form of stove that, like open fires, is still responsible for black carbon emissions—and these stoves vary in their design. Some designs are thousands of years old and range in materials from mud or pottery in Asia, metal "jikos" and "forneaux" in East and West Africa, and other brick and mud varieties (Foley 1983:12).

The brightly-painted, shiny metal of the Envirofit stove looks nothing like these stoves found in these poor rural homes. Yet a lot of people are putting a lot of time and money into getting more Envirofit stoves, or other clean-burning and fuelefficient stoves, into those same homes. These stoves are often sold commercially but the engineers, government agencies, non-governmental organizations and charities that work to get these stoves into their target kitchens have only the best of intentions. Their work reflects their concern for the stoves' users and a concern for the environment as they endlessly strive to design and disseminate the perfect stove—one that will be safe and sustainable, one welcomed into the kitchens of the developing world.

These modern stoves, according to tests of their efficiency, perform better "than even the most carefully operated fire" (Bryden et al. 2005:5). Their focus is on transferring heat from the burning fuel to the food as efficiently as possible. They use the same fuels that these cooks have available to them—wood, charcoal, coal, crop residues, animal dung, and other forms of biomass and waste—but they burn

these fuels more efficiently. The stoves are also safer, especially for children, as they are not as hot to the touch as traditional stoves tend to be.

A major benefit of these efficient stoves is their ability to cook the same amount of food with much less fuel. In areas where fuel is scarce, this saves time spent collecting firewood or other fuels. The new stoves also save time cooking, as they can heat food much faster. In areas where cooking fuel must be purchased, the stoves are an investment that will save their users an unbelievable amount of money in fuel costs.

The reduction in indoor air pollution and its effects on human health, are the most valuable benefits of the stoves. More than 1.5 million people die prematurely each year from inhaling indoor air pollution (Bhattasali 2005:1). The smoke from traditional cooking methods has been shown to cause a long list of health problems, including acute respiratory infections, chronic obstructive pulmonary disease such as bronchitis or emphysema, cancer of the nose, throat, and lungs, asthma, cataracts, tuberculosis, heart disease, birth problems such as low birth weight, stinging eyes, chronic headaches, and coughing (Thakuri 2009:2, Bhattasali 2005:1). These health concerns affect women and children in particular, as they spend much more time in the home and over the stove (Jetter and Kariher 2009:1). Manas Ranjan Roy of the Chittaranjan Cancer Research Institute in India asserts, "These women are actually inhaling pollutants equivalent to as many as 20 cigarettes every day" (Bhattasali 2005:1). There is a strong campaign against cigarette smoking throughout the world, yet there is little awareness of the greater threat of indoor air pollution to these rural cooks. Efficient stoves may also help to cook food more nutritionally—a major concern in developing countries where malnutrition is prevalent. A study of "balady bread," a flat bread popular throughout the Middle East, has shown that cooking the bread at high temperatures or for long periods of time may reduce the bread's protein content. It is likely that these results would be similar with similar breads, and thus it is important to ensure that temperature and cooking time are carefully controlled. Modern stove technology allows food to be cooked at lower temperatures and in less time; thus, the new stoves may produce bread higher in protein than traditional stoves do.

3. The Challenge

It is clear that modern stoves have significant economic, environmental and health advantages over traditional stoves. They seem an obvious solution to climate change and indoor air pollution. But they are not. There have been several challenges in the global initiative to swap cooking systems in the developing world to clean stoves. As Brandon Keim points out in his Wired Science article, it would only cost \$15 billion to slow climate change with these stoves. But who is going to pay that \$15 billion? There is little awareness about the importance and effectiveness of clean stoves and thus little funding. That funding is necessary, since the populations that cook with the culprit stoves are the populations that cannot afford new stoves. If we want residents of developing nations to switch to cleaner stoves, we must provide those stoves, because they simply do not have the resources to naturally create a market for them. "People at the absolute bottom of the pyramid—those living on less than \$1 or \$2 per day—will not be able to afford a stove even with financing. In such cases, subsidies are necessary," explain Xander Slaski and Mark Thurber, of Stanford University's Program on Energy and Sustainable Development. It is crucial that stoves and the threat of black carbon are brought to the world's attention in order to obtain this funding to subsidize stoves for those who need them. "On the other hand," they continue, "various studies have shown that subsidized stoves turn into little more than scrap if target customers do not value the product to begin with." This cultural disinterest in new stoves is the greatest obstacle in the development and dissemination of sustainable stoves.

The focus in the search for the perfect stove needs to shift from efficiency to the stove's resemblance to its original counterpart—in ease of use and in ability to cook food in just the same way. Stoves designed for use in developing countries are constantly compared in terms of efficiency. Those that are just slightly more efficient are chosen for mass-production and mass-distribution. But distributing these stoves only represents the environmental disaster of unnecessary production if the stoves are not used. Douglas F. Barnes, Keith Openshaw, Kirk R. Smith, and Robert van der Plas state an important message that should be heeded by all:

> No matter how efficient or cheap the stove, individual households have proved reluctant to adopt it if it is difficult to install and maintain or less convenient and less adaptable to local preferences than its traditional counterpart. On the other hand, households have been most receptive when the dissemination process takes full account of the capacities and needs of local stove producers and consumers (1994:v).

4. The Role of the Stove in Rural Life

Aside from the countless environmental and health benefits of sustainable stoves, there are many ways in which these stoves may improve the daily lives of their users. As a result of their increased efficiency in transferring heat from the fuel to the food, the stoves can save cooking time, giving women more time in their day. Additionally, decreased soot emissions means that walls and clothing will no longer be discolored, a small but noteworthy benefit. The stoves themselves are also more attractive, often with handles to make them easier to carry, and can become symbols of modernity and higher status for their users (Barnes et al. 1994:10).

Yet even when these stoves are made, and made affordable, cooks do not use them. In a review of past stove programs—both successful and unsuccessful— Douglas F. Barnes, Keith Openshaw, Kirk R. Smith and Robert van der Plas write:

> The work on stoves continually refers to 'stove dissemination,' which seems to imply that the improved stove need only be distributed to be adopted and that it is intrinsically and obviously superior to the traditional stove just because it has greater energy efficiency. As a consequence of this perhaps naïve thinking

oblivious to the influence of custom, setting, and circumstance many programs failed (1994:13).

