



Scaling Up Clean Cooking Solutions

The Context, Status, Barriers and Key Drivers

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Preface

The Group of 20 (G20) nations increasingly recognize the importance of green growth, and many countries are demonstrating strong leadership through effective and progressive policies. However, governments do not act alone—the private sector is an important partner, providing new technologies, business models and investment opportunities across a variety of sectors to help scale up transformation. In 2012 the G20 Development Working Group commissioned the International Finance Corporation, as the largest development finance institution dedicated to private sector development with a strong emphasis on sustainability, to take stock of mechanisms to mobilize private capital, including from institutional investors, for inclusive green growth investments in developing countries. This work is intended to inform the creation of a public-private G20 Dialogue Platform on Inclusive Green Investment.

As part of this effort IFC commissioned a series of supporting documents and materials, including this publication, specifically created as underpinning material to inform the final synthesis report produced by IFC for consideration

at the G20 meeting in St. Petersburg in 2013. These publications can all be found at www.ifc.org/Report-MobilizingGreenInvestment.

The nexus of improved energy access, direct health benefits and reduced indoor air pollution can be achieved in part through expanding access to clean cookstoves and fuels. This is of particular significance to approximately three billion people, mainly in South Asia and Sub-Saharan Africa, who still rely on solid fuels (traditional biomass and coal) for cooking and heating.

Large-scale adoption and sustained use of clean cookstoves is not materializing due to a variety of context specific barriers both on the consumer and producer/distributor sides. While financing in terms of a lack of investment and working capital appear to be constraints for producers, lack of information, awareness, and cultural barriers dominate for consumers and should not be underestimated.

Addressing these challenges requires a multi-pronged approach across four key drivers that have been identified through reviewing successful programs: awareness raising; markets and preferences; technologies and standards; and innovative financing.

The Context

Interventions to improve energy access to the poor have focused mainly on electricity access and have often neglected non-electricity household energy access. While 1.3 billion people lack access to electricity, more than double that number—about 3 billion people, mainly in South Asia and Sub-Saharan Africa—are still relying on solid fuels for cooking and heating (UNDP and WHO 2009; IEA 2012). Solid fuels in the form of traditional biomass (wood, charcoal, crop residues, and animal dung) are used by about 2.6 billion people, while solid fuels in the form of coal are used by about 0.5 billion people, mainly in China and to a lesser extent in India and South Africa. In a business-as-usual scenario, it is estimated that about 2.5 billion of people will still depend on traditional biomass for cooking and heating in 2030 (IEA 2012). The projections indicate that the developing countries in Asia will make progress in providing clean cooking solutions to people, but the situation will worsen in Sub-Saharan Africa, where the number of people without clean cooking facilities will increase by about 20 percent.

There is a new and growing global mobilization about household energy access issues. This is driven by the realization that considerable health benefits can be gained by improving indoor air pollution with the use of clean cookstoves and fuels. An important milestone of this mobilization is the launch of a public-private initiative, the Global Alliance on Clean Cookstoves (GACC) led by the United Nations Foundation to help 100 million households

adopt clean and efficient stoves and fuels by 2020 (United Nations Foundation 2010). The recognition by the UN Sustainable Energy for All Initiative that providing efficient cookstoves and clean fuels to poor households should be part of the broader objective of energy access for all by 2030 (United Nations 2012) created another impetus.

It is well documented that exposure to indoor air pollution (IAP) from the inefficient combustion of solid fuels in low-quality stoves is a significant public health hazard (Smith and others 2009; Venkataraman and others 2010). Recent data indicate that about four million people die prematurely every year from illness attributable to IAP from household solid fuel use (Lim and others 2012). Health-damaging IAP exposures can be reduced by more than 90 percent in comparison to solid fuels (Smith, Rogers, and Cowlin 2005; MacCarty and others 2010).

With the rapid urbanization in many countries in Sub-Saharan Africa, South Asia, and Central America, inefficient use of woodfuels and in some cases inefficient production of charcoal might be threatening forest cover in the neighboring catchment areas (Arnold and others 2003). In these countries, in addition to households, small and medium enterprises (SMEs), such as bakeries, laundries, and restaurants, rely heavily on woodfuels. Unsustainable production and use of forest resources affect wildlife habitat and watershed functions (Geist and Lambin 2001). The reliance on fuelwood for cooking and heating is increasingly drawing attention to the role in global warming of black carbon

originating from incomplete combustion of fossil fuels, particularly diesel, and other sources, including biomass. There is a growing body evidence that black carbon acting alone might

be the second most important factor affecting the rise in global temperatures after carbon dioxide (CO₂) (Ramanathan and Carmichael 2008; Gustafsson 2009; Bond and others 2013).

