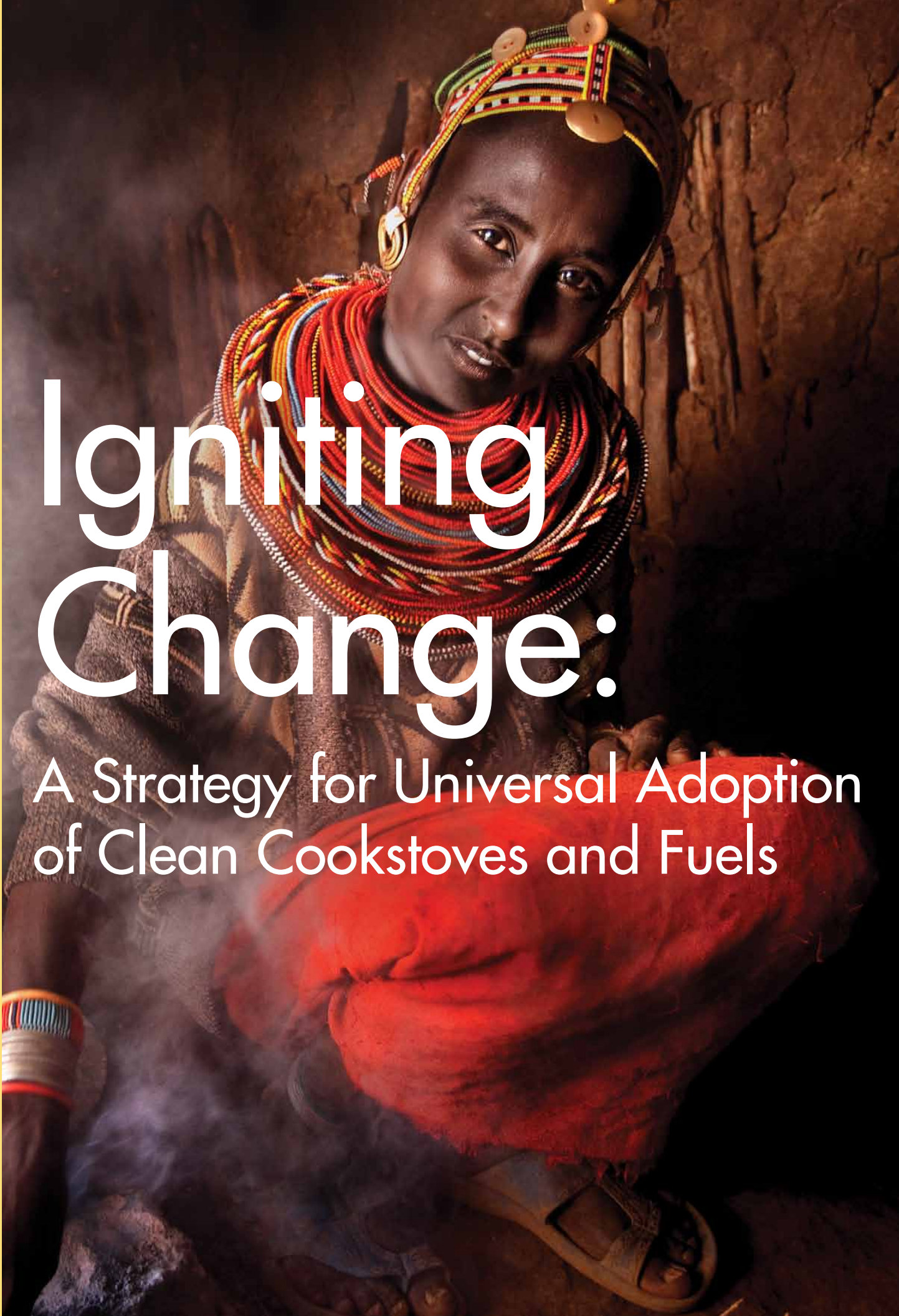

# Igniting Change:

## A Strategy for Universal Adoption of Clean Cookstoves and Fuels


GLOBAL ALLIANCE FOR
CLEAN COOKSTOVES

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# Executive Summary

## A Dangerous and Unhealthy Reality

In an era of cell phones, satellites, and the Internet, it can often be hard to believe that almost half the world's population still cooks food, boils water, and warms their homes by burning wood, dung, other biomass, and coal in open fires or rudimentary cookstoves. Yet this is the reality facing the nearly three billion people who meet their daily household energy needs in this dangerous and outdated way. **Open fires and rudimentary cookstoves are inefficient, unhealthy, and unsafe, and inhaling the acrid smoke and fine particulates they emit leads to nearly two million deaths a year worldwide, primarily among women and children.** In addition to these premature deaths, millions more are sickened from acute and chronic lung and heart diseases while hundreds of thousands more suffer burns or disfigurement from open flames and dangerous cookstoves.[1]

Women and girls are at the center of this issue. They are typically responsible for securing fuel to cook the family meal, and when they must leave the safety of their communities to search for firewood and other traditional biomass fuels, they are at increased risk of gender-based violence, particularly in conflict areas. Time spent collecting fuel is wasted human capital time that could be better spent on income generation, education, or other activities. Where fuel must be purchased, primarily in urban areas, the cost places a high burden on families struggling to meet their basic needs. Inefficient cookstoves also place pressure on ecosystems and forests and contribute to climate change through emissions of greenhouse gases and black carbon.

Adding to the challenge is the relatively low level of global awareness about this wide-reaching health and environmental threat, even among the policy, donor, and development communities. Well-known killers such as HIV/AIDS, malaria, and tuberculosis justifiably capture headlines and donor dollars, but the devastating health impacts of toxic cookstove smoke merit equal attention and resources. In fact, data from the World Health Organization indicate that more men, women, and children die each day from diseases that could be entirely prevented by using advanced or "clean" cookstoves and fuels than die from malaria or tuberculosis.[2] Not only is adoption of clean[3] cooking solutions a health, economic, gender, and environmental imperative, it is essential for achieving the United Nations Millennium Development Goals (MDGs) for child mortality, maternal health, poverty eradication, gender equality, and environmental sustainability. In fact, by the United Nations Development Programme's (UNDP) 2009 estimates, 1.9 billion people will need access to modern fuels by 2015 to meet the MDG for poverty reduction.[4]

**While some may say that the poor cannot afford to adopt clean cooking solutions**, the opposite is in fact the case. **The poor pay heavily for their lack of access to clean cookstoves and fuels**, and the high cost of poverty in many developing countries means that clean cookstoves can quickly pay for themselves in health, economic, and environmental benefits.

## A Global Issue at a Tipping Point

Fortunately, the prospects for success are stronger than ever before. Advanced biomass cookstoves now exist that, if deployed in large numbers, could save millions of lives over the coming decades, while improving countless others, empowering women, creating opportunities for the poor, and reducing environmental impacts. For some, cleaner burning fuels like liquefied petroleum gas (LPG), biogas, ethanol, and solar power offer healthier and more efficient options when available and affordable.

There are several reasons for this steady progress in the sector over the past decade. **Improved cookstove designs that better reflect consumers' needs, more precise health and climate data detailing the harmful impacts of traditional cookstove use, innovative business models and financing mechanisms, comprehensive national programs, robust testing protocols, and inexpensive but effective monitoring devices** are just a few of the promising breakthroughs that have propelled the sector to a 'tipping point'. In short, tremendous progress in the availability, affordability, accessibility, and adoption of clean cookstoves and fuels offers the prospect for *life-saving* and *life-changing* benefits for the world's poorest citizens. In addition, these breakthroughs have sparked renewed interest among the development, public policy, and donor communities because of the significant health, economic, gender, and environmental benefits that can be realized by the use of clean cooking solutions.

## Toward Universal Adoption of Clean Cookstoves

These advances represent important progress, yet much remains to be accomplished by the international community to fully realize the vast benefits from clean cooking solutions. Foremost among these priority actions is the development of a thriving global market for clean cookstoves and fuels, with the ability to sell tens of millions of clean cookstoves a year. Without a market, it will be almost impossible to adequately and sustainably address the vast cooking needs of the more than 600 million of the world's households still using solid fuels in inefficient cookstoves and open fires.[5]

Without a stronger evidence base, it will be very difficult to drive sufficient investment to solve this issue at a global scale; without rigorous standards, there will be little accountability; without greater ownership at the local and national level, the sector will not be able to scale up adoption of cleaner cookstoves and fuels; and without effective measurement and verification of results, there will be no way to ensure vital health and environmental benefits on the ground. However, no single stakeholder in the cookstove sector has the capability to transform the field on their own. **A concerted and coordinated international approach among all the key stakeholders to create a robust market for clean cookstoves and fuels has the greatest potential for success.**

Toward this objective, U.S. Secretary of State Hillary Rodham Clinton and a range of leading international public and private actors launched a public-private partnership in September 2010 with the ambitious mission to transform the global market for clean cookstoves and fuels. The Global Alliance for Clean Cookstoves (Alliance), led by the United Nations Foundation, is an innovative initiative to save lives, improve livelihoods, empower women, and combat climate change, with a goal of spurring the adoption of clean cookstoves and fuels in 100 million households by 2020. To ensure that the new initiative harnessed the tremendous expertise of the sector as it developed its programmatic platform, the Alliance convened experts from a cross-section of cookstove-related disciplines in an unprecedented six-month effort to capture their collective knowledge and experience.

The resulting recommendations of nine Working Groups and two Cross-Cutting Committees fell roughly into three strategic pillars of engagement **— enhancing demand, strengthening supply, and fostering an enabling environment**. These three pillars form the framework of the following Sector Strategy, a report designed to foster a cohesive vision for the clean cookstoves sector among current stakeholders and new partners and to map a strategy to achieve universal adoption of clean cookstoves. This blueprint for donors, the private sector, implementers, the United Nations, and policy-makers outlines a combination of policy levers, programming, research activities, and funding to catalyze the clean cookstoves and fuels sector and will serve as the foundation of the Alliance's Business Plan.

# Reaching Universal Adoption of Clean Cookstoves and Fuels

# Introduction

Smoke from traditional cookstoves and open fires has been a silent killer in developing countries for far too long. While there are important signs that the sector is at a tipping point, a concerted and coordinated strategy to develop a thriving market for clean cookstoves and fuels is needed to maximize these opportunities and transform the sector.

The Global Alliance for Clean Cookstoves has been at the forefront of recent efforts to catalyze a revolution in the sector and mobilize high-level national and donor commitments toward the goal of universal adoption of clean cookstoves and fuels. Its ambitious **ten-year goal to foster the adoption of clean cookstoves and fuels in 100 million households by 2020** has mobilized support from a wide range of private, public, and non-profit stakeholders. The Alliance's unprecedented consultative process with the global cookstoves sector has led to the development of the Sector Strategy for achieving its goal. By providing a roadmap for concerted action and measureable results that can quite literally change the lives of nearly three billion people around the world, the Sector Strategy will foster a unified vision for the sector while building a common sense of engagement by all stakeholders on the most critical actions required for universal adoption of clean cookstoves and fuels.

*Igniting Change* will provide a brief overview of the risks associated with traditional cooking practices, outline the opportunities presented by the use of clean cookstoves and fuels, and chart the steps that will be needed for the global community to radically transform the sector.

# Background and Need

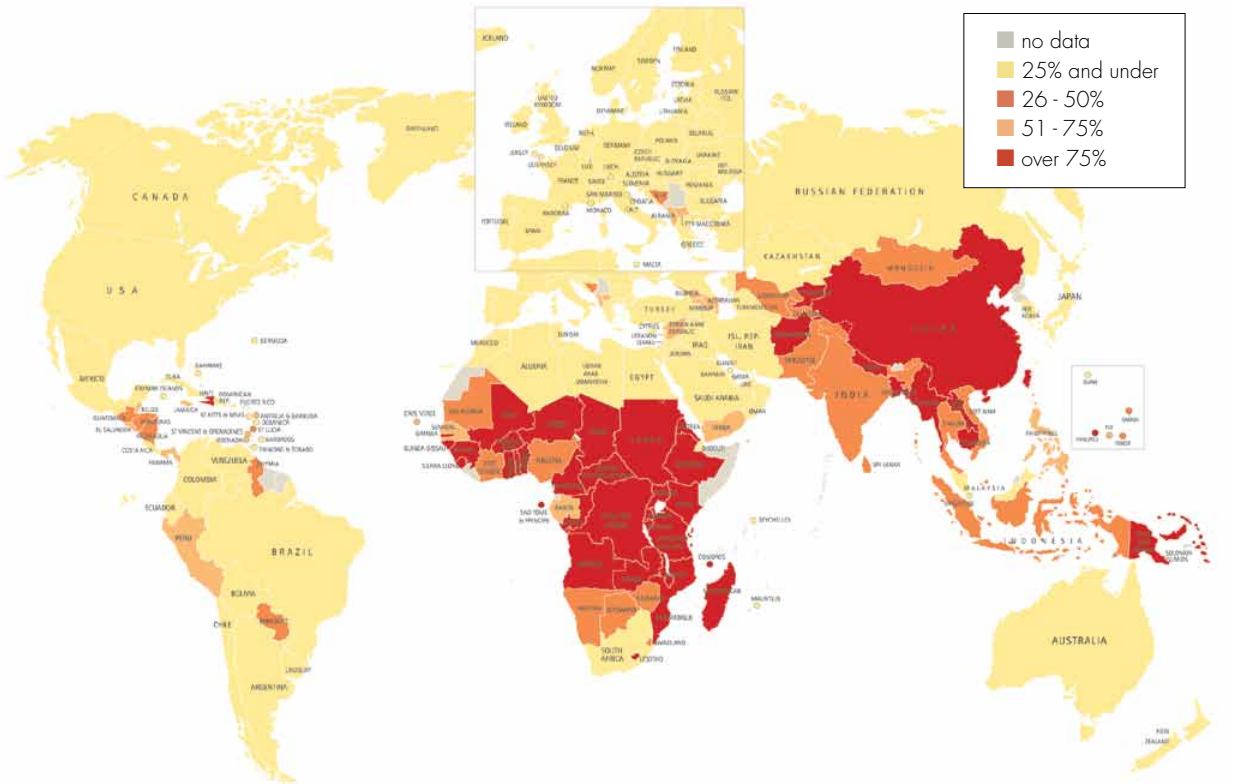
While use of modern cookstoves is scarcely even considered a luxury in most of the developed world, nearly three billion people across the developing world still cook their food each day the way it has been done for thousands of years – over an open flame or on a crude cookstove using solid fuels like wood, coal, crop residues, and animal dung. In sub-Saharan Africa and Asia, the lack of access to clean cookstoves and fuels for cooking is especially acute, with a third of the urban population and the vast majority of the rural poor using solid fuels to cook their daily meals over open fires or inefficient cookstoves[6] made from clay, metal, or bricks. In many countries, the rate of solid fuel[7] usage, especially in rural areas, is 80% to 90%[8], and the number of people who use these fuels for cooking is expected to rise as population growth outpaces economic development. The International Energy Agency estimates that by 2030, 100 million more people will use traditional biomass fuels than do so today.[9] Even where there is access to electricity or LPG, primarily in urban areas, the use of solid fuels for cooking persists due to cost and cultural factors.