As they argue, it is naïve to think that all of those benefits will necessarily lead to the stoves being readily accepted in the developing world. The perfect stove has yet to be created, because the new stoves are different and often cannot perform the same vital tasks that traditional stoves performed. While many stove designers may view the benefits from improved stoves as much greater than the forgone benefits of traditional stoves, it is important to take note of these shortcomings of the improved stoves. To many who still cook with traditional stoves, these are important details, and a truly ideal stove would fix the ways in which these new stoves fail to live up to the old ones.

A major complaint of the improved stoves is their complexity and difficulty of use. In reducing heat loss, engineers have decreased the size of the hole in which to add firewood, and this makes the stoves harder to light and to control. It also means women have an added burden of cutting firewood down to smaller sizes (Barnes et al. 1994:10). As an added measure to increase efficiency, the stoves often have adjustable power outputs, which can be very difficult to control (Barnes et al. 1994:14). Other stoves, meanwhile, can focus too much on health and not enough on efficiency. Adding a chimney, for example, prevents indoor air pollution but may actually reduce the efficiency of the stove (Barnes et al. 1994:10).

The fire in rural homes also serves an important social function, as families traditionally sit around the fire, and it is the only source of light for many families who cannot afford lamps, electricity or even candles. More significantly, a major benefit of fires or traditional stoves is their secondary role as space heaters, and stove designers who focus on increasing efficiency often overlook this role. That usually means increasing the efficiency with which heat transfers from the fuel to the food, losing no heat to the surroundings. This heat lost to the surroundings should not be considered a loss for stoves to be used in many parts of the world, though. Foley argues that "using more fuel than is strictly needed for cooking is not wasteful if it is meeting an essential family need for heating" (1983:13), and argues that this is a widespread necessity. Even some homes in tropical climates have a need for heating in winter mornings and evenings.

Smoke's food preservation capacity is another sometimes crucial aspect of traditional stoves that is lost with healthier, more sustainable stoves. The smoke causes sickness and death among cooks, and the black carbon in the smoke contributes to climate change, but many households use the smoke to preserve and dry food hung above the fireplace. Most homes cannot afford refrigerators, and smoking food is essential to prolonging the life of the food, keeping insects and rodents away, and preventing molds and fungi during the wet seasons. Chomcharn describes that, despite women's complaints that the smoke causes eye irritation, they still like to allow the fire to smolder long after they are finished cooking (1991:1).

Keeping insects away from people can be even more important than keeping them away from just the food, and the smoke from fires and traditional stoves often fills this role, too. Disease-carrying mosquitoes and other poisonous insects are a serious concern in many environments, but these insects are repelled by a home filled with smoke. While mosquito nets and repellents work, they are less effective than smoke and often too expensive to be practical (Chomcharn 1991:1). As a result, stove designers have been surprised to see that, while asthma rates may drop after the introduction of cleaner stoves to a community, malaria rates may spike—an unforeseen and worrisome tradeoff.

With these considerable benefits of fires and traditional stoves, it is clear that designing the perfect stove is a challenge.

Cooks need to love the stoves. There is a large focus on the need for more affordable stoves, with the underlying assumption that the success of a stove program depends upon the stove's price. There is a considerable amount of literature and press surrounding sustainable stoves, but in much of this writing there is that assumption that if people in rural communities can afford the stove, they will definitely buy it and use it. Further, there is a sense that a stove is clearly superior to its user if it prevents pneumonia or other health concerns and reduces fuel use (saving its user time and money). And there is a sense that it is simply a "better stove" if it accomplishes these goals and also has a reduced impact on the environment and the atmosphere. Therefore, there are many arguments for engineers to design a stove that can be assembled at a low cost and for government agencies and charities to subsidize the stoves so that the world's poor will switch from fires and inefficient stoves to cleaner stoves.

The race for more efficient, cheaper stoves is in fact the race for the perfect stove. It seems there cannot, however, be one perfect stove. Not all cooks will love the same stove, because members of each culture have different needs from a stove—from space heating and food preservation to the stove's ability to cook the perfect injera. And cooking the perfect injera—a flat bread that is a staple in Ethiopia—is a necessity to many Ethiopians. Peter Scott of the Aprovecho Research Center, tells Burkhard Bilger of The New Yorker, "The Ethiopians are unbelievably particular. If the injera doesn't have the exact size of bubble in the batter, they'll say it's garbage" (Bilger 2009:88).

It is particular requirements like these, which abound among rural cooks, that constitute the "custom, setting, and circumstance" that Barnes et al. describe as so crucial to a stove program's success (1994:13). Engineers can design cheap, clean stoves, and philanthropists can make them even more affordable, but if they are not designed for the cooks who will use them, the cooks will probably not love them and probably not use them.

Cooks like their traditional stoves because of tradition, and as Bilger writes, "the trouble with tradition...is that it can be remarkably thickheaded" (2009:94). It seems that no one stove can emit less black carbon into the atmosphere, repel mosquitoes, and cook everybody's meal just the way they like it. And while traditions may be very important to cooks, they may be detrimental to the community. This raises the question: should cooks change their traditions in favor of more sustainable stoves? Is sacrificing tradition necessary to the development of poor communities?

5. Cooking and Culture

The film "The Gods Must Be Crazy" depicts the tragic scenario of one product of Western development (a Coca-Cola bottle) completely destroying the culture and the harmony in which a tribe of African bushmen lived. While the film itself may represent an offensive attempt at anthropology, it asked the world this same question: does Western development lead to the disintegration of a culture so beautiful as that of the bushmen?

There may be huge cultural significance stored in something so simple as a traditional stove, or even a fire pit. "Cooking tools, as the durable objects that we take with us from place to place, or hand down in a family (usually maternal) line, come to be storehouses of memories which help tell stories of people's lives," write David Sutton and Michael Hernandez of this certain kind of magic connected with cooking tools (2007:1). Stoves can be easily compared to tools in the sense that in rural communities, many generations have used the same stoves and many women have spent a large portion of their lives over these stoves cooking food for their families—a vital part of their lives.

We must be careful to acknowledge that cooks in developing countries place much more value on their stoves and other cooking tools than we might understand. "In Western capitalist modernity such objects are often discarded in the name of progress," Sutton and Hernandez write (2007:1). In other parts of the world, though, the connections people have with their cooking tools may be more important to them than progress.

Food is not just a part of the culture in these communities; food *is* the culture. "The emergence of national cuisines is part of a process of assembling a national culture...Food is an important, if not crucial, contributor to both an individual's and to a group's collective sense of identity," writes Igor Cusack, a scholar of cuisine, culture, and identity (2003:278). Like most valuable traditions, this means food must be cooked just right to truly represent and preserve that identity.