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Status of World Bank Group Programs, Initiatives, and Projects on Energy for Cooking

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 many specialists from these different sectors. ESMAP's focus on household energy access issues began in 1985 as many completed energy assessment reports highlighted the major challenge securing an adequate long-term supply of household fuels at affordable prices (ESMAP 1985). The 2002 ESMAP annual report pointed out that ESMAP supported analytical work on household energy in five countries—China, Guatemala, India, Mongolia, and Nicaragua—covering a range of issues, such as IAP's health impacts, barriers to commercializing of improved cookstoves, and promotion of the use of alternative cooking fuels, such as LPG, kerosene, and natural gas.

During 2005–08, ESMAP household energy access work ramped up through the introduction of the regional block grants and the energy small and medium enterprise (SME) program. ESMAP retained management of cutting-edge and knowledge dissemination activities, but devolved pre-investment activity implementation to the World Bank regional energy units by providing them with annual block grants to support activities falling within ESMAP's five redefined business lines: energy security, renewable energy, energy poverty, market efficiency, and governance. In addition,

ESMAP initiated the energy SME program funded by the United Kingdom, which launched cross-cutting thematic activities, including improved cookstoves in Haiti, small-scale, off-grid systems in Cambodia and Cameroun, and solar home systems in Bolivia (ESMAP 2007a).

The program has also strengthened its support to the Global Village Energy Partnership (GVEP) by setting up a grant program, the GAPFund, which focuses partly on the role of SMEs in improving energy access. These initiatives resulted in a stronger household energy access portfolio. ESMAP is playing a key role in the Bank's re-engagement in the clean cooking sector. Table 1 shows the current programs and initiatives on energy for cooking within the Bank, including their geographic focus, key activities, business model and impact to date.

World Bank–Funded Projects on Clean Cooking Solutions: Ekouevi and Tuntivate (2012) have reviewed a total of about 70 World Bank Group projects covering the past 20 years. They have selected 19 projects which had the objective of improving household cooking and heating energy access through fuelwood management or improved stoves. The total cost of these projects was \$1.2 billion, to which the World Bank contributed \$698 million and of which \$161 million was devoted specifically to household fuels (Table 2). These projects have focused on community-based forest management for sustainable supply of fuelwood, substitution of polluting fuels with cleaner fuels, and institutional capacity development. With

TABLE 1: World Bank Energy for Cooking Programs and Initiatives

Energy for Cooking Program & Initiative	Geographic Focus	Implementation period (years)	Activities	Partners	Business Model	Impact
Energy Sector Management Assistance Program	World	Established in 1983 Operates with five-year strategic business plans Currently implementing its 2008–2013 business plan	Analytical work to support technical assistance and lending operations Knowledge sharing	GACC Sustainable Energy for All 13 bilateral donors	Provide funding to regional teams working on clean cooking initiatives	Awareness raising within and outside the Bank Facilitation of lending operations
Africa Clean Cooking Energy Solutions	Sub-Saharan Africa (Pilot countries are Democratic Republic of Congo, Senegal, and Uganda)	2012–2014	Enterprise development Support to energy for cooking lending operations	Global Alliance for Clean Cookstoves	Enterprise-based Platform to promote clean fuels and technologies	Awareness raising in Sub-Saharan Africa Mobilization of private sector and NGOs
Clean Stove Initiative	East Asia and Pacific (Pilot countries are China, Indonesia, Mongolia, and Lao PDR)	2012–2015	Capacity building Policy development Knowledge sharing Institutional strengthening	AusAid, ASTAE, GERES, China Alliance for Clean Stoves	Result-based financing	Awareness raising in East Asia and the Pacific Mobilization of private sector operators and partner organizations
Household Biomass Cooking Review	Central America (Pilot countries are El Salvador, Guatemala, Honduras, Nicaragua)	2011–2013	Review of country and regional programs	SICA, OLADE, CEPAL, and Global Alliance for Clean Cookstoves	Knowledge forum	Regional ownership of clean cooking solutions
South Asia Household Energy	South Asia (Pilot country is Bangladesh)	2013–2018	Bangladesh (Disseminate 1 million cookstoves and 20,000 biogas units)	IDCOL, GIZ, USAID	Social mobilization, Market facilitation, Enterprise development	Awareness raising Mobilization of partner organizations