## Health Impacts

Daily exposure to toxic smoke from traditional cooking practices is one of the world's biggest – but least well-known – killers. Penetrating deep into the lungs of its victims, this smoke causes a range of deadly chronic and acute health effects such as child pneumonia, lung cancer, chronic obstructive pulmonary disease, and heart disease, as well as low birth-weights in children born to mothers whose pregnancies are spent breathing toxic fumes from open fires.[10] The World Health Organization (WHO) estimates that exposure to smoke from the simple act of cooking constitutes the fifth worst risk factor for disease in developing countries, and causes almost two million premature deaths per year – exceeding deaths attributable to malaria or tuberculosis.[11] In addition, tens of millions more fall sick with illnesses that could readily be prevented with improved adoption of clean and efficient cookstoves and fuels.[12]

Exposure to these toxic fumes is greatest among women and young children, who spend the most time near open fires or traditional cookstoves tending to the family meal, or schoolchildren who may study by the weak light of an open flame. Typical wood-fired cookstoves and open fires emit small particles, carbon monoxide, and other noxious fumes that are up to

**Percentage of Households Using Solid Fuels for Cooking**




Fuel for Life: Household Energy and Health. World Health Organization, 2006.

100 times higher than the recommended limits set by WHO, and in some settings, considerably higher.[13] The illnesses caused by smoke from toxic cooking methods lead to serious problems for the health and livelihoods of these families, hampering their ability to escape grinding poverty. Women in developing countries are also at risk of head and spinal injuries, pregnancy complications, and maternal mortality from the strenuous task of carrying heavy loads of firewood or other fuels, and may also suffer from animal attacks, dehydration, and skin disorders.[14] Frequent exposure to cookstove smoke can also cause disabling health impacts like cataracts, which affect women more than men, and is the leading cause of blindness in developing countries.

**Health effects are especially deadly for children under the age of five in developing countries: nearly half of all pneumonia deaths among this age group occur as a result of smoke exposure.**[15] A randomized-control study in Guatemala led by the University of California, Berkeley, found that halving exposure to household air pollution with a chimney stove brought about a reduction in severe pneumonia, and that larger reductions in exposure had more pronounced effects.[16] A systematic review of all available studies on the link between solid fuel use and child pneumonia has found an almost doubling of risk for those exposed. Studies also show that without improvements to the combustion performance of a cookstove, simply adding a chimney on a cookstove can help reduce direct exposure to smoke, but provides limited health benefits and no environmental benefits.[17]

*The World Health Organization estimates that exposure to smoke from cooking constitutes the fifth worst risk factor for disease in developing countries, and causes almost two million premature deaths per year.*

Burns from open fires and unsafe cookstoves are another insidious risk faced by poor households dependent on kerosene, open fires, and unstable metal or clay cookstoves, contributing to a substantial percentage of the estimated 300,000 burn deaths that occur annually.[18] In a crowded household where the family hearth may be located on the ground within reach of small children, flames can quickly catch the hem of a garment or sleeping pallet, leading to disfiguring injuries and excruciating burns, infection, and even death. Because burns require prompt and sophisticated medical intervention, often lacking in remote areas of the world, such injuries often result in debilitating scarring and loss of movement in their victims.

## Gender and Livelihood Impacts

Reliance on inefficient cookstoves and solid fuels leads to enormous burdens on families' livelihoods, especially for women and girls. For the most part, cooking remains a woman's responsibility in developing countries, and women bear the burden of not only cooking for their families, but also of gathering the fuel necessary to cook the family's meal. Yet, cooking remains the least developed energy sector and, in many countries, fuel scarcity and natural resource depletion affect large numbers of women. What's more, the difficult work to collect fuel is rarely counted as productive or compensated labor.[19]

Women and girls can spend 20 or more hours per week on long, exhausting walks in dangerous and isolated areas in order to collect fuel for their families' cooking needs.[20] When they leave the relative safety of their communities to do so, they are at increased risk of gender-based violence, particularly in war-torn areas.[21] In places like the Democratic Republic of Congo and Somalia, where armed conflicts make exposure to rape and other physical assaults a daily threat, women and girls often pay a high price for the lack of safe and efficient cookstoves and fuels. The non-profit Physicians for Human Rights reports that the majority of confirmed rapes in Farchana, a refugee camp in Eastern Chad, occurred outside camps while women were collecting firewood to use as fuel.[22] Given the stigma often associated with rape, it is likely that the real number of women victimized by gender-based violence linked to the collection of fuel for cooking is even higher than reported.

> *"My awakening moment was being in Darfur, meeting with the women, and realizing they're getting raped trying to cook the food we bring them."*
>
> — JOSETTE SHEERAN, UN WORLD FOOD PROGRAMME

Not only does fuel collection increase a woman's vulnerability to personal attack, but **time spent collecting fuel often leaves less time to work in the fields, start a small business, or engage in other pursuits that can bring much needed money into the household**. If women are unable to spend time generating income or increasing their educational opportunities because of the time spent collecting fuel, they may find themselves even more deeply embedded in a cycle of poverty. The lack of income leads to dependence on collecting fuel, but time collecting fuel greatly diminishes their opportunity to earn more income. In addition, young girls are often called on to assist their mothers in physically demanding fuel collection and cooking activities, preventing them from regular school attendance and the benefits of a nutritious midday meal that some schools provide.[23] Ultimately, women and girls pay the highest toll for the world's reliance on inefficient and dirty cooking practices.

The use of solid fuels also inflicts high economic costs on families who can pay as much as one-third of their scarce income simply to purchase sufficient fuel to cook the daily meal. The financial toll is especially draining on the very poor, whose incomes of as little as a dollar a day must be stretched to cover basic necessities such as food, fuel, school fees, and medical care.[24] Money spent on charcoal for cookstoves may mean the loss of scarce household income to buy medicine for a sick baby, food for a hungry child, or capital to start a small business. In cases where fuel is purchased rather than collected, the initial higher cost of a more efficient cookstove can often be recovered through fuel savings within a few months, and savings after that point allow for expenditures on a range of livelihood-enhancing activities such as starting a business, purchasing medicines, and paying school fees. In the case of one Indian-based women's cooperative, women in a clean cookstoves program were able to use the savings from the reduction in fuel use to provide two meals a day for their families instead of one, increasing the caloric and nutritional intake levels of their children.[25] In addition, studies show that women reinvest 90% of their income in their families and communities versus 30% to 40% for men[26], which means fuel-saving benefits can ripple through the entire community.

Finally, as evidenced by the massive market for charcoal across much of the developing world, the manufacture, distribution, sales, and service of clean cookstoves and fuels could be a major potential source of employment in regions where jobs are scarce.

## Environmental Impacts

Reliance on polluting, inefficient cookstoves and fuels leads to a wide variety of environmental problems. In many countries, much of the native forest cover has been stripped to support charcoal production[27], and in others reliance on wood fuel for cooking can lead to increased pressures on local forests and natural resources.[28] In most of the urban or peri-urban areas in developing countries, charcoal is usually the fuel of choice.[29] The unsustainable collection of wood for charcoal production can contribute to mud-slides, loss of watershed, and desertification, which places further pressures on regional food security and agricultural productivity.[30] In nations like Togo, the Democratic Republic of Congo, Cambodia, and Guatemala, the increasing loss of forest canopy for charcoal production also brings devastation to local biodiversity, while the construction of logging roads damages the environment and exacerbates the dwindling habitat of endangered species.[31]

Transported through elaborate networks of buyers and sellers, **charcoal production is a $10 billion industry in sub-Saharan Africa alone and causes significant environmental destruction to forests felled to produce the precious fuel.**[32] Alarmingly, the cycle of destruction grows direr every year as population growth and increasingly protracted refugee crises place growing pressure on natural resources, and as women venture further and further from home in a desperate search for fuel. In addition, competition between local communities and refugee populations for local fuel resources is a frequent source of strife in many

countries.[33] As the world's population grows, and conflicts globally lead to increased pressures on natural resources, fuel scarcities are expected to intensify, affecting rural women most of all.[34]

Emissions from traditional cookstoves also contribute significantly to outdoor air pollution and exacerbate already deadly air pollution in large towns and cities around the world, affecting those with and without access to clean household energy.[35] In India, where outdoor air quality is often very poor, researchers from the University of California, Berkeley, estimate that almost half of ambient health-damaging particulate air pollution is caused by the burning of household fuels for cooking.[36] China also experiences significant ambient air impacts from the use of coal-fired and biomass-fired stoves for residential cooking and heating.[37]

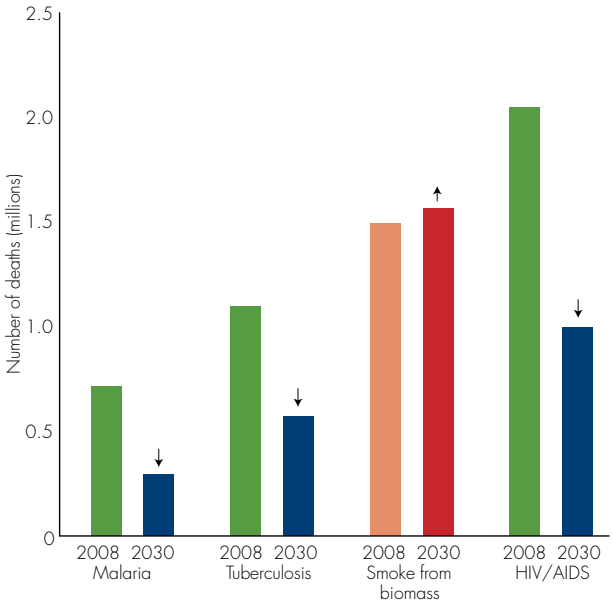
In addition, emissions from combustion of unsustainably harvested wood fuel and biomass in inefficient, traditional cookstoves are a significant contributor to global climate change. The burning of solid fuels produces significant quantities of emissions that impact the climate in the short-term, including gases such as methane, carbon monoxide, and nitrous oxides, as well as particles such as black carbon.[38] Residential sources, mainly from cookstoves, represent more than 25 percent of the global inventory of black carbon emissions.[39,40]

Because these gases and particles have short life spans — from a few weeks for black carbon, to a decade for methane — reductions in their emissions could leverage a more rapid climate mitigation response than would occur from reductions in carbon dioxide alone.[41] In fact, a recent report by the United Nations Environment Programme underscored the importance of introducing clean burning biomass cookstoves, as well as substituting traditional biomass burning cookstoves with clean cookstoves that use modern fuels, to address climate change and improve air quality.[42]

## Awareness and Financing Gap

Data from the World Health Organization indicate that more people die each day from diseases that, in many cases, could be entirely prevented by using advanced or "clean" cookstoves and fuels, than from HIV/AIDS, malaria, or tuberculosis.[43] In fact, mortality figures associated with the use of crude cookstoves and open fires are more than double the number of deaths from malaria, more than three times those from tuberculosis, and roughly equal to the deaths from HIV/AIDS. With global progress in disease control expected to reduce death rates for malaria, HIV/AIDS, and tuberculosis, WHO predicts that the number of deaths for diseases associated with cookstove smoke will surpass those from the aforementioned diseases by 2030.[44] Despite this enormous burden, the issue of exposure to cookstove smoke and its impacts, as well as clean cookstoves and fuels as a solution, have received relatively little visibility from the global health or donor communities to date. Better known health issues such as the lack of clean water, poor nutrition, and communicable diseases tend to receive greater attention in the news and have traditionally been the focus of donors' efforts.