Food may be an important aspect of identity in its ability to tell a community's history. In many parts of the world, textbooks and classes do not exist, literacy rates are low, and there are few ways for a people to remember their history. Food can tell this story in a language that takes no formal training other than the education a mother provides to her daughters. "Cuisines are not just innocent concoctions, but reflect the dominant ideologies of the societies in which they emerge so that, for instance, imperialism and colonialism have been crucial contributors to African cuisines," Cusack writes (2003:278). A meal can illustrate the ways in which a community is unique as well as its connections with other cultures around the world through this combination of influences, representing that community's place in space and time.

A meal can paint a personal history just as it can paint a national history. Signe Arnfred, author of "Sex, Food, and Female Power: Discussion of Data Material from Northern Mozambique" writes of a dish in Mozambique called "makeya," which is said to have "a touch of the holy." The locals say, "when you want to communicate with the government you take a pencil and write a letter. When you want to communicate with the ancestors, you pour makeya" (Arnfred 2007:148). The act of pouring the makeya is given significance here—not just eating it. Food preparation is in itself an art form, a form of expression, and a form of communication with one's ancestors, with one's community, and with the rest of the world.

Cusack presents social psychologist Michael Billig's theory of food as "banal nationalism," or "everyday, unnoticed nationalism" (2003:279). Just as food represents a people's national identify, cooking and eating that food is a way in which any citizen can show their national pride, strengthening the nation and, through the sense of community, reinforcing the value of tradition.

6. The Other Side of Tradition

There are plenty of practices aside from the customs of food preparation that accompany fires and basic stoves and which residents of developed countries would view as unnecessary or even harmful to some of these communities. These include not only the aforementioned use of a tool which is harmful to the health of its users and contributes to climate change, but also acts of deforestation and unjust treatment of women.

Increasing stove efficiency decreases fuel requirements. In many areas, such as Honduras, fuel is firewood from nearby forests. The strain on the forests can cause deforestation, a concern in almost all developing countries. Deforestation is in itself a serious environmental problem, causing loss of biodiversity (including the loss of crops used for food), floods, and desertification, all serious threats throughout the world, especially in developing countries (Allen and Barnes 2010:164). Beyond this, though, the loss of forests causes fuel shortages, increasing the need for more efficient stoves. And the decrease in global forest cover affects carbon cycles since there is less vegetation to absorb carbon dioxide from the atmosphere, accelerating climate change.

Even if connections are not made between the collection of firewood for cooking and floods, desertification, or climate change, it is clear that forests, the major fuel source for many communities, are growing scarce. It seems that it should be in the best interest of these communities to preserve the limited firewood resources. Arun Agrawal and Clark Gibson warn against this assumption, though:

Claims on behalf of community-based conservation often retain a rather simple quality. One such form such claims assume is that 'communities' have a long term need for the renewable resources near which they live, and they possess more knowledge about these resources than other potential actors. They are, therefore, the best managers of resources...But such representations of community ignore the critical interests and processes within communities, and between communities and other social actors (2001:7).

These "critical interests and processes within communities" may include traditional cooking practices and the community's willingness to change them, and the authors may argue that these interests take a higher priority in decision-making than concerns for the sustainability of local resources. In this way, these traditional cooking practices seem detrimental to the community's sustainability and should perhaps be sacrificed.

Another tradition that may prevent the communities from using more efficient stoves, another one that Westerners would be quick to put an end to, regardless of its influence on the success of stove programs, is the treatment of women in many developing countries. Women perform more than 90 percent of the cooking duties in developing countries (Kammen), so the health risks of inefficient stoves disproportionately affect women. Yet men have historically been the decisionmakers in the developing world. While it may be impossible to prove that women's lack of decision-making power is to blame for the resistance to cleaner, safer stoves, it seems possible that men will choose how women cook their food and women, along with the children by their sides, will bear the burden of that decision.

7. Accepted Oppression of Women

What is best for women and children is not necessarily best for the whole family. Health benefits for women and children do not directly affect the men of the family, nor does an extra hour in a woman's day. But most of traditional stoves' benefits—heating, food preservation, protection from insects and the cultural importance of dishes—are appreciated by the whole family. The decision whether to use sustainable stoves then becomes one that pits the interest of the family against the interests of the mother, and the family, led by the husband, often wins.

Women may even prefer to cook on newer stoves—they may be willing to sacrifice the perfect injera in favor of healthier conditions for themselves or their children—but their husbands, removed from the health risks, may prefer their bread cooked just right.

Igor Cusack says of cooks in Mexico, "Women were perhaps less concerned than men with the social stigma associated with the pre-Columbian dishes like tamales made of corn" (288). He extends these gender-based attitudes on food preparation to other cultures with a strong sense of tradition, arguing that women are more open than men to branching out to new recipes outside of their own ethnicity. If the men are more concerned with the preservation of culture through cooking, it is even more likely that the men will choose the stoves that their wives use.

Clean stoves may be a threat to culture, but it is important to note that every aspect of a culture may not be worth protecting. Giving women, rather than the family, the choice in how to cook the family's meal will complicate the power structure ingrained in that culture. Ruth Meinzen-Dick and Margreet Zwarteveen write about water resource management in South Asia with an argument generally applicable to resource management in poor, rural areas. They say this power structure should be upset and women's rights brought to these areas, especially if women have a greater concern for environmental sustainability.

"Romanticizing views of 'communities' as homogeneous groups that have a strong common commitment to maintaining their local resource base, and ignoring the effects of power differences within the community on who can participate in decisions regarding management and the share of benefits, risks reinforcing inequality," write Meinzen-Dick and Zwarteveen (2001:64). While the focus is on resource use rather than the design and use of clean stoves, clean stoves deal heavily with the use of fuel resources and represent a difference between men's and women's "needs"—health needs, fuel needs, and perceptions of sustainability as a "need." This can be read as a call to all those involved in stove programs to recognize men's and women's decisions as separate, and to be sure to include women in the decision-making process. They should not assume that when a community rejects a stove, it is the choice of the entire community. When this assumption is made, they warn, inequality may be reinforced as a feature of the culture.

Efficient stoves heat up more quickly and cook food more quickly, so these stoves would save women huge amounts of time—a benefit that would only concern the woman herself or a very sympathetic husband. But most husbands are not sympathetic.

"Studies have consistently shown that women in rural areas of developing countries work longer hours than men," writes sustainable stove scholar Peter Watts, "and that much, if not most, of their time is taken up by the essential 'survival activities' of food preparation, water hauling and fuel collection" (2008:1). He says a survey of five villages in India shows that women work an average of nine hours per day, while men work only five, the amount of time, coincidentally, women spend on food preparation alone.