the exception of the Mongolia Urban Stove Improvement Project financed by the GEF, the remaining projects were on 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 (Table 3). The total cost of these projects was \$1 billion, to which the Bank contributed \$365 million with 70 percent allocated to household energy access components. Similarly, the Bank has financed eight household energy access projects on natural gas for cooking and heating, mostly in Europe and Central Asian countries, and one project in Colombia. The total project cost is \$203 million, to which the Bank has contributed \$126 million. The total cost of specific components on household access to natural gas is \$142 million.

It is clear from Table 2 and Table 3 that only few Bank-funded projects have been prepared to tackle the clean cooking challenge. As it stands, the absence of mainstreaming household energy access interventions in lending operations may be a result of the following factors:

- These projects require detailed upstream studies that are time-consuming, which can delay project preparation;
- 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 a limited project preparation budget;
- The number of staff equipped to prepare household energy access projects is low, and this expertise is scattered throughout the institution;

- Transaction costs in preparing a household energy access project are high compared to the volume of lending it can leverage; and
- The demand for interventions on household energy access from countries is low, probably caused by lack of awareness of the issues.

TABLE 2: World Bank-Funded Projects with Access to Fuelwood and/or Stove Component (\$ million)

Project	Year	Total project cost	IBRD, IDA, GEF, GPOBA	HH energy access component	% of total project costs	Project closing date
1 Niger: Energy Project	1989	65.9	30.4	16.2	25	12/31/96
2 Mali: Household Energy	1995	11.20	11.20	11.20	100	12/31/00
3 Madagascar: Energy Sector Development	1996	102.60	44.20	2.90	3	12/31/05
4 Senegal: Sustainable and Participatory Energy Management (PRODEGE I)	1997	19.93	19.93	19.93	100	12/31/04
5 Chad: Household Energy	1998	6.30	5.27	6.30	100	6/30/04
6 Mongolia: Urban Stove Improvement (GEF)	2001	0.75	0.75	0.75	100	3/31/07
7 Ethiopia: Energy Access Project	2002	199.12	132.70	5.44	3	6/30/13
8 Mali: Household Energy and Universal Access	2003	53.35	35.65	13.47	25	6/30/12
9 Madagascar: Environment Program	2004	148.90	40.00	2.50	2	6/30/11
10 Senegal: Electricity Services for Rural Area	2004	71.70	29.90	4.60	6	12/31/12
11 Benin: Energy Services Delivery	2004	95.70	45.00	6.20	6	12/31/11
12 Rwanda: Urgent Electricity Rehabilitation	2004	31.30	25.00	0.90	3	4/30/10
13 Chad: Community-Based Ecosystem Management	2005	94.45	39.76	2.50	3	3/30/11
14 Benin: Forests and Adjacent Lands Management (GEF)	2006	22.35	22.35	22.35	100	11/30/11
15 Burkina Faso: Energy Access	2008	41.00	41.00	6.70	16	4/30/13
16 Benin: Increase Access to modern Energy	2009	178.50	72.00	5.50	3	6/30/15
17 Rwanda: Sustainable Energy Development (GEF)	2009	8.30	8.30	8.30	100	N/A
18 Mozambique: APL for Energy Development and Access	2010	80.00	80.00	6.30	8	6/30/15
19 Senegal: 2nd Sustainable and Participatory Energy Management (PRODEGE II)	2010	19.37	15.00	19.37	100	11/30/16
Total		1,250.72	698.41	161.41	13	
Average loan/credit		65.83	36.76	8.50		

TABLE 3: World Bank-Funded Projects with Household Access to Biogas Component

Project	Year	Total project cost	IBRD, IDA, GEF, GPOBA	HH energy access component	% of total project costs	Project closing date
1 China: Second Red Soil Area Development Project	1994	336.02	139.67	3.1	1	9/30/01
2 NEPAL: Fourth Biogas Support program (GPOBA)	2006	76.41	5.15	76.41	100	4/30/12
3 China: Changjiang and Pearl River Watershed Rehabilitation	2006	200.00	100.00	17.73	9	6/30/12
4 China: Eco Farming (with Biogas CDM program)	2008	439.75	120.00	157.00	36	6/30/14
Total		1,052.18	364.82	254.24	24	
Average loan/credit		263.05	91.21	63.56		

Main Barriers

Despite the recognized benefits of clean cookstoves for health, local environment and climate change, their large-scale adoption and sustained use are not yet occurring. The following boxes show some specific consumer barriers and producer/distributor barriers.