**Premature Annual Deaths from Cookstove Smoke and Other Selected Diseases***




Source: World Energy Outlook 2011, International Energy Agency

However, **investments in the clean cookstoves sector will likely need to reach $4.5 billion annually**, according to recent 2011 World Energy Outlook figures by the International Energy Agency, if the world is going to meet the tremendous global need.[45] While daunting, these figures are smaller on a per capita basis than those from comparable health risks such as HIV/AIDS, malaria, and efforts to promote clean water. HIV/AIDS experts estimate that investments of roughly $17 billion a year[46] will be needed to address this public health priority, and figures in the 2008 Global Malaria Action Plan developed by the Roll Back Malaria Partnership estimates investments of approximately $5 billion a year[47] to address the disease. Given the relative enormity of the health risks and deaths caused by cookstove smoke, large investments are clearly both needed and in-line with the budget realities to confront the problem.

Funding needs must be urgently addressed, as substituting the current inefficient and polluting use of solid fuels for cooking can have multiple cost-effective health, environmental, economic, and women's empowerment co-benefits over time. For example, fewer trips to local clinics for smoke-induced pneumonia and lung ailments can mean less strain on overtaxed health services and systems, while reducing the need to collect scarce firewood preserves precious watersheds, animal habitats, and dwindling forest cover.

Time saved in fuel collection through the use of efficient cookstoves and fuels can mean the ability to keep a girl in school, while financial savings from more efficient cookstoves means that income previously used to buy fuel can now be used to buy chickens for eggs or to start a small business. Higher birth weights lessen risks for disease throughout adult life, independent of any future exposure to cookstove smoke.[48] In short, adoption of clean and efficient cookstoves and fuels in developing countries can help the international community meet the MDGs for maternal and child health, other chronic diseases in adults, education, and environmental sustainability, as well as foster gains in nutrition, female literacy levels, and economic independence.

Clean cookstoves and fuels can also serve as cost-effective mitigation options for addressing climate change. A 2010 U.S. Agency for International Development report on black carbon abatement measures in Asia found that clean cookstoves and fuels, when implemented effectively, achieved the highest level of black carbon reductions per unit cost. The same study found that clean cookstoves and fuels also provided the most cost-effective greenhouse gas abatement benefits of any intervention.[49]

*Does not include deaths from coal-fueled cookstoves – total 2008 deaths from inhalation of cookstove smoke were 1.96 million.

# Barriers to Widespread Adoption

The development of a thriving global clean cookstoves and fuels industry that is constantly innovating to improve design and performance, while lowering the cost of cookstoves and fuels, is the most sustainable way to bring modern cooking solutions to hundreds of millions of families in developing countries. While reducing costs for clean cookstoves, designing products that people will buy, addressing cultural preferences, and reaching greater scale in the manufacturing and distribution of clean cookstoves are challenges, success will literally mean life-saving and life-changing improvements in the lives of billions of people.

The good news is that progress is underway to unlock the most effective means for addressing current demand and supply constraints and catalyzing a market for clean cookstoves and fuels. Yet several critical market barriers must be overcome. In addition to the obvious barriers of ensuring a strong demand for and supply of clean cookstoves and fuels, the existence of a strong enabling environment for clean cookstoves is equally critical, as is a continued commitment to monitoring and evaluating the improvements to health, livelihoods, women's empowerment, and climate from their use. Additional barriers to widespread adoption of clean cookstoves and fuels include:

Lack of objective certification for validating the efficiency and emission reduction claims of manufacturers has led to uncertainty in the current clean cookstove market. The **absence of internationally-recognized clean cookstove standards and limited in-country testing capabilities** has hampered efforts to scale up adoption rates and led to health and efficiency claims by some manufacturers that often overstate their products' benefits to the consumer. While many countries either currently have, or plan to build, local cookstove testing centers, such facilities can require expensive investments in laboratory equipment, security measures, and staff training that can be hard to make by financially-strapped developing country governments.

Lack of robust evidence on the impacts of interventions has also contributed to a shortage of commitments by governments and donors to secure the necessary investment, technology development, and support for implementation. In particular, there has been **a dearth of compelling evidence regarding the health benefits of clean cookstove and fuel interventions**, notably for large-scale programs. Although this is now starting to emerge and requires further strengthening, the historic lack of evidence has resulted in the health sector failing to take a lead in promoting the issue in strong public health policy, the media, and training programs.

The **lack of awareness among households in developing countries regarding the benefits of clean cookstoves and fuels** is another key barrier. This affects the purchase rates of cleaner but often more costly products, and raises the bar for new entrants wishing to sell clean cookstoves in sufficient quantities in order to be profitable. Having fewer manufacturers in the market because of low demand may impact the ability to meet varied consumer needs, and can result in higher prices which could put the more expensive, cleaner cookstoves farther out of reach for customers. In addition, both the purchaser and the end-user need to be aware of and value the benefits of clean cookstoves and fuels to drive the market. In those frequent cases where men are responsible for purchasing decisions of products like cookstoves, awareness of clean cookstoves and fuels must go beyond the female end-user.

Further adding to the complexity of addressing the cooking needs of the end-user is that families do not always make the transition to clean cookstoves and fuels in discrete steps. Many families use more than one cookstove or fuel and may in fact switch between biomass and LPG, solar and biomass, and other combinations as their incomes and cooking needs allow.[50] Despite the fact that many solid fuel users will eventually transition to cleaner fuels like LPG or electricity as their incomes rise[51], projected population growth in developing countries is expected to outstrip the current pace of progress in moving people to cleaner fuels.[52] In addition, traditional biomass fuels will almost certainly continue to be used by the world's poorest citizens if present usage patterns persist, and there is evidence that rising prices for cleaner fuels in some countries are forcing some families to revert to the use of solid fuels.[53]

The clean cookstoves and fuels market is intrinsically complex, requiring approaches that are applicable across a range of ethnic groups, income levels, and settings (such as rural or urban environments). **Failure to meet consumers' needs** has often been cited as an impediment to adoption, especially in those cases where cookstoves were subsidized for the end user but not selected to best meet their needs.[54] Cookstove preferences are as varied as the different foods that they

are used to cook, with flat-top plancha cookstoves for cooking tortillas in places like Peru and Guatemala built for a different set of culinary needs than the small two pot cookstoves used to cook rice and curry in Nepal and India. Even within individual countries, local preferences for particular fuels and cookstove designs can complicate the development of products that can be sold to and used by large segments of the population.

**Distribution and supply chain issues** also hamper the development of a market for clean cookstoves and fuels in developing countries, and the difficulty of reaching rural residents who do not have access to retail stores in which to purchase or repair a clean cookstoves can further complicate adoption rates.[55] While there may be some humanitarian, refugee, or other particularly vulnerable populations (e.g. the extreme poor and HIV/AIDS patients) where income levels do not allow for the purchase of clean cookstoves and fuels, care to ensure that the end-user's needs are being valued and met is critical to ensuring a sustainable market for clean cooking solutions.

In addition, the lack of sufficient credit and financing for clean cookstove and fuel purchases makes it difficult for consumers to cover the **high initial cost of clean cookstoves.**[56] Most small cookstove distributors do not have the financial resources to allow their customers to buy on credit, and cookstove projects are often considered too small to qualify for bank loans or favorable lending rates.[57] Even when customers who are already purchasing fuel understand that cleaner fuels like LPG may generate fuel savings, the higher initial cost of the cookstove, on average $60, may deter customers.[58] Countries have not had the financial and technical support, nor created the enabling conditions required to attract the level of private investment needed to create a thriving market for clean cookstoves and fuels.[59]

Finally, the **lack of a cohesive vision for the sector** has led to a failure to build the enabling environment necessary to foster a robust market for clean cookstoves. There has been little international coordination to date around a common strategic approach for developing clean cookstove and fuel markets, and this has contributed to a failure to develop international standards, address key outstanding research needs, and rectify the alarming lack of awareness of the issue, as well as the long-standing existence of a piecemeal, project-based approach to the problem. Adding to this, in many countries a patchwork of cookstove manufacturers, non-governmental organizations, and other stakeholders often exists with little coordination among themselves or with the host government. This situation has resulted in missed opportunities and a failure to achieve the economies of scale that come with a more cohesive and strategic approach.


The clean cookstoves and fuels sector has evolved dramatically over the past decade
The launch of high-profile national clean cookstove and fuel programs offer the promise of scaling up markets.
Use of advanced materials for cookstove combustion chambers can deliver efficiency gains over previous generations of cookstoves.
Recent improvements in laboratory and field testing bolster the credibility of the sector.
Better data are providing new insights into the link between use of clean cookstoves and improved health and climate.
The rise of successful domestic manufacturing efforts is providing efficient cookstoves at scale.
Several multinational firms have stepped into the market with clean cookstoves and fuels designed for markets at the base of the pyramid.
Innovative financing allows consumers to overcome the high initial upfront cost of some cookstoves and fuels.
Women's cooperatives and similar networks are making strides in the effective marketing and distribution of cookstoves.
Carbon finance offers manufacturers and distributors the chance to harness carbon reductions from fuel savings to bring down the cost of cookstoves.

# A Rapidly Evolving Sector

The clean cookstoves and fuels sector has evolved dramatically over the past decade and is now poised to offer significant life-saving and life-changing benefits to the poor at a global scale.

While cookstoves are consistently evolving and improving in their efficiency and emissions, **current models exist in many developing country markets that can dramatically reduce exposure to harmful smoke**. Higher-performing advanced cookstoves, including the proliferation of clean fuel options and forced draft technologies have the potential to improve the efficiency of the combustion chamber by over 90%, but considerable financial, acceptability, and infrastructure challenges remain.[60] Recent scientific evidence indicates that significant reductions in emissions will be needed to achieve meaningful global health benefits for cookstove users and their families.[61] Use of advanced materials for cookstove combustion chambers and the addition of technology to allow for increased functionality, such as the charging of batteries for cell phones or the inclusion of a small reading light, offer the prospect of revolutionizing the way the developing world cooks and are a huge leap from previous generations of clean cookstoves. Cleaner fuels including emission-free solar and low-emission LPG and ethanol also bring the virtual elimination of emissions of harmful soot and other toxic gases, as well as measurable safety benefits.

"Game changing" developments in the market for clean cookstoves and fuels also include the **success of various innovative business models**. These models help manufacturers expand beyond local and artisanal cookstove production efforts to those that offer standardized, high-quality clean cookstoves at a price and scale that can improve their accessibility to the poor.[62] Commercial players who are more experienced in marketing and sales, as well as a transition away from distribution of subsidized products, are also helping to transform the clean cookstoves and fuels market. Even more importantly, **consumers at the base of the economic pyramid are being viewed by the private sector as viable customers** with the right to the same range of goods and services as those farther up the economic ladder. This evolution in how consumers are viewed by the sector has led to a more thoughtful, innovative, and interdisciplinary approach to promoting modern, aspirational cooking solutions than has occurred in the past.

Notable as well is the rise of successful domestic manufacturing efforts in Cambodia, China, Ethiopia, Ghana, Guatemala, India, Kenya, Peru, Uganda, and elsewhere, which are providing efficient cookstoves at scale, as well as local employment opportunities in their respective countries.[63] Firms in China and India are also manufacturing clean cookstoves for export to global markets, making high-quality, efficient cookstoves available throughout the developing world.[64] Several multinational firms have also stepped into the market with clean cookstoves and fuels designed for markets at the base of the pyramid. In addition, women's cooperatives and similar networks are making strides in the effective marketing and distribution of clean cookstoves by employing local distribution channels, as well as woman-to-woman outreach and demonstration programs.

**Innovative financing tools have also begun to accelerate progress** in the sector, and consumer financing options such as microfinancing and consignment mechanisms can provide clean cookstove customers with an opportunity to overcome the higher initial upfront cost of cleaner cookstoves and fuels. Carbon finance also offers manufacturers and distributors the chance to harness carbon reductions from fuel savings to bring down the cost of cookstoves for their customers. In addition, new commercial entrants to the clean cookstove market are increasingly leveraging social venture financing or "impact investing" to generate equity investments that greatly facilitate their ability to scale their operations.

The **advent of high-profile national clean cookstove and fuel programs and a rise in the number of government champions** is also spurring unprecedented advances in the adoption of clean cookstoves at scale. Deployment efforts in China, Peru, India, and Indonesia, among others, are targeting dissemination and adoption among the poor[65,66], while nascent efforts in countries such as Nigeria, Mexico, and Ethiopia offer additional promise for reaching large sectors of the population lacking clean cooking solutions. Implementing organizations and national governments are increasingly moving away from give-away and highly subsidized product deployment programs and focusing on market-based commercial approaches. In addition, efforts by the World Bank to replicate their successful Lighting Africa initiative through their new Clean Cooking Initiative and foster an improved commercial market for clean cookstoves in Africa, highlight the adoption opportunities within

regional markets, as does the rise of several regional Alliances in Latin America, Africa, and Asia.

The U.S. Environmental Protection Agency-led Partnership for Clean Indoor Air (PCIA) has been a key ally in leading the maturation of this sector over the past decade. With a current partnership base of over 500 non-profit organizations, cookstove manufacturers, distributors, and other stakeholders, PCIA has facilitated cookstove testing, training, networking, and capacity building programs and has greatly strengthened the sector's ability to meet the challenges of clean cookstove and fuel adoption. The program's integration into the Alliance in 2012 will provide even greater leverage for stakeholders and national governments, and advance efforts to increase adoption rates in developing countries.

