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Gold Standard Improved Cookstove Activities Guidebook

Increasing commitments to clean-cooking initiatives

Gold Standard®

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Cover Photo: GS3018: Improved Cook Stove Project with Carbon Finance (ICF), Nepal

Acknowledgement

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About partners

Gold Standard Foundation

www.goldstandard.org

Our role as a standard and certification body is to maximise the impact of climate and development activities. We design the strongest processes that amplify the impact of efforts to deliver clean energy and water, responsibly manage land and forests, and transform the lives of the world's poor. We then verify the impacts, inspiring the confidence needed to drive investment and accomplish even more.

Gold Standard was established in 2003 by WWF and other international non-governmental organisations (NGO) as a best practice standard to ensure that projects which reduce carbon emissions under the UN's Clean Development Mechanism (CDM) also deliver on their dual mandate to foster sustainable development. Now with more than 80 NGO supporters and 1100 projects in over 70 countries, our projects have delivered billions of U.S. dollars in climate and development outcomes in local communities all around the world.

Microsol

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Microsol is a social business organization dedicated to associate institutions and NGO experts in projects that improve the life quality of people affected by poverty and climate change in rural areas of Latin America. Microsol specializes in projects that are capable of being sustained long-term, thereby guaranteeing lasting impacts and integrating all of the actors involved in the process. Microsol developed the first ever voluntary Gold Standard Programme of Activities (PoA), the Qori Q'oncha PoA (GS1005), which has certified more than 100,000 improved cook stoves (ICS) implemented throughout Peru by several public and private local partners. The Qori Q'oncha PoA was registered in 2010 and is currently undergoing its fifth verification.

Microsol builds programmes that replicate this experience and allow project developers of ICSs and other appropriate technologies to benefit from our knowledge transfer methodology and the resources of the international carbon market. Within this framework, Microsol has developed the Utsil Naj PoA (GS1377), multi-technology programme in that certifies ICSs and water filters project activities throughout Central America. It has been registered with Gold Standard since 2015 and is currently undergoing its first verification.

Abbreviations

ACS	Advanced Cookstove
BC	Black Carbon
CCLF	Clean Cooking Loan Fund
CDM	Clean Development Mechanism
CO	Carbon Monoxide
CO_2-eq	Carbon Dioxide equivalent
CH4	Methane
DALYs	Disability Adjusted Life-years
aDALYs	Averted Disability Adjusted Life-years
DFID	Department for International Development (UK)
GACC	Global Alliance for Clean Cookstove
GHG	Greenhouse Gas
GS	Gold Standard Foundation
HAP	Household Air Pollution: Air pollution generated by household fuel combustion, leading to indoor air pollution, and contributing to ambient air pollution. (WHO, 2014)
IAP	Indoor Air Pollution
ICS	Improved Cookstove
ISO	International Organization for Standardisation
LPG	Liquefied Petroleum Gas
MFI	Microfinance Institution
NGO	Non-governmental Organization
PoA	Programme of Activities
RBF	Result-based Finance
SDGs	Sustainable Development Goals
SE4All	Sustainable Energy for All
SLCPs	Short-lived Climate Pollutants
VER	Voluntary Emission Reduction
WHO	World Health Organisation

Useful terms

The following terms are commonly used in the cookstove domain, but in different ways. In the recent publication "The State of the Global Clean and Improved cooking sector," the World Bank's Energy Sector Management Assistance Program (ESMAP) and the Global Alliance for Clean Cookstoves (GACC) defined these terms for the purpose of the report with reference, where appropriate, to the ISO IWA tiers and standards. The following terms are adopted from the aforementioned publication with modifications where applicable for the purpose of this report.

Improved cooking solutions	Cooking solutions that improve, however minimally, the adverse health, environmental, or economic outcomes from cooking with traditional solid fuel technologies. This definition encompasses modern fuel cookstoves, renewable fuel cooking solutions, and the entire range of improved and advanced biomass cookstoves. Clean and improved cooking solutions reduce emissions and improve health and the environment.
Clean cooking solutions	Cooking solutions with low particulate and carbon monoxide emissions levels (IWA ISO Tier 3–4 for the indoor emissions indicator). The IWA tiers for indoor emissions are consistent with the World Health Organization indoor air quality guidelines. These stoves can include advanced biomass cookstoves, renewable fuel solutions, and modern fuel stoves—with the partial exception of kerosene, since emerging evidence suggests that many kerosene stoves may actually create significant negative health impacts.
Traditional cookstoves	Traditional solid-fuel cooking solutions include cookstoves such as three-stone fires, unvented mud/clay "U" shaped stoves, basic charcoal cookstoves, and poorly vented coal cookstoves.
Improved (biomass) cookstoves (ICS)	Solid-fuel stoves that improve on traditional baseline biomass technologies in terms of fuel savings via improved fuel efficiency. Some improved cookstoves also lower particulate emissions through improved combustion efficiency, but the critical distinction of "clean" cooking solutions is that "improved" stoves may not reach sufficiently low emissions levels to generate meaningful health benefits. Cookstoves covered by this definition include basic chimney ICS, basic portable ICS and intermediate ICS.
Basic chimney ICS	Solid-fuel cookstoves whose chimneys feature minimal to moderate improvements in thermal efficiency
Basic portable ICS	Portable biomass cookstoves that are unvented and feature moderate improvements in thermal efficiency. This category includes minimally improved ceramic and clay cookstoves.
Intermediate ICS	A wide range of solid fuel cookstoves with significant improvements in fuel efficiency but typically more limited health and environment outcomes in comparison to clean cooking solutions, such as gasifier and modern fuel cookstoves
Advanced (biomass) cookstoves (ACS):	Fan draft or natural draft biomass gasification cookstoves that achieve significant particulate emission reductions.
Modern cooking solutions	Petro-chemical fuel (LPG, natural gas, kerosene), electric stoves, and electromagnetic induction cookstoves
Renewable cooking solutions	Biofuel cookstoves powered by ethanol and other plant-based liquids, oils or gels; biogas cookstoves; solar cookers; and retained-heat cooking devices.

Executive summary

» Traditional cooking stoves and inefficient combustion of traditional fuels contribute significantly to human lives, primarily impacting women and children. The fact that the majority of the global population still relies on the use of solid-fuels is a large and growing problem. Inefficient and polluting stoves are one of the world's major public health challenges, causing more premature deaths than HIV/AIDS, malaria, and tuberculosis combined.

» The clean and improved cooking sector has evolved significantly over the years, but is still underdeveloped. Impacts from the cookstove market can be seen from two perspectives: (1) medium term impacts such as the wide-scale adoption of ICSs and sustainable fuels and (2) long-term impacts such as climate change mitigation (via reduced greenhouse gas emissions) and improved livelihoods (via improved health and greater income).

» A few countries have managed to introduce clean and improved cooking solutions on a broad scale to address the widespread negative impacts of solid-fuel use, but these alone are not adequate for transformational health and environmental outcomes. Consequently, it is difficult to foresee quick adoption for clean cooking solutions without a mechanism for reducing price, an often-cited barrier. Apart from the need to attract investments in this sector, this report makes recommendations for cookstove project developers, including the cookstove manufacturers, to emphasize consumer education and awareness, address the willingness-to-pay barrier, and design projects based on results-based financing (RBF) mechanisms such as carbon finance, amongst others.

» Current improved cookstove projects from the Gold Standard portfolio serve as stepping-stones to understanding the barriers associated with these projects and how to overcome these to ensure successful implementation. Selected project studies from countries across the globe, such as Nepal, Brazil, Peru, Bangladesh, Rwanda, Bolivia, Malawi, Lesotho, India, etc., help to provide examples of how carbon finance can positively impact projects. We hope the lessons captured by this report will encourage different stakeholders, such as private sector players, policymakers, and project developers to increase their commitment to clean cooking initiatives across the globe.

Key findings

This section summarizes some important findings which are discussed in detail in the report:
Cooking is a basic need of every household yet access to clean cooking is limited. There is a staggering reliance on solid-fuels and traditional methods of cooking, which are associated with significant costs to human health. These conventional methods lead to forest degradation, black carbon emissions, and other emissions from burning of the fuels which contribute to global warming. The gender and social impacts are also skewed; women and children are primarily affected given their proximity to cooking fires and there is decreased opportunity for children due to the time spent collecting fuel.

ICS projects are implemented in Asia, Africa, and the Americas. This report addresses the different cooking patterns and practices in these regions and also provides a snapshot of the Gold Standard cookstove portfolio. The Gold Standard case studies are a clear reflection of how partnering with the end-users to understand their requirements and conducting robust research helps the success of the projects on the ground.

Although the end-user product preferences may vary worldwide, given heterogeneous cultural habits, differences in the willingness to pay, and varying household characteristics, etc., there is generally a potential demand for clean cooking solutions given rising fossil fuel prices and increased deforestation. To accelerate the uptake of ICSs, interventions such as RBF through carbon credits, ADALYs, etc., can help consumers afford better technologies.

The most important barriers in the ICS sector are affordability of clean cooking fuels and high-quality cookstoves. Smart and targeted subsidies, private sector interventions, financing solutions in the form of 'carbon credits', and developing distribution channels can improve the penetration barriers which are addressed in the report.

1.0 Introduction

Box 1: Cost of cooking with solid fuel

The costs associated with the reliance on the inefficient use of solid-fuels are staggering. The health, environmental and economic costs, estimated at over $123 billion USD (range: $22 – 224 billion USD) annually, take a heavy toll on society.

Economics and livelihoods

- Around $100 billion USD—an amount set to double by 2020—is spent on typically inefficient and increasingly costly cooking fuel. Roughly one-half of this spending is dedicated to solid-fuels, of which a significant share is avoidable.
- An average household spends roughly 7% of income on cooking and lighting fuel expenditures in developing countries, whereas urban consumers on average spend 1.3 times more on energy as a share of their expenditures than rural consumers.
- Households spend an average of roughly 1.3 hours per day collecting fuel, with a range of 30 minutes to over 6 hours daily for rural households across different geographies.
- Avoidable cooking drudgery and fuel collection tasks globally is over 60 million person years annually. Even with moderate assumptions, these time savings could translate into incremental annual household income of $5–30 billion USD annually. Interestingly, once time use is factored into cooking costs, the traditional open fire is the most expensive form of cooking with wood.

Health

- At least 4.3 million premature deaths annually and 110 million disability adjusted life-years (DALYs) resulting from household air pollution (HAP), including lower respiratory infections, chronic obstructive pulmonary disease, lung cancer, heart disease, and cataracts. Many additional health harms not quantified include asthma, tuberculosis, adverse pregnancy outcomes, depression, bacterial meningitis, a variety of moderate-to-severe physical injuries associated with firewood collection, burns, widespread minor ailments from smoke inhalation such as eye irritation and headaches, and the emerging concerns about the harms of kerosene cooking.
- Of this mortality figure, it is estimated that over 500,000 deaths stem from household air pollution via it's contribution to ambient air pollution (AAP), with HAP contributing to 12% of AAP globally.

Environment and climate impacts

- A recent Global Alliance funded study estimates the total biomass fuel demand at 1.36 billion MT annually. It is clear that such high levels of solid fuel combustion contribute to global warming, have negative local climatic effects, and—largely because of charcoal production—are contributing factors to localized deforestation and forest degradation. Substantial emissions from solid fuel use and charcoal production contribute to 0.5–1.2 billion MT in carbon dioxide (CO_2) equivalent of Kyoto Protocol greenhouse gases (up to 3% of annual global CO_2 emissions).
- The residential solid fuel generates 25% of global black carbon emissions, when the assessment includes these black carbon emissions and other particles of incomplete combustion not listed in the Kyoto Protocol, like carbon monoxide and non-methane hydrocarbons, the potential annual carbon footprint of global solid fuel cooking increases to 1.3–1.7 MT CO_2-equivalent

Gender equity and other social impacts

- Disproportionate risks of negative HAP-linked health outcomes and physical injury for women and girls, given their proximity to cooking fires and primary responsibility for firewood collection in many cultures. Also results in decreased educational opportunities for children involved in fuel collection, impaired nutrition because of the diversion of resources to fuel purchases, and home environments damaged by smoke and soot.
- The aggregate time loss across fuel collection, traditional biomass cookstove cooking, and related fuel preparation and food processing activities translates into 2–8 hours of effort per day, with a likely average of close to 5 hours daily

Source: The State of the Global Clean and Improved Cooking Sector, 2015

The cookstove is one of the oldest and simplest household technologies. However, in the modern era, access to clean cooking solutions remains a universal challenge, leading to immense human costs to humans, in health as well as environmentally and economically. More than 3 billion people, representing over 60% of the developing world's population, rely on traditional biomass fuels, such as wood, crop residues, and dung for their primary cooking needs via open fires or traditional stoves[1]. Of these, about 2.7 billion people, primarily representing poor, rural households, use traditional biomass like wood, charcoal, animal dung, and crop waste while a further 400 million use coal[2]. Less than one-third of solid-fuel users operate improved cookstoves (ICSs) and even these households predominantly rely on basic ICSs that have limited health and environmental benefits[3].

Solid-fuel cooking imposes immense health, environmental, economic, and social costs on households in developing countries (Box 1, p. 8). The household air pollution (HAP) from traditional stoves is often ignored due to the limited level of awareness and resources amongst consumers. Over recent years, momentum has been growing at national and international levels around the need to increase adoption of ICSs and clean fuels in order to address problems associated with continued use of traditional cooking methods. In spite of intensifying efforts, access to clean cooking solutions still remains limited in much of the developing world, leading to devastating outcomes on people's health, environment and society. Each year around 4.3 million people die prematurely due to indoor air pollution from cooking[4,5]. Household Air Pollution (HAP) is responsible for nearly 5% of the global disease burden (expressed as disability-adjusted life-years (DALYs)), making it the greatest global environmental health risk factor[6].

In addition to the health burden, burning solid-fuels contributes to global climate change by emitting greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane and short-lived climate pollutants (SLCPs) such as black carbon (BC). According to recent estimates, solid-fuel cooking and related charcoal production across the developing world generate around 1.5–3.0% of global CO_2 emissions[7]. Globally, approximately 25% of BC emissions are from residential solid-fuel use for cooking and heating, about 84% of which is from households in developing countries[8]. If one includes BC emissions and other particles of incomplete combustion not listed in the Kyoto Protocol, such as carbon monoxide and non-methane hydrocarbons, the potential annual carbon footprint of global solid fuel cooking increases to 1.3–1.7 from 0.5–1.2 billion tCO_2-equivalent.