The degree of importance of these barriers varies from one setting to the next. It is therefore important for interventions to

have an assessment of the barriers pertaining within context. Cultural barriers are particularly important and should not be underestimated. A recent study in Bangladesh found that intra-household externality prevents adoption of improved cookstoves; women were found having stronger preference for improved cookstoves but they lack the authority to make the decision to purchase one (Miller and Mobarak, 2013).

BOX 1: CONSUMER BARRIERS

Consumer Barriers	Description
Lack of information on adverse health consequences of inefficient use of solid fuels	Households lack information on the negative health outcomes associated with the inefficient combustion of solid fuels. The demand therefore for clean cookstoves does not exist.
Poor access to clean cooking solutions	Clean cookstoves are not available in many rural, peri-urban and urban areas due to limited distribution networks and relatively small-scale production facilities.
Liquidity constraints to afford clean cooking solutions	Affordability of a clean cookstove is an issue for the poor as cash flow is a major constraint. Price competitiveness of fuels is another constraint preventing the transition to cleaner fuels. Cleaner fuels and especially petroleum fuels like LPG are highly priced and affordable if available mostly to middle to upper income households.
Concerns about safety, convenience and durability of new cooking technologies	Households are concerned about safety, convenience and durability issues associated with the use of a new cooking device or fuel.
Cultural resistance to clean cooking solutions	Cooking is very much embedded in culture. The adoption of new cooking solutions is behavioral change from the norms that have prevailed over many generations. In many settings, women do not have the income to purchase a new cookstove. They rely on their husbands to make such a purchase. There may be resistance from the husband to purchase a new cookstove even if the wife is convinced about its benefits.

BOX 2: PRODUCER/DISTRIBUTOR BARRIERS

Producer/Distributor Barriers	Description
Lack of investment capital	Access to investment capital to start up a business is difficult for small and medium scale entrepreneurs working on clean cooking solutions. They usually operate in difficult business environments with a low profit margin activity.
Lack of working capital	Absence of capital to run business operations, including staffing and inventory management. Even in the presence of carbon finance schemes, working capital is needed to bridge the gap till carbon revenues become available.

Key Drivers for Scaling up

Many development specialists and donors are looking for modalities to scaling up clean cooking solutions. The following are some key drivers to scaling clean cooking solutions based on reviews of successful programs:



Awareness Raising

Households need to be sensitized to the risks they incur by cooking with inefficient cookstoves. Programs that have assumed that households would spontaneously adopt clean cookstoves have failed. Households need to perceive and be convinced about the direct and indirect benefits associated with these interventions. The challenge of providing clean cooking solutions to households requires therefore an intensive awareness-raising on the health hazards associated with IAP from the use of solid fuels in inefficient cookstoves.

- *Public financing* is needed to support awareness raising. Some activities to be supported include the development of a communication strategy, the design of targeted messages, media coverage, demonstration workshops, and sponsoring of events to reach targeted audiences. The approach usually adopted is that of social marketing to raise awareness to induce behavioral change. As much as

possible, the social marketing of clean cooking solutions should benefit from existing social networks that have proven track records for inducing change on other issues in the targeted communities. The approach of partner organizations in Bangladesh that are using distribution networks to build the water and sanitation programs is a good example to illustrate how the dissemination of clean cooking solutions can benefit from existing networks (Kumar et al 2010).

- *Private financing* is also usually needed to support product-specific advertising, sponsorship of events to target potential customers, and marketing to promote sales and market expansion.

Sustained public awareness, however, is closely linked to the level of local ownership of programs. Interventions must be developed within strategic frameworks owned by the government in consultation with local communities, including women. Ad hoc interventions without local grounding tend to be sporadic experiences with little chance of sustainability.