Further bolstering the rigor and credibility of the sector are **recent improvements in and growing demand for laboratory and field testing**. This work has included the refinement of testing protocols, the publishing of testing results in peer-reviewed scientific journals, and the comparison of high-tech government labs with lower-tech labs. More accurate emissions monitoring innovations such as temperature sensors and those that can let manufacturers and researchers know a cookstove is actually being used are now being employed. Mobile technology is also being developed to more accurately monitor and track cookstove usage and emissions.[67] Increasingly, clean cookstoves are being tested in the field as well as the lab, inspiring investments from venture capitalists and those active in carbon financing. These technologies have also helped increase confidence in the ability of manufacturers to deliver on their stated health and efficiency claims, as well as greater rigor for the clean cookstoves sector.

Performance standards not only ensure that users are able to buy clean cookstoves with confidence in their health and environmental benefits, but also facilitate carbon financing and guide additional investment in the sector. Such standards also help manufacturers to develop and differentiate clean products and assist national governments and non-governmental organizations to certify that locally available cookstoves meet a set of uniform performance benchmarks. In one of the most promising breakthroughs for the advancement of a clean cookstove market, leading cookstove testing experts reached consensus in February 2011 at the 5th Biennial PCIA Forum in Lima, Peru on an approach to develop strong standards.[68] This agreement at the premier international clean cookstove conference, attended by 350 participants from 42 countries, established a path forward for the development of efficiency, emissions, and safety standards for cookstoves to ensure measureable environmental and indoor air-quality improvements.

**Emerging evidence from leading academics regarding the health and climate impacts of traditional cookstoves and fuels** has allowed for improved estimates of the burden of diseases associated with exposure to cookstove smoke. Better data from WHO, sociologists, and academics is also starting to provide new insights in to the link between the use of clean cookstoves and fuels and improved health and climate benefits. Cross-cutting research from the gender and economic development fields has also shed new light on the impacts that traditional cooking practices have had on women's empowerment and livelihoods.[69] Additionally, ongoing work by WHO on health-based air quality guidelines for household fuel combustion will complement the development of standards by permitting the benchmarking of cookstove emissions performance against health benefits.

# The Global Alliance for Clean Cookstoves

In early 2010, a diverse group of 85 international representatives from the clean cookstoves and fuels industries, as well as government, multilateral, philanthropic, humanitarian, non-profit, academic, and private sectors gathered in Washington for a fresh look at an old problem. Hosted by the United Nations Foundation and the Shell Foundation, the two-day meeting was designed to bring together a small number of global experts for a frank and off-the-record discussion about the best way to address the barriers preventing the adoption of clean cookstoves and fuels at scale in developing countries. Attendees were asked to set aside their individual and organizational self-interests in order to come together as a group around a common global strategy for advancing the adoption of clean cookstoves and fuels.

The group responded enthusiastically to the concept of an "alliance" of partners from a range of interests focused around a common strategic objective. This sentiment was especially shared by those participants who felt that the strength of collective voices on the issue of cookstove smoke might result in more donor support and global awareness than had previously existed in the sector. Participants were also intrigued by the notion of a partnership that was not focused on distributing large numbers of cookstoves per se, but rather on helping to enhance demand, strengthen supply, and build the enabling environment for the development of a thriving market for clean and efficient cookstoves and fuels.

In September 2010, **U.S. Secretary of State Hillary Rodham Clinton and a broad set of international governments, companies, UN agencies, and non-governmental organizations formally launched the newly- named Global Alliance for Clean Cookstoves** at the Clinton Global Initiative. The Alliance, an innovative public-private partnership to save lives, improve livelihoods, empower women, and combat climate change, included 19 founding partners. With **an ambitious goal to foster the adoption of clean cookstoves and fuels in 100 million households by 2020, the initiative seeks to establish a thriving global market for clean cooking solutions by addressing the market barriers that currently impede the production, deployment, and use of clean cookstoves in developing countries.**

Following its launch, the Alliance invited over 350 of the world's leading experts from a cross-section of related disciplines to serve on nine Working Groups and two Cross-Cutting Committees[70] in an unprecedented effort to analyze and rank the various components of what a strategic intervention to foster a healthy market for clean cookstoves and fuels might look like. Led by co-chairs with expertise in the respective subject areas, the members collaborated over six months to develop a series of detailed short- and long-term recommendations highlighting the key steps necessary to transform the global market for clean cookstoves and fuels and bring it to scale.

At the conclusion of the process, several clear themes emerged. First, **the Working Groups identified a number of critical areas for driving both demand for and supply of clean cookstoves**, including awareness and education campaigns, training programs, removal of trade and tariff barriers, and efforts to address manufacturing constraints through improved access to raw materials, better skilled labor supply, and assistance with removing the logistical impediments in getting products to the end consumer. Financing was deemed critical to both the demand and supply sides of clean cookstove deployment efforts, but was thought to be especially critical in helping to facilitate the entrance of new products and firms into the marketplace. The need for technical assistance in researching and developing better cookstove designs and materials was also identified by the groups as a key priority, as was a concerted effort to develop alternatives to biomass as a cookstove fuel.

Second, **efforts to increase awareness at the consumer level were also deemed essential**, as the lack of end-user knowledge about the health and economic impacts of traditional cookstoves, and the benefits from the use of clean cookstoves and fuels had historically served to depress demand. **Capacity development was also deemed critical** in training women on how to use their clean cookstoves and fuels. Only a well informed consumer will purchase the clean cookstove or fuel, and only a well trained consumer will use the cookstove in the correct way so that the benefits can be realized. Non-profit and development organizations were identified for their essential role in providing this training because of their in-country expertise and experience developing projects in the sector. Comprehensive market analyses and surveys to help gather data on local economic conditions, market


size, and consumer demand for clean cookstove products were also seen as crucial for fostering the entrance of new private sector players and facilitating the design of products that better meet consumers' needs. Where information did not exist, commercial players had previously been reluctant to enter the market or make investments in production or distribution of clean cookstoves and fuels – a barrier that could be broken by clear and comprehensive market analyses.

Third, **Working Group members concurred with the importance of strengthening the long-neglected enabling environment for clean cookstoves and fuels**. Cookstove deployment efforts around the world have been stymied by a lack of the fundamental market enablers that no single partner has had the resources or the political will to execute. There was also a strong consensus among the groups that the development of robust standards for what constitutes "clean and efficient" is critical, along with the priority health studies needed to provide a robust, widely accepted consensus that will address the question of how clean the emissions from cookstoves need to be to ensure substantial health benefits. These standards could evolve over time as new clean cookstove designs come into the market and better means for testing emissions and other attributes, like durability, are developed. Closely tied with an emphasis on clear emissions and efficiency standards for cookstoves is the need to improve the sector's ability to test their products by enhancing the capacity of testing laboratories at the local, national, and private sector level. In addition, the groups identified convening the sector, priority research, global advocacy and awareness efforts, and knowledge management as essential steps to advancing the field.

Two other areas were deemed critical by the groups in terms of advancing the sector and fully realizing the health, environment, economic, and gender benefits from the use of clean cookstoves. The first was **advocacy and awareness of the issue on the broader global stage**. Recognizing that the issue of household air pollution had historically lagged in terms of awareness at both the public and policy-maker levels, suggestions were offered regarding how best to mobilize an international awareness effort that would bring a much needed understanding of the issue and help raise funding for developing the sector. The Working Groups also agreed that **efforts are needed to collect better data on all aspects of the issue**, be it information on the health or climate impacts of cookstove smoke or the time that women and girls spend collecting fuel. By building the empirical case for clean cookstoves and fuels, policy makers, funders, and other key stakeholders would likely be more compelled to get involved, and better able to assess how best to engage in finding solutions for the problem.

Finally, if the sector were going to reach its goal of universal adoption of clean cooking solutions, **the role of national programs was viewed by the Working Groups as a critical component of successful implementation and the development of a strong enabling environment for clean cookstoves and fuels**. Catalyzing national clean cookstove and fuel campaigns to spur activities at scale and build local, regional, and national markets was seen as an effective way to help manufacturers realize economies of scale and help to build a thriving market. Major components of such national campaigns could include extensive local market analyses, development of national networks, support for capacity development and awareness campaigns (including national advocacy efforts through schools, clinics, and other public institutions), and nationally appropriate standards and testing centers. These elements were also seen by the Working Groups as including measures to address tariffs and import duties that discourage investment in clean cookstoves and fuels, the establishment of strong national targets, domestic financing tools to encourage business chain development, and robust programs to measure program effectiveness.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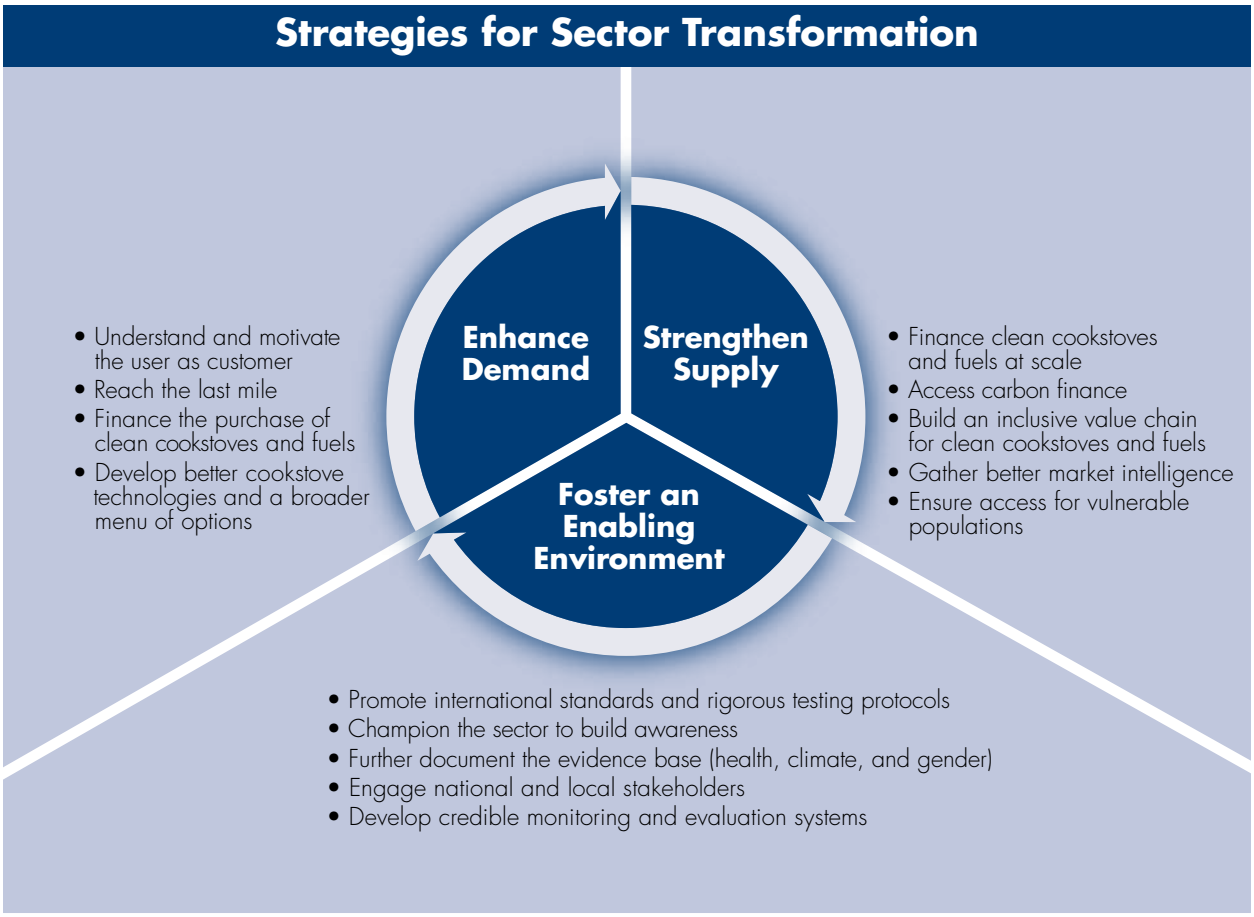
# Strategies for Achieving Global Scale

The remainder of this report lays out a roadmap for the clean cookstoves and fuels sector. If the sector is to achieve its ultimate vision of universal adoption, what must happen? How can a thriving global market truly be created in order to reach and sustain success for this sector? How can the sector address the cultural preferences, income constraints, financing and policy barriers, and lack of awareness of the health, gender, economic, and environmental benefits of cleaner and more efficient products that have stymied previous efforts to build a market for clean cookstoves and fuels? And how, for reasons discussed at length in the previous sections, can a growing cohort of stakeholders best transform the sector and spur adoption of clean cooking solutions for millions of people in developing countries? To answer many of these questions, a comprehensive Sector Strategy developed along three primary themes is suggested:

- Enhance demand for clean cookstoves and fuels;
- Strengthen supply of clean cookstoves and fuels; and
- Foster the enabling environment for a thriving market for clean cookstoves and fuels.

These strategic priorities are laid out in greater detail below and each is accompanied by several illustrative interventions that the sector could undertake to advance the adoption of clean cookstoves and fuels.[71] These interventions are drawn from both the early actions and broader strategic roadmap recommendations submitted in final form by the Working Groups in September 2011. A complete list of these roadmap recommendations may be found at www.cleancookstoves.org/ignitingchange. While the forthcoming Alliance Business Plan will identify the specific activities that the Alliance will undertake in order to drive the greatest additional value for the sector, many of the Alliance's actions will be drawn from this Sector Strategy.



