

Household Energy Access for Cooking & Heating

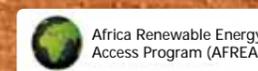
Lessons Learned and the Way Forward

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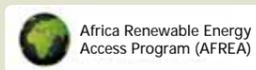




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EXECUTIVE SUMMARY

Half of humanity—about 3 billion people—are still relying on solid fuels for cooking and heating. Of that, about 2.5 billion people depend on traditional biomass fuels (wood, charcoal, agricultural waste, and animal dung), while about 400 million people use coal as their primary cooking and heating fuel (UNDP and WHO 2009). The majority of the population relying on solid fuels lives in Sub-Saharan Africa and in South Asia. In some countries in Central America and in East Asia and the Pacific, the use of solid fuels is also significant. The inefficient and unsustainable production and use of these fuels result in a significant public health hazard, as well as negative environmental impacts that keep people in poverty.



Strategies to improve energy access to the poor have focused mainly on electricity access. They have often neglected non-electricity household energy access. It is, however, estimated that about 2.8 billion of people will still depend on fuelwood for cooking and heating in 2030 in a business-as-usual modus operandi (IEA 2010). The need for urgent interventions at the household level to provide alternative energy services to help improve livelihoods is becoming more and more accepted.



The failure of past large-scale fuelwood plantations and improved stoves programs has generally created pessimism in the development community about the relevance and effectiveness of interventions on household energy access. Altogether, this has affected the level of policy attention considerably and consequently the allocated resources for interventions. This situation is gradually changing. There is a growing global mobilization around household energy access issues. An important milestone is the recent launching of a public-private Global Alliance on Clean Cookstoves led by the United Nations Foundation to help 100 million households adopt clean and efficient stoves and fuels by 2020 (United Nations Foundation 2010). A primary driver of this mobilization is the realization that considerable health benefits in line with the Millennium Development Goals can be gained by improving indoor air pollution (IAP) with the use of efficient cookstoves and clean fuels (AGECC 2010). Discussion of household energy access in the climate change community is also helping keep up attention on the issues.

This report's main objective is to conduct a review of the World Bank's financed operations and selected interventions by other institutions on household energy access in an attempt to examine success and failure factors to inform the new generation of upcoming interventions. First, the report provides a brief literature review to lay out the multidimensional challenge of an overwhelming reliance on solid fuels for cooking and heating. Second, it highlights how the Bank and selected governments and organizations have been dealing with this challenge. Third, it presents lessons learned to inform upcoming interventions. And finally, it indicates an outlook on the way forward.