Meinzen-Dick and Zwarteveen refer to the view of the male perspective as that of the entire community as the "unitary model" (2001:64). Even with the focus on the risks stoves pose to women and women's cooking practices, it is likely the research and writing on stove programs which refers to a community's preferences is guilty of viewing the community as this unitary model. "Gender differences in power and influence are a recurring pattern," Meinzen-Dick and Zwarteveen argue. "Women's participation has received considerable rhetoric, but less careful attention has been paid to the differences between women's and men's needs and priorities with regards to resource use, and to the barriers women face in achieving control over resources" (2001:64). One of these barriers, in fact, is their reluctance to voice their concerns—one reason that, despite the huge focus on women's participation, their needs and priorities are still not heard. Many women living in oppressive cultures stay quiet because they "often seem to acquiesce in their own noninvolvement," not because of lack of interest but because they are aware of "the social costs and risks involved in contesting the masculine rules and norms" (Meinzen-Dick and Zwarteveen 2001:83-84).

This power struggle occurs at both the household and community levels. As Meinzen-Dick and Zwarteveen explain, "leaving this analysis at the household level is incomplete, because it does not take into account the effects of the community on gender relations in the household, or vice-versa" (2001:65). The community dictates this power distribution within the household because it is ingrained in the culture, and when men have more power in the household, they have more power in the community. As such, they are the ones who represent the desires of the entire community to researchers. It is the household that rejects the stove, but rejection of stoves can be a trend within the communities because the culture of that community plays a key role in the stove's acceptance.

Just as ignoring women's cooking needs risks widening the gender gap, if women are given the power within the household to purchase a clean stove, they can improve their societal status. "Strengthening women's claims over common property can strengthen their position in the household and community," Meinzen-Dick and Zwarteveen explain (2001:82). Stove programs, then, should focus on breaking down these barriers rather than reemphasizing the health benefits of clean stoves for women. It does not matter whether women want to reap these benefits, if their culture prevents them from saying so. As a result, the concern for sustainability of the "community" (which will transform from the unitary model to a more accurate depiction of the entire population) may change.

Currently, women are not the only members of the household whose health is at risk due to soot-emitting stoves. Children often sit by their mothers while they cook, suffering from the same ailments as their mothers. In fact, children under the age of five are at a higher risk of respiratory infections. These infections often lead to pneumonia, the cause of 19 percent of deaths in children under five. Many children are even born underweight or with health defects such as asthma due to pregnant mothers inhaling soot while cooking (Williams 2005:1).

As with women, children have no decision making power, though this is not as much a concern of justice as is women's status. However, fathers tend not to consider children in family decisions as heavily as they perhaps should. Meinzen-Dick and Zwarteveen describe this lesser concern of the fathers, writing "a number of studies have found that women and men spend income under their control in systematically different ways, with women more likely to devote a high proportion of their income on food and health care for children" (2001:65). Unfortunately, the income is usually under the control of the men, and therefore less money is spent on their well-being. Money is a form of power, and if men are less willing to spend money on healthcare for children, they are also probably less likely to use their power to protect children's health from threats such as stove smoke.

Women's greater concern for their children is linked with their domestic responsibilities, which include childcare (Meinzen-Dick and Zwarteveen 2001:82). These responsibilities, in turn, are both the result of "rule-setting by men only" (Meinzen-Dick and Zwarteveen 2001:82) and the reason for women's continued subordination: with their role limited to household duties, their power within the community is limited. But as women are better representatives of children's needs, it is even more important to work to hear women's true opinions.

Even after growing up with such exposure to the health risks of indoor air pollution, and even with women as the primary influence in children's lives, each generation continues to value tradition over the health of women and children and the sustainability of resources. Liesbeth van der Hoogte and Koos Kingma, scholars in gender and development, explain:

> Women play a central role in socializing children to continue cultural practices, but if these cultural practices have a harmful impact on women and girls, they have very limited scope to question or change them. If women rebel against tradition, they run the risk of being excluded from the community. Exclusion carries a very high price, if you are also discriminated against in the wider society based on your membership of a marginalized group (2004:51).

Again, women's lack of power actually ensures their continued oppression even as new generations, having suffered in the home alongside their mothers, grow up and make their own decisions.

Some organizations are already taking note of this crucial step of recognizing women's perspectives. The "Global Assessment for Gender and Energy," or GAGE, project was proposed at the World Renewable Energy Conference V on the

premise that "better understanding is needed about how renewable energy solutions affect men and women differently so that organizational responsibilities and resources can be accurately targeted (Farhar 2000:2). The project is aimed at increasing the role gender plays in the energy discourse and increasing women's power in making energy-related decisions.

Analysts and development experts from several countries agreed at the Village Power '98 conference on sustainable energy development (SED) that recognition of women was a priority. Their consensus was:

That access to sustainable energy in rural areas is particularly difficult for women; that participation of local people, including women, is essential for successful SED; that international financing agencies should integrate energy into their gender policies; that electricity access can be increased by matching resources to women's energy needs; and that financing should be actively extended to women to acquire sustainable energy systems (Farhar 2000:3).

Farhar details many more instances of organizations realizing the importance of women. This provides hope that, in the future, the views of the community truly will represent the views of everyone within the community. Perhaps, at least where stoves are concerned, women's voices may even hold more weight than men's, as women are more directly involved in cooking than are men.

Unfortunately, though, van der Hoogte and Kingma present a less optimistic view of organizations working with developing countries. They argue that often employees do not value women's perspectives, that they falsely assume they understand women's conditions without actually listening to the women, and even that, in an attempt to be sensitive to a culture which oppresses women, they purposely do not hire local women while still attempting to appear as though women's needs were taken into account.

"It was reported that NGO staff attempted to solve the problem of traditional leaders opposing women's equal participation in the organization, by excluding women from responsible roles or on committees, or by including women only in limited areas of a project, to solve the problem of participation," they write (2004:54).

This has two effects: women within a community who are trying to change that element of culture which is so detrimental—their own oppression—are not supported by the outside organizations which are trying to help them (such as stove programs, for which success may depend on giving women the right to choose their cooking methods), and the staff of the organizations may dismiss an entire culture as backwards and fail to offer it the respect it deserves.