## ENHANCE DEMAND


Consumer awareness and education, innovative distribution models, capacity building, training, and enhanced access to consumer finance are all critical and mutually reinforcing elements for building and maintaining demand in the clean cookstove and fuel sectors. To achieve the adoption of clean cookstoves at scale, all these elements must be executed as part of a coordinated strategy that also emphasizes proper use of the clean cookstoves and fuels.

### Understand and Motivate the User as Customer

Consumer awareness and education regarding the health, environmental, gender, and economic benefits of clean cookstoves is critical to any effort to stimulate demand for clean cookstoves. Yet, convincing people to make the behavioral shift from a way of cooking that their families and communities have used for generations to a clean cookstove is one of the sector's major challenges. If the customer is not aware of the products' benefits, demand for clean cookstoves and fuels will be low and efforts to increase their use will be in vain.

Surveys show that even in developing countries, cookstove smoke-affected households have extremely low awareness of the health, time-saving, or economic benefits offered by clean cookstoves and fuels and often do not aspire to own a cleaner cookstove. In one survey of cookstove smoke-affected households conducted in southern India, only 10% of respondents suggested clean cookstoves as a way to reduce smoke in their homes.[72] While it is important to remain conscious of cultural and other local preferences, local cooking practices can be shifted to cleaner products and fuels with the appropriate use of awareness-raising, marketing, and outreach to help build demand. In some cases, a market for clean cookstoves and fuels can be driven by addressing the intangible value that consumers place

on factors beyond health and economic benefits that motivate them to purchase a clean cookstove.

Typical methods for building awareness of new and improved products through television, magazines, and social media often do not exist in developing countries, where the poor may lack access to basic media outlets, and where radio, word of mouth, street plays, and rural social marketing are often the best means for sharing information. However, efforts to build demand for cleaner cookstoves and fuels can also be complicated by other factors, including the fact that cookstoves are a 'push' product, or a product that people need to be convinced to purchase as they may not have an immediate perceived value. This is contrary to what is considered a 'pull' product such as a mobile phone or computer that provides a service or addresses a need that had not been previously met or even envisioned.

Furthermore, it is difficult to know who in the household ultimately has the decision-making power to purchase a clean cookstove or switch to the use of a cleaner fuel, which can complicate the development of appropriate and targeted campaign messaging. As the primary users of cookstoves, women are likely to be the main drivers of any efforts designed to increase awareness and enhance demand. Yet men are often responsible for making decisions regarding expenditures of cookstoves in the household. Furthermore, as clean cookstoves represent a new and often untested product, customers can also be skeptical of efficiency or health claims and often prefer to view the cookstoves in use before making a purchase.

One way of countering consumers' skepticism is for the sector to develop awareness programs and specific messages that will resonate with the end-user. These programs include education of, and endorsements from, credible individuals and organizations, including: NGOs, women's self-help groups, school teachers, faith-based charities, rural sales teams, local health workers (who are already educating patients about disease prevention tactics), and village leaders, who may also lack information on the multiple benefits of clean cookstoves and fuels. There are also powerful voices closer to home, such as children, who can be educated at school about the issue, and family dynamics such as the important relationship between a mother-in-law and her daughter-in-law in countries like India that can be tapped. Specific efforts to educate and involve men in understanding the benefits of clean cookstoves are also important so they can support purchasing decisions even if they are not the primary users of the new technology.

Additionally, as with the introduction of any new product category, an initial surge of culturally appropriate advertising and social-marketing may be required to raise awareness. In time, word of mouth, particularly among female consumers, may play a more useful role in spreading awareness of clean cookstoves, but in the early stages the costs of raising awareness can be high and can rarely be fully met by individual cookstove businesses. This presents an ideal opportunity for the international donor community and/or national governments to provide funding or advertising for large-scale consumer awareness campaigns.

**"The cookstove sector must promote broad-based awareness campaigns targeted at impacted populations. The design of such campaigns should be based on learning from the successes and failures of similar programs for equally significant issues (HIV/AIDS, malaria, tuberculosis, etc.)"**

— REACHING CONSUMERS WORKING GROUP

— ILLUSTRATIVE INTERVENTIONS —

■ **Assess Customer Segmentation and Behavior Profiling** – Families or households at the poorest income levels do not represent a homogenous market. It is therefore vital to provide support for qualitative and quantitative research on the purchasing behavior of impacted households in order to assess the most effective tools for building consumer awareness of clean cookstoves and fuels. Using this research, the sector can develop marketing and branding techniques that appeal to specific consumers such as women who are able to purchase cookstoves, or those men who make purchasing decisions for the entire household.

■ **Leverage Best Practices in Sales of Other Products** – A limited amount of international and regional cookstove social-marketing has been conducted to date, with little evaluation of the sector's needs in order to identify which practices are successful. The sector should also evaluate past efforts to sell other social goods, such as cell phones, water purifiers, and solar lanterns, and identify those factors that consumers valued and why.

■ **Develop and Launch Awareness Campaigns** – Once best practices are identified, broad-based awareness campaigns should be developed and launched. To have the greatest reach and impact, these campaigns should be carried out in collaboration with other partners such as government, UN agency, non-profit, faith-based, and financial organizations, as well as cookstove manufacturing or distribution businesses. National governments can also be effective partners for the development of mass awareness campaigns, particularly through their existing outreach and communication channels.

## Reach the Last Mile

Many cookstove smoke-impacted households are often located in rural or remote locations, which present challenges for reaching those customers with clean cookstoves and fuels in the so-called 'last-mile' before the product reaches the consumer's door. The size, weight, and fragility of clean cookstoves often provide distribution and logistical challenges that purveyors of mobile phones or easily transportable consumer goods like soap or shampoo do not face. Similarly, consumers who may not have access to retail locations in towns or cities may need the convenience of purchasing their cookstoves within a few kilometers of their homes. They also may want a local or familiar vendor presence in the event that the cookstove, which to them represents a new product that they are not confident in, breaks or does not operate as expected.

Training on the operation and maintenance of clean cookstoves is critical to establish and ensure successful adoption of clean cookstoves and fuels, and such training must be done locally to ensure that the cookstoves are used properly and provide the greatest benefits. Other factors such as consumer price sensitivity, deeply ingrained cultural preferences, gender bias, and the need for both scalability and customization must be considered when developing mechanisms for reaching the end-user.

In addition, women can often play a central role in addressing these demand–side challenges, as they often excel in entrepreneurial activities and can be pivotal in the creation of distribution and repair networks. For example, respected local women's organizations may have the existing product distribution capacity (staffed by women entrepreneurs), access to financing, and a history of successful social-marketing campaigns to address the many challenges on the demand-side in a coordinated manner. They may also serve as effective local intermediaries for new or unfamiliar cookstove manufacturers because of their relative familiarity to and trust of their customers and local communities. As a result, they can serve a unique role in catalyzing last-mile solutions.

**"Innovative distribution models must be a vital priority.... for the cookstove sector as a whole."**

— REACHING CONSUMERS WORKING GROUP

— ILLUSTRATIVE INTERVENTIONS —

■ **Replicate Innovative Distribution Models** – In order to address issues hindering clean cookstove and fuel sales in the so-called 'last-mile', the sector should build on innovative distribution models such as rural sales initiatives, work with self-help groups and women-run businesses, and partner with local village savings and loan associations to build awareness of clean cookstove business opportunities, bring microfinance players into the mix, and stimulate inclusive supply chain models.

■ **Invest in Women Entrepreneurs** – The sector should increase financial and technical investments in capacity building activities for female entrepreneurs in the clean cookstove and fuel distribution chain, in order to enable them to access the resources necessary to start and expand businesses that will scale up the manufacture, distribution, and use of clean cookstoves and fuels.

■ **Conduct Regional and Country-Level Workshops** – The sector can raise the profile of the clean cookstove issue and encourage knowledge sharing and cooperation among cookstove program implementers, funders, and governments by conducting workshops in key countries and regions. The workshops should be held, where possible, with governments and local stakeholders such as small businesses and micro-retailers in order to help them build their businesses and profitably reach customers.

**"Women are uniquely positioned to play a critical role in promoting the adoption of improved cooking technologies."**

— GENDER CROSS-CUTTING COMMITTEE

## Finance the Purchase of Clean Cookstoves and Fuels

For many households dependent on biomass fuel for their cooking needs, the price of clean cookstoves and fuels can be a major barrier to their purchase. Cleaner cookstoves often have a higher first cost, and clean fuels such as ethanol, pellets, and LPG are more costly than fuel that is gathered for free, and can also be more costly than charcoal or coal. One mechanism for tackling this cost constraint is through enhanced or innovative consumer financing, which can allow consumers to pay for the clean cookstove in installments spread across several months. This finance can be provided by a range of organizations, whether microfinance institutions (MFIs), credit unions, credit cooperatives, and/or self-help groups. However, to date, few MFIs offer loan products for clean cookstoves, and more institutions should be encouraged to do so.

— ILLUSTRATIVE INTERVENTIONS —

■ **Provide Catalytic Funding to MFIs** – International and local financial institutions should provide grants, soft loans, or technical assistance to enable MFIs to conduct market research, train cookstove manufacturers and vendors to work alongside loan officers, and implement other practices to facilitate their support for clean cookstoves. These mechanisms will allow more MFIs to utilize investment financing to on-lend for clean cookstove programs.

■ **Develop Guarantee Mechanism for Cookstove Loans** – Donors could develop a first-loss guarantee mechanism, whereby donors would take the first loss on cookstove loans, which are seen by investors as riskier than traditional microfinance paper loans. This could leverage private investment in the sector.

■ **Replicate Innovative Financing Models** – Attention should be paid to replicating novel financing models used in other sectors that are likely to help jumpstart behavior change and demand at the consumer level, including rent to own, free trial periods, micro-franchising, consigning, and other methods.

## Develop Better Cookstove Technologies and a Broader Menu of Options

The availability of high-quality products that women want to use is critical to ensuring widespread adoption of clean cookstoves and fuels. Just like any other consumer product category, different cookstove designs are needed to meet different individual needs (e.g. varying local fuel sources, family sizes, and food types), user-friendliness (e.g. cook quickly), aspirations

(e.g. clean, modern kitchens), and ability to pay. In addition, safety and durability are important.

Yet, despite the recent surge in clean cookstove innovation in the past few years, with the market entry of multinational players bringing world class research and development to the sector, the breadth of cookstoves required to meet consumers' needs and wants does not yet exist.

Some cookstoves are efficient, safe, and durable, but their initial cost may be too expensive for consumers (usually in the $15-$40 range). Others are very clean, but cost even more ($25-$150 range), while others only cost a few dollars and sell at scale, but their health and environmental benefits may be limited in scope and the cookstoves may not last long enough to obtain carbon revenues. The physical appearance of the stove, including its color, size, and shape, as well as its user-friendliness and ability to cook the locally-preferred foods in the proper way, also impact a cookstove's desirability to the end-user and further complicate the design equation. Important elements for achieving these results include materials and design research and field testing, advocacy and education, and activities that support entrepreneurs' efforts to scale design and production of high-quality cookstoves and fuels.

**"Aim for the development of state-of-the-art cookstoves that are desirable to consumers and can burn a variety of fuels, while at the same time focusing on the availability and use of cleaner processed fuels."**

— TECHNOLOGY AND FUELS WORKING GROUP

Similarly, the sector needs to explore the more efficient use of existing fuels and/or develop new fuels. Turning biomass – wood, leaves, rice husks, etc. – into dense fuel pellets through machines that crush and bind the raw material together can improve fuel efficiency, though there is somewhat limited consistency in performance. However, this consistency has been addressed by a few players in the sector that are making standardized pellets from a mix of biomass selected to maximize efficiency and minimize emissions. Other firms are growing cassava that can be turned into ethanol and sold locally, displacing the use of expensive, dirty, and environmentally destructive charcoal. Still others are marketing solar cookers and other technologies that harness the sun's rays to cook food cleanly and cheaply.

The sector is also seeing a steady increase in innovative technologies and applications that support additional functionality of clean cookstoves. Some are specifically linked to improving cookstove performance. One example uses electricity generated by heat from the cookstoves to drive fans that make the cookstoves burn more efficiently. This removes the need for batteries or the cookstove to be plugged into an electricity source. Others are providing co-benefits that should increase adoption, such as using heat-generated electricity to charge mobile phones or small LED lights.[73]

Other technologies are helping the broader sector mature. Temperature data-loggers that can be attached to the side of clean cookstoves to measure how often they are being used are useful for both understanding consumer behavior and for proving carbon reductions for carbon revenues. Personal

exposure monitors worn by cookstove users also can provide researchers with a better understanding of exposure levels, and mobile phone and computer technologies allow this data to be collected and analyzed more effectively.[74]

In addition, tremendous opportunities exist for increasing heat transfer efficiency in cookstoves through the use of simple techniques such as pot skirts and retained heat cookers. All of these technological areas require focus and resources if cookstoves are to be adopted at scale – and their impacts effectively measured.

**"Our vision is to develop an M&E framework that is highly credible and pragmatic."**

— MONITORING AND EVALUATION WORKING GROUP

It is also critical to not only understand the innovations in cookstove models and fuels that consumers currently value, but also those that they may value in the future once they are exposed to them. LPG is often preferred not just because it is clean, but because it can be turned on and off easily, the flame can be adjusted up or down in real time, there is a status associated with it, and it cooks food quickly. In some regions, cookstoves that allow women to stand up while they cook have been introduced, and is a feature that may be central to their long-term adoption.