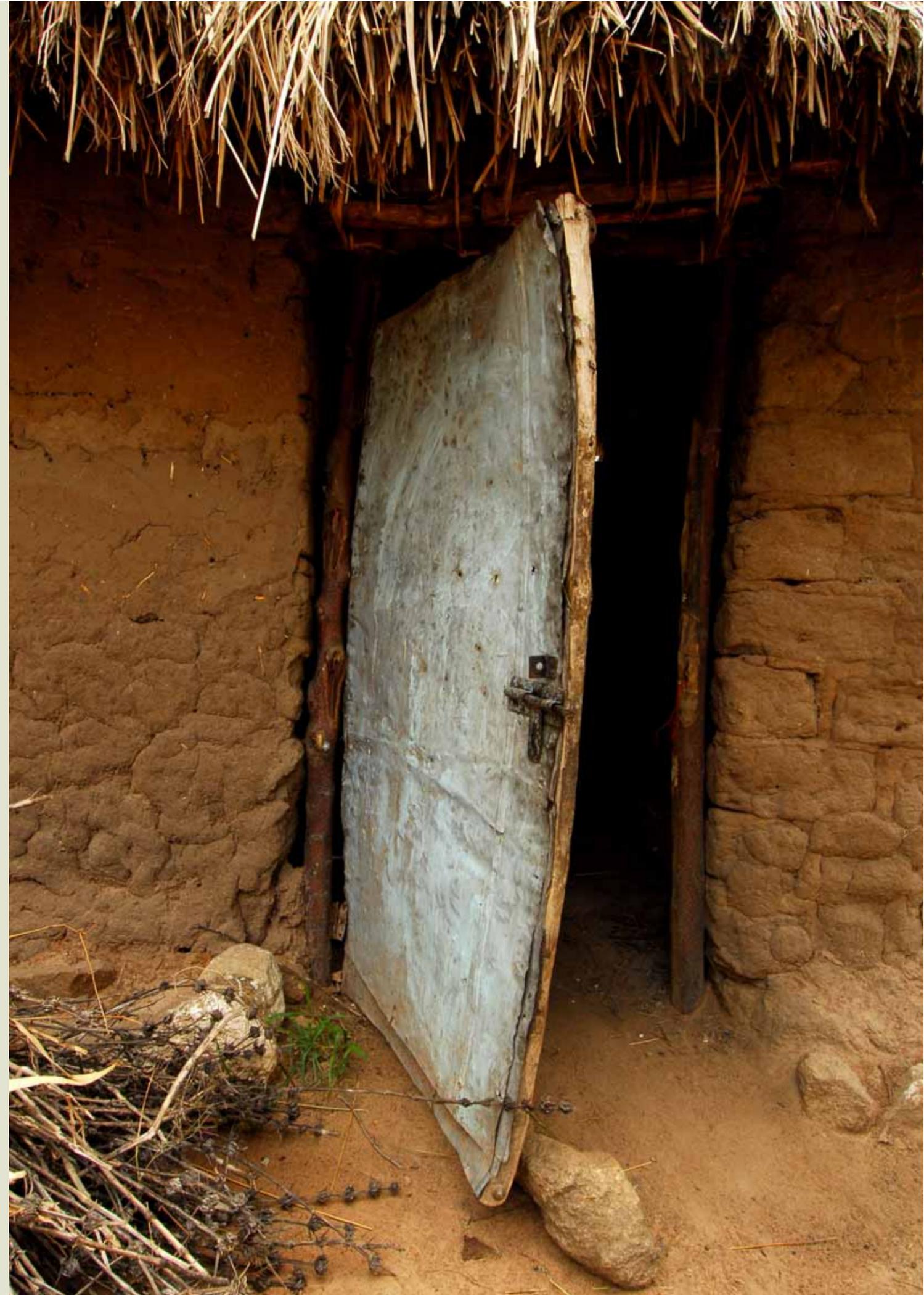
A MULTIDIMENSIONAL CHALLENGE

It is well documented that exposure to IAP from the inefficient combustion of solid fuels with low-quality stoves in poorly ventilated kitchens is a significant public health hazard. The World Health Organization (WHO) estimates that 1.9 million people die prematurely every year from exposure to smoke from traditional cookstoves and open fires; that is nearly 1 death every 16 seconds. Women and children in developing countries are particularly affected by the negative health outcomes of IAP from the use of solid fuels. Women and children in these countries are exposed daily to pollution in the form of small particulates that exceed World Health Organization and U.S. EPA recommended limits by 10 to 50 times (von Schirnding and others 2002; WHO 2006).

Although there are many studies on solid fuels, IAP and their health outcomes, research gaps remain that need to be filled to inform the design and monitoring of interventions better. At the same time that strong evidence exists that links IAP to childhood pneumonia, chronic obstructive pulmonary disease, and lung cancer (from coal) in adults, the evidence is weak on how inhaling wood smoke is associated with tuberculosis, low birth weight, and cataracts. What we do not know is the exposure-response relationship between IAP and different negative health outcomes. In other words, we do not know what different dose levels of IAP cause different negative health outcomes. Evidence on the exposure-response relationship is important in order to ensure to what level exposure should be reduced to start gaining positive health outcomes. Three main areas of further research are generally acknowledged: (a) the need for better exposure assessment to make more direct measurement of exposure-response relationships; (b) the need to handle confounding better by using more adequate statistical methodology to control the effects of confounders, such as poverty, malnutrition, and housing environment; and (c) the importance of intervention studies to complete findings of observational studies (von Schirnding and others 2002; Ezzati and Kammen 2002; and Jaakkola and Jaakkola 2006).