Possibly as a result of dismissing the cultures as backwards, the organizations sometimes "accept gender inequality in a culture as unchangeable, and consider criticism of inequality as an offence against the culture in general" (van der Hoogte and Kingma 2004:54). This increases the likelihood that the community's perspective that is presented to stove programs the rest of the world may be simply the perspective of the men within the community. Striking a balance between respecting tradition and promoting development is thus incredibly difficult.

Nevertheless, stove programs aimed at providing developing countries with clean, efficient, safe stoves may be overly intrusive if they were to interfere with gender relations, attitudes towards the environment and natural resources, or other aspects of culture which the communities themselves may view as important aspects of their lifestyles and parts of their collective cultural identities. This is especially true if the programs attempt to break down gender barriers not to increase the acceptance of stoves within a culture, but purely to help women gain power. And where do stove programs draw the line between believing that women within a culture truly want to use their traditional stoves and interpreting such a claim as women's forced acceptance of their husband's desires? Should a stove program simply give up if women truly do not want to cook with sustainable stoves?

8. Ethics of Adapting Cultures to Stoves

It cannot be easily assumed that, simply because of the risks and burdens that women face in cooking with traditional stoves, women would prefer to use sustainable stoves. There is also a certain level of fulfillment many women feel when cooking the dishes that are important to their culture: the same dishes their mothers and grandmothers cooked and taught them to cook, and the same dishes their mothers' families and grandmothers' families ate and enjoyed. Cooking can be empowering for women. Signe Arnfred contrasts the conceptions Westerners have of the work of a housewife with those of developing countries.

"Cooking in general is a female capacity and domain," she writes, but warns that we should not interpret this as a form of oppression: "in a Western context this seems a trivial statement and may be equated with the burdensome household chores of a western 'housewife," suggesting that this is not how the role of the housewife is viewed outside of the Western world (2007:148). In societies which are based on subsistence production—the majority of poor, rural communities around the world—"cooking and distribution of food has a different status. Food is a female domain and a basis for female authority" (Arnfred 2007:149).

Arnfred gives an example from Mozambique to represent the power associated with food production in all economies of subsistence production: Men and women are both involved in the production (they both work in the fields), but at harvest time the products from the field are stored in the granaries of the older women, the grandmothers. They are the ones who control the granaries, deciding what to take out, when, and for what purpose. A man who wants to control the granary of his wife gets a nickname, which is translated to avarento in Portuguese to mean "the one who wants to have it all for himself"—as opposed to the women who are supposed to administer the granary for the benefits of all (2007:149).

This brings a new perspective to what appears to be the oppression of women in these communities—though they work longer hours and lack political power within the family and community, it seems they do have power over food production. To attempt to "free" women from the shackles of domestic work, or to dictate how they ought to cook, may improve their health and slow climate change, but it would come at a cost: removing the one source of power, and of pride, in these women's lives. And to call the housewife's role a form of "oppression" now seems erroneous when, in fact, men are seen as selfish if they attempt to perform any tasks conventionally reserved for women.

Through this compelling relationship between women and food, whether or not it is the result of oppression, ecofeminists argue that women may have a connection with nature and, by extension, they may be more likely to have strong feelings about sustainability. In this way, their traditional roles as cooks may actually increase the likelihood that they will embrace sustainable stoves.

Meinzen-Dick and Zwarteveen describe this connection:

Ecofeminists maintain that traditional communities lived in close harmony with nature, according to feminine principles. Colonialism and markets have broken up this harmony, often resulting in men engaging in life-destroying activities or having to migrate. The women meanwhile continued to be linked to life and nature through their role as providers of sustenance, food, and water. Hence, for ecofeminisits, in terms of environmental sustainability it is a fortunate scheme of events that women have been left out of development, because this has made it possible for them to retain their unity with nature (2001:68).

The advent of technology that promotes sustainability, especially when this technology is sold in a capitalist market system, complicates this theory. According to the claim of ecofeminists that Meinzen-Dick and Zwarteveen present, women have retained their unity with nature as a result of their exclusion from markets and development. Thus, allowing women to make decisions about technology, and giving them purchasing power, would allow them to make the transition to sustainable stoves. But to introduce women to these markets would break them from their alleged harmony with nature, just as has occurred among the men in their community, and they may no longer have strong feelings about sustainability.

If the Western world is to work to increase women's decision-making power in the developing world, we must be sensitive in how we do so. Their cooking practices extend far beyond simply the final result: the food on the plate. For women, cooking is a social activity and has several other rewards.

A major argument for clean stoves is these speedy stoves will shorten women's time spent cooking. They already work so many hours more than men and deserve free time, many advocates state. And women can devote this extra time to economic activities, increasing their familial or, more progressively, their personal incomes. Peter Watts writes that this is an idealistic assumption, though:

> Because time is a limited commodity, women are required to make rational decisions concerning its use. The basis of those decisions is the contribution that a particular use of time will make towards sustaining the household. If the time required for one activity increases, then women must make a trade-off with time spent on another. Any development program which aims to increase women's productivity or improve women's welfare must first consider the activities which the women will have to forgo as a result (2008:1).

The concept of spare time for these poor, rural women may in itself be a fantasy, negating the argument that clean stoves will help women. It may even have adverse effects: if women find high levels of satisfaction in cooking, time spent doing other activities may feel less rewarding and more suggestive of chores.

9. Technological Imposition

Stove programs, especially those that developed countries initiate, do not always know what is best for the communities they are trying to help. This is no fault of their own; they simply do not understand the individual needs of each community, and perhaps they cannot. Local members of the community know best which stoves the community will embrace. It seems that, instead of designing a stove such as that pretty, shining, and mass-produced Envirostove to all of these communities, the best thing the developed world can do is to fund local stove projects.

Kirk Smith contends that, while larger, government-funded stove projects are capable of producing stoves much quicker, at a lower cost, and of more uniform quality, they cannot beat local stove programs. He writes that such programs "suffer from high rejection rats and lack of integration into local social and economic development programs" (1989:521), implying that local stove programs will be much enthusiastically accepted by local communities.

"Unfortunately, the local stoves currently available do not always represent the best designs that modern engineering can offer," according to Mark Bryden, Dean Still, Peter Scott, Geoff Hoffa, Damon Ogle, Rob Bailis, and Ken Goyer of the Aprovecho Research Center (Bryden et al. 2005:5). While their argument is no different from that of Smith: the most efficient stoves are probably not going to be made by the designers who call rural villages in developing countries home, their definition of a successful stove is different. Smith's primary source of success is the acceptance of a stove by a community, while the researchers at Aprovecho define success as optimal energy efficiency. Jacob Moss of the U.S. Environmental Protection Agency elaborates on this point while at Aprovecho's stove camp in Oregon:

> When we first got into this, we had this utopian vision of working with local communities to build locally grown stoves. We've moved away from that—I won't say a hundred and eighty degrees, but maybe a hundred and sixty. I don't really listen to small stove projects anymore. When I hear Dean say that one millimeter can make a nontrivial difference, it's inconceivable to me that all these local stovemakers can make all these stoves efficiently. You have to work in a different way (Bilger 2009:96).