Markets and Preferences

Clean cooking solutions should be targeted to market segments with an account of specific market characteristics, including availability and affordability barriers. Households, depending on their residence—whether rural, peri-urban, or urban—have access to different energy carriers and energy services. In addition to availability issues, the affordability of modern fuels and cooking devices is an important issue to deal with. For example, while LPG promotion might make sense in an urban middle- to upper-class market segment, it has lower chances of success in a poor rural setting where affordability issues are more prominent. Clean cooking solutions should be targeted to market segments with an account of specific market characteristics, including availability and affordability barriers.

Market segmentation also needs to integrate different consumer preferences and behavior. This is particularly important because the technical performance of fuels and cookstoves in fuel efficiency and emissions efficiency is usually not the determining factor of adoption and use. Preferences, tastes, habits, culture, safety, reliability, and other nontechnical factors play an important role in the decision-making process of households in fuel switching and in the acquisition and sustained use of a new cookstove. Working with households—and particularly women—to determine energy for cooking solutions that respond to their specific needs and preferences is critical. The fact that women are the main users of cookstoves in many settings dictates a dedicated effort to reach out specifically to them, bearing in mind the complexities of household decision making across cultures and the particularly disadvantaged situation experienced by female-headed households. Specific measures should be taken to target women in general and to account for their preferences. Characteristics of market segments play an

important role in technology choices and in the design of business and financing models.

- *Public financing* is needed to support the removal of the barrier pertaining to the poor access to clean cooking solutions by the implementation of policy, legal and regulatory reforms to improve the business environment, by working in partnership with operators to expand distribution networks to reach remote locations. Public financing is also needed to support micro-lenders through guarantees and smart subsidies to address the affordability barriers.
- *Private financing* is required to support investment in production facilities and to develop and expand distribution networks to reach the bottom of the pyramid consumers. Regarding affordability issues, private financing can help support flexible repayment terms and micro-finance possibilities.

Technologies and Standards

A fundamental principle is that stoves and fuels should be addressed together. A cookstove can provide expected performance efficiency only when it burns an associated fuel. While selecting technology options for targeted market segments, it is important to offer a menu of solutions for households and other users. Fuel efficiency and emissions reduction efficiency are important factors in technology choices, but from the perspective of the users, durability and safety are equally and even more important factors. It is important to account for durability issues associated with the design and construction of cookstoves, in addition to technical considerations, such as heat transfer efficiency and combustion efficiency. Project designers should recognize that products offered to consumers should be continuously improved

with feedback received from users to guarantee sustained adoption and use.

Testing, standard setting, and certification should be an integral part of the design and implementation of clean cooking solutions. Public and donor financing is often needed to cover testing and standard setting. Laboratory performance test results are often different from field test results. Provisions should be made by project designers to ensure that a testing facility is closely associated with the design and implementation of projects. Successful projects are those that have adopted an interactive process where testing is used to improve technology choices adapted to the user's needs and preferences.

- *Public financing* is required to support research and development activities, standard setting, certification, quality control, training related to stove design and maintenance, and monitoring and evaluation. The health, environment and climate

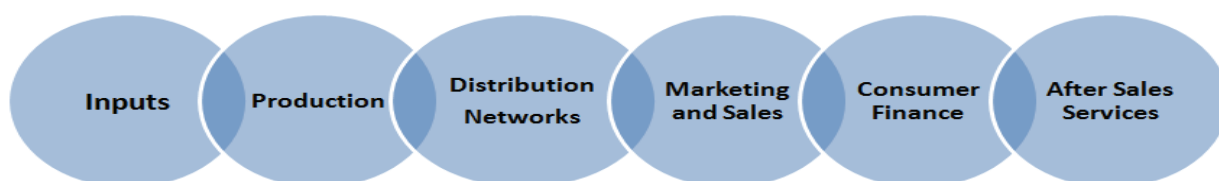
co-benefits associated with clean cooking make the case for public investment in research and development for technical innovative solutions. Evidence indicates that a certain level of public funding is necessary at the initial program stages for their takeoff. This is particularly true in settings where the business environment is not well developed. The commercialized Anagi stove in Sri Lanka which has reached over three million households benefited from donor funds in product development and testing over two decades (GVEP, 2009). The success of the Chinese National Improved Stove Program is partly due to strong support from the central and county government funds to set standards and to enforce certification to gain consumer confidence (Bailis et al, 2009).