In the last decade, the growing recognition of health and environmental impacts of traditional cookstoves have seen a variety of efforts aimed at cleaner, more efficient household cookstoves ranging from small-scale NGO-led projects to government-run national ICS programmes. There is a global consensus among policymakers that energy access is critical for sustainable development. Earlier in 2012, the United Nations launched the initiative Sustainable Energy for All (SE4All) with ambitious targets for universal access to electricity and modern cooking energy systems by 2030. In 2015, the United Nations adopted seventeen Sustainable Development Goals, including Goal 7 to "ensure access to affordable, reliable, sustainable and modern energy for all" by 2030, bringing the issue to centre stage. According to recent estimates, $4.7 billion USD is needed globally to ensure universal access to clean cooking energy through 2030. With the goal of enabling 100 million households to adopt clean and efficient cookstoves and fuels by 2020, the Global Alliance for Clean Cookstoves (GACC) achieved significant success by enabling the distribution of around 28 million clean and/or efficient stoves[9] by 2014.

In this context, carbon finance is emerging as an attractive option for upscaling cookstove initiatives. Carbon finance is different from traditional donor support and works on an RBF model, where money is only paid when agreed-upon results are delivered and verified—in this case, greenhouse gas emission reductions. Carbon finance solely depends on GHG emission reduction, but it also enables technology development and uptake by providing incentives for performance. The use of carbon finance in cookstove projects is a relatively recent phenomenon and is gaining traction despite fluctuations in the global market for carbon credits. Many programme implementers, ranging from NGOs to private, national and international organizations are tapping into carbon finance to support a commercial upscaling of their efforts, especially in developing countries. According to recent estimates, the GACC has attracted $265 million USD in carbon finance for the cookstove sector[10].

1 2015, World Bank, The State of the Global Clean and Improved Cooking Sector

2 2011, Smith et al; UNDP and WHO, 2009; IEA, 2011; Our global fuel-use database, including coal users, tracks an estimated 3.03 billion solid fuel users for cooking and heating and 2.85 billion solid fuel users for cooking globally.

3 2015, World Bank, The State of the Global Clea n and Improved Cooking Sector

4 2010, Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al. 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. 2012;380 (9859):2224–60. doi: 10.1016/s0140–6736(12)61766–8.

5 2014, Smith KR, Bruce NG, Balakrishnan K, Adair-Rohani H, Balmes J, Chafe Z, et al. Millions dead: how do we know and what does it mean? Methods used in the comparative risk assessment of household air pollution. Annu Rev Public Health. 2014;35:185–206. doi: 10.1146/ annurev-publhealth-032013–182356.

6 2014, WHO guidelines for indoor air quality: household fuel combustion, World Health Organization

7 2015, World Bank, The State of the Global Clean and Improved Cooking Sector

8 Sims, R., V. Gorsevski and S. Anenberg (2015). Black Carbon Mitigation and the Role of the Global Environment Facility: A STAP Advisory Document. Global Environment Facility, Washington, D.C.

9 The definitions for "clean" and "efficient" are aligned with the ISO International Workshop Agreement (IWA) Guidelines for evaluating cookstove performance. The Alliance considers stoves and fuels that are tier 3 or higher for indoor emissions to be clean and those that are tier 2 or higher for efficiency/fuel use to be efficient.

10 2015, The Global Alliance for Clean Cookstoves, Five years of Impact 2010-2015.

Clean cooking presents an opportunity to mitigate climate change. Despite successful examples of carbon finance-based initiatives, project developers face barriers to securing carbon finance, ranging from technology selection, financing, and project design to successful adoption of technology. Affordability of clean cooking fuels and high-quality cookstoves, low willingness to pay for the incremental benefits of clean cooking solutions, and limited access to quality, high-performing products to end-users are critical barriers to implementing clean stoves. On the developer's side, constraints include the difficulty of achieving a cost-effective supply chain (especially in rural areas), limited technical and management capacity for producers and distributors, and a lack of access to finance.

Current trends suggest that the reliance on solid-fuels for cooking and heating will persist in the coming years. By 2020, around 3 billion people will rely on solid-fuels for cooking and heating (Box 2, p. 8). Ensuring that the growth of clean cooking in the coming years is faster, more equitable, and sustainable in the long-term will require substantially increased investment from the public and private sector with market support and transformation initiatives from development institutions, NGOs, and foundations. In addition, greater scale and ambition in national clean cooking programs and improved program coordination and support from funders will also be needed. Carbon finance has played a significant role in transforming the cookstove market to date, and is expected to alleviate the barriers even further.

1.1 Objectives

The nexus of cooking practices, household economics, health indicators, forest resource management, and global greenhouse gas (GHG) emissions is remerging as a transformative opportunity for improving health outcomes, livelihoods, and the global environment. In the cookstove sector, the Gold Standard is by far the leading voluntary carbon standard. Nearly all voluntary cookstove projects for carbon finance have been developed under Gold Standard, and the majority of CDM cookstove projects applied for Gold Standard labelling due to its strong quality assurance.[11] This report takes stock of the collective knowledge of the problems and challenges in the clean cookstove sector and provides plausible solutions with respect to Gold Standard cookstove projects. In summary, this report aims to:

- examine the barriers for cookstove project developers
- assess how developers can overcome barriers and use standardization frameworks to quantify the benefits from cookstove projects, driving finance into these initiatives
- recommend best practices for cookstove project developers

11 2013, Stockholm Environment Institute, **Assessing the Climate Impacts of Cookstove Projects: Issues in Emissions Accounting.**

The report also provides practical and logistical insights into the development of cookstove projects using carbon finance. It is directed at cookstove practitioners that include private companies, NGOs, governments, public entities and any other entities involved in setting up a cookstove project.

1.2 Methodology

This report is a result of extensive research into the array of cookstove projects, combined with live examples of successfully implemented projects across the globe. The methodology adopted for the purposes of this report includes a systemic desk review of secondary sources, including the recent GACC market assessment reports and analysis of the Gold Standard cookstove project portfolio.

The case studies selected for the report are based on a focused set of questions to gather a wide range of perspectives related to cookstove financing instruments for project funding, the role of carbon finance, stove design to meet end-user needs, distribution models and their sustainability, training end-users and creating awareness, provision of post-sale services, participation of women, monitoring and data collection, sustainable development benefits, etc. The case studies are also accompanied by one-on-one discussions with some of the project developers.

1.3 Structure

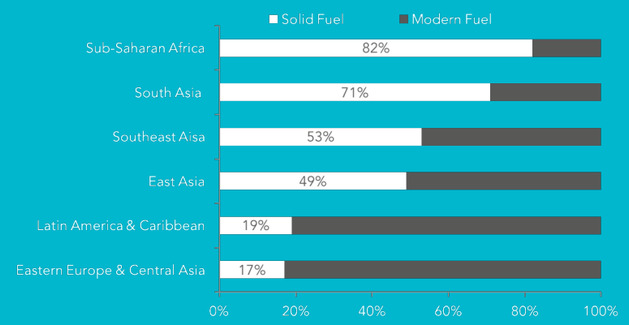
The report is organized into five main sections. The preceding first section introduces the purposes and scope of this report. The following second section provides a brief snapshot of cooking patterns and an overview of Gold Standard cookstove projects in different geographical regions. The third section presents an overview of challenges and how Gold Standard projects overcome these barriers. The fourth section analyses the lessons learned, followed by updated recommendations for project developers looking to setup a cookstove project. Selected projects from the Gold Standard portfolio are presented in Annex -1, highlighting the key barriers and lessons from projects across the globe. Annex-2 summarises the key GHGs quantification methodology available for developing cookstove activities for carbon finance.

GS500: Darfur Efficient Cookstove Project

2.0
Overview of Gold Standard Improved Cookstove activities

Box 2: Global cooking practice

More than 3 billion people—over 60% of the developing world's population and 40% of the global population—rely on solid-fuels for their primary cooking needs via open fires or traditional stoves. Sub-Saharan Africa has the highest level of solid-fuel dependence globally, followed by Asia, Latin America, and Eastern Europe.



- In all regions, the urban population is less likely to rely on solid-fuel cooking than rural populations.
- Wood is dominating solid-fuel in developing countries, where approximately 40% of the population relies on wood as a primary fuel. About 58% of rural households use wood as a cooking fuel, compared to 15% of households in urban areas.
- Latin America and East Asia feature large rural LPG populations whereas the fuel is less common in rural South Asia and almost entirely absent in rural Africa.
- Around half of all solid-fuel users (<45%) pay for their cooking fuels, while 37% do not pay for their fuels.
- Population growth, increasing urbanization, and rising middle-class incomes in the coming decades will be the major demand-side driving forces for mixed cooking fuel.
- Population growth will have its most dramatic impacts in Africa, where the region's population has grown at an annual rate of 2.5%, and is predicted to double by 2036. Slower but still rapid population growth in other regions (1–1.5%) will likewise continue to drive solid-fuel demand.
- Under a moderate scenario, Africa's solid-fuel population will grow by 200 million people to 850–900 million by 2020. South Asia will increase slightly to 1.2 billion solid-fuel users, with the slowing growth in India counterbalanced by increases in solid-fuel use in countries like Bangladesh and Pakistan. In contrast, the solid-fuel population in East Asia is projected to decrease significantly given the strong trend of migration to modern fuels across all segments in China, combined with rapid urbanization in that country. In Latin America and Southeast Asia, increasingly urban and modern fuel-oriented middle-income economies of leading regional nations are continuing to decrease these regions' solid-fuel footprints.
- Cumulatively, the forecast is that there will be a stagnant global solid-fuel population, culminating with 3.1 billion solid-fuel users by 2020.
- Over the past decade, prices for many fuel types have steadily increased. This growth in fuel costs provides households less incentive to switch to modern fuels, which remain up to 10 times more expensive than biomass alternatives.
- Annual growth in all ICS cookstove sales has exceeded 50% over the past decade (2003–13), quadrupling from 3.6 million units distributed and sold in 2011 to 14.3 million units in 2013.
- The existing market dynamics will ensure that tens of millions of households will gain access to (at least) minimally improved cooking solutions by the end of this decade. While millions will gain access to some form of improved cooking appliance by 2020, 35–45% of the global population will remain vulnerable to the adverse effects that stem from traditional cooking methods.

Source: The State of the Global Clean and Improved Cooking Sector, 2015

In spite of the rapid technological advancements of the 21st century, nearly half of the world's population still meets cooking requirements by burning fuels such as wood, crop residues, and dung. According to recent estimates, large populations across geographical regions depend on solid-fuels for their primary cooking needs. Sub-Saharan Africa has the highest level of solid-fuel dependence globally at 82%, followed by Asia (44 – 71%), Latin America (17%) and Eastern Europe (19%)[1].

Compared to rural populations, urban populations across all regions rely less on solid-fuel cooking due to better access to new technologies, driving higher adoption rates of modern fuels (Box 2, p. 12). Current trends point to an increase in the overall number of solid-fuel users globally over the next decade. It is anticipated that population growth will have the most dramatic impact in Africa, where the region's population has grown at an annual rate of 2.5% and is predicted to double by 2036. Slower but still rapid population growth in other regions (1–1.5%) will likewise continue to drive solid-fuel demand. In total, the number of users utilising solid fuels globally will be around 3.1 billion by 2020. The largest shares of users of traditional solid-fuel stoves appear in Sub-Saharan Africa, followed by South Asia, and East Asia. In the following sections, a brief overview of current cooking patterns and likely future scenarios are presented for each region.

2.1 Regional profiles

About 200 million households use ICSs, representing 30% of 700 million global households who rely on solid-fuels (about 3 billion individuals total). There is significant variability across regions as described in the sections below.

2.1.1 Latin America

The majority amongst the urban populations in Latin America have transitioned to modern fuels (only 8% still rely on solid fuels), thus the populations relying on solid-fuels for cooking are concentrated in rural areas (58% of them rely on solid fuels) due to poverty, exclusion and lack of infrastructure[2]. Household air pollution from solid fuels causes the deaths of more than 70,000 people annually in this region[3]. Approximately 40 million families in Latin America cook using traditional biomass cookstoves, compared to 1 million households who benefit from an ICS[4].

Collection of wood fuel and other agricultural residues for cooking is usually performed either by the whole family or exclusively by the head (usually the man) of the family. Women generally take charge of cooking[5]. In the entire region, traditional open fire stoves are preferred for cooking practices in addition to heating water for drinking or bathing, providing space heating, smoking food, keeping insects away, lighting in the absence of electricity, etc. It has been observed that due to the varied usage of cookstoves, ICSs rarely replaces all usage, commonly resulting in "stacking" behaviour, i.e., continuing to use traditional devices even after the ICSs are adopted. Further, this behaviour is observed even when households have access to modern fuels like liquefied petroleum gas.

Traditional open-fire cooking devices are distinguished throughout the region based on cooking habits and customs. For example, in Mexico and Central America, tortilla-making is the main cooking task, thus it requires a *plancha* (hot flat surface) type cookstove, while in South America, where tortillas are not consumed, meals are cooked in pots in direct contact with the flame or hot air. Therefore, the vast majority of ICSs in Latin America include in-situ rocket stoves with chimneys, such as the *Patsari* in Mexico, the ONIL in Guatemala, *La Justa in* Honduras or the *Inkawasi* in Peru. Portable and typically less expensive stove solutions have seen much less uptake in the region, with the exception of some portable *plancha* models (*Ecocina* stove) in Central America and the majority of charcoal stoves in Haiti. A new generation of ICSs with nearly 20 models is available in Central America with significant improvements in design and performance.

The costs of producing the most common ICSs in Latin America, whether in-situ or pre-manufactured, range from $60 USD to $250 USD[6] per unit, a price that is hardly affordable for low-income households. This explains why the ICS sector in this region is dominated by institutional and NGO-based distribution, while the commercialization of ICS is very limited. Today, there is major progress being made in national cooking programs in Latin America. Mexico and Peru have longstanding programs with approximately 600,000 and 300,000 ICSs already installed, respectively. Other countries, like Honduras, Guatemala, Colombia and Ecuador, are designing large-scale programs through national strategies or Nationally Appropriate Mitigation Actions (NAMAs)[7].

2.1.2 Africa

More than 700 million Africans, representing 82% of the continent's total population, use solid-fuels, such as wood, charcoal, dung, crop waste, and coal for their primary cooking needs [8]. Consequently,

1 2015, World Bank, The State of the Global Clean and Improved Cooking Sector.

2 ibid

3 2013, WHO, Global Burden of Disease.

4 2014, Latin American Clean Fuels and Cookstoves Network, **Report from first workshop "Promoting large-scale and sustainable adoption and use"**.

5 2013, ESMAP, World Bank, What Have We Learned about Household Biomass Cooking in Central America?