However, if Moss is correct in saying that local stovemakers cannot make an efficient stove—perhaps they can make a stove that is "better" in some ways but still doesn't meet a certain standard—then the community's acceptance of that stove is irrelevant. If we are to agree with these representatives of the Aprovecho Research Center—leaders in sustainable stove design—and the Environmental Protection

Agency, then we agree that stoves for the developing world should be designed in the developed world and subsequently distributed to a variety of diverse communities.

This does not mean that stovemakers from outside the communities should not take local preferences into very serious account. And the researchers at Aprovecho are aware of this. "The campers in Cottage Grove spent half their time agonizing over cultural sensitivity," Bilger writes. "We're highly dominated by elderly white engineering types,' a stovemaker who'd worked in Uganda told me. 'So you get a lot of preposterous ideas that'll never fly in the kitchen" (2009:94). These expert stovemakers, advocating for stoves designed far from their future homes, are conscious of this drawback of their own method.

The compromise, it seems, is stove design should be done by outside experts, with considerable input by the community members who will be using the stoves. Douglas F. Barnes, Keith Openshaw, Kirk R. Smith, and Robert van der Plas advise that engineers must build the stoves, with heavy local influence on their design, rather than the other way around. Stove programs often fail, they explain, when outside engineers dictate to community artisans how the stove should be built (1994:14). Local cooks should instead dictate how outside engineers should build the stoves. The stoves will be technically better when Western engineers have control over those critical millimeters, but they will be more successful (even if a bit less efficient) if they take local preferences into account.

There is, of course, a balance between too little local input and too much. Stoves must be custom-designed for communities, but they will fail if "critical stove components are custom built" (Barnes et. Al 1994:14). These critical components, such as the combustion chamber, should be mass-produced, while the body of the stove should be adapted to local needs.

Unfortunately, this push for local input may have developed into a basis for false advertisement. Stove programs that claim to welcome local input may not actually take that expertise into account. As Smith argues, "you can have it in any color, as long as it's black," he says of this false sense of choice consumers are offered (1989:521). The companies that design the stoves are so much larger and more powerful than the consumers, he explains, that the designers have no need to truly listen to their customers, and he suggests that in this way the designers are taking advantage of their customers' lack of power.

"Even if legislation or policy boasts a 'participatory' or 'community' label, it is rare that individuals from the community have had any say at all in the policy. Further, many of these centrally imposed 'community' programs are based on a naïve view of community," seconds Elinor Ostrom (2001:ix). But programs using deception in this way, she writes, benefits nobody, as the programs are likely to fail. She is referring to any community resource legislation or policy, demonstrating that stoves fit in with other environmental initiatives—best understood by communities but often overtaken by outsiders.

This idea is important to keep in mind: stovemakers are marketing their stoves. A quick Internet search of "sustainable stoves" will produce countless testimonies by local cooks detailing the ways in which the stoves have improved their lives. Most cooks in the developing world still cook with their traditional stoves and fires, though. There is a huge resistance to these stoves that the articles and YouTube videos carefully ignore. But because of this resistance, in order to sell the stoves, for profit or for a genuine concern for human health and the environment, the stove programs must market them. This raises new ethical dilemmas.

10. Marketing Strategies

Sustainable stoves are not immediately successful because, for a variety of reasons, they do not immediately appeal to consumers. "They are expensive, imply a significant change in user habits, and, worst of all, are usually not highly valued by potential users at the offset" (Slaski and Thurber 2009:6). Many Westerners are surprised; we expect stove users to be as impressed by the long list of health benefits, if not environmental benefits, as we are. But even after consumers are told of these benefits, they still tend to value their traditional cooking methods over these stoves. There are two options for stovemakers in this case: give up, or find other ways to convince people to buy the stoves.

Slaski and Thurber write to educate stovemakers on strategies for this latter option. They present a chart depicting products that are marketed to populations in developing countries. One branch of the chart shows why consumers promptly adopt products. The example is one that has initial perceived value and is affordable with disposable income, though it has a low magnitude of change: Coca-Cola. Several branches in the middle show different combinations of factors, and the bottom branch represents the complete opposite of Coca-Cola. This product has no initial perceived value but instead may be valued after education and social marketing. It is not affordable with disposable income (nor financing, so subsidies are necessary) but has a high magnitude of change (higher than vaccines): stoves (Slaski and Thurber 2009:5).

In order to create perceived value, Slaski and Thurber explain inherent motivation must be manipulated. Fortunately, motivation to purchase sustainable stoves is actually quite high in urban areas where fuel is usually purchased, often at a high cost. But the majority of black carbon is emitted into the atmosphere by rural stoves, and these communities do not always feel strained by resources. Their inherent motivation is low, and designers must target their strategies towards creating perceived value for stoves among these potential consumers:

> What have worked better are efforts that actually create and market new perceived value associated with the stove. A stove could be seen, for example, as contributing to a cleaner kitchen, adding new cooking functionality, or providing a status symbol associated with modernity. . .The commercial players who will be most successful in the cookstove space are those who are most innovative in creating these kinds of observable value for their customers (Slaski and Thurber 2009:6).

It is a bit disconcerting that these stoves are now being marketed for selling points other than the humanitarian principles of improved health and climate change mitigation. Envirofit takes the marketing to another level. In these target communities, devoid of televisions and radios, the company has begun holding live demonstrations of the stoves. In order to capture the community members' attention, though, they have developed a few tactics: providing entertainment with games, song, and drama (Rehman 2009). Entertainment levels and social status are suddenly prioritized above the traditional cooking methods, which previously seemed so indispensable, that are still valued above the health of the cooks. The stoves also suddenly resemble commercial merchandise much more closely, risking some loss of their character as charitable contributions to their consumers.

The problem with marketing and capitalistic methods, Agrawal and Gibson explain, is that they deconstruct community.

For Marx and Engels, Spencer and Comte, and even for Weber and Durkheim, society moved along an evolutionary path. Status, tradition, charisma, and religion would increasingly give way to equality, modernity, rationality, and a scientific temper. This theorization of social change automatically pits community against the market, since marketization and urbanization erode community (2001:3).