— ILLUSTRATIVE INTERVENTIONS —

■ **Support the Development of Advanced Cookstoves** – Many cookstoves in use today employ a simple single-step combustion process, usually based around a 'rocket stove' design where fuel is loaded at the base. While cookstove designs that are much more efficient are in production, many do not meet the requirements for robust operation such as ease of use, low cost, and long life-spans. Additional funding is needed for early stage assistance with research, development, and design of new cleaner cookstoves and fuels, new materials for combustion chambers, and supporting technologies, as well as a global mapping of current advanced technologies and fuels.

■ **Improve Fuel Processing Technologies** – Opportunities to improve production of clean cooking fuels such as biogas, ethanol, and plant oils should be pursued. A program is also needed to support research and development of clean processed solid fuel technologies. For example, technologies should be developed that can turn biomass, wood, rice husks, and other materials into clean- and efficient-burning pellets or briquettes.

■ **Increase End-User Input into Design** – A program is needed to ensure that end-consumers, and particularly women, have the opportunity to provide input into the design of the cookstove. This will ensure that the cookstoves meet consumer expectations and will increase the likelihood of adoption.

## STRENGTHEN SUPPLY


A key component for advancing the adoption of clean cookstoves and fuels entails ensuring sufficient supply of the products that customers value at a price they can afford. Ensuring sufficient capital for cookstove businesses, research and development, and start-ups, helping the sector access potential carbon finance revenues, gathering better market intelligence, and including women in the value-chain all help strengthen the supply-side. Building cookstoves for humanitarian populations can also provide opportunities for clean cookstove businesses to move to scale via bulk or large-scale sales to governments and relief organizations, yet should be undertaken as part of a larger, coordinated overall humanitarian strategy.

### Finance Clean Cookstoves and Fuels at Scale

Creating a thriving global market for clean cookstoves and fuels will require significant capital from a range of players in the financial sector at each stage of the cookstove supply value chain – research and development, manufacturing, marketing, distribution, and financing. These resources are vital to helping all segments of the clean cookstove manufacturing sector overcome the daunting challenges which hinder the adoption of high performance clean cookstoves and fuels at an affordable price. The types of support needed to ensure sufficient capital run the gamut from early stage grant funding for start-up costs, to subsidized capital, angel equity investment, and ultimately commercial capital. The significant needs and challenges of securing this financing differ along various points of the clean cookstoves and fuels supply chain and for firms of various sizes. The International Energy Agency's *2011 World Energy Outlook* estimates initial annual financing needs for the clean cookstoves sector at $4.5 billion, which would come mostly in the form of grants from donor groups, multilateral institutions, and government agencies.

The Alliance's own initial survey of partners seems to support these claims. In a survey of 30 leading clean cookstove businesses and deployment efforts conducted as part of the Alliance's Working Group process, respondents of all company sizes mentioned the need to secure sufficient financing to meet their business needs (research and development, marketing, manufacturing, etc), as their top priority for driving cookstove sales.[75] When queried about what the sector would need as a whole in coming years to develop a thriving market for clean cooking solutions, three-quarters of the respondents suggested financing needs in the range of $500 million to $1 billion, with individual companies stating their needs at between $1 million to $100 million each.

— ILLUSTRATIVE INTERVENTIONS —

- **Use of "Soft" Debt Financing (manufacturers)** – As a matter of doing business, cookstove manufacturers must purchase raw materials, finance the production of finished goods, and transport their products to distributors. Many distributors make a down payment before production starts and some pay on delivery, but many require flexibility in the timing of their payment until after sales have been completed. In order to carry this financial burden, manufacturers may require long-term and entrepreneurial debt financing in combination with 'patient' equity or other forms of risk capital. Support should be provided for so-called "soft" debt financing, which has flexible interest rates and repayment structures that create breathing space for all segments of the manufacturing sector in the early years. This form of financing will likely come from the donor community or Development Finance Institutions until the market begins to mature.

- **Increase Loans for Working Capital (distributors)** – Manufacturers typically require upfront payments from their clean cookstove distributors. Thus working capital to manage inventory is crucial for distributors whose cookstoves may sit on a shelf or in a warehouse for weeks or months before a consumer finally purchases them. Increasing the availability of working capital loans (ranging in size from $30,000 to $300,000) to credit-worthy distributors that have diversified their business and may be selling cookstoves as well as other products, would be beneficial in encouraging distributors to sell clean cookstoves.

- **Foster an Investment Marketplace for Clean Cookstoves** – To familiarize individual donors, corporations, and governments with investment opportunities, the cookstove sector should create a marketplace to connect the cookstove research and development community with the donor and investment communities. Such a marketplace could be created at specialized workshops, via side events at related conferences, or virtually through a web portal specially designed to facilitate project opportunities.

## Access Carbon Finance

While not a panacea, carbon finance could become a game changer during the development of a global market for clean cookstoves and fuels. It is arguably the best near-term means to make advanced solutions affordable to the poor. While clean cookstoves can conservatively save one metric ton of carbon dioxide emissions per year under the right conditions, many models can save two to four times that amount.[76] These emission reductions are then valued and sold through global carbon markets, generating significant revenue for the project and providing options for keeping prices low for the consumer. If a project were able to achieve $8 to $15 per ton of carbon dioxide, for example, carbon finance could produce annual revenues of $8 to $60 per cookstove that can be tracked and confirmed to be in use.[77] For a cookstove that lasts five years, this is an enormous revenue opportunity that could make even the most expensive cookstoves affordable to the very poor.

**"Carbon finance provides a commercial pathway that generates revenues to scale clean cookstove deployment while incentivizing monitoring, increased usage and adoption, and increased fuel efficiency and durability. "**

— CARBON FINANCE WORKING GROUP

Carbon financing of cookstove projects also offers other important benefits for the sector. It can change the funding dynamic for cookstove projects from one that has traditionally focused on subsidized donor aid to that of a financial transaction that attracts investment from the private sector. Carbon finance also requires rigorous monitoring and tracking to ensure cookstoves are used as they were intended, as revenue results from the project only if emissions reductions are realized. This potential income stream creates enormous incentives (once approval is granted for the financing) to keep the cookstoves in operation for as long as possible.

However, the expense of applying for carbon financing, the precise and lengthy obligations to measure and monitor projects, and other requirements for program execution have presented insurmountable barriers to all but the most persistent project developers from accessing carbon finance to support their projects. Generating carbon revenues from clean cookstoves is still in its infancy with only seven Clean Development Mechanism (CDM) cookstove projects registered as of October 2011.[78] Unfortunately, uncertainty surrounding the future of carbon markets hampers investment at scale. Only one-third of those cooking with dirty fuels live in Least Developed Countries and are hence guaranteed access to the largest compliance carbon market of Europe beyond 2012. The other two-thirds, more than 1.5 billion people, may not benefit from carbon finance unless regulations are changed.

Despite the high technical and financial hurdles to structuring carbon finance deals, this specialized instrument is not available to many other health interventions of this magnitude and could lead to financing of cookstove projects at scale while ensuring significant societal benefits. Given all of the impediments and uncertainty currently surrounding the carbon markets, the development of a viable and thriving cookstove sector should not rely solely on carbon financing. Integrating carbon finance into current project development while simultaneously working to remove the remaining barriers will provide a significant opportunity to facilitate investments at the scale required to meet the need for clean cookstoves and fuels in developing countries.

— ILLUSTRATIVE INTERVENTIONS —

- **Promote Simplified Crediting Approaches and Standardized Tools** – The sector should propose revisions to the current rules for generating emission reductions that will lessen transaction costs and time delays in the crediting process. The registration process also could be streamlined in order to improve accessibility for cookstove projects in need of immediate financing. For example, the creation of a comprehensive carbon finance web portal that contains information about the process, templates, and standardized tools would support the increased utilization of carbon financing for the sector and assist stakeholders with varying levels of carbon expertise.

- **Create Regional Carbon Offsetting Infrastructure** – Developing Programs of Activities (PoAs) that generate carbon offsets under the CDM can help facilitate access to carbon finance for clean cookstove projects. Setting up PoAs for countries and regions that allow for the flexible participation of many cookstove implementation partners is expensive and time consuming, and few companies can afford to do this on their own, or wish to assist their competitors by paving the way. Creating investor-friendly PoAs that are managed by neutral parties would lower the barriers to entry into the CDM market currently experienced by cookstove carbon projects, and would help more projects tap carbon financing.

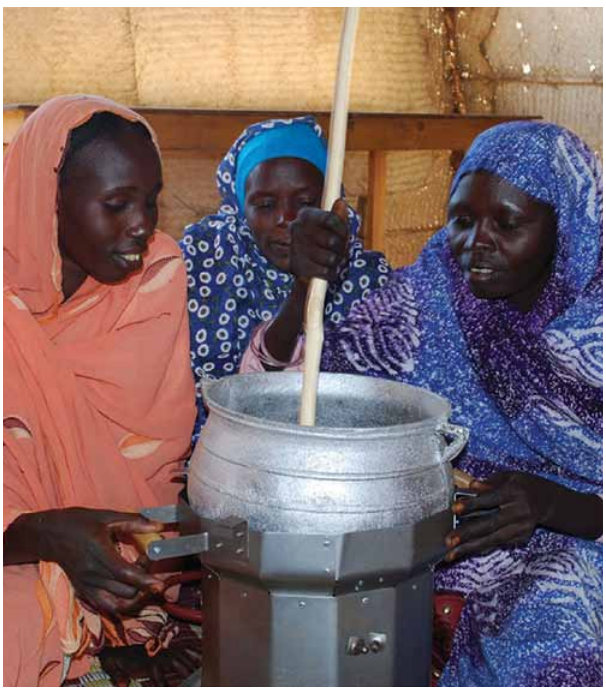
- **Support Offset Demand Generation and Carbon and Methane Price Guarantees** – Cookstoves are sources of carbon and methane, yet market uncertainty related to the lack of a post-Kyoto agreement and the types of offsets that will be eligible in the European Union has dampened investor interest in these projects in non-Least Developed Countries (non-LDCs). Strong demand for cookstove offsets from both developing countries and non-LDCs in compliance markets will bolster pricing and attract investment. Instruments that ensure a premium price or reduced price risk for carbon and methane offsets from cookstove projects may reduce private sector investment barriers and stimulate additional financing for clean cookstove programs.

## Build an Inclusive Value Chain for Clean Cookstoves and Fuels

In order for a global cookstove market to thrive, it is important for the sector to build an inclusive value chain for clean cookstoves and fuels. This process entails the involvement of a wide range of stakeholders in the development of new cookstove designs, local manufacturing projects, distribution efforts, marketing techniques, awareness campaigns, and other components of the value chain. Women are a particularly important component of the value chain as they are responsible for the cooking; therefore, their preferences around design, taste, cooking times, fuel supply challenges, and other cultural considerations must be taken into account or the cookstoves will go unused.

That said, women should not be merely seen as end-users, and their inclusion throughout the value chain will increase the successful adoption of clean cookstoves and fuels as well as their long-term use. Women can be economically empowered by participating in, starting businesses around, and earning income from product design, engineering, manufacturing, marketing, distribution, sales, and other related enterprises, including the use of clean cooking technologies in businesses that involve cooking, such as restaurants and street food sales.

The Working Groups emphasized the need to build capacity in the field for women and other user groups such as local artisans, through engagement of local organizations and networks, entrepreneurs, and small and medium enterprises, and through education and training in business skills, marketing, and financing. In order to reach all consumers, local actors throughout varied distribution chains must be able to deliver quality products and services in the most efficient and cost-effective manner possible.



— ILLUSTRATIVE INTERVENTIONS —

- **Support Capacity-Building for Enterprise Development** – Business training and enterprise capacity building along the value chain for those at the base of the pyramid, whether through individual organizations and women's networks or via regional knowledge and training centers, would increase the capacity of local enterprises. Where possible, leverage existing enterprise training programs to include skills development in the design and creation of clean cookstoves and fuels businesses.

- **Invest in Women Entrepreneurs** – With appropriate education, training, and investment, women can become engaged and employed throughout the value chain leading to increased success of cookstove businesses. Likewise, economic opportunities for women can generate significant income and social benefits because they tend to reinvest their income back into their families and communities at a higher rate than men.

- **Develop Social Marketing Efforts that Target Women** – The lack of awareness among female consumers regarding the negative health and economic impacts of traditional cookstoves, as well as the availability of clean cooking solutions, prevents initial clean cookstove purchases and their ongoing use. Development and implementation of social marketing efforts for clean cooking solutions that are geared toward women and their cooking needs would begin to address the problem.

## Gather Better Market Intelligence

A thriving global market for clean cookstoves and fuels is ultimately a collection of healthy local and regional markets – and each of these smaller markets varies in critical ways on both the supply and demand side. The lack of a central source of data or transparency regarding local markets is a major barrier for cookstove businesses, donors, and potential investors, who may be discouraged from entering the clean cookstoves sector due to a lack of sufficient information in which to make informed business decisions. This data gap also leads to inefficiencies, with many organizations spending precious resources to collect and analyze information that other clean cookstove stakeholders may have already gathered.