6 2015, World Bank, The State of the Global Clean and Improved Cooking Sector

7 **NAMA database**

8 2014, World Bank, Clean and improved cooking in sub-Saharan Africa

solid-fuel cooking emissions kill nearly 600,000 Africans annually. Emissions from solid-fuel cooking emissions are now recognized as the second-largest health risk factor in terms of death and disability in the region.

Sub-Saharan Africa is predominantly a market of portable stove users with the three-stone stoves serving as the traditional firewood and crop-waste cooking solution, with the metal brazier or bucket stoves historically serving as the baseline charcoal cooking solution. Chimney stoves are used occasionally, but not often. Built-in stoves do have a tradition in some countries in the continent like Ethiopia (fixed stoves for *injera* cooking), Uganda, Kenya, Rwanda, and Nigeria, but the vast majority of built-in and semi-portable stoves have been introduced over multiple generations of improved stove programs.

Many of the households use traditional biomass-burning stoves as their secondary cooking device due to the common phenomenon of fuel and stove "stacking". Consumers' limited willingness to fully adopt new fuels and limited ability to pay for improved cooking solutions are the greatest long-term obstacles to broader adoption of clean cooking in Africa. Even when consumers are educated about stove benefits, willingness to adopt often remains low due to the new solutions' inability to fit with consumers' cooking preferences as a result of perceived or actual design shortcomings, lack of consumer trust in stove performance and durability, concerns about the accessibility of fuel supply and after-sales support, and the behavioural (e.g., risk aversion, present bias) and cultural obstacles to sustained adoption of new technologies.

The vast majority of ICSs in Sub-Saharan Africa (whether basic, intermediate, or advanced) follow in the mould of traditional technologies—portable, typically chimneyless, single-burner stoves designed to handle wood-fuels, crop-waste biomass, or a combination of solid-fuels. Stove prices across the continent are moderately high due to the increased costs of labour, materials, and poor distribution infrastructure for basic stoves ($5–10 USD), and high import duties, taxes, and transport costs for industrial ICS solutions that are mostly imported ($25–100 USD)[9].

There is a growing consensus among regional policymakers on the case for clean cooking energy. National cookstove programs are being launched and scaled up aggressively in countries like Ethiopia, Ghana, Malawi, Nigeria, Rwanda, Senegal, and Uganda. Biomass ICS distribution is small but growing; fewer than 10 million sub-Saharan households use the basic ICS, 5-7 million use the intermediate 'rocket' ICS or the highly improved charcoal ICS, and another 7-8 million use the legacy stoves. The ICS supply is focused on urban areas. More than 90% of stoves in Africa are artisanally manufactured, such as, chiefly portable ceramic jiko style stoves, legacy chimney stoves, and efficient rocket stoves in some areas.

The number of people relying on solid-fuels in Africa is expected to increase toward the end of this decade. Historical fuel mix trends and demographic drivers, such as population growth, suggest that the number of Africans relying on solid-fuels as a primary fuel will grow to 850–900 million by 2020.

2.1.3 Asia

East Asia, dominated by China, differs significantly both in terms of solid-fuel preferences and traditional stove features. China is the world's largest coal cooking market. Consequently, coal stoves (basic coal stoves or improved stoves distributed via the National Program and now replaced through more commercial mechanisms) and coal fuel supply chains (coal briquettes) are major features of the market. During the 1980s and 1990s, China's National Improved Stoves Program (NISP), one of the world's most successful stoves programs, distributed about 180 million improved stoves. Yet stove development and production has not kept pace with the multidimensional challenges associated with promoting clean stoves[10].

The majority of coal stoves feature chimneys and many are built to provide space and water heating—another important feature of the China market explained by the large share of the population living in cool climates. The China market also has a large biomass-cooking segment which is split into crop waste cooking (20–50% based on region) and firewood users. Most biomass stoves are built into the structure of the home and often have space-heating features. The fact that many stoves are built-in implies that their costs of construction are higher. The legacy of the NISP and its historic reach has meant that most of the stoves in China are either industrially or semi-industrially produced.

The burning of solid-fuels represent a major health-risk to Chinese households. The Global Burden of Disease Study 2010 estimates that each year about 1.04 million premature deaths can be attributed to HAP linked to smoke emitted from solid cooking fuels.[11] The International Energy Agency estimates that about 280 million residents— including many poor, rural households—will still depend heavily on solid-fuels for cooking and heating by 2030.

South Asia is characterized by vast intra-regional variation, however the *chulha*-style stoves with multiple pot-holders and chimneys are mostly used for cooking. Most stoves utilize firewood, crop-waste, and animal dung—the latter being a regionally important fuel. Charcoal and coal are prominent in selected sub-regions. The use of unimproved *chulhas* is often combined with basic three-stone fires or, more rarely, primitive clay stoves that offer the household flexibility for cooking stew-based dishes and bread preparation.

Most of the unimproved *chulhas* are built by owners. A large swathe of the region requires specific cooking adaptations for the preparation of staple rice dishes (Indian rice belt, Bangladesh, Sri Lanka) and beans (dhal). The *chulha* culture can be traced across key regional geographies like India, Pakistan, Nepal, and Bangladesh. The improved stove culture mirrors these preferences with the dominance of fixed, chimney-based improved stoves, although portable stoves have also seen uptake. Portable ICSs are particularly important in markets like Sri Lanka (e.g., *Anagi* stove). The vast majority of improved stoves are artisanally produced, often on location by skilled artisans or constructed by owners with some external support. Stove costs across all manufacturing modes are relatively low ($5–40 USD)—typically below the cost of improved stoves in all regions other than Southeast Asia.

Approximately 67% of households in India remain wedded to solid-fuels as their primary source of cooking fuel[12]. The use of solid-fuels and traditional cookstoves has had significant impacts on health outcomes and livelihoods, particularly for women. Approximately 400 million people in India (of which 90% are women) are exposed to the negative health effects associated with indoor air pollution from traditional cookstoves, resulting in respiratory, pulmonary and vision problems. It is estimated that household air pollution is the leading cause of DALYs in South Asia, leading to approximately 875,000 premature and avoidable deaths. In addition to the health effects, traditional cookstoves and practices entails that women spend up to around 5-8 hours per day on cooking activities, with around 20% of that time devoted to the collection of fuel.

Overall, there is a high potential for cookstoves to become an attractive opportunity for the private sector to engage in an impactful mechanism that improves health outcomes while the decreased amount of time spent on collecting solid-fuels generates livelihood opportunities for millions of households. However, in order to scale up both the supply and demand for cookstoves in India, support is required in four areas: (1) facilitating greater partnerships between stakeholders and sharing of knowledge within the sector, (2) developing and promoting acceptable and minimum standards for stove performance, (3) promoting awareness of cookstoves and the positive benefits they hold, and (4) providing and promoting a wider base and diversity of financing options for consumers and suppliers.

Based on the background information presented in the sections above, one can conclude that irrespective of the diversity in cultures, traditions and cooking practices, the problem in adopting clean stoves share similarities across the globe.

2.2. Gold Standard ICS projects

The Gold Standard certifies renewable energy supply and end-use energy efficiency and waste handling and management projects. ICS-type activates primarily fall under the end-use energy efficiency scope. Approximately one fourth of the Gold Standard's project pipeline comprises of ICS-type projects, including domestic, institutional and commercial stoves. In addition, household biogas project type, which comprises around 15% to total projects, also belong to the improved cooking solutions category. In total, Gold Standard cookstove projects have been registered or listed in over 40 countries globally as of September 2015. Together, ICSs and household biogas activities contribute around 18% of the total 90 million tCO2eq emission reductions annually that is expected from all Gold Standard projects.

The ICS activities comprise two types: (1) GS-CDM that are being developed under CDM and (2) GS – VERs that are voluntary in nature. The majority share is comprised of voluntary activities that represent around 80% of total ICS activities (excluding household biogas activities) and contribute around 6.0 million tCO2eq annually.

In terms of project scope, ICS activities are represented by three categories of scale: (1) large-scale, (2) small-scale and (3) micro-scale. Partially, due to the dispersed nature of the project technology, the micro-scale activities with a cap of 10,000 tCO2eq are large in number, but the emission reduction contribution is only around 13%. The small-scale activities have the highest share of 54% followed by the large-scale activities. Note that each of the activities developed under PoAs are accounted according to the individual activities within their scope.

Due to the flexibilities and advantages of PoA schemes, a large number of developers adopted PoA schemes for ICS activities. Around 52% of total GS-PoAs are ICS PoAs, which are comprised of 40% GS CDM-PoAs and 60% GS VERs PoAs.

9 2015, World Bank, State of the global and Improved Cooking Sector

10 2013, World Bank. 2013. China: Accelerating Household Access to Clean Cooking and Heating. East Asia and Pacific Clean Stove Initiative Series. Washington, DC: World Bank.

11 WHO, Global Burden of Disease (GBD).

12 2013, GACC, India cookstoves and fuels market assessment.

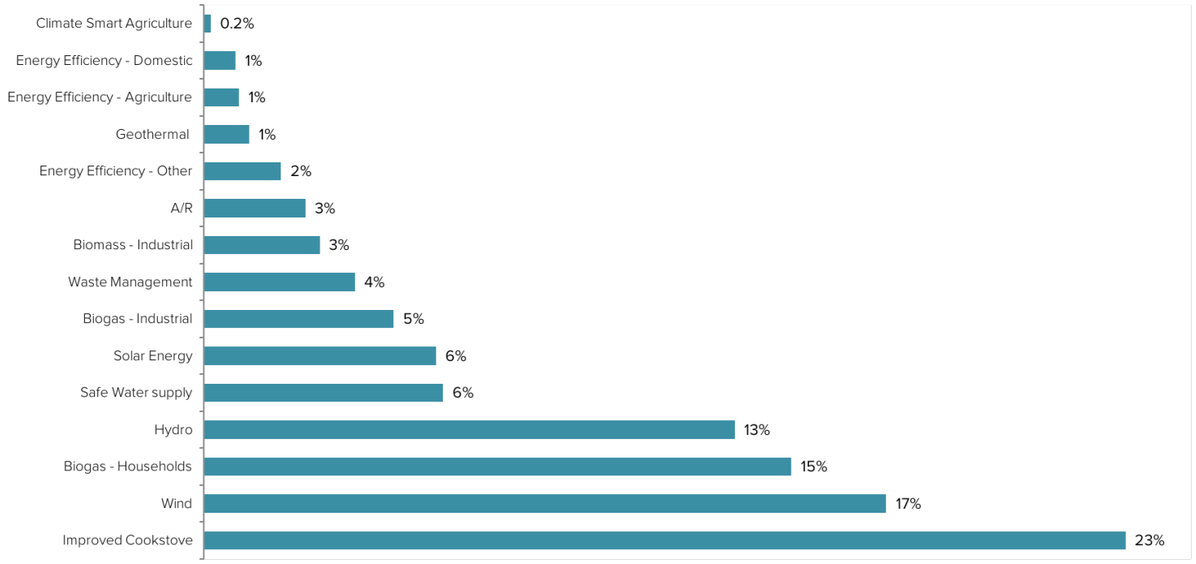
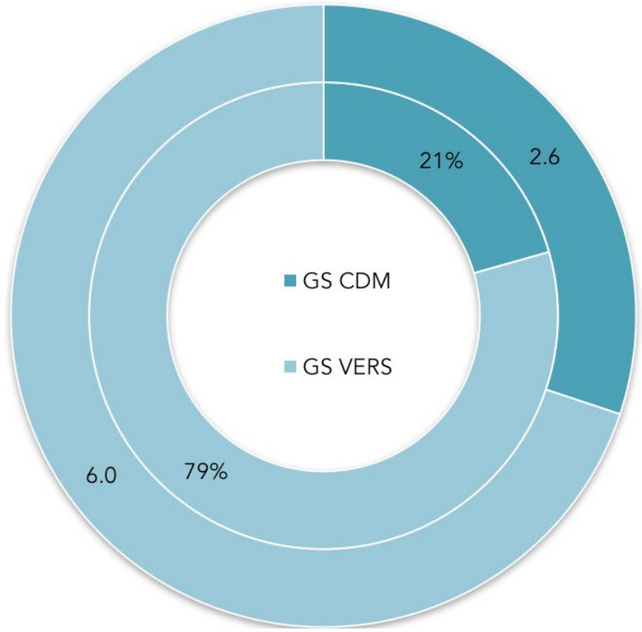
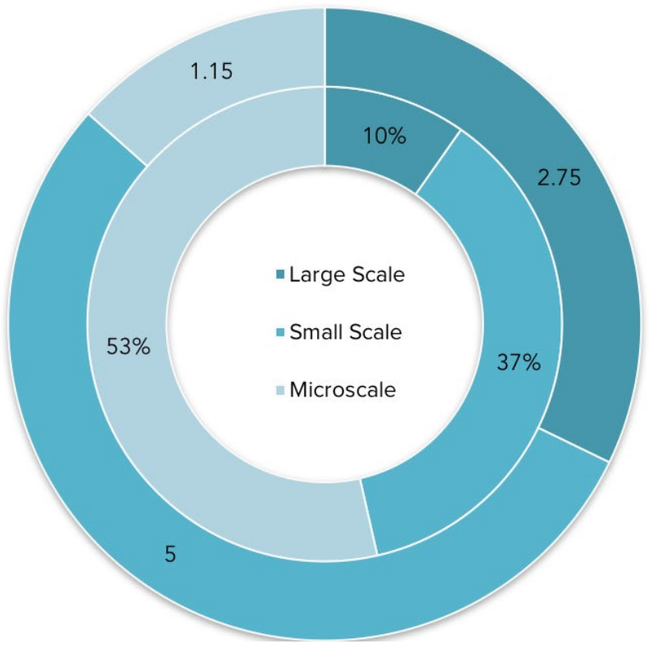


Fig. 1: Shows the types of projects certified under Gold Standard



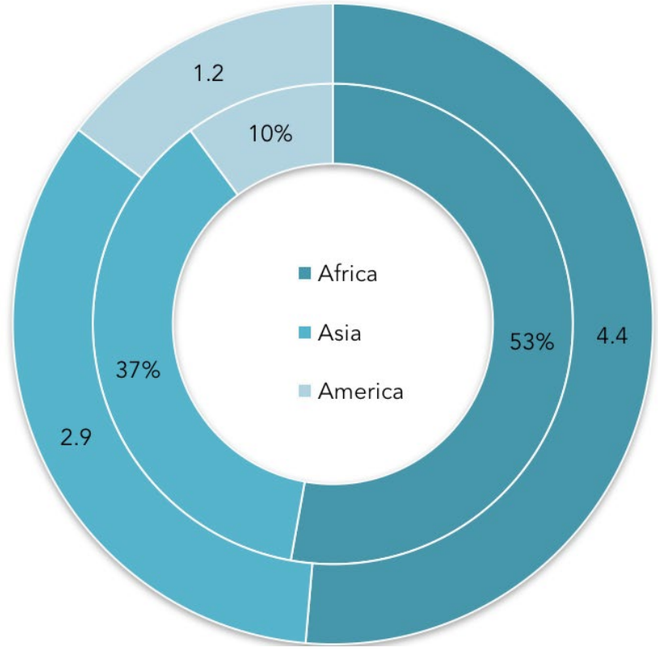
- Inner circle represents the number of activities; Outer circle represents the expected annual emission reduction (million tCO2eq))
- The annual emission reductions are based on ex-ante estimations, it may differ from actual issued units.