Modernization theorists, they add, agree with this concept of a linear evolutionary path in which culture and tradition are primitive ideals that are replaced through development by "equality, modernity, rationality, and a scientific temper." These theorists view the culture and tradition, which forms such a strong identity for citizens of developing countries, as the "idiocy of rural life" (Agrawal and Gibson 2001:3).

The entire concept of community, in fact, embodies this "idiocy of rural life." In their opinion, the loss of tradition through development is not only acceptable, but a *favorable* consequence. And development is clearly a priority. This is evident, they say, in categorization of the world under the words "underdeveloped," "developing," and "developed." These words are descriptive of the nations' actual circumstances, but by creating such a clear hierarchy, the words also reflect the desirability of development (Agrawal and Gibson 2001:3).

To fulfill what many residents of developed countries and sustainable stove activists see as our responsibility to help the developing countries reach the status of "developed," then, we must help them see that their culture and their traditions are holding them back, and convince them to purchase and use these stoves that will bring them one step closer to "developed." We must teach them to cook in new ways and, according to Slaski and Thurber, encourage them to change their entire lifestyles to adapt to this new piece of technology, the basic stove:

> Cooking touches on an entire lifestyle, which can include gathering wood (an activity with a strong social component) as well as cooking (an activity heavily influenced by tradition). Changes in lifestyle may bring significant benefits—the ability to replace wood gathering with productive economic activities, for example—but they are not undertaken lightly. In addition, products like improved cookstoves that are more complicated than traditional technologies may require training and ongoing correct use to reap their benefits (Slaski and Thurber 2009:7-9).

11. Accidental Imperialism

"What does loss mean to whole cultures, whole peoples of the global South who have seen their societies penetrated, worked over, restructured, modernized and made more 'civilized'?" asks development scholar David Slater (2006:1372-1373). This connection between the civilizing of an entire people and the society's penetration raises concerns of imperialistic tendencies, and it seems to be exactly what stove programs that the Western world initiates are doing in developing countries. The willingness of engineers to sacrifice tradition in favor of modernity is closely aligned with Slater's definition of imperialism. He points out a key characteristic of imperialistic tendencies as the failure to recognize another community's culture and its inherent differences:

> It is important to emphasize that the imperial relation carries within it a lack of respect and recognition for the colonized or, expressed more broadly, imperialized society. Hence, processes of penetration and imposition are viewed as being beneficial to the societies that are being brought into the orbit of imperial power. The posited superiorities of Western 'progress', 'modernization', 'democracy', 'development' and 'civilization', and so on are deployed to legitimize projects of enduring invasiveness that are characterized by a lack of recognition for the autonomy, dignity, sovereignty and cultural value of the imperialized society. Overall, there is a mission to Westernize the non-Western world (2006:1372).

Slater also calls imperialism a "violation of the sovereignty of a Third World society" which "negates the autonomous right of peripheral societies to decide for themselves their own trajectories of political and cultural being" (Slater 2006:1371). By searching for any way to convince customers in developing countries to purchase new stoves (and consequently make significant lifestyle changes), developing nations are doing just this. They justify their means—manipulative marketing strategies—by claiming that the end result will be a more developed country with a better standard of living. The developed world thinks our stoves, our cooking practices, our household division of labor, and our concepts of women's rights are correct and desired by all.

Stove programs also need re-evaluating in their ability to create a risky case of short-term stability. It may be ambitious to compare a stove program to a puppet regime, but both can seem beneficial in the short term but can have detrimental effects in the long run: "The semblance of short-term stability achieved by the installation of a puppet regime often evolves into long-term instability, creating the need for further intervention, as demonstrated by the repeated U.S. intrusions in several Latin American countries," Slater writes (2006:1371). In the style of a puppet regime, a stove program simply provides a quick fix by sending stoves from the developed world to the developed world. By consciously excluding local stovemakers from the process, we are accidentally preventing these communities from developing their own technology. The stoves they buy now will not last forever, and if we stop

sending them subsidized stoves, they will never learn to make their own stoves or have control over the technological evolution of these stoves. This creates a dependency that is characteristic of imperial relations.

Finally, the developed world is exploiting the developing world in this push for the transition to sustainable stoves. This may seem counterintuitive, as we are providing the communities with goods rather than taking them away. In fact, Slater describes this exploitation as "appropriating resources and raw materials" (206:1371), but climate change forces us to redefine the goods that fuel a nation.

With global climate change conferences and cap-and-trade systems controlling the amount of damage any one country can do to the planet, carbon credits have become a new currency. A quantity of carbon not emitted into the atmosphere by one party can be sold to another like a commodity. While black carbon is not officially regulated, efforts to mitigate climate change abroad may satisfy the guilt of developed nations enough that they may continue spewing carbon dioxide into the atmosphere at the same alarming rates. This method of removing guilt is like a figurative system of carbon trading: by removing dangerous emissions from the developing nations through our kind, charitable acts, the developing world earns the credit to continue emitting greenhouse gases from our own side of the world.

This exploitation is especially striking when remembering the huge cultural sacrifice stove programs demand of the developing world. Residents of developed countries have been incredibly resistant to give up driving or using excessive amounts of electricity in order to combat climate change, so the expectation that these communities give up the cooking methods that are so important to them is quite bold. If we will not change our culture, it is unfair to ask them to change theirs.

By doing so, we are immorally shifting the burden of climate change. That burden is ours. Black carbon may pose a serious threat to the atmosphere, but it is only the second most significant warming pollutant after carbon dioxide. These rural communities contribute very little to the carbon dioxide levels in the atmosphere. The United States alone contributes 21 percent of the global carbon dioxide emissions.

"Reductions in black carbon emissions could buy us significant time to reduce CO2 emissions," stated Tom Davis, representative from Virginia, at a House of Representatives hearing before the Committee on Oversight and Government Reform. "That would be a welcome respite to allow the world to develop consensus solutions that don't stall growth or give some nations competitive advantages over others" (H.R. Rep 2007:7). Davis demonstrates this desire to reduce black carbon abroad in order to continue our carbon-intensive behavior at home with minimal interruption. The fear of stalling growth shows this attitude of rich nations that growth is more important than culture. His desire to not give any country a competitive advantage is an amusing one, as he then proceeded to explain that "the developing world is the major source of black carbon emissions," and therefore the United States must be sure to include developing nations in climate talks, as "failure to do so would forfeit a prime opportunity to bring about meaningful changes in behavior that both include quality of life and reduce the immediate impact of climate change on the planet" (H.R. Rep 2007:7). His insincerity is evident, as nobody is excited for the "prime opportunity to bring about meaningful changes in behavior"

to combat climate change; it is seen as a burden by all, though some communities are more willing to make such changes than others.