Proper open source market data collected by a neutral body like the Alliance[79] could be far more effective and efficient than multiple efforts across different local, regional, and national markets. Better country-level information is needed regarding consumer awareness of clean cookstoves and fuels, attitudes and cooking practices, local and regional use of fuels and technologies, the potential size of the clean cookstove market by segment (i.e., socioeconomic status, rural versus urban), percentage of population currently using clean cookstoves, key stakeholders, and potential local

investors and implementation partners (e.g. banks, NGOs, MFIs, religious organizations, or others). Working with local institutions who best understand the in-country markets will be critical for successful assessments of market conditions.

— ILLUSTRATIVE INTERVENTIONS —

■ **Develop In-Country Market Analyses** – Conducting in-depth market analyses would help focus research, development, manufacturing and promotional activities in individual countries, and would provide solid guidance for use by manufacturers, fuel suppliers, governments, donors, and other stakeholders in their clean cookstoves and fuels deployment efforts.

■ **Develop Detailed Country Strategies** – While the Alliance has completed in-depth market assessments of clean cookstoves and fuels in several countries and is planning to undertake several more, work is now needed to turn these analyses into specific country strategies. Such strategies can prove invaluable in helping existing firms and new clean cookstove and fuel entrants better understand the best means for overcoming the barriers to successful deployment in their particular market, and can help identify opportunities for growth in their customer base.

■ **Establish Regional Market Information Workshops and Knowledge Sharing** – Many local producers don't have the same access to information as larger or international cookstoves firms do. In order to benefit local producers as well as international producers, the sector should broaden and deepen access to new technologies and regional market information.

## Ensure Access for Vulnerable Populations

Vulnerable populations such as refugees, the very poor, and other similarly disenfranchised sectors of society in developing countries may not be easily reached by traditional commercial deployment efforts but have much to gain from adoption of clean cookstoves and fuels. Humanitarian settings present an enormous challenge to cookstove deployment with conflict and severe resource constraints exacerbating existing supply chain barriers. The United Nations estimates that over 80 million people in over 16 million global households are currently displaced as a result of conflict and natural disasters.[80] These 80 million people receive food such as dried beans, rice, and flour, from UN agencies such as the World Food Programme and the United Nations High Commissioner for Refugees, as well as non-governmental organizations, and this food must be cooked before it can be eaten. The fuel required to cook this food, however, is rarely distributed.

**"The Humanitarian Working Group envisions a world in which cooking fuel becomes an institutionalized and systematic part of humanitarian response, in the same manner as food or water distribution... Ultimately we seek to ensure that all crisis-affected women can safely cook for their families. "**

— HUMANITARIAN WORKING GROUP

Cleaner household and institutional cookstoves and fuels can play a significant role in improving the quality of life for these disenfranchised people, who can often spend many hours a day collecting firewood from increasingly barren landscapes and are

often at grave risk of personal attack while doing so. However, the humanitarian system does not yet have the sufficient technical, human resource, logistical, or financial capacities required to meet the needs of all crisis-affected households. Adequate financing and effective coordination between cookstove manufacturers, donors, and aid organizations will be critical to ensuring that cookstoves are distributed at scale effectively and fairly to the people who need them.

If the sector is to achieve universal adoption of clean cookstoves, it will not only need to develop new mechanisms for providing cookstoves to those who can afford to purchase clean cookstoves or are currently buying charcoal, but also to those along the base of the pyramid who currently use three stone fires and biomass fuels to cook their food. The Alliance is committed to universal adoption, and its partners are working with all market segments to ensure broader deployment of clean cookstoves and fuels. Discussions with key stakeholders regarding the best approach for transitioning cookstove deployment from disaster or humanitarian relief to market-based approaches will also be essential to ensure the establishment of commercial cookstove markets in the affected areas.

One synergy from including a cross-section of market segments is that building cookstoves for high volume humanitarian settings may enable cookstove makers to move more quickly to scale, which will in turn reduce per unit costs, strengthen distribution networks, and help ensure more consistent reliability and performance. While consumers who purchase their fuel will always constitute the market segment with the lowest hanging fruit for manufacturers due to the clear economic payback, the Alliance and its partners hope to help vulnerable and humanitarian market segments with innovative financing and other deployment mechanisms.

— ILLUSTRATIVE INTERVENTIONS —

■ **Develop the Infrastructure for Rapid Deployment in Humanitarian Settings** – The sector must ensure a predictable, appropriate, and coordinated response to household cooking needs in relief settings. By building the technical, research, and training capacity within the humanitarian community to develop efficient cookstove interventions, such as local assembly projects that are appropriate for use in refugee settings, the relief community would be in a better position to meet the needs of populations in crisis. Efforts should also be made to leverage and support existing systems, such as the Interagency Standing Committee Task Force on Safe Access to Firewood and Alternative Energy in Humanitarian Settings (the SAFE Task Force).[81]

■ **Mobilize Rapid Response Funding** – Substantial sums of money are needed to stockpile or quickly mass-manufacture cookstoves for use in emergency situations. While such sums can be difficult to secure, donor governments should help ensure that the sector gets the help necessary to meet humanitarian needs in such crises by exploring the feasibility of a global revolving fund to speed the purchase of clean cookstoves during relief/humanitarian efforts, which meet the Alliance's standards for efficiency, safety, and durability. In addition, innovative mechanisms to speed financing, such as pledge guarantees, for deployment of clean cookstoves and fuels in disastrous situations should also be developed.

■ **Employ Effective Intermediaries to Reach Vulnerable Populations** – To develop and deploy clean cookstoves and fuels that better meet the needs of end-users, the sector can partner with non-profit, government, and private sector intermediaries and delivery networks that know the needs and resource constraints of the vulnerable populations they serve. In addition, working with UN agencies, relief organizations, donor governments, and other key stakeholders, the sector could develop illustrated communications materials that could be disseminated at food distribution sites to help change behavior on fuel-efficient cooking techniques.

## FOSTER AN ENABLING ENVIRONMENT


Fostering an enabling environment for a thriving clean cookstoves and fuels market through the development of appropriate structural conditions and empirical guidance is crucial for advancing the sector. However, building such a framework often entails a range of activities that can be prohibitively expensive for any one stakeholder to undertake, and are best suited for a collaborative process involving a variety of stakeholders and related skills. These critical but long neglected areas of common engagement should include activities to:

- Promote international standards and rigorous testing protocols;
- Champion the sector to build awareness;
- Further document the evidence base;
- Engage national and local stakeholders; and
- Develop credible monitoring and evaluation systems.

While many of these recommendations may seem self-evident, the lack of global champions and sufficient donor funding has hindered initiation and implementation of each of these in the past. This section highlights many of the actions that must be taken by the global community to foster the enabling environment for successful adoption of clean cookstoves and fuels at scale.

### Promote International Standards and Rigorous Testing Protocols

Adoption of globally recognized standards and rigorous testing protocols is one of the most cost-effective measures that can be taken to advance the development of a thriving global market for clean cookstoves. The lack of an accepted definition for what constitutes a clean, efficient, and safe cookstove has had significant consequences for the sector. Without recognized standards, consumers do not know if they are buying a clean or reliable product, while manufacturers of quality cookstoves often see their market share eroded with a flood of cheap copies. Regulators and other government authorities also stand to gain from international standards and robust testing protocols. Additionally, investors, especially in the carbon markets where revenues depend on cookstoves achieving measurable and durable benefits over several years, may lack confidence regarding promised carbon reductions. Without some objective way to gauge their improvements, bilateral and philanthropic clean cookstove donors also run the risk of promoting poor quality cookstoves that do not deliver promised health and environmental benefits.

Testing protocols and corresponding testing centers are an integral part of the effectiveness of standards, as without the means to validate a cookstove's emissions and efficiency the standards would not be as effective. In short, the current lack of standards undermines the allocation of resources to the best and most effective clean cookstove programs, which are urgently needed to elevate clean cooking solutions to the status of other proven interventions.

**"Whether voluntary or compulsory, [standards] increase access to information about product performance and therefore allow markets to function better. This promotes competition and technological advances, benefiting both consumers and suppliers."**

— STANDARDS AND TESTING WORKING GROUP

— ILLUSTRATIVE INTERVENTIONS —

■ **Develop a Cookstove Rating System and Voluntary Global Standards** – The sector has made considerable progress in the development of a consensus voluntary global standard. This standard will enable the rating of cookstoves by emissions, efficiency, safety, durability, and affordability while allowing for differences in local conditions and user behavior. Although the standards could take a variety of forms, one mechanism that is currently being explored is the establishment of international standards through the International Standards Organization. Such an international consultative process will take time (perhaps as long as three years), so in the near-term the sector should develop an interim tiered rating system to be used while a voluntary global standard is in formal development.

■ **Enhance Capacity of National and Regional Cookstove Testing Centers** – The success of the Lima Consensus is contingent upon the existence of sufficient in-country technical expertise and local infrastructure to test clean cookstoves and fuels. The sector should promote the creation of a global network of testing and knowledge centers with comparable testing equipment and qualified staff in order to strengthen national, regional, and local testing capacity. End-consumers should also have access to these testing centers so their preferences can be incorporated into the design and testing process.

■ **Develop Consensus Testing Protocols** – Consensus protocols for performance testing should be revisited and appropriate changes made to allow for comparability of test results and assessment of products in a common rating system. In addition, these testing protocols must demonstrate the correlation between laboratory and field testing, and provide assurances to manufacturers and project implementers regarding the rigor of the clean cookstoves standards process.

## Champion the Sector to Build Awareness

While the issue of smoke from open fires and rudimentary cookstoves has been around for thousands of years, awareness of the tremendous health, environmental, gender, and economic impacts has been relatively low among the general public, policy makers, and other key stakeholders. Therefore, greater awareness of the issue overall is key to developing a robust foundation on which to build the enabling framework to address and arrest a silent killer.

Awareness of the benefits from the use of clean cookstoves and fuels has also been very low, making outreach to the general public and policymakers alike a high priority for the sector. While lessons learned from other high-profile issue campaigns such as malaria, polio, and climate change are certainly useful, cookstoves are too different to make direct comparisons and by definition need different tactics and strategies for raising awareness. The sector needs major investment in developing marketing/sales strategies for clean cookstoves and fuels.

— ILLUSTRATIVE INTERVENTIONS —

■ **Leverage International Partnerships and Campaigns** – Because the issue of cookstove smoke cuts across so many sectors – health, environment, energy access, etc. – the sector would benefit from partnerships with a variety of high-profile campaigns currently being developed. These campaigns include the United Nations 2012 International Year of Sustainable Energy for All, the United Nations Millennium Development Goals, and the international focus on non-communicable diseases. Efforts should be made to develop complementary messaging, outreach to reporters, op-eds and other activities that could ratchet up awareness of the issue of household air pollution and clean cookstoves and fuels.

■ **Cultivate Appropriate Issue Champions** – While the Alliance has been fortunate to secure relationships with two high-profile issue champions for its work, the sector overall suffers from a lack of champions for the issue. The sector should reach out to issue experts, international diplomats, culturally appropriate celebrity spokespeople, and other individuals willing to champion the sector and the issue more broadly.

■ **Develop International Marketing Collateral** – High-quality, country-specific, and culturally-appropriate collateral materials are key to effective outreach and awareness building. It is especially important to use these materials to target key influencers, the media, and policy-makers who can help advance the sector's goal of universal access to clean cookstoves and fuels.

## Further Document the Evidence Base

While there is new and compelling research to document the significant health, environmental, gender, and economic benefits of clean cookstoves and fuels, important gaps remain in the evidence base for these outcomes. In order to remedy this, the sector needs funding for critical, targeted, catalytic research to help identify the best policies and programs to undertake in developing countries. For most nations, fairly reliable information exists on the size of the population lacking access to clean fuels. However, much more information is required to identify the types of clean cookstoves and fuels that are currently being used, their availability in the market place, their acceptance by the end-users, and the specific impacts on the lives of women and girls who are using them.

Furthermore, in contrast to other health and environmental interventions such as bed nets, vaccines, and clean water, few cost-benefit analyses exist that test the value proposition of clean cookstove use. This is very important because clean cookstove interventions have many co-benefits – health, environment, gender, and economic – and when the multiple benefits of cookstoves are aggregated, an extremely strong case for their use as an integrated global intervention is expected to emerge. As the evidence of cookstove impacts is better documented, research comparing cookstoves to other public health and environmental interventions should be undertaken. The following sections suggest illustrative priority activities for health, climate, and gender research.

**"A series of robust analyses of costs and benefits of different cookstove types on climate, health and social metrics is required."**

— CLIMATE RESEARCH WORKING GROUP

### *Health Research and Public Health*

In order to validate health claims from clean cookstoves and fuels, the sector must also be able to demonstrate that the levels of exposure reduction delivered by clean cookstove and fuel interventions will sufficiently result in declines in related illnesses and deaths. Put more simply, the sector needs to answer the question "how clean is clean enough?" to affect substantial reductions in childhood pneumonia, adverse pregnancy outcomes, and other illnesses.