Fig. 2: Shows the number of Gold Standard cookstove projects certified under the CDM (GS CDM) versus the voluntary market (GS VERS).



- Inner circle represents the number of activities; Outer cirle represents the expected annual emission reduction (million tCO2 eq
- The annual emission reductions are based on ex-ante estimations, it may differ from actual issued units.

Fig. 3: Shows Gold Standard cookstove projects represented by scale.



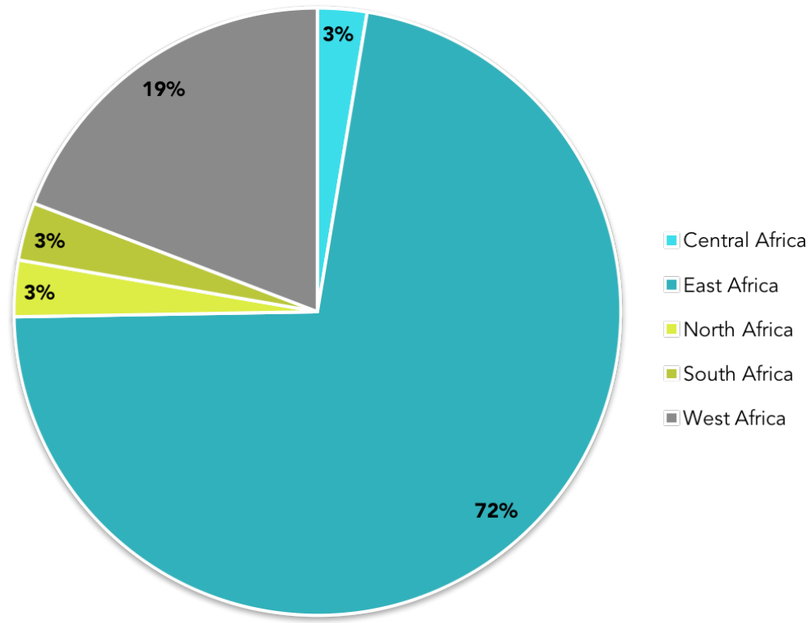
- Inner circle represents the number of activities; Outer circle represents the expected annual emission reduction (million tCO2eq))
- The annual emission reductions are based on ex-ante estimations, it may differ from actual issued units.

Fig 4: Shows the geographical distribution of Gold Standard cookstove projects.

Since the highest number of solid-fuel users reside in Africa, more than 50% of the ICS activities are located there, followed by Asia and Latin America. The ICS projects from Africa also contribute 4.4 million tCO2eq emission reductions annually. However, the ICS solutions are highly uneven across African continent, skewing heavily to a handful of countries. For example, the highest number of the projects are located in Kenya, which contributes around 20% of total annual emission reductions in Africa.

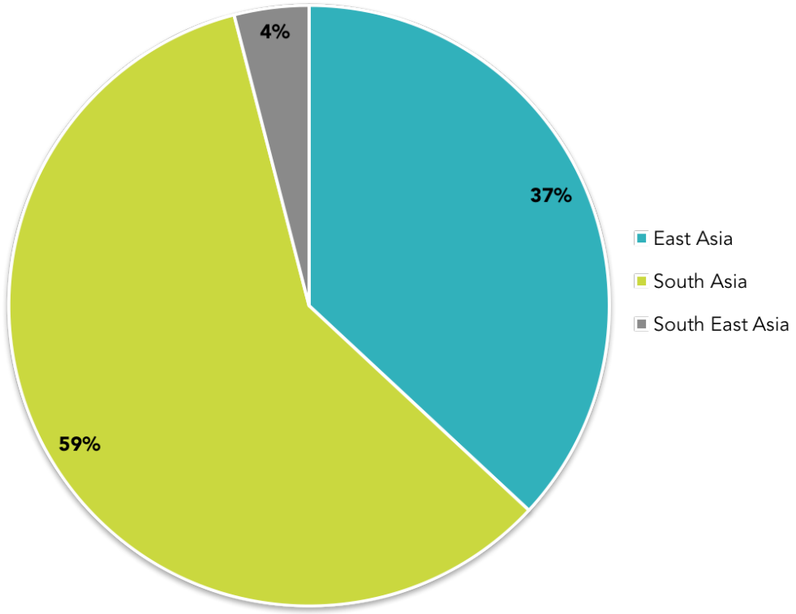
The fuel savings are in the range of 20–35% and 35–65% for the portable wood and charcoal intermediate ICSs that are the focus of Africa distribution efforts by companies like *Envirofit*, *Ezy Stove*, *EcoZoom*, and *BURN Manufacturing*. Among other factors, the rapid growth of carbon-financed projects across the region in 2012 and 2013 are due to significantly enhanced profits for distributors of wood rocket stoves.

Fig 5. Africa: The annual number of expected emission reductions by sub-



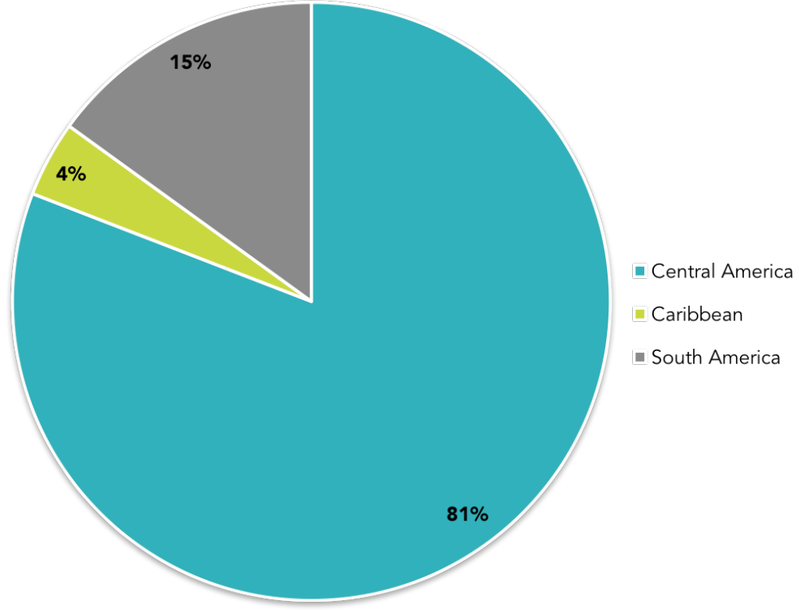
	Region/Country	No. of projects	Annual expected emission reductions (tCO2e)
Central Africa	*Cameroon*	*3*	*48,799*
	Congo	*5*	*66,349*
East Africa	*Burundi*	*4*	*365,118*
	Comoros	*2*	*2,000*
	Eritrea	*3*	*24,490*
	Ethiopia	*10*	*378,690*
	Kenya	*27*	*786,821*
	Madagascar	*1*	*168,759*
	Malawi	*7*	*280,358*
	Mozambique	*2*	*184,984*
	Rwanda	*26*	*409,795*
	Tanzania	*4*	*201,429*
	Uganda	*13*	*357,286*
North Africa	*Sudan*	*4*	*131,494*
South Africa	*Lesotho*	*2*	*22,000*
	South Africa	*18*	*112,999*
West Africa	*Benin*	*2*	*10,000*
	Burkina Faso	*14*	*128,803*
	Cote d'Ivoire	*2*	*40,000*
	Ghana	*5*	*380,086*
	Guinea	*1*	*8,000*
	Mali	*3*	*105,025*
	Nigeria	*9*	*169,074*
	Grand Total	**167**	**4,382,359**

Fig 6. Asia: The annual number of expected emission reductions by sub-region



	Region/Country	No. of projects	Annual expected emission reductions (tCO2e)
East Asia	*China*	*10*	*622,809*
	Mongolia	*12*	*448,720*
South Asia	*Bangladesh*	*44*	*390,361*
	India	*29*	*1,252,863*
	Nepal	*3*	*39,271*
	Pakistan	*1*	*30,961*
South East Asia	*Indonesia*	*1*	*1,500*
	Laos	*1*	*75,174*
	Myanmar	*4*	*40,000*
	Grand Total	**105**	**2,901,659**

Fig 7. Americas: The annual number of expected emission reductions by sub-region



	Region/Country	No. of projects	Annual expected emission reductions (tCO2e)
Central America	*El Salvador*	*6*	*130,308*
	Guatemala	*2*	*349,996*
	Honduras	*8*	*342,268*
	Mexico	*2*	*129,094*
	Nicaragua	*2*	*57,780*
Caribbean	*Haiti*	*3*	*51,227*
South America	*Bolivia*	*3*	*15,123*
	Brazil	*2*	*13,534*
	Colombia	*2*	*9,977*
	Peru	*5*	*148,977*
	Grand Total	**35**	**1,248,284**

3.0
Results and discussion

Box 3: Clean Cooking Loan Fund

Three of the most influential organizations in the global clean cookstove market have announced the creation of the Clean Cooking Loan Fund (CCLF) which will help leverage private sector finance to scale-up the adoption of clean cookstoves to billions of people around the globe.

The GACC, The Gold Standard Foundation and Nexus Carbon for Development have joined forces to create this unprecedented fund to mend the gap of commercial financing for clean cookstoves and fuels that has served as a strong barrier to entrepreneurs and others to develop a thriving market for these technologies.

The purpose of the CCLF is to provide cost effective loans to clean cookstove and fuels enterprises to help finance carbon certification costs.

The CCLF is administered by Nexus Carbon for Development, which manages project origination, technical due diligence, performance monitoring and financial management, including repayment. In addition, there is a Technical Committee, which reviews the final outputs of the due diligence process, and an Investment Committee, which makes the final investment decisions after the full due diligence processes and reviews by the Technical Committee have been completed.

The Global Alliance for Clean Cookstoves has kicked-off the fund with $290,000 USD. The target is to raise additional investments of $300,000 USD to $1,000,000 USD within 1 year. The fundraising target will be adjusted based on results from the call for proposals, which will help the CCLF determine demand.

Any project that delivers durable, efficient and clean cookstoves and/or clean cooking fuels to the base of the pyramid households via a market-based approach is eligible to apply for a loan from the CCLF. Eligible projects may use funds from a CCLF loan to cover the following costs:

- General certification costs, including, but not limited to validation, registration, verification and issuance fees.
- For Gold Standard projects, funds from a CCLF loan may also cover any costs associated with the Local Stakeholder Consultation ("LSC") or Stakeholder Feedback Round ("SFR").
- Inclusion costs for any Programmes of Activities.

Further details about CCLF **available here.**

Cooking will continue to be an inseparable part of human life, but ensuring that clean cooking is practiced in every household remains a mammoth task. According to the World Bank[1], millions will gain access to some form of improved cooking appliance by 2020, however, 35–45% of the global population will remain vulnerable to the adverse effects that stem from traditional cooking methods. Thus, it is imperative to carefully consider the barriers that stand in the way of adoption of improved or advanced stoves and identify the key drivers which can potentially scale up clean cooking solutions.

In the recent past, there is a growing momentum at national and international levels to scale up access to cleaner cookstoves and fuels in developing countries. Initiatives such as SE4ALL brought back clean cooking to the international development agenda and successfully raised awareness for the need to increase adoption of ICSs and clean fuels in order to address long lasting problems associated with continued use of traditional cooking methods. In the last decade, carbon revenue opportunities proved to be a catalyst in realising clean cookstove activities on the ground and transforming the ICS market at commercial level[2]. Despite challenges in the carbon market, carbon financing for improved and clean cookstoves is booming, with voluntary buyers channelling $61 USD million to Gold Standard certified offsets from projects that distribute clean cookstove in 2013[3]. The project developers, including NGOs, donor agencies, international and national agencies, private investors and stove manufactures have successfully infused carbon revenue into their business models for financing cookstove interventions, aiming for the distribution of millions of stoves in the coming years.

This section combines insights from the case studies and international best practices in the establishment of cookstove projects. The recommendations are in the context of cookstove project development using carbon revenue, based on best practices adopted for successful Gold Standard activities.

3.1 Financing

For a carbon cookstove project to be successful, the literature suggests that financing is as important as the adoption and sustained use of the cookstove. Nevertheless, both challenges depend on key elements involving financing models, start-up costs, market research, product development, financing for users, outreach and promotion, and after-sales support and monitoring. The case studies highlight how Gold Standard project developers successfully developed, scaled up, and sustained the operations by alleviating these barriers. The key to a successful cookstove program is an appropriate business model that facilitates the design, production, sales, marketing, and maintenance of cookstoves. The financing for cookstove activities includes access to the seed capital for market research, product design and basic marketing needs. Establishing the distribution network is essential for developing a successful project[4]. At the consumer level, the prevailing barriers like the limited ability to pay for higher costs and access to clean cookstove and fuels are commonly citied barriers for almost all projects registered with Gold Standard.

3.1.1 It has commonly been observed that carbon finance complements other financing options like donor funds, private funding, loans, etc. Along with carbon finance, there are several options to finance clean cookstove projects (summarized in the table below). The most commonly cited models include grant funding, upfront sale of carbon credits, micro-finance, and government/national agencies subsidies. For instance, Microsol and local partners rely on public funding and donation along with carbon revenue for project implementation and scaling up. Since targeted rural poor households, who are unable to pay in cash, contribute in-kind by providing the locally-available construction materials, such as adobe, lime, and water, in addition to manual labour during the cookstove construction. After the successful implementation of its first activity, Microsol has replicated the model in other regions of Peru and installed over 100,000 stoves across the country. However, it is evidenced that only subsidized approaches face difficulty when donor or public funding dries up. To overcome this barrier, the project developer uses a blend of different financing options. In another instance, Proyecto Mirador has installed over 100,000 stoves over the past decade in Honduras by following a similar financing model as Microsol, but accepts smaller cash contributions along with raw materials and labour from end-users. Instituto Perene's approach is similar with 90% of costs be

"In regions where households have very limited cash availability and have no access to micro-finance facilities, it can be useful to value their in-kind contribution. Providing some of the materials can save production and transport costs whereas participating in the stove's construction can save labor costs. These contributions should not be neglected by the project developer and can be substantial in remote regions with difficult access."