As an example, after deciding that the developing nations deserve the opportunity to change their lifestyles in an effort to slow climate change, Davis describes the necessity of energy in the United states: "As we look for ways to mitigate harmful greenhouse gases, we must do so while acknowledging that energy is essential to the economic activity that sustains and improves our quality of life" (H.R. Rep 2007:7).

Eileen Claussen, President of the Pew Center on Global Climate Change, feels differently about this burden. "Equity demands that developed countries—the source of most past and current emissions of greenhouse gases—act first to reduce emissions" (Chandler et al. 2002:1). Unfortunately, the majority of the developed world does not share this view. It is actually much more likely that clean stove advocates would agree with Claussen's argument, as they share a concern for the environment and human rights, yet they are responsible, at least in part, for this exploitation of developing countries through their approach to stove dissemination. They are not consciously attempting to exploit the communities with which they are working, though. The imperialistic tendencies of the stove programs are accidental.

12. A Message to Stove Programs

To avoid this accidental imperialism, stove programs should be careful not to manipulate the marketing of their products. If the stoves are not selling, it is not because customers should be convinced in a different way of the stove's value. Rather, it is because the stove is not well adapted to the customer's needs. If the cooks that are exposed to the health threats accompanying traditional stoves are unwilling to switch to cleaner stoves, it is probably because there is something intrinsically unappealing about those stoves.

"My number one piece of advice of doing successful work in the stove business is first listen to your clients. You cannot change your clients out there, it's much easier to change your technology, so if you're not selling your stoves you've got the wrong product," advises Christa Roth of the GTZ Program for Biomass Energy Conservation in Southern Africa (Toward Clean Cooking).

Stovemakers may be unable to design stoves that appeal to the cooks because of their relentless quest for optimal efficiency. Perhaps a small degree of efficiency must be sacrificed in order to create the greatest magnitude of change, by shifting the emphasis from near-perfect efficiency to performance that can match that of traditional stoves when cooking traditional meals (Barnes et al. 1994:13).

This performance standard has been ignored in most stove tests. In fact, the efficiency of the stove when cooking the traditional foods of one's community may be completely different from the efficiency measured in the laboratory. The most common test for measuring stoves' efficiencies is the Water Boiling Test (WBT). The models that boil water the quickest with the minimal amount of fuel and ambient heat loss are chosen to be mass produced and distributed to the rural communities. This test is preferred as it is an easy way to standardize between stoves when choosing the best model, but standardization is exactly what stovemakers should

avoid. Stoves should be custom-designed for each community, not used to perform a function that the stove may never actually perform in its lifetime.

An example of a stove which may be preferred by many cooks enough that they may actually purchase it and use it, so that it may make a more significant impact on climate change and human health than those stoves which are never adopted, is the Ecostove. Jetter and Kariher describe this stove, just one of many they tested:

> This stove has a steel griddle top that is useful for making tortillas and frying foods, but it is not well suited for boiling water or cooking with a pot. . .The ecostove could be more fairly compared to other griddle stoves used for tortilla making and frying foods using a test protocol different from the WBT, such as the Controlled Cooking Test (CCT) (2009:7).

For cooks who want to make tortillas (some variety of which is popular in communities in many developing countries throughout the world), this Ecostove may function similarly enough to their traditional stoves that they would be willing to make the switch. They will never make that switch, though, if the stove is rejected because its efficiency is slightly lower than that of another stove. In fact, Kariher and Jetter explain that the stove performs poorly in the WBT because the heat transfer from the griddle top to the pot is inefficient.

"Some stoves are designed in the laboratory and then manufactured without prior field testing to verify that they actually perform the necessary tasks for persons who prepare meals," Douglas F. Barnes, Keith Openshaw, Kirk R. Smith, and Robert van der Plas explain (1994:15). The use of the phrase "necessary tasks" is noteworthy—these are not tasks that cooks should hope their stoves might be able to do—they are the tasks which these cooks demand from a stove, and it is the responsibility of the stovemakers to design stoves which can perform these tasks.

Nevertheless, the marketing of stoves does have its advantages. The market competition leads to the development of better stoves, and the cost may actually increase their perceived value to consumers. The subsidies are important, too, as they make the stoves affordable to those who need them, and reflect their role in contributing to the public good (Smith 1989:521).

"Clearly a balance must be sought among the perceived and real social benefits, which depend both on the stove and on the cooking customs of the people who use it. In some areas, there just may not be a balance between these factors that will permit the production of affordable stoves," write Douglas F. Barnes, Keith Openshaw, Kirk R. Smith, and Robert van der Plas (1994:10). The authors seem too quick to give up, though. The quest for the perfect stove is of serious concern, and this balance should be taken as a challenge, not a point of surrender.

The failure of a stove program is just that—the failure of the program, not of the stove or of the community. Stove programs must do background research into the community's food preferences, cooking methods, and fuel sources, and run trials in the community, before attempting to simply "disseminate" a large quantity of stoves. Barnes et al. later explain, "differences among programs have proved even more important than differences in local conditions in explaining the relative successes of stove disseminations" (1994:16).

Stove programs have the opportunity to save lives from premature death that indoor air pollution causes, to help protect the world from climate change, and to create social change. They should always be conscious of all of these opportunities. While it is easy to put a chimney on a stove and prevent indoor air pollution, the soot will still be released into the atmosphere and warm the Earth. And while some women may find fulfillment cooking traditional foods on traditional stoves, others may be afraid to express their desire to change their traditional cooking methods or their roles as housewives.

Kanchan Sinha, a women's rights activist in India, proclaims that changes in culture can be necessary. "Changes in culture do occur, even if over long periods of time, and there are famous and heroic examples in history when such changes have been brought about through conscious and planned interventions," she writes (2003:25). She explains that the development sector has the power and the responsibility to create this change, through working with local social movements. "This is of crucial importance if conditions are to be created whereby the right to equal citizenship is realized by women in societies like India" (2003:25).

This is not to say that stove programs should always strive to fix all three of these challenges. Just as stoves must be custom-designed for the communities in which they will be used, stove programs should also be custom-designed to fit the needs of each community. Always, though, we must remember that providing sustainable stoves to developing countries is no substitute for changing our own behavior at home to live more sustainably.

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