- *Private financing* is needed to support activities such as product field testing, product quality enhancement, and after sales services.

Innovative Financing

A market-based approach in the promotion of clean cooking solutions is often viewed as the best way to ensure their sustainability. This is based on the evidence that subsidized programs do not continue when the donor or public funding dries up. 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 commercialization business model. Some level of public financing is often needed for project uptake. The Appendix shows a summary of consumer and producer/distributor barriers and financing opportunities.

Clean cooking solutions should be approached dealing with the whole value chain of activities from inputs, including research and development, design of products and testing to production, the setting



up and expansion of distribution networks, marketing and sales to consumer finance issues, and after sales services. Two main innovative features are making inroads in the clean cooking sector: (a) the involvement of social enterprises and (b) the increasing use of carbon finance. Social enterprises are also developing innovative business models to scale up clean cooking solutions. Their approach is to apply market-based business solutions to social problems.

Social enterprises include such nonprofit entities as NGOs and for-profit organizations with an activity on clean cooking solutions as part of their corporate social responsibility. The overarching objective pursued is to create sustainable enterprises to provide the poor with clean cooking solutions by developing business models that provide cooking appliances to the poor in an affordable way. This process often entails an expectation of a lower return on investment as compared to a purely commercial venture. A notable example of a successful enterprise in the delivery of energy products to the poor is Grameen Shakti in Bangladesh. Grameen Shakti has developed an approach combining soft credit for consumers, adaptive technology to lower costs, maximization of income generation, and effective after sales

service, including consumer-friendly options, such as a buy-back system (Barua 2007).

Carbon finance is increasingly being used to scale up the delivery of clean cooking solutions. The dissemination of clean cookstoves results in efficient combustion and may lead to efficiency in fuel consumption. Their dissemination therefore can result in reduced greenhouse gas (GHG) emissions, assuming the fuels (including biomass) are nonrenewable. If this activity is combined with afforestation and reforestation activities even more, GHG reductions can be achieved. Clean and more energy-efficient cookstoves can conservatively save at least one metric ton of CO₂ emissions per year under the right conditions. Many advanced combustion stoves are believed to save twice that amount. In carbon markets, a value is given for each ton of CO₂ reduced. Therefore, revenues from carbon credits could be used to support the financing (upfront or repayment costs, or both) and dissemination of clean cookstoves. The emission reductions that are purchased in the carbon market are created only once the program is in place and households are using the technology. This leaves sponsors with the challenge of identifying upfront financing for the household energy program. One approach,

BOX 3: SUPPORTING COMMERCIAL MARKETS FOR COOKSTOVES IN CAMBODIA

Cambodia: Supporting Commercial Markets for Efficient Cookstoves and Household Bio-Digesters

With support from the public and private sectors, including technical assistance from the Asia Sustainable and Alternative Energy Program (ASTAE), the World Bank Energy Sector Management Assistance Program (ESMAP), and active involvement of NGOs, small and medium enterprises are working to develop creative business models and payment schemes so that poor households can access efficient cookstoves and household bio-digesters. Interventions were developed with the technical assistance of GERES-Cambodia, including enterprise development. Lessons learned revealed the need for greater emphasis on local production, training on production, standards and understanding of the demand structure. A model production facility for the efficient cookstoves was established with the focus on areas such as stove production and distribution, standards setting and research and development. The model production facility employs and provides training to women potters to produce the Neang Kongrey Stoves. It also supports the setting up of a microfinance mechanism providing a small daily income.

Extracted from Cambodia: Supporting Self-Sustaining Markets for Improved Cookstoves and Household Biodigesters ASTAE. 2010.

used in the Nepal Biogas Program, is to use carbon revenues to replenish funds initiated by donors, improving the financial sustainability of the program and enabling it to extend its reach.

The bottom line of a successful business model to scale up clean cooking

solutions is its ability to address producer, distributor and consumer financing (Zerriffi 2011). All of these financing requirements can be met with a smart blend of public and private financing removing the barriers to clean cooking solutions.