Source: Microsol. Peru

1 2015, World Bank, **The State of the Global Clean and Improved Cooking Sector**

2 2015, Oliver Johnson, Hannah Wanjiru, Cassilde Muhoza, Fiona Lambe, Marie Jürisoo, Wathanyu Amatayakul and Audrey Chenevoy; From Theory to Practice of Change: Lessons from SNV's Improved Cookstoves and Fuel Projects in Cambodia, Kenya, Nepal and Rwanda, Stockholm Environment Institute

3 2015, World Bank, **The State of the Global Clean and Improved Cooking Sector**

4 2011, Shrimali, G., Slaski, X., Thurber, M. C. and Zerrif , H. Improved stoves in India: A study of sustainable business models. Energy Policy, 39(12). 7543–56. DOI:10.1016/j. enpol.2011.07.031.

Financing Option	Description	Examples
Commercial Loans	Manufacturer already sufficiently "credit worthy" through other business lines or is able to provide enough collateral. Commercial finance quite prevalent, but not tailored for stove sector and with limited reach due to access.	US Aid Deutsche Bank Local Banks
Subsidized Loans	Donors or loans subsidize commercial credit provided by impact investor who's time horizons are longer and interest rates are lower. Reach is limited due to geographic focus and eligibility requirements.	GIZ Grameen Shakti
MSE Loans	MFIs provide credit to stove distributors and retailers to finance business and inventory costs, and may partner to serve as distribution channel also. Widely prevalent and accessible, although of less use to supply side actors who need large loans for scale	MicroEnergy Credits FINCA
Grants/ Seed Funding	Seed financing to move new solutions to commercialization or to help organizations scale	GACC World Bank US AID Ashden

Table 1: Financing solutions for Supplier[5]

ing covered by carbon revenues and 10% through in-kind contributions.

3.1.2 The project developer also tailors the financial mechanisms to local contexts to scale up the activities. In Bolivia, Myclimate partnered with municipal governments, agricultural associations and NGO's, or relied on direct donations by the public, to provide the cookstove to end-users on subsidized cost while helping CEDESOL (Coordinating and Managing Entity for the PoA) cover operating cost.

The project developer indicated that using micro-finance to subsidise the upfront cost of cookstoves has not been very effective since the bulk of the demand was in very remote rural areas where micro-financing institutions do not operate. In Sudan, the project developer Carbon Clear adopted the micro-financing model at a very early stage to fund the procurement of LPG stoves which costs on an average monthly salary for households who earn daily and weekly incomes and cannot afford the upfront cost. For the first five years, the project was fully funded by anticipated proceeds from carbon revenues to build the micro finance facility. At a later stage, funding from other sources was raised to grow the revolving fund and for scaling the project activity.

"The use of MFIs / Self Help Groups, Village level Entrepreneurs can bridge the financing gap for averagely poor class. For the ultra poor class, CSR / donor funds may be helpful in bridging financial barriers for the ultra poor class."

Source: The Breathing Space Program. India

3.1.3 Different types of financial mechanisms for reducing upfront stove costs to users and scaling up the programmes are increasingly being tested and explored. Project developers are using different financing mechanisms including payments in instalments, micro-credits, and government grants to scale the distribution of cookstoves. For instance, in Nepal, SNV started the efficient cookstove distribution programme with an initial funding from DGIS/

Government of Netherlands, a grant from OPEC fund for International Development (OFID), and financing from Eneco Energy Trade BV via upfront sale of carbon credits. While funding early stage distribution of the cookstove with grant money, the developer piloted a micro-finance model to integrate financial institutions/micro-financing agencies in order to support low-income users to pay the cost on install. This was an approach typically different from the other cookstove projects in Nepal which were driven mostly by NGOs. Nevertheless, the project developer was able to meet the financing requirements with a mix of public and private financing options.

Traditional finance institutions, such as banks, are often unwilling to lend to low-income consumers due to several reasons, ranging from lack of collateral, irregular household income to high transaction cots associated with formal identification of risks when compared to the small loan size. Unlike lending to a small business, where loan repayment represents a clear future revenue stream, lending to a cookstove buyer finances a product that will generate savings. Consequently, the repayment mechanism is less clear. Several options exist for consumer finance:

Among these options, carbon finance can be a game changer in the development of a global

5 2015, World Bank, The State of the Global Clean and Improved Cooking Sector

GS3018: Improved Cook Stove Project with Carbon Finance (ICF), Nepal

Option	Description	Examples
Micro-finance	Small loans for stove purchase disbursed through MFIs and typically bundled with distribution arrangements	Microenergy credits
Carbon finance	Subsidy is provided to consumer in-lieu of expected carbon revenue	Envirofit, Atmosfair,
Performance Based Grants (Non-Carbon "Buy-Down" Performance Based Grants)	Performance-based subsidies provided directly by donors/governments to lower upfront costs of the stove to the end-user. Subsidy can go to the manufacturer to lower the price, or to the user for purchase.	Indian National Programme for Improved Cookstoves (NPIC)
Installment / PAYG Plans	Consumers can pay for a stove in instalments. Pay-as-you-go systems eliminate upfront costs for consumers but transaction costs of collection are high and difficult to scale.	Toyola Energy Limited
Results-based Financing (Output based aid, conditional cash transfers)	Focuses on results that the public sector cares about and rewards private-sector suppliers who can deliver them. Investment and performance risks shift from the public to the private sector. In turn, private-sector suppliers have the flexibility to innovate in designing, producing, and selling defined clean stoves that are eligible for targeted incentives.	World Bank DFID4

Table 2: Consumer Financing Options[6,7,8,9,10]

market for clean stoves and fuels. Carbon credits can be sold in advance (forward-selling) or after they are issued by a carbon standard. Depending on one's needs, if 'sold forward' the pre-payment can help cover upfront investment during the implementation phase of the project. If sold after issuance, the revenue can be used to cover operational costs. Several different arrangements and combinations of carbon financing can be worked out depending on the investor needs as observed in the case studies. In some instances, develop

ers of clean cookstove projects often find it challenging to fund certification processes due to the one-to-two year time lag between registration and first revenues from carbon credits. To address this issue, the GACC, in partnership with Nexus Carbon for Development and the Gold Standard Foundation, has recently launched the Clean Cooking Loan Fund. This initiative offers loans to project developers to cover certification costs (Box 3, p. 20).

The backbone of a successful business model to scale up clean cooking solutions is its ability to address producer, distributor and consumer financing. All of these financing requirements can be met with a smart blend of public and private financing, thereby removing the barriers to clean cooking solutions.

For a majority of Gold Standard project developers, carbon revenue also serves to ensure the long-term sustainability of the project in the form of post-sale services, another barrier commonly cited by implementers. Provision of repair and hands-on services by the developers is imperative for the replacement of the inefficient stoves. Direct sales to consumers has been a highly effective but resource-intensive option. Thus establishing third-party dealer distributor networks as been found to be a more widely used option, which has led to a wide distribution of improved stoves. The ultimate goal of the adoption of cleaner cooking technology was made possible through an innovating financing mechanism—carbon credits.

6 2015, World Bank, The State of the Global Clean and Improved Cooking Sector

7 MicroEnergy Credits PoAs – carbon revenues as a catalyst to move MFI financed energy programmes forward.

8 2013, GIZ, Ingredients for Sustainable Cookstove Interventions, Lessons Learned from the Indian National Programme for Improved Cookstoves (NPIC).

9 2014, World Bank, Results-Based Financing for Clean Cookstoves in Uganda.

10 2014, DFID, Result-Based Financing for low carbon energy access (RBF)

"Geres, a prominent NGO in the cookstove sector attributes the success of its Gold Standard cookstove project in Mali through a mix of donor funding, private investment and upfront sale of carbon credits. Carbon revenue provided an incentive to local partners (producers and distributors), supported a promotion scheme for cookstove promotion, supported R&D, quality control of stoves and monitoring and capacity building activities of the project."

"If end-users are offered an additional discount on an efficient stove if the purchase is accompanied by surrendering a functioning inefficient stove of roughly similar capacity, it can help in the acceptance of the new improved stove."

Source: Swiss Carbon Group

"We produced pilot stoves and road tested them, selecting the preferred as the final design. Yes, cookstoves have changed over time, moving from a highly efficient design to one that is less efficient but more popular. "

Source: CO2 Balance. Project Developer

3.2 Understanding user needs

3.2.1 Acceptance of the ICS over the long-term is important. Incorporating users' needs and preferences into the design of the ICS is critical to ensuring that the cookstove is used consistently and correctly. This should also take into account the broad spectrum of non-technical factors such as cultural context, local traditions, aspirations, aesthetics, safety, and cooking habits. Household requirements are rarely met in a "one–size-fits-all" manner, emphasizing the importance of incorporating user requirements in research and development and offering a choice of high-quality designs[11]. The literature review and statements by developers confirmed that it is a fundamental requirement to account for the user needs in preparing local dishes with traditional cooking utensils and available fuels.[12] Where relevant, stove design must also meet other household energy needs like seasonal space heating, otherwise the ICS will be used for some, but not the majority of purposes, thereby hindering its sustained adoption and use. The ability to cook outside for larger gatherings is also important in many settings. The success of the entire project/programme hinges on getting this right from the start.

Many project developers have confirmed that following end-user feedback, cookstove design has gone through several alterations prior to distribution. Envirofit carried out extensive market research about the needs of potential end-users, desired product features, and the most suitiable regions for initiating ICS projects. Thus, over the years Envirofit has invested significantly in research and development, user feedback collection and developed a diverse range of models (more than 20 models so far) catering to the needs of different people related to their food and cooking habits, geographical context, and additional preferences.

"Preliminary tests by a sample of users (from 10 to 40 households) with complete feedback from women using the stove are also a good way to test the cookstove in real conditions."

Source: Horn of Africa Regional Environmental Centre and Networks

Another example is Instituto Perene that adopted a participatory decision-making process for cookstove design and selection. The developer confirmed that local communities played a crucial role in the development of Perene's ICS. In particular, cooking practices, fuel consumption patterns in the region, local women's needs, and necessary raw materials for stove construction and their availability were carefully considered and incorporated into the cookstove's design. In addition, Perene involved local masons, metal workers and ceramic crafters to use local knowledge and skill. The Institute's project team also worked with a specialist from the Aprovecho Research Centre to build a new and efficient cookstove model catering to the region. Several changes to the stove design were made after monitoring the test cookstoves' usage over several months before implementing the final design. The design process included inputs from women and local masons and was refined to meet the domestic cooking needs of the region. This rigorous cookstove design process ensured a high adoption rate of Perene's stove among the users.

3.2.2 Involving women in cookstove design is critical. Women are the primary end-users of ICSs, thus it is crucial to involve them in the project in order to ensure they adopt and use the stoves. The ICSs that have been designed in collaboration with women are more likely to be accepted and used. If a clean cookstove is difficult to use, does not match traditional cooking practices or pot types, takes longer to cook food, limits the ability of cooks, and/or changes the taste of food, it is unlikely that a woman will use it exclusively over a long period of time. Thus, working with households—and particularly women—to determine the parameters for cooking solutions that respond to their specific needs and preferences is paramount. All project developers largely agreed that the involvement of women was imperative to the acceptance, popularity, awareness and long-term sustained use of the stove. Women participated in the stove design phase with Perene and Aprovecho Research Center and were directly involved in deciding the dimensions, location, and features of the new stove model. The developer attributes the popularity of the stove to the prominent participation of women in developing the cookstove model from the ground up.

3.3 Role of Women

Women can play a key role in scaling the cookstove distribution and adoption. Women and their networks often play a crucial role in stove selection, marketing, sales and adoption because of their central role. All the project developers con-

11 2014, Rehfuess EA, Puzzolo E, Stanistreet D, Pope D, Bruce NG. Enablers and barriers to large-scale uptake of improved solid fuel stoves: a systematic review. Environ Health Perspective 122:120–130.

12 ibid

firm the crucial role of women in the success of a project. For example, the GS 500 project is run entirely by a team of 11 women. Some of them work for the network within which associations need to be affiliated with to benefit from the project. The target beneficiaries are women and they can be best understood and served by women, at least in the specific context of Sudan. These women are in charge of the stoves' procurement, distribution, due diligence for loans, data and repayment collection and monitoring efforts. As such, they are trained on a continuous basis by local and international experts.

Many project developers value the critical role of women and hence involve women in different roles. Envirofit and Qori Q'oncha programmes proactively involved female entrepreneurs for marketing and sales, awareness raising, capacity building and post sales services. In the Lesotho Atmosfair activity, women are responsible for marketing, user training and monitoring purposes of the project. The Paradigm Project in East Africa is tapping into the market by utilizing the wide reach of women as a trained and branded clean energy sales force. Paradigm Project intends to recruit a sale force constituting a minimum of 50% female sales agents in Rwanda, Ethiopia, and Kenya over the next two years. The overall project goals are to deploy 5 million ICSs over the next 10 years.[13]

The Bolivian-based Centro de Desarrollo en Energía Solar (CEDESOL) is dedicated to equipping the Andean people with improved cooking technologies and education. CEDESOL involves women in the entire value chain, from design considerations to after sales service. CEDESOL has developed an integrated model of cookstove distribution and support that leverages existing community networks. By working with the local leaders (Dirigentes) and community members, a representative is chosen to participate in the CEDESOL training and support program called the Modular Education Training (MET). This community representative is called an Innovative Leader (IL) and they are responsible for supporting a cluster of 15-20 households that have obtained an ICS. Each cluster of families is referred to as an Environmental Wellbeing Brigade. Several Innovative Leaders are chosen in areas where large number of families with ICSs exist. Currently 95% of the Innovative Leaders and the majority of Brigade members are women.

3.4 Consumer Awareness

Willingness to adopt and pay for clean stoves is a function of consumer awareness and the cultural contexts associated with transitioning to new and unfamiliar technologies. Behavioural change cannot be managed through technology selection alone. Currently there is a low level of awareness about the damaging health effects of indoor use of traditional stoves and how clean cooking technology can combat these health hazards while reducing household costs. Sensitisation and awareness raising community workshops, live demonstrations, house-to-house visits and presentations are crucial tools in changing the behaviour of users. Households need to be convinced of the direct and indirect benefits of the cookstove interventions. This inadequate public knowledge can be addressed by public campaigns released via media channels to educate consumers about the many advantages of clean stoves over traditional methods. Increased research and development of the stove designs and understanding the local requirements by the project owners can further enhance the acceptability of the stoves and influence their demand, thus also ensuring good quality stoves are delivered to the consumers

> *"Group discussion, "word-of mouth" advertising, product demonstrations and involvement of community leaders are more or less adopted. The main aim is to make the user understand better what benefits they would have with high-efficiency stoves. As a matter of fact, since the benefits are easy to see and very big, the user accepts the high-efficiency cookstove very quickly."*
>
> **Source: South Pole, Project developer**

3.5 Marketing and Distribution Model

Creating demand for the ICSs is vital for increasing uptake and ensuring sustainable business model. Innovative distribution models such as rural sales initiatives, working with self-help groups and women-run businesses, partnering with local village savings and loan associations to build awareness of clean cookstove business opportunities, bringing microfinance players into the mix, and stimulating inclusive supply chain models should be built upon. Some widely accepted distribution channels[14] are presented Table 3.