It is now widely accepted that the clearing of land for arable and pastoral agriculture is the main cause of deforestation rather than the use of wood for energy, as was believed in the past. Surrounding growing urban areas in some Sub-Saharan African countries and Haiti are some exceptions. In these settings, inefficient use of fuelwood is putting tremendous pressure on forest resources (World Bank 2009; ESMAP 2007b).

The reliance on fuelwood for cooking and heating is increasingly being associated with climate change. There are claims that reducing black carbon emitted from the burning of open biomass with the use of improved stoves may provide quick gains to help slow down global warming (Ramanathan and Carmichael 2008; Gustafsson 2009). Recent research indicates that while black carbon emissions from diesel is clearly shown to have a warming effect on the climate, black carbon emissions from burning biomass in inefficient cookstoves, because of their organic nature and small-size particles, may be interacting with other aerosols in the atmosphere to produce a net cooling effect on the climate (Bauer and others 2010). It appears that current science points to uncertainties around the potential climate change impact of black carbon emissions from biomass combustion.





MEETING THE CHALLENGE

During the last 25 years, household energy access issues have retained the attention of many specialists within the Bank from different sectors, such as energy, forestry, environment, health, agriculture and rural development, gender, and climate change. The Energy Sector Management Assistance Program (ESMAP), jointly set up by the World Bank and the United Nations Development Programme (UNDP) in 1983, has played and is still playing a leading role in funding work undertaken by specialists from these different sectors. In the specific case of Sub-Saharan Africa, the Regional Program for the Traditional Energy Sector (RPTES) supported analytical work and upstream studies between 1993 and 2003. Since 2009, work on household energy in the Africa region is supported by the Biomass Energy Initiative for Africa. Work on household energy is also done within the East Asia and Pacific energy team and also by the Asia Sustainable and Alternative Energy Program (ASTAE). Moreover, the Bank Climate Change Team is gradually including household energy access in its activities.



A total of 31 projects covering the period 1989-2010 were reviewed. Nineteen of these were selected as having the objective of improving household cooking and heating energy access through fuelwood management or improved stoves. The total cost of these projects was US\$1.2 billion, to which the World Bank contributed US\$698 million and of which US\$161 million was devoted specifically to household fuels. These projects focused on community-based forest management to improve sustainable supply of fuelwood, substitution of polluting fuels with cleaner fuels, and institutional capacity development in the household energy subsector. With the exception of the Mongolia Urban Stove Improvement Project financed by the Global Environment Fund (GEF), the remaining projects are covering Sub-Saharan African countries.

During the period of the review, the Bank funded four biogas projects for cooking and lighting at the household level in China and Nepal. The total cost of these projects was US\$1 billion to which the Bank has contributed US\$365 million with 70 percent allocated to household energy access components. Similarly, the Bank has financed eight natural gas projects

for cooking and heating, mostly in Europe and Central Asian countries, and one project in Colombia. The total cost for these projects is US\$203 million to which the Bank has contributed US\$126 million.

A review of the Implementation Completion Reports (ICRs) of five closed projects indicated that they had performed satisfactorily. Their sustainability was also rated likely and even highly likely in the case of the Senegal Sustainable and Participatory Energy Management Project.

A review of the last and current ratings of the Implementation Supervision Reports' progress suggests that while some of the projects seem to be showing a satisfactory performance, there are also projects in the portfolio that are having implementation difficulties. A further probe in assessing the reported problems on the projects rated moderately unsatisfactory or moderately satisfactory suggests that delay in physical implementation of activities is an important factor affecting their performance. This may be caused by the participatory and multidisciplinary nature of these activities, which require a broad consensus between many stakeholders-an exercise that requires a lot of time.

LESSONS LEARNED

Reviewing the experience of household energy projects and their success and failure factors revealed the following important lessons: (a) a holistic approach to household energy issues is necessary; (b) public awareness campaigns are prerequisites for successful interventions; (b) local participation is fundamental; (d) consumer fuel subsidies are not a good way of helping the poor; (e) both market-based and public support are relevant in the commercialization of improved stoves; (f) the needs and preferences of stove users should be given priority; (g) durability of improved stoves is important for their successful dissemination; and (h) with microfinance the poor can gradually afford an improved stove.