5

The Way Forward

A realistic way of approaching the scaling up of clean cooking solutions is to view it in phases, as suggested by Foell and others (2011):

- In the short to medium term, for the majority of households relying on traditional biomass, affordability and availability of modern fuels will remain important issues. Their transition to the use of modern fuels will take time. A realistic approach is to secure the sustainability of the traditional biomass resource used while also introducing fuel-efficient cookstoves with measures to control IAP, such as the use of chimneys, hoods, and better room ventilation. In some of these contexts, the promotion of biogas use is also an attractive alternative. Middle- to upper-income households, especially those living in urban areas where fuelwood is increasingly becoming expensive, may be more willing to adopt and use advanced combustion stoves.
- In the longer term, when affordability and availability issues are under control, interfuel substitution in the form of

a significant transition from solid fuels to the use of modern fuels, such as LPG and natural gas, with modern cooking appliances will become a realistic possibility for the majority of households; this assumes that factors, such as reliability, safety, and cultural barriers attached to the use of modern fuels, are addressed.

In summary, as indicated by World Bank (2011), the way forward would require cooperation among government, the private sector, and qualified NGOs to support clean cooking interventions. Grants and financing would be necessary to encourage the development of businesses or other organizations for selling or retailing stoves. Encouraging businesses can be done through development grants that are available to communities or to individuals either through retail markets or organizations that can provide both financing and quality assurance for products. The fact that other products such as Coca-Cola and cell phones have reached populations at the bottom of the pyramid suggests that barriers can be removed, allowing a large scale deployment of clean cookstoves.

Appendix

APPENDIX: Barriers and Financing Opportunities		
Consumer Barriers	Public Financing	Private Financing
Lack of information on adverse health consequences of inefficient use of solid fuels	Awareness campaigns Media coverage Demonstrations, workshops Sponsoring of events to reach targeted audiences Social marketing	Product specific advertising Sponsorship of events to target potential customers
Poor access to clean cooking solutions	Policy, legal and regulatory reforms to improve business climate Partnerships with private operators to develop clean cooking initiatives	Investment in production facilities and in distribution networks Investment in the expansion of existing distribution networks reaching the bottom of the pyramid customers
Liquidity constraints to afford clean cooking solutions	Guarantees to micro-lenders Partner with private operators to buy down costs using smart subsidies	Flexible repayment terms Micro-finance Integrate carbon finance to lower product costs
Concerns about safety, convenience and durability of new cooking technologies	Support research and development, standard setting, certification, quality control, monitoring and evaluation	Product field testing Investment on product quality enhancement After sales services
Cultural resistance to clean cooking solutions	Awareness raising Campaigns to promote empowerment of women	Demonstrations using early adopters
Producer/Distributor Barriers	Public Financing	Private Financing
Lack of investment capital	Subsidize loans Guarantee credit Advisory services to develop business plans Facilitation of access to commercial loans Reform tax and duty regimes pertaining to energy technologies	Social impact equity investment Debt investment Integrate carbon finance in business plans
Lack of working capital	Facilitation of access to commercial loans	Develop SME products Micro-credit