Hestian Innovation, a project developer in Malawi, adopted the private dealers and retailers option. They secured supply agreements with three key national retail outlets and now collect stoves from rural production groups to supply these outlets on a regular basis. The biggest challenges to this system were ensuring stable supply to meet demand and working with the Malawi Bureau of Standards to assure retail outlets that the product is saleable.

Instituto Perene believed that identifying and recruiting the local movers and shakers – often informal entrepreneurs who already make, sell and distribute products in the region – can be a useful strategy. Perene identified a local entrepreneur who was already selling and distributing housewares to rural homes across dozens of communities. His strengths included an in-depth knowledge of the region, communication and interpersonal skills, access to communities, local contacts and a knack for finding market opportunities in the widely-distributed but numerous low-income households of the region. Over time, this enterprise has grown both in revenue and institutional strength, and is now an independent operator rendering services regionally.

The Bondhu Chulha Programme used sanitary shops—micro-entrepreneurs, engaged in making latrines and drainage systems and other products out of concrete—as their distribution and supply chain units. These businesses are present all over Bangladesh and already have the expertise to sell, construct and install concrete facilities in households. The addition of the Bondhu Chula as a new product in their existing business allows them to generate more income and grow their business. Since these entrepreneurs are based in close proximity to the locality of the users, they are able to provide better post-sales service.

Channel Type	Direct Sales	Private Dealers and Retailers	Social Enterprises	Institutional Bulk Sales
Details	Sell direct to consumer via sales staff, branded commission based agents, or proprietary store network	Sell to third-party (e.g., fast-moving consumer goods) distributor networks or direct to dealers and retailers (large or small format)	Run sales and order fulfilment via microfinance institution (MFI)/ NGO workforces, government extension agents, or social micro-franchise networks (e.g., Living Goods)	Bulk purchases and redistribution by institutional clients, such as relief agencies, schools, and government programs
Examples (Project developers)	Up Energy, The Paradigm Project, Ezy stove	Envirofit, Impact Carbon, BioLite, Geres	Impact Carbon, BioLite, Up Energy, Microsol	International Lifeline Fund, Envirofit, InStove

Table 3: Distribution channels

3.6 After-sales service

Lack of or poor quality post-sales services and support becomes a barrier to the ongoing and sustained use of the ICSs. Therefore, it is critical to provide post-sales services in order to develop a successful project. The nonexistence of an after-sales support program has three key implications for adoption and use of ICSs:

- Without adequate after-sales training for consumers on proper use of the stoves, customers may believe that stoves do not work properly, negatively affecting brands and the market as a whole.
- Customers may be dissuaded from the original purchase if there is uncertainty around how/ when/if they will have access to repairs or support.

> *"The project has a stove maintenance budget. The stove users report to village workers who also conduct random user monitoring. Stoves which are not working or broken are reported to producers for immediate maintenance."*
>
> **Source: Horn of Africa Regional Environmental Centre and Networks**
>
> *"We involve local suppliers to market and provide replacement parts and services directly to users – provide logistics support but encourage independent secondary market."*
>
> **Source: Instituto Perene**

- Lack of after-sales support makes tracking and monitoring of cookstove distribution and use very difficult. This is a challenge for projects and programs that are using carbon financing

13 2013, GACC, Scaling Adoption of Clean Cooking Solutions through Women's Empowerment.

14 2014, WB Clean and Improved Cooking Landscape Report

4.0
Recommendations and conclusion

Box 4: Black Carbon and Clean Stoves

Black carbon (BC), which results from incomplete combustion, contributes an estimated 25-50% of carbon dioxide warming globally, and residential solid fuel burning accounts for up to 25% of global black carbon emissions, about 84% of which is from households in developing countries. Black carbon increases the melting of ice and glaciers, harms public health, reduces food security and disrupts weather patterns. With the reduction of carbon dioxide taking a priority under the Kyoto Protocol, mitigating short-lived climate pollutants, such as BC, have taken a back seat with many organisations and governments.

Many of today's more efficient cookstoves have been shown to reduce fuel use by 30-60%, resulting in fewer GHG and BC emissions and reducing negative effects on forests, habitats, and biodiversity. Since the atmospheric lifetime of BC is only a few days, reducing BC emissions can bring about a more rapid climate response than reductions in CO2 and other long-lived greenhouse gases alone. In addition to having an immediate impact on the global climate, reducing BC emissions would have a regional effect.

In collaboration with Project Surya, The Energy and Research Institute (TERI), the Global Alliance for Clean Cookstoves, Nexleaf Analytics and the University of California at San Diego, with funding from the Climate and Clean Air Coalition (CCAC) as part of the Reducing SLCPs from Household Cooking and Domestic Heating initiative and with extensive input from experts in the scientific and development finance communities, the Gold Standard developed a methodology for quantifying and monitoring emission reductions and associated climate impacts from black carbon and other short-lived climate pollutants. The goal is to drive finance into projects that provide an immediate and measurable impact on mitigating climate change at a local level.

For further details visit Gold Standard.

The perks of clean cookstoves are numerous, and can have life-changing impacts on communities. Whether a clean cookstove is predominantly distributed to a rural, urban or a speri-urban household, the factors governing its acceptance remain similar. From this report the following recommendations can be drawn:

- Market intelligence and a nuanced understanding of user needs are vital public goods at the early stage of development.
- An astute combination of public and private financing options can help the project emerge and support itself successfully. Carbon financing can have a "domino effect" from the initial planning stages to sustaining the project model in the long-term, and has therefore demonstrated its effectiveness as a financing solution.
- Getting close to the consumer is imperative. Considering end-user needs and incorporating their feedback is crucial for ensuring long-term adoption of ICSs.
- Raising awareness to stimulate demand is crucial.
- It is critical to involve women's groups as producers, distributers and/or sales agents, especially where they are already in well-organized groups that can access finance and influence others in the community.
- Creating demand for ICSs is important for guaranteeing uptake and a sustainable business model. The key focus may vary depending on the project developer's involvement, but it requires focus on demand creation, establishing the supply chain, sales approaches, distribution model, and post-sales services.
- User training for the ICS is essential. Lack of maintenance impairs functionality and sustained use, prompting end-users to switch back to traditional stoves. Hands-on training tends to be more effective than the provision of an instruction manual.
- Effective monitoring and evaluation systems are a prerequisite for ensuring a successful carbon finance based project.
- Direct incentives via CDM and voluntary carbon schemes and new incentives tied to health outcomes could aid in scaling up clean cooking technologies, especially given their high costs and the resulting affordability barriers.

In the coming decades, cookstoves will remain in the households of underdeveloped and developing countries until they are replaced by modern methods of cooking. Thus, the provision of clean and affordable household energy as a part of scaling up energy access for the poor is even more important. Today, there is a new potential to promote advanced biomass cookstoves and affordable, effective ICSs that burn fuel cleanly and efficiently. Microfinance organizations, private companies, governments, donors, and NGOs already promote advanced and effective ICSs in many countries, but need support to scale up. With the advent of funds going toward climate change mitigation, new potential avenues are available for financing and supporting this process. Finally, a new international coalition is forming around the issue of promoting advanced biomass cookstoves and alleviating indoor air pollution to ensure positive health outcomes.

Box 5: Health impact quantification methodology Stoves

The Gold Standard is also working on a methodology to quantify health impacts from cookstove projects. Payments for positive health outcomes in the form of an Averted Disability Adjusted Life Year (alternately called as DALYs averted)—under a results-based financing, pay for performance structure—presents tremendous potential for incentivising the implementation of ICSs, improved kitchen ventilation and cleaner fuel projects. Such a methodology would enable donors and impact investors to evaluate the benefits that have been realised through a simple MRV approach. The methodology will be made available towards the end of 2016.

GS3018: ICS Project with Carbon Finance, Nepal

7 Selected Gold Standard cookstove projects

The case studies are prepared based on a focused set of questions to gather a wide range of perspectives related to financing instruments for ICS project funding, role of carbon finance, stove design to meet end-user needs, distribution model and its sustainability, creating awareness amongst end-users and their training, provision of post-sales services, participation of women, monitoring and data collection and sustainable development benefits. This was also accompanied by one-on-one discussions with the project developers.

This section attempts to address the current barriers faced by project developers and the solutions implemented to overcome them by different market players across the globe. It describes the experience of project developers in tackling issues related to project financing, designing and selection of ICSs, providing post-sales services, and the importance of involving women in cookstove projects. The fact that carbon financing is essential to the active existence of a project is also addressed in the section detailing Gold Standard Project Case Studies. These case studies can be viewed as key drivers in scaling up clean cooking.

Case study 1: Improved Cook Stove Project with Carbon Finance (ICF), Nepal

GS ID	GS3018
Country/ Multi- Country	Nepal
Project Scale	Micro-scale
Annual emission reductions	6,470 tCO2/annum
Number of stoves installed	12,418 installed progressively, including replacements
Project Developer Profile	http://www.snv.org/, http://www.eneco.com

"Improved indoor air quality, reduction in cooking time and firewood collection giving more time for other activities like livestock care, vegetable farming, etc. Reductions in health effects like coughing, eye irritation and nausea. Kitchen environment became clean and reduced fire burning accidents."

Tulsi Devi Sharki (Dadeldhura), 45, Female

Project Description:

The objective of the project is the installation of ICSs in individual households in seven rural districts of Nepal in order to substitute the traditional cookstoves. The project is a voluntary action undertaken by the SNV Netherlands Development Organisation, Nepal, a company based in the Netherlands. The project is implemented in partnership with the Centre for Rural Technology, Nepal (CRT/N). The partnering organizations consist of district level NGOs, district development committees, village development committees and development organisations.

Project Finance and Carbon Revenue:

The programme was started with initial funding from DGIS/Government of Netherlands, which was later accompanied by a grant from OPEC fund for International Development (OFID), and financing from Eneco Energy Trade BV (a Dutch utility company and project participant) via upfront sale of carbon credits. Although no barriers were observed on the demand side, a pilot was initiated to integrate financial institutions and micro financing in the programme's process. This was done to support low-income users in paying for the cost of install if they were unwilling or unable to pay the upfront cost in a single payment.

The business model adopted by the project differs from typical ICS projects in Nepal. Typically, ICS projects around Nepal have been NGO driven. But this project was designed to be led by the private sector from the outset. The performance-based incentive provisions for the implementing agencies encourages them to perform and reach more households. This has been a key to the outstanding success of this programme, compared to the results of the decade-long national programme.

Carbon revenues are used to provide a direct consumer-subsidy for the stove. An affordability and willingness-to-pay study was conducted prior to project launch. The carbon revenues are earmarked to close the gap between cost of the ICS and consumers' ability to pay—in this case it was 500 NPR, or approximately $5 USD. Other plans for carbon revenues include focus on research and development; a research wing at the partner organization continuously works on improving the product design based on user feedback and to improve efficiency and performance. A portion of the carbon revenue is also used for after-sales maintenance and stove replacement.

Stove Selection:

Project implementer SNV and local partner CRT/N conducted extensive research to design an appropriate stove model. CRT/N houses the Regional Cookstove Testing and Knowledge Center (RTKC) in Kathmandu which designed, developed, and tested multiple iterations of ICS models for both SNV's project in the Far West Development Region (FWDR), as well as other ICS programs throughout Nepal. The main criteria in designing and selecting the stove models were:

- *Simple technology design (rocket stove design)—This was a priority to reduce cost, as well as garner more economic opportunity in the project area, located in the Far West Development Region (FWDR), the poorest region in Nepal.*
- *Affordability to appeal to households with limited disposable income—The design process included multiple iterations of stoves to ensure the efficiency met the minimum 25% thermal efficiency and Tier II standards for GACC/ ISO standards.*

The project also emphasizes the importance of user feedback because they recognize that households will only use ICSs if they work well and suit end-user needs while remaining affordable. Mechanisms to collect user feedback included:

- *Stove promoters—the individuals who install the stoves are typically members of the communities where they work, thus stove owners can contact them with feedback. The promoters meet monthly with project staff to report feedback.*
- *Contact information—each stove owner also has the contact information written in the user book provided to them so they can contact the project implementers and related people to report concerns and complaints.*
- *Supervisor Visits—End-users can also report to stove supervisors during their regular visit to communities for programme support.*

Additionally, a detailed procedure for making complaints is written in the user book, which is provided to users during installation. This message is also disseminated through regular events organized by the project developers at the community level. The stove supervisors were also oriented to facilitate promoters and users on reporting complaints. After more than three years of project implementation with frequent visits by project staff and ongoing orientation events in villages, many of the users know about the facilities provided by programme including the replacement options.

Operation and Maintenance:

The development of the supply chain and distribution model was critical for the project because it was intended from the outset to use a market-based approach, with a long term vision for SNV to exit the market, enabling private sector actors to take over.

One key barrier to establishing the distribution network was the geographic area. The project is in the FWDR in the high hills. This provided a key logistical challenge. The program overcame this barrier through a relatively complex but thoughtful organizational structure. SNV worked directly with their implementing agency Center for Rural Technology-Nepal (CRT/N), which has great depth of experience in implementing cookstove programs throughout Nepal. CRT/N trains local manufacturers and works with Local Partner Organizations (LPOs). LPOs work with community organizations to generate demand in villages and employ and manage locally hired stove promoters to install the stoves and provide follow-up service.

The project focused on training stove promoters, who are hired and trained in the skills needed to carry on stove sales and installations once ICSs have transitioned completely to the private sector. The additional training focused on the long-term benefits of good after sales service in terms of customer loyalty, referrals to expand their customer base, and repeat customers buying replacement stoves. The replacement mechanism was virtually the same; households were encouraged to contact the promoters when they needed a replacement stove. The project also anticipated the stoves to last for three years, so at the scheduled end of the stove's life, they would contact the households. A pictorial manual giving clear understanding on why regular maintenance is important and solutions for the minor yet frequently occurring problems was provided so that end-users don't have to wait and stop using the stove for longer that necessary.