1. A holistic approach to household energy issues is necessary.

Successful programs are designed with a holistic approach on how household energy access can contribute to a global agenda of social transformation and poverty reduction. With this perspective, the programs are design to cover: (a) supply-side interventions ensuring that the fuelwood supply is sustainable; (b) demand-side and interfuel substitution with the introduction and dissemination of improved stoves and alternative household fuels, such as kerosene and liquefied petroleum gas (LPG); and (c) the capacity to develop and strengthen institutions to create the regulatory incentives for the sustainable production of fuelwood and for the facilitation of fuel switching.

2. Public awareness campaigns are prerequisites for successful interventions.

Successful programs have paid particular attention to public awareness, education, and information campaigns. Households need to be sensitized to the risks they incur by cooking with inefficient stoves. Programs that have assumed that households would adopt spontaneously improved stoves or participate in forest management initiatives have failed. Households need to perceive and to be convinced about the direct and indirect benefits associated with these interventions.

3. Local participation is fundamental.

Experience indicates that the active participation of communities, governments, nongovernmental organizations (NGOs), and the private sector is fundamental for household energy access projects to be successful and sustainable. For example, local communities need to be involved at an early stage to ensure that they own supply-side forest management initiatives. They should understand why they should be the ones protecting the forests in their communities. A clear rule of engagement should be discussed for communities to know their rights and responsibilities, the prerogatives of the national forest service, the role of NGOs and local associations.

4. Consumer fuel subsidies are not a good way of helping the poor.

Experience has shown that across the board consumer fuel subsidies are not a good way of helping the poor. Affluent households tend to benefit the most from prevailing fuel subsidies, given that in most cases, energy consumption increases in parallel with income. For governments, these subsidies result in heavy fiscal deficits diverting direct public expenditures away from productive and social sectors. Alternative options are usually designed in the form of social protection programs. The challenge remains in successfully implementing these options to effectively reach the poor.



5. Both market-based and public support are relevant in the commercialization of improved stoves.

A market-based approach in the commercialization of improved stoves is often viewed as the best way to ensure sustainability of programs. This is based on the evidence that subsidized programs do not continue when donor or public funding dries out. Evidence indicates, however, that a certain level of public funding is necessary at the initial program stages for improved stoves programs to take off. This is particularly true in settings where the business environment is not well developed. Funding is usually needed to support research and development (R&D), marketing, quality control, training related to stove design and maintenance, and monitoring and evaluation. Work on developing stoves standards and certification protocols rely on the availability of public funding. Without this initial support, small enterprises find it difficult to participate in improved stoves programs, and scaling up is unrealistic. A challenge is to determine what level of public funding is adequate and the timing to transition to a fully market-based business model.

6. The needs and preferences of improved stove users should be given priority.

Successful programs pay attention to the needs and preferences of the users of improved stoves. Targeting households susceptible to buying and using these improved stoves and working with them to supply a suitable stove that responds to their needs is critical. At first, this target group is usually not the poorest of the poor. By first focusing on households that can afford to adopt an improved stove, the program can subsequently capitalize on the benefits of the demonstration effects

produced. Successful, improved stoves programs are also designed bearing in mind the preferences of the users. Experience has shown that when these factors are ignored, stove dissemination rates are low, and programs are not sustainable.

7. Durability of improved stoves is important for their successful dissemination.

For households that can afford an improved stove, the decision to adopt one or not includes their perception of durability of the stoves. The durability depends on the quality of the materials used in the production of the stove, the resistance of the stove in the climatic context where it is used, how it used, and the maintenance that is needed. It is important to account for durability issues in the design and construction of improved stoves, in addition to technical considerations, such as heat transfer efficiency and combustion efficiency.

8. With microfinance, the poor can gradually afford an improved stove.

Availability of improved stoves and cleaner fuels is one thing, whereas their affordability is another one. Programs that have included microfinance options to help households afford the stoves tend to be more successful. The poor need to have a time horizon to gradually pay for the improved stoves. For example, in Bangladesh, Grameen Shakti has been working with international donors to provide cookstoves as part of its microfinance activities. This dimension is very important. Having an improved stove is not perceived as a first priority by the poor, but by integrating the adoption of an improved stove in a broader program, creating opportunities to generate income is a different proposition.