References

- Arnold, M., G. Köhlin, R. Persson, and G. Shepherd. 2003. "Fuelwood Revisited: Who Has Changed in the Last Decade?" CIFOR Occasional Paper No. 39.
- Bailis, R., A. Cowan, V. Berrueta, and O. Masera. "Arresting the Killer in the Kitchen: The Promises and Pitfalls of Commercializing Improved Cookstoves," *World Development* 37(10):169-1705
- Barua, D. 2007. *Grameen Shakti: Pioneering and Expanding Green Energy Revolution to Rural Bangladesh*. Presented at the conference, Greening the Business and Making Environment a Business Opportunity. Bangkok, Thailand. 5-7 June 2007.
- Bond, Tami, and others. 2013. "Bounding the Role of Black Carbon in the Climate System: A Scientific Assessment," *Journal of Geophysical Research, Atmospheres*, doi: 10.1002/jgrd.50171, January.
- Díaz, Esperanza, Nigel Bruce, Dan Pope, Anaité Díaz, Kirk R. Smith, and Tone Smith-Sivertsen. 2008. "Self-Rated Health among Mayan Women Participating in a Randomised Intervention Trial Reducing Indoor Air Pollution in Guatemala." *BMC International Health and Human Rights* 8:7 doi:10.1186/1472-698X-8-7. <http://www.biomedcentral.com/1472-698X/8/7>.
- Ekouevi, K., and V. Tuntivate. 2012. *Household Energy Access for Cooking and Heating: Lessons Learned and the Way Forward*. Washington, D.C.: World Bank.
- Foell, W. S. Pachauri, D. Spreng and H. Zerriffi. 2011. Household Cooking Fuels and Technologies in Developing Economies. *Energy Policy* 39: 7487-7496.
- GACC (Global Alliance for Clean Cookstoves). 2011. *Igniting Change: A Strategy for Universal Adoption of Clean Cookstoves and Fuels*. Washington, D.C.: GACC.
- Geist, H., and E. Lambin. 2001. *What Drives Tropical Deforestation? A Meta-Analysis of Proximate and Underlying Causes of Deforestation Based on Subnational Case Study Evidence*. Lucc Report Series No. 4. Louvain-la-Neuve, Belgium: Lucc International Project Office.
- Gustafsson, O. 2009. "Brown Clouds over South Asia: Biomass or Fossil Fuel Combustion?" *Science* 323:23.
- GVEP International (Global Village Energy Partnership). 2009. "Cookstoves and Markets: Experiences, Successes and Opportunities." <http://www.gvepinternational.org/en/business/news/cookstoves-and-markets-experiences-successes-and-opportunities>
- IEA (International Energy Agency). 2012. *World Energy Outlook 2012*. Paris: OECD.
- Lim S.S and many others, 2012, A Comparative Risk Assessment of Burden of Disease and Injury Attributable to 67 Risk Factors and Risk Factor Clusters in 21 regions, 1990-2010: A Systematic Analysis for the Global Burden of Disease Study 2010, *Lancet* 380: 2224-60
- MacCarty, Nordica, Dean Still, and Damon Ogle. 2010. "Fuel Use and Emissions Performance of Fifty Cooking Stoves in the Laboratory and Related Benchmarks

- of Performance." *Energy for Sustainable Development* 14(3):161-71.
- Miller, G., and M. Mobarak. 2013. Gender Differences in Preferences, Intra-Household Externalities, and the Low Demand for Improved Cookstoves.
- Ramanathan, V., and G. Carmichael. 2008. "Global and Regional Climate Changes Due to Black Carbon." *Nature Geoscience* (March 23).
- Smith, K. 2002. "Indoor Air Pollution in Developing Countries: Recommendations for Research." *Indoor Air* 2002 12:198-207.
- Smith, K., M. Jerrett, H. Anderson, R. Burnett, V. Stone, R. Derwent, R. Atkinson, A. Cohen, S. Shonkoff, D. Kewski, C. A. Pope, M. Thun, and G. Thurston. 2009. "Public Health Benefits of Strategies to Reduce Greenhouse-Gas Emissions: Health Implications of Short-Lived Greenhouse Pollutants." December 19-26. *Lancet* 374:2091-2103.
- Smith, K., Rogers J. and S. Cowlin. 2005. "Household Fuels and Ill-Health in Developing Countries: What Improvements Can Be Brought by LP Gas?" Report prepared for World LP Gas Association, Paris.
- UNDP and WHO (World Health Organization). 2009. *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*. New York: UNDP.
- United Nations. 2012. Sustainable Energy for All. <http://sustainableenergyforall.org/>
- United Nations Foundation. 2010. <http://clean-cookstoves.org>.
- Venkataraman, C., A. D. Sagar, G. Habib, N. Lam, K. Smith. 2010. "The Indian National Initiative for Advanced Biomass Cookstoves: The Benefits of Clean Combustion." *Energy for Sustainable Development* (14)2.
- WHO (World Health Organization). 2006. *Fuel for Life: Household Energy and Health*. Geneva: WHO.
- World Bank. 2009. *Environmental Crisis or Sustainable Development Opportunity? Transforming the Charcoal Sector in Tanzania. A Policy Note*. Sustainable Development, Africa Region. Washington, D.C.: World Bank.
- . 2010. *Improved Cookstoves and Better Health in Bangladesh. Lessons from Household Energy and Sanitation Programs*. Washington D.C.: World Bank.
- . 2011. *One Goal, Two Paths: Achieving Universal Access to Modern Energy in East Asia and the Pacific*. Washington D.C.: World Bank.
- Zerriffi. 2011. Innovative Business Models for the Scale-Up of Access Efforts for the Poorest." *Current Opinion in Environmental Sustainability* (Special Issue: Energy Systems) Vol. 3, No. 4 (September 2011).

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