Women and Clean Stoves:

The project emphasizes hiring women among all partner organizations. Despite the emphasis on hiring throughout all levels of the organization, cultural barriers still make this a challenge, as women are not encouraged to work. Nonetheless, per the Governments' rule of inclusion, it is mandatory to have one third participation of women in every aspect of the work and the project is committed to reaching that target and beyond. It is effective to have women stove promoters, with whom the women of the user households feel more comfortable interacting and asking questions.

Sustainable Development Benefits:

Currently, the program directly employs 658 people. One of the key highlights of the project is the staff involved in the promotion of the stoves; 20% of them belong to lower caste and 16% of them are women. A relatively high number of jobs (92%) are provided to local people. Approximately 40% reduction in fuelwood consumption with ICS over traditional cookstove (TCS) results in approximately 1.6 tons of firewood saved per household per annually. This translates into savings of around $161 USD per year for households that purchase fuel.

Case study 2: Efficient Cookstoves in the Bahian Recôncavo Region

GS ID	GS832
Country	Brazil
Project scale	Micro-scale
Annual emission reductions	10,000 tCO2/annum
Project stove model	Fixed, two-burner rocket-stove with Chimney
Number of stoves distributed	5,000
Project Developer	Instituto Perene www.perene.org.br, www.cleancookstovesbrazil.org

Project description:

Brazilian project developer Instituto Perene distributed efficient rocket stoves for domestic use in low-income rural families in Reconcavo region of Bahia state of Brazil. Perene's pioneering program is benefiting 25,000 people through the construction of 5,000 efficient stoves. These families were using common rudimentary stoves in the baseline situation. Instiuto Perene received the prestigious US EPA award for Monitoring Impacts of Cookstove Interventions in 2011, amongst may other awards.

Project finance and carbon revenue:

Perene operates with the revenue generated by up-front sales of carbon credits, the carbon revenue for two instalments or in-kind contribution by paying for raw material bricks, cement and raw material. The carbon credit revenue does not cover post-installation training and maintenance.

Cookstove selection:

The cookstove designing and selection process is worth a mention here. The project developer adopted a participatory design process by involving local communities in the development of Perene's ICSs. In particular, cooking practices, regional fuel consumption patterns, local women's needs and raw materials for stove construction and their availability were carefully considered and incorporated into the design. In addition, Perene involved local masons, metal workers and ceramic crafters to use local knowledge and skill. The Institute's project team also worked with a specialist from the Aprovecho Research Centre to build the new and efficient cookstove model catering to the region. Several changes to the stove design were made after monitoring the test cookstoves usage over several months before the final design. The design process included inputs from women and local masons and was refined to meet the domestic cooking needs of the region. This rigorous cookstove design process ensured the high adoption rate of Perene's stove among the users.

Operation and Maintenance:

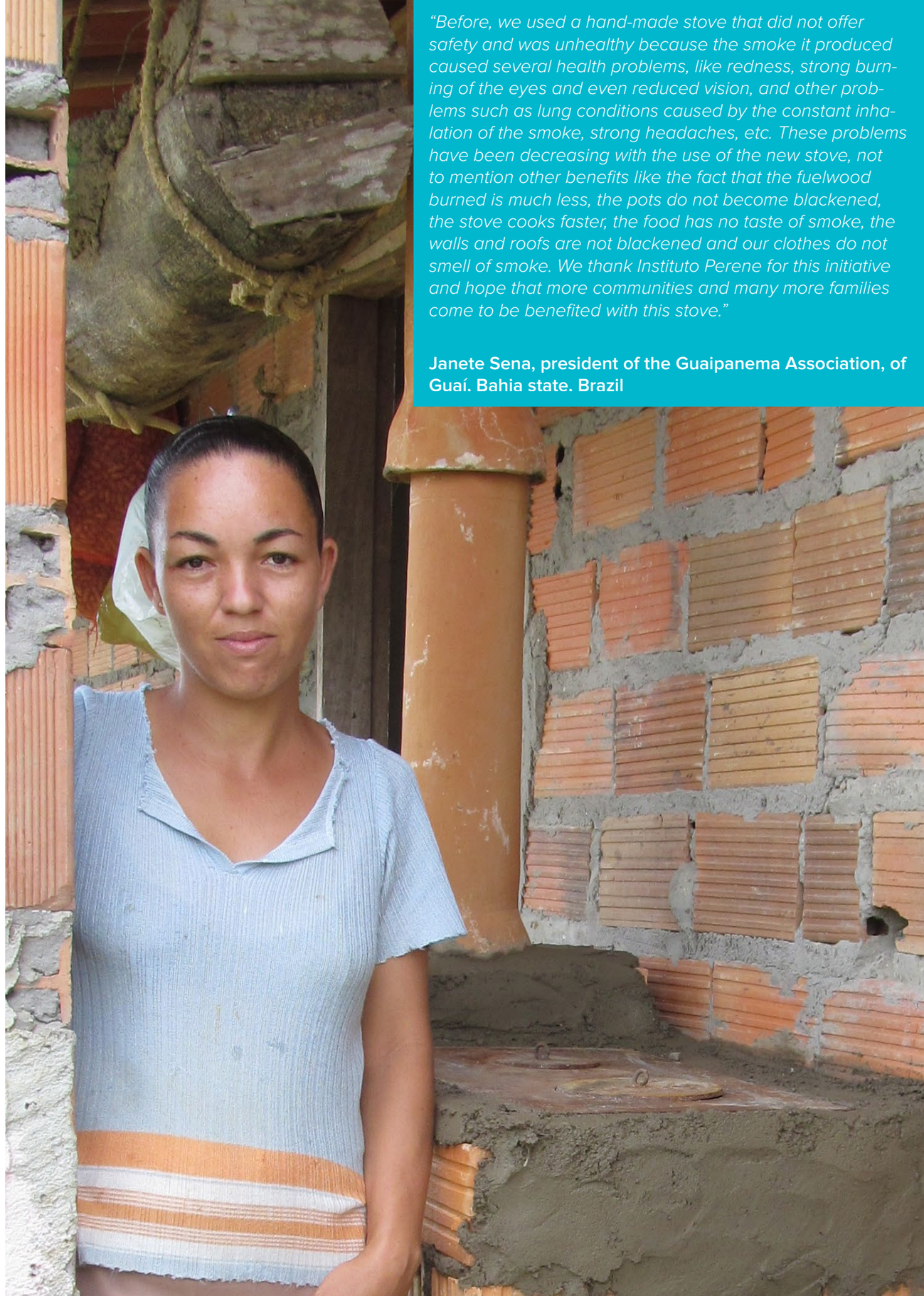
The normal process of wear and tear can lower the stove performance. The stove model is very popular among end-users and has completely replaced the traditional stoves. In many cases the project stoves were constructed at the same spot where the old stove was. Therefore, if the there is wear and tear, the user gets it repaired as soon as possible. The success of the project has created a new demand for parts and repair service in the project boundary. In a testing phase, Perene donated parts (surplus stove tops, chimneys and combustion chambers) and local entrepreneurs offered installation and repair services by charging the customer directly. It has been observed that after realizing the benefits of the efficient cookstoves, end-users are willing to pay for the full cost of service and parts.

Women and clean stoves:

Women know best what works in their kitchen. Perene involved women in the cookstove design stage. In Brazilian society women tend to be very outspoken and this has greatly facilitated the process of gathering feedback during the design stage. The cooks participated in the stove design phase with Perene and Aprovecho Research Center, and were directly involved in deciding the dimensions, location, and features of the new stove model. We attribute the popularity of the stove to the prominent participation of women in developing the stove model.

Sustainable Development Benefits:

- Around 25,000 people have access to cleaner stoves in rural areas
- Over 88% users confirm an improvement in the indoor air quality
- 8 women trained and employed as Community Agents



"Before, we used a hand-made stove that did not offer safety and was unhealthy because the smoke it produced caused several health problems, like redness, strong burning of the eyes and even reduced vision, and other problems such as lung conditions caused by the constant inhalation of the smoke, strong headaches, etc. These problems have been decreasing with the use of the new stove, not to mention other benefits like the fact that the fuelwood burned is much less, the pots do not become blackened, the stove cooks faster, the food has no taste of smoke, the walls and roofs are not blackened and our clothes do not smell of smoke. We thank Instituto Perene for this initiative and hope that more communities and many more families come to be benefited with this stove."

Janete Sena, president of the Guaipanema Association, of Guaí. Bahia state. Brazil

Case study 3: Improved cookstoves diffusion programme in Peru

Project GS ID	GS1005
Country	Peru
Project Scale	Large-scale programme of activity (PoA)
Annual emission reductions	98,130 tCO2/annum
Project stove model	Four different ICS models are implemented by the local partners (LPPs): Inkawasi Sembrando, Inkawasi UK, Inkawasi Sujita and Sumaq Mikhuy. All the ICS are locally constructed fixed models with chimney.
Number of stoves	106,000
Project Developer	http://www.microsol-int.com/

"Cooking using the new stove is better than before. Now we only use 3 pieces of wood and that's it. Before we had to light the fire outside and it was very difficult, sometimes the wind blew very hard, it rained, it was very bad. In that aspect it's better. Now the smoke goes through the chimney. We do the maintenance ourselves. It is just like if we had a gas stove. It boils very fast, not like before. Now we consume less firewood. Before we had to use a lot of firewood, because the sparks kept flying everywhere. In contrast, now everything is well sealed and in 45 minutes we are ready to eat. Now it is much better."

Juan Mamani Mamani, stove-user, Miraflores community, region of Arequipa

Project Description:

The PoA "Qori Q'oncha: Improved Cookstoves Diffusion Programme in Peru" is spread across nine regions of Peru: Piura, Cajamarca, La Libertad, Huánuco, Cusco, Huancavelica, Arequipa, Moquegua y Tacna. The programme is primarily designed for the long-term improvement of the living conditions of local people by the use of improved stoves. All the stoves are two-pot stoves with chimneys and are built in the household. SENCICO, Peru's National Training Service for the Construction Industry, part of the Ministry of Housing, Construction and Sanitation tested the different models of cookstove included in the programme. On an average, each family reduces around 2.5 ton CO2/year and saves around 40% in fuel. Over the period of six years the stove has improved the lives of approximately 4,93,000 people in Peru. The programme has also won a special achievement award at the 2011 Partnership for Clean Indoor Air (PCIA) Forum in Lima.

Project Finance and Carbon revenue:

In the Qori Q'oncha programme, the developer specifically targets poor households (people pertaining to the first two quintiles of the population) who can not afford the installation cost of ICS. The project partners have adopted an innovative financing model in which the stove user provides no cash contribution rather provides the basic construction material that is locally available such as adobe, lime, water and also participate during the stove construction. Primarily, the end-users live in remote rural areas with no or very limited financial resources and are therefore unable to provide monetary contribution. As an alternative, they are asked for in-kind contribution. In order to fund the ICS project activities, the local partners rely on public funding, donations and carbon revenues. Carbon revenues are used for two main purposes: (1) providing a price subsidy to the end-user and (2) ensuring the stoves sustainability in the long term through sensitization, capacity-building, monitoring, follow-up, maintenance and spare parts replacement activities. The use of carbon revenues is monitored as a part of sustainability monitoring parameters. It is being monitored to avoid any corruption and to ensure that income generated from the sale of carbon credits are satisfactorily reinvested in the project activities in order to ensure programme sustainability and expansion.

Stove Selection:

The stove models have been designed by the local partners themselves or other competent institutions like the regional governments who have selected models designed by GIZ, the German international cooperation. To select and design the project stove the following aspects were considered: locally available materials, fuel type use, cooking patterns, taste preferences and local beliefs. Each stove model included in the project activity went through a rigorous design process prior to its final certification. The developer carried out the background research, developed a prototype to carryout the field and underwent laboratory testing followed by the design iteration based on the feedback collected.

Operation and Maintenance:

The ICS models can last for many years if adequate maintenance and repairs services are provided. In this programme the small and easy repairs are carried out by the end-users themselves since the cookstoves are made of locally available materials such as adobe. The local partners provide the maintenance services for complex repairs such as the replacement of chimney and combustion chambers. The operation and maintenance services are very much dependent on carbon revenues. The local project partner nominates the trained representatives in the project area to help the end-users in managing their cookstove. The representatives monitor the level of sensitisation and capacity building of the end-users in order to ensure they have understood the benefits of the stoves and have acquired the knowledge to use and maintain them adequately. The robust operation and maintenance approach followed in this programme ensures high adoption and usage rates of ICS.

Women and clean stoves:

Women are the first end-users of the ICS, thus it is crucial they are actively involved in the project in order to ensure they adopt and use the stoves. In the case of Qori Q'oncha programme where stoves were constructed in the households, this implied the involvement of women in selecting the stove model, proper use, awareness raising regarding positive benefits and capacity-building activities.

Sustainable Development Benefits:

Almost 100% of end-users claim improvement in indoor air quality. The efficient stoves reduce around 40% of fuel consumption and therefore significantly reduce the fuel collection time by almost 7 hours per month. The fuel saving also cuts the household fuel expenditure close to $879 USD/year/stove. In addition, around 299 jobs were also created due to this activity.

"My improved cookstove is really good. I've never had one before. I used to have a traditional cookstove, it used to fill the kitchen with smoke and hurt our eyes. The smoke was on our clothes, the kitchen was covered in smoke, but not anymore."

Natividad Machaca De Quico, woman 71-year-old, Arenales community, region of Arequipa

Case study 4: Darfur Efficient Cook-stove Project

Project GS ID	GS500
Country/ Multi- Country	Sudan
Project Scale	Small-scale
Annual emission reductions	33,993 tCO2/annum
Project stove model	LPG stove, Portable, Without Chimney
Number of stoves installed	6,500
Project Developer Profile	www.carbon-clear.com and www.practicalaction.org

Project Description:

The project reduces greenhouse gas emissions by providing LPG fuel and appliance systems. The LPG stoves have increased combustion and heat transfer efficiency compared with the baseline stove. Most households use biomass fuels (firewood and charcoal) in traditional stoves such as three-stone fire places, improved mud stoves for firewood, and traditional metal stoves and Mubkhar stoves for charcoal. Almost 39,000 people have benefitted from the stove. The project is located in and around El Fashir town, Northern Darfur district of Sudan. The project location is approximately 1,000 km from the capital city Khartoum. Six selling points have been established through the project area: Deim Silaik, El-thora, Al-salam, Krgo Kaber, Emtdad Eltijaneyah and Alshabaka.