Improvements in human health achieved through the adoption of clean cookstoves are one of the primary motivations for governments, non-profits, and funders seeking to address the issue of cookstove smoke. The link between exposure to cookstove smoke and a wide range of health problems such as pneumonia, chronic obstructive pulmonary disease, and lung cancer is well established, while linkages of other side effects such as cataracts and low birth-weight are newer but also quite convincing. There are however, important gaps and weaknesses in the evidence for some very important health outcomes, including those that affect child survival and development, and common and serious conditions such as tuberculosis, heart disease,

and other cancers. There is only tentative knowledge about the levels of exposure reduction needed to ensure significant health benefits. Furthermore, almost all of this evidence is based on observational studies that compare groups using traditional cookstoves with those using cleaner fuels, with very little being directly obtained from much more powerful studies that directly measure the effects of interventions. These limitations need to be addressed to guide intervention strategies, benchmark standards, and to make the most compelling case for large-scale investment in this area, particularly by the health sector.

There is also a need to convene the international health community, which has not fully engaged on the issue of exposure to smoke and burns from cooking. It is critical that research institutions, national governments and ministries, bilateral and philanthropic donors, women's groups, aid groups, and other key stakeholders work closely together to assess research needs, design appropriate interventions, and monitor and evaluate programmatic impacts. A committed global public health community could serve as a catalyst for adoption and use of clean and safe cookstoves linked to monitoring of health impacts.

**"The time has come to raise public and professional awareness about the lives damaged and lost from exposure to toxic smoke."**

— HEALTH WORKING GROUP

— ILLUSTRATIVE INTERVENTIONS —

■ **Conduct Short- to Medium-Term Health Research (<10 years)** – Studies, including Randomized Control Trials, should be initiated to examine the maternal, neonatal, and child health risks associated with cookstove smoke exposure and the impact of clean cooking interventions. These studies should include thorough exposure assessments to allow description of 'exposure-response' relationships that will help answer the 'how clean' question. With strategic funding, the sector could make significant advances in its understanding of the impact of clean cookstoves and fuels on critical outcomes such as restricted fetal growth, pre-term birth, and neonatal illness and mortality, within two to three years. Well-targeted research is also needed to define the impact of interventions on an increasingly broad set of illnesses. This research can help make a broader case for funding and implementing clean cookstove and fuel interventions and could include: short-term outcomes such as reduced burns, changes in blood pressure, acute cardiovascular disease events and infectious eye diseases, as well as early changes in the development of other chronic diseases.

■ **Invest in Long-term Research/Cohort Studies (>10 years)** – There is also a strong case for starting long-term research studies that assess the impacts of cleaner cookstoves and fuels on health in later childhood and in adults, especially the impact of reducing exposures during pregnancy and early childhood. While some new studies will be required, including extensions to trials and other short-term activities, there are also opportunities to add a cookstove smoke component to existing long-term research programs.

■ **Integrate Clean Cookstove Implementation with Other Public Health Programs** – As noted earlier in this report, there is a relatively low level of awareness of this global health threat among the public health and development communities. Increased awareness and implementation of clean cookstove initiatives can be strengthened by integration with other public health programs such as clean water, immunizations, prenatal services, HIV/AIDS prevention, etc.

## *Climate Research*

Large-scale adoption of clean cookstoves can mitigate climate change by reducing carbon dioxide emissions from non-sustainable harvesting of biomass, and by lowering emissions from short-lived greenhouses gases and aerosols such as methane, carbon monoxide, and black carbon. However, particularly for the short-lived climate forcing agents, the sector needs a better understanding and quantification of the net climate impact of cookstove emissions because current knowledge of the climate-cookstove relationship remains inadequate. In addition to understanding the impact

of these emissions, the sector needs to identify and target regions where the climate benefits from cookstoves will be greatest, such as in those areas with close proximity to glaciers where the emissions of black carbon may have the greatest warming effect.

— ILLUSTRATIVE INTERVENTIONS —

■ **Conduct Cookstove Field-Tests** – Field tests of clean cookstoves to date have been largely independent of one another, thereby reducing the potential for useful comparisons, appreciation of lessons learned, and identification of major research gaps. A comprehensive inventory should be undertaken of all field tests completed to date, and a comprehensive field testing program then implemented to clearly quantify the climate (and other) benefits of different cookstove-fuel combinations in field settings.

■ **Revise the Methodology for Estimating Carbon Offsets** – Researchers recognize that current methodologies for estimating carbon offsets from clean cookstove projects do not accurately reflect reductions of greenhouse gas emissions and lack scientific rigor. These methodologies could be substantially improved with a minor effort to provide more robust estimates by, for example, incorporating recently developed methods for monitoring actual cookstove use, estimating emission factors based on field measurements for all gases and aerosols, and incorporating other factors that will enhance the accuracy of emissions tracking.

■ **Undertake Global Mapping of Emission Factors and Wood Fuel Use** – Major gaps remain in the sector's understanding of the impact that fuel collection for cooking has on deforestation. In particular, the sector lacks sufficient research data on the specific areas where collection of firewood is causing deforestation, soil erosion, and other natural resource impacts, and therefore where clean cookstoves could provide the greatest environmental benefits. Additionally, global mapping of non-sustainable fuel collection would be especially useful in identifying the areas of greatest impact, and would allow donors and policy-makers to target their clean cookstoves and fuels adoption efforts.

### *Gender and Women's Empowerment Research*

Though the link between women's entrepreneurship, economic growth, and empowerment in general is well established, there is currently a lack of strong data on the impacts of clean cooking solutions on women's empowerment. More research is needed to understand the factors that influence clean cookstove adoption and use by women, including design and socio-cultural factors, as well as how time saved from use of clean cookstoves is spent. New empirical research and the development of case studies are essential to strengthen the case for clean cookstoves as an effective intervention. Current and future project implementers will benefit from the development of best practices related to gender and women's empowerment, including those that utilize effective empowerment tools, such as capacity building and training.

— ILLUSTRATIVE INTERVENTIONS —

■ **Conduct Gender Analysis of Business Models** – Researchers should review key components of various business models to evaluate economic implications for women in the value chain, as well as the social benefits and barriers for women related to different production modes.

■ **Conduct In-Depth Studies of Gender Impacts** – There are clear gaps in the availability of data around women and cookstoves, such as fuel collection time, time savings, and entrepreneurial opportunities for women in cookstoves businesses. Additional research must be conducted regarding the regional contexts for and social practices associated with cooking, linkages between gender-based violence and fuel collection, time savings and opportunity costs, etc.

■ **Assess the Ripple Benefits of Clean Cookstove Use** – Researchers should carry out an assessment of the collateral or ripple benefits from use of clean cookstoves and fuels, including increased education levels for adolescent girls, better nutrition for families, greater access to health care, and enhanced independence and decision-making authority for women. Better research on the benefits of empowering women through their inclusion in cookstove businesses would also be informative for policy-makers and donors.

## Engage National and Local Stakeholders

International engagement around a common strategy for fostering the adoption of clean cookstoves and fuels is essential, but equally important are efforts to mobilize engagement at the national and local level. Often the main barrier to a strong national dialogue on clean cookstoves and fuels is the lack of leadership or effective champions among the range of players in a particular country.

Country-specific efforts have been the most effective when a cross-section of ministries, private sector partners, academics, and non-governmental stakeholders have coalesced around a common strategy or campaign with the resources to sustain the advocacy, outreach, and implementation efforts. This has been borne out in the last few years where several governments, including Peru and Indonesia, launched national cookstove initiatives. These countries made clean cookstoves a national priority. More specifically, they are encouraging cookstove adoption through a wide variety of mechanisms, including:

- Integrating cookstove and fuel programs into broader government policies and activities on health care, education, environment, and energy;
- Launching government and non-profit awareness raising and education campaigns;
- Instituting support for better cookstove design, standards and testing, and capacity building along the value chain; and
- Providing clean cookstoves to vulnerable populations such as pregnant women and refugee populations.

The sector needs to build on these initiatives by replicating lessons learned, helping successful programs reach scale, and ensuring their inclusion as a national priority.

— ILLUSTRATIVE INTERVENTIONS —

■ **Form National Alliances** – The development of national committees or alliances structured around a common clean cooking objective is an excellent way to mobilize government and non-governmental national stakeholders to ensure that resources are being marshalled effectively and that partners are working collaboratively to help create the enabling environment for thriving local cookstoves markets.

■ **Set National Strategies to Advance Clean Cooking Solutions** – Agreement on specific activities – such as national cookstove surveys or assessments of cooking practices, changes to trade policies, investments in cookstove testing facilities, education of consumers, and capacity building along the entire clean cookstove value chain – would allow for the most efficient use of scarce resources and foster donor engagement around a common platform for action.

■ **Employ Trade Instruments to Advance Adoption** – Revamping outdated or ill-advised trade measures, such as taxes and tariffs on the importation of clean cookstoves to protect domestic cookstove industries, can foster trade in cleaner and more efficient cookstoves and fuels. A survey of trade barriers and policy measures would help national governments and major stakeholders identify which policy levers are most critical to address in advancing the clean cookstoves and fuels sector.

## Develop Credible Monitoring and Evaluation Systems

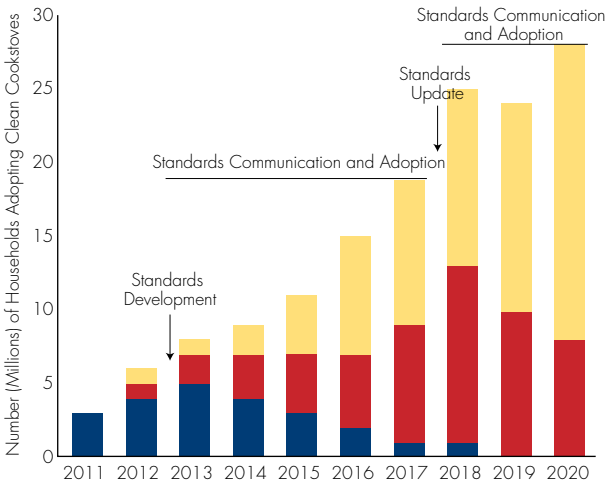
Careful monitoring and evaluation of clean cookstove adoption programs will be critical for observing progress and measuring the impact of the sector's work. Clearly understood and transparent indicators must be developed that can cost-effectively measure results from the most basic project parameters like cookstove sales, adoption rates, household air pollution, fuel collection time, and fuel and cost savings, to broader objectives regarding saving lives, empowering women, improving livelihoods, and combating climate change. These efforts must be applicable to all geographies and target markets as well as to the majority of cookstove distribution efforts.

— ILLUSTRATIVE INTERVENTIONS —

■ **Employ Project-Based Monitoring** – Institute a program of project-based monitoring that requires primary implementing organizations above a predetermined size to report the results of their clean cookstoves and fuels projects to a central database run by a global institution.

■ **Utilize National Survey-Based Monitoring** – Use national surveys conducted by governments and other organizations to assess cookstove adoption rates. This monitoring system could also allow the Alliance to track the yearly progress of national implementing partners.

■ **Replicate Best Practices from Other Organizations** – The sector should review monitoring and evaluation procedures from other organizations. Considerable work regarding best practices for global health initiatives has been conducted by organizations such as the Gates Foundation and others. Review of their approaches for insights and techniques that could be used in the clean cookstoves sector would be very useful and could lead to improved methods for tracking results.




The clean cookstoves market will continue to evolve as better solutions emerge and standards for emissions, efficiency, and safety are developed and adopted, so that optimal health, climate, gender, and economic benefits can be attained in the near future.

# Conclusion

Rarely does the global community have the opportunity to address a problem where the societal benefits from concerted action are so far-reaching. Yet, such is the opportunity in addressing one of the least known but most insidious health risks faced every day by three billion people in the developing world – exposure to toxic smoke from the use of inefficient cookstoves and open fires. While much of the world is rushing forward with technological breakthroughs in the communications, transportation, and information sectors, cooking practices for nearly half the planet remain untouched by the industrial revolution that has transformed this sector for the developed world over the past two centuries. As a result, hundreds of millions of women risk their and their children's lives carrying out one of life's most basic daily tasks – cooking for their families.

Fortunately, we have the means to address this global challenge with the right mix of resources, education, advocacy, and business acumen. In fact, thanks in part to the efforts of some dedicated stakeholders, the sector has the makings of a "perfect storm" for success: better cookstove and monitoring technologies to drive emission and efficiency gains; growing national-level commitments to clean cooking; innovative business models and financing schemes that are starting to bring clean cookstoves and fuels to those who need them most; and, perhaps most importantly, the growing global sentiment that it is no longer acceptable for the mere act of cooking a meal to put the lives of three billion people at risk.

*Igniting Change* lays out a vision and roadmap for engagement in this field. It is long past time to develop an effective blueprint for action, and by addressing the key areas of demand, supply, and the enabling environment, the sector can achieve rapid progress and measureable success. The Alliance has outlined its own role in this initiative in its forthcoming business plan and invites you to join us in working to promote universal adoption of clean cookstoves and fuels because...*cooking shouldn't kill!*

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*On the cover:* **Marsabit/Kenya** – A two day drive from Nairobi, Kenya, Marsabit lies at the southeastern edge of the Chalbi Desert. Plagued by the ongoing drought raging across the arid lands throughout the Horn of Africa, a lack of water and firewood makes life difficult for Kenya's nomadic tribes who have made the desert their home for generations. This young Rendille woman wakes each day to face the daily hazards in collecting scraps of wood from an already heavily deforested landscape to fuel her fires for cooking and for heat. *(2010 © Rodney Rascona/The Paradigm Project)*

GLOBAL ALLIANCE FOR
CLEAN COOKSTOVES

1800 MASSACHUSETTS AVENUE NW | SUITE 400 | WASHINGTON, DC 20036 | +1-202-887-9040

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