THE WAY FORWARD

The recent momentum aimed at providing clean cookstoves and fuels to the poor is a unique opportunity that should be firmly seized for action. The World Bank is well positioned with knowledge, expertise, and the potential for funding leverage to play an important role in helping governments design effective and sustainable programs to provide poor households with clean energy solutions. However, this calls for strategic choices on what the Bank itself can do, and what it can do through partnerships.

WHAT CAN THE WORLD BANK DO?

The Bank can support the household energy access agenda by doing the following:

1. Help broaden the scope of energy sector reform to include household energy access issues.

The Bank is uniquely placed to help broaden the scope of energy sector reform to include household energy access issues. Through its energy dialogue with countries, the priorities are focused on power sector reform, regional power trade, and electricity access expansion. Household energy access issues should be raised to a level where they are viewed as commensurate with the importance they represent in the energy balance of countries and the potential impact they can have on poverty reduction. With a global trend of rapid urbanization in developing countries in the coming years, issues dealing with pricing of household fuels will have increasing fiscal and macroeconomic significance. Raising awareness at the highest levels of policy formulation and decision making is important to generating political commitment for action.

2. Produce strategic upstream analytical work to inform dialogue and to support technical assistance and lending operations.

Pertinent, timely, and convincing upstream analytical work on household energy access is necessary to strengthen the quality of the dialogue with the countries. Past authoritative analytical work done by the Bank and the scope of its lending operations are solid foundations to build on. In many countries, the upstream studies done by the Bank in the 1980s and 1990s are still the only detailed available ones to date. There is clearly a need to update these studies.

3. Strategically mainstream household energy access interventions in lending operations.

Mainstreaming will require strategic internal institutional and funding arrangements capable of mobilizing and using the available high-quality, in-house multidisciplinary expertise. As it stands, the absence of mainstreaming of household energy access interventions in lending operations may be a result of the following factors: (a) these projects require detailed upstream studies that are time consuming, which can delay project preparation; (b) the interplay of many disciplines in dealing with household energy access issues makes it difficult for teams to deal with them in the context of limited project preparation budget; (c) the number of staff equipped to prepare household energy access projects is low, and this expertise is scattered throughout the institution; (d) transaction costs in preparing a household energy access project are high compared to the volume of lending they can leverage; and (e) the demand for interventions on household energy access from countries is low, probably also to the result of an absence of awareness of the issues at stake on the part of the majority of the affected populations and of many governments.

WHAT CAN BE DONE THROUGH PARTNERSHIPS?

To address the multidimensional challenge of improving household energy access to the poor, both internal and external partnerships are needed.

1. Internal partnerships

At the moment, work on household energy access is being done by teams in the energy, health, forestry, gender, rural development, and climate change sectors. Some of these teams are with anchor departments and others are within operational units across Regions. Collaboration between these teams can be improved. Formal partnerships between these teams will help leverage the Bank's expertise and funding. Opportunities for collaboration with IFC teams should also be explored to help countries address this important challenge.

2. External partnerships

There are many organizations well grounded with tremendous experience in household energy access interventions that the Bank could partner with in innovative ways. The review of household energy access projects reveals that grassroots efforts are needed to raise the awareness of populations to adopt alternative ways of harvesting their forests and using improved stoves and fuels. These behavioral changes require a lot of time and operational resources that are close to targeted communities. Civil society organizations, including NGOs and community-based associations, and the private sector are better equipped to deliver on this work.

Another way the Bank can leverage partnerships is to help facilitate the use of funding mechanisms on climate change with windows that will allow funding to be directed at technical assistance or operational work on household energy access-related issues. A number of climate change mechanisms are available, but they are either not well known by beneficiary countries or are difficult to access. In working with other multilateral and bilateral organizations and governments, the Bank can play a pivotal role in making this funding accessible.

Going forward, it appears that partnerships have an important role in scaling up household energy access interventions. However, selectivity should be exercised in the choice of partners, and tools should be developed to measure performance and impact.