Project Finance and carbon revenue:

The main barrier to the adoption of the clean burning stoves was and still is the upfront costs required to purchase a LPG stove and a cylinder. The procurement of an LPG set would cost on average a month of salary for households who earn daily and weekly incomes and cannot afford the upfront cost of it. Hence, a micro-finance facility was created right from the beginning and a team of local women trained to operate it. Due to the circumstances of a post-war area, there was not much private finance such as payment facilities available to individuals. Without proper management the end-users financing facility will be unable to operate properly leading due to slow repayment or low repayment rates and would impair future lending ability. The bulk purchase of stoves and cylinders through the micro-finance facility also enables to reduce the cost of each LPG units. One of the market barrier faced is related to the size of the micro-finance facility. The demand for stove payment facility far exceed the capacity to provide loans. Moreover, the stoves and cylinder suppliers are not willing to offer payment facility, which slow down the rate of distribution.

Over the five first years, the project was fully funded by the sale of carbon credits. The anticipated proceeds from carbon revenues were used to build the micro finance facility and still pays for the project management and operation (employing 11 staffs, providing on-going trainings, solving market issues locally, etc.) and the "carbon" monitoring efforts. Since the price of carbon credits have decreased, a partner was identified to grow the revolving fund and the carbon proceeds still provide the resources required to pay for the project operations and carbon monitoring and certification.

Stove Selection:

The project initially started distributing 3 different models/brands of stoves, provided by market intermediaries. One of them was imported from China and the two others were assembled locally. Later, the project developer focussed only on one model which is assembled locally and makes it one of the cheapest. This is a Turkish brand that meets certain certification standards and is of a better quality that the others. This model being assembled locally, can be delivered within days on the project site and finally, the stoves have 3 burners, more convenient and accepted than the 2-burner. The regular surveys a project registered under the Gold Standard have to carry out (notably the Kitchen Surveys – for fuel consumption and usage – and the Usage Surveys – for the stove lifespan) have enabled to amend the project design.

Operation and Maintenance:

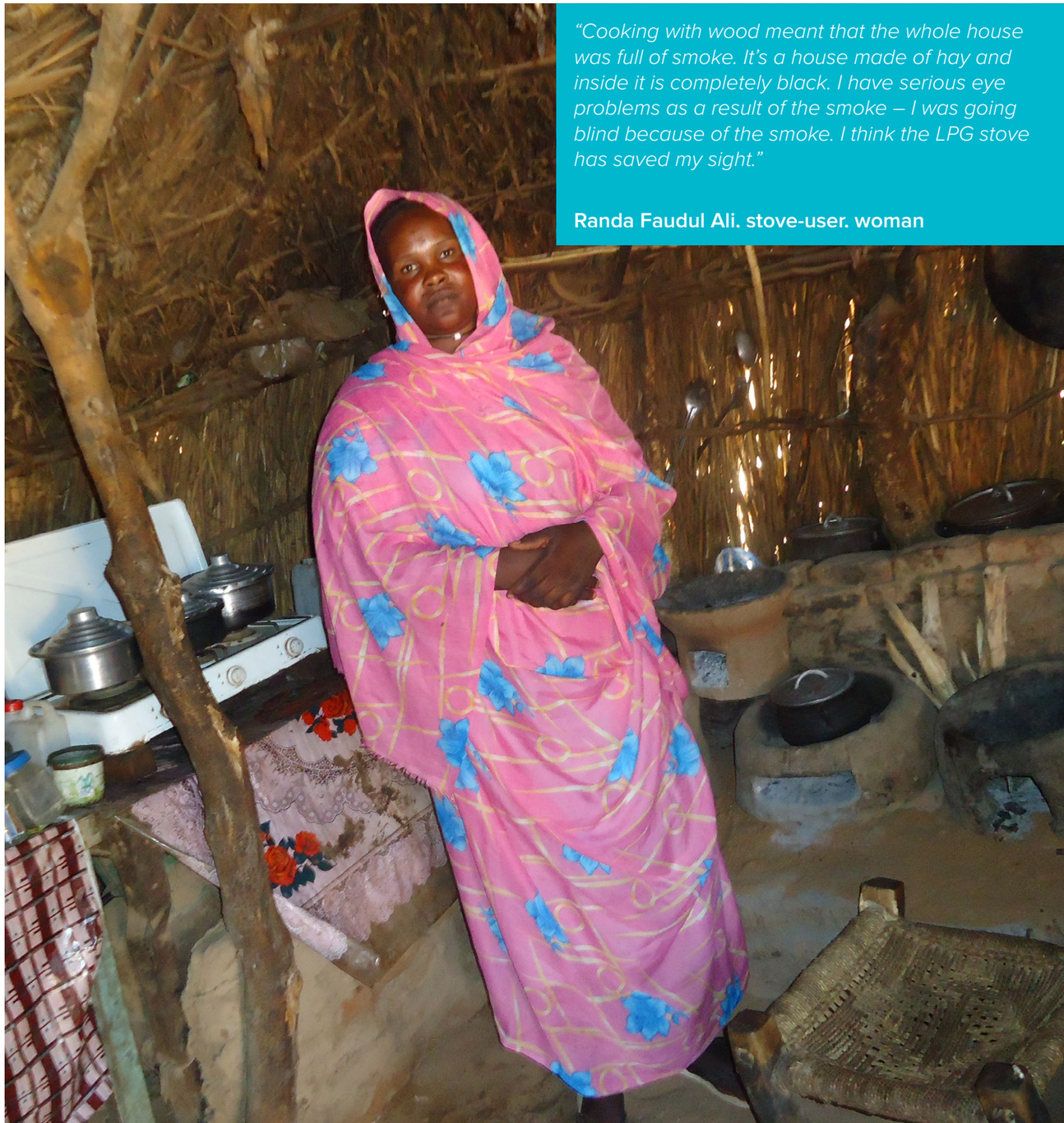
The distribution of stoves is centralized. To access a stove and a loan, a woman must be affiliated to an association and this association must be affiliated to the network. Stoves are purchased in bulk from the manufacturer and distributed through gatherings. The products sold are generally of a good quality and would last many years. The users are guaranteed for a month (to cover manufacturing defects) and are easy and fairly cheap to repair by local repairers. These stoves are relatively expensive and as a result, beneficiaries take good care of them. No specific after-sales support is provided.

Women and Clean stoves:

The project is entirely run by a team made of 11 women. Some of them work for the network within which associations need to be affiliated with to benefit from the project. The target beneficiaries are women and they can be best understood and served by women, at least in the very specific context of Sudan. These women are in charge of the stoves procurement, distribution, due diligence for loans, data and repayment collection and monitoring efforts. As such they are trained on a continuous basis by local and international experts.

Sustainable Development Benefits:

One of the most significant benefits from the project is fuel savings to the tune of 480 kg wood/ stove/ year and 480 kg/ charcoal/ stove/ year and all the beneficiaries acknowledge the improved indoor air quality.



"Cooking with wood meant that the whole house was full of smoke. It's a house made of hay and inside it is completely black. I have serious eye problems as a result of the smoke – I was going blind because of the smoke. I think the LPG stove has saved my sight."

Randa Faudul Ali. stove-user. woman

Case study 5: Integrated Biomass Energy Conservation Project - Malawi

GS ID	GS613
Country/ Multi- Country	Malawi
Project Scale	Large-scale
Annual emission reductions	59029 tCO2/annum
Project stove model	Portable ceramic Stove, Fixed esperanza stove, Rocket barns, Institutional stove, Urban cookstove (both fixed and portable type)
Number of stoves installed	26,730 household Chitetezo Mbaula 260 Institutional Mayankho
Project Developer Profile	www.hestian.com

Project Description:

The project is based on research and development in the stoves and barns by the Programme for Biomass Energy Conservation (ProBEC) in Malawi. Hestian Rural Innovation Development, a company that promotes fuel-efficient technologies was founded on the basis of this pilot work in 2008. The project disseminates improved household and institutional cook-stoves and fuel-efficient rocket barns to replace existing inefficient curing barns. This project have benefitted around 1,22,000 people by providing access to the improved stoves. Additionally, 100 institutional stoves are also distributed in this project.

Project Finance and carbon revenue:

Long-term sustainability is completely contingent on securing buyers of carbon credits. The project developer is exploring other financing avenues such as grants and loans, but these would have to be repaid in the future with revenues raised from sale of carbon credits, which is not guaranteed. Hestian, using private funds, survived for 3 years until the first carbon payment. Carbon revenue is currently elusive and has been for years. If secured, carbon revenue would be used by the project implementer to conduct monitoring activities and scale up project activities.

Stove Selection:

Malawi is 8th poorest country in world, with large population dependent on Agriculture and with very disposable income. The primary selection criteria was to design a low cost efficient stove, with ability to replicate and scale up. One of the crucial features for East African cooking practices is a strong and sturdy body that can withstand 'beating' of maize porridge staple food. Since 1999 the developer, gathered feedback from users and carried out the performance test to finalise the design of the project stove. After several years of effort, the production of project stove "Chitetezo Mbaula" was scaled up in 2013 with the release of production guidelines for local manufacturers. Later on, the production guidelines were also endorsed by the National Cookstove Steering Committee.

Operation and Maintenance:

The project implementer secured supply agreements with three key national retail outlets and now collects stoves from rural production groups to supply to these outlets on a regular basis. The biggest challenges to this system were ensuring stable supply to meet demand, and working with Malawi Bureau of Standards to assure retail outlets that product is saleable. The project is currently considering most appropriate and cost effective ways to let consumers know where to purchase additional/replacement household stoves. The Chitetezo Mbaula is a fired clay stove and it is not feasible to implement a warranty system. There is a limited 5-year warranty system for the institutional stove.

Women and Clean stoves:

The more women involved the better at every stage of the value chain. Women account for more than 50% of project employment. Project implementers are all interested in empowerment of women and therefore try to involve women in every step of the value chain.

Sustainable Development Benefits:

The project created 450 jobs in its fourth year of operation and estimates 100 jobs created per year but this is largely dependent on how quickly the project scales up. The Institutional stoves save approx. 3,065 kg wood per institution per year while the household stoves save up to 1,209 kg wood / household / year.

"The Chitetezo Mbaula strengthens the family because when you are cooking your husband is always there. But with the three stone fire he goes out because of the smoke. If we use Chitetezo Mbaula, we save the environment. We don't go to the bush to fetch firewood frequently."

Sidiveria Zaawe. Chitetezo Mbaula Producer and User

Case study 6: Efficient Wood Fuel Stove-Cooking-Sets, Lesotho

GS ID	GS913
Country	Lesotho
Project Scale	Small-scale
Annual emission reductions	24433 tCO2/annum
Country/ Multi- Country	Lesotho
Project stove model	SAVE80, Portable Without Chimney
Number of stoves installed	10,000
Project Developer Profile	www.atmosfair.de

Project Description:

The purpose of this project activity is the dissemination of efficient fuel wood stoves and heat retaining polypropylene boxes in several districts of Lesotho at subsidized prices. Users are households who previously used inefficient, traditional fireplaces. Around 55,000 people are benefitting from the project. The SAVE80 system also consists of custom-fit pots, pans and a heat-retaining box ('Wonderbox'). While the stove is assembled by locals, its parts as a kit are imported from Germany.

Project Finance and carbon revenue:

Deutsche Post-DHL, Germany provided 100% of the investment for ICS including distribution. The project was implemented with a 50% subsidy of the ICS set (cooking set consisting of 5 pieces: 1 x ICS, 3 x pots and 1 x retained heat cooker funded by the expected carbon revenue. The end-users paid a deposit 10% of the commercial price and the remaining balance is paid over the next 4 years in interest free instalments. The project gives a 5 year warranty plus a 5 year free repair service on the metal parts of the ICS cooking set, including glass lids.

Stove Selection:

Prior to scaling up the activity, the project developer carried out the efficiency and field test with a minimum of 50 stoves. During the initial testing phase, the developer gathered feedback from users. The SAVE80 Stove-Cooking-Sets are made of 100% of stainless steel, pots made from stainless steel and cast-iron and a retained heat cooker (wonderbox). To adopt to the local cooking habits of using cast-iron pots for certain dishes, the locally produced cast-iron pot was added to the standard stainless steel pots provided by the manufacturer.

Operation and Maintenance:

While distributing the technology, the developer preferred households with immovable jobs etc over those with movable jobs like teachers, nurses, etc. The rational was that the household with moveable jobs have higher risk drop-out. The post-sales services were aligned with the collection of balance instalments spread over 4 years after installation. This created a reason to follow up continuously for the next 4 to 6 years. Since a large number of customers do not pay continuously, the instalment time will further extend, prolonging the reason to offer post-sales services. However, the cost of visiting the customers over a long period of time in remote areas is costly and time consuming but the developer believes that "Keeping physical contact with the customers is costly but essential practice to ensure the continuous use of the project stove". In additional, the developer organises frequent public cooking demonstration events with the potential end-users to discuss the issues and explain the correct use of the retained heat cooker. Also, follow up end-user training is part of the project sales activities, since mouth-to-mouth (peer to peer) training on village level is helpful but have its own limitation.

Women and Clean stoves:

There is a 50/50 gender mix in all activities. With this project there is clear a separation of gender duties. Manufacturing is done only by men, while marketing, training and monitoring is done only by women.

Sustainable Development Benefits:

Over 98% end-users agree that there has been an improvement in indoor air quality and thus better health of the household members.

"Food cooked in the wonderbox keeps the nutrient value. [My wife] has time to do other things for her family and community such as farming, meeting, check-ups, etc. She is healthier as she is not exposed to a lot of smoke"

Phale. Cookstove End-user

Case study 7: The Breathing Space Improved Cooking Stoves Programme, India

GS ID	GS916
Country/ Multi- Country	India
Project Scale	Small-scale
Annual emission reductions	27495 tCO2/annum
GHGs quantification methodology	AMS II.G version 3
Number of stoves installed	Approximately 30,000
Project Developer Profile	www.envirofit.org

Project Description:

The project is the part of the PoA that is a voluntary initiative taken by Envirofit that develops well-engineered technology solutions to improve the living conditions on a global scale with primary emphasis on applications in the developing countries. The programme covers multiple states across India and replaces the traditional 'Chulhas', three stone stove made of mud and clay. Approximately 200,000 households have access to the Envirofit stove under this programme. The project is also the recipient of the WWF Climate Solver Award, 2013.

Project Finance and Carbon Revenue:

The developer believes that if the project is large and spread across a large area then retailing may not work. Seed-funding from a donor organization against future carbon credits from the PoA helps in mitigating the financial barrier at the project developer level. At the distributor / retailer level, the stoves are provided on credit to make the product easily available / accessible to the market. At the end-user level, multiple awareness raising efforts are made to make them aware of the cost benefit analysis of the stove. Subsequently proceeds from carbon credits and business revenues helps manage these barriers. Carbon credit revenue is imperative to the PoA. The carbon credit revenue is used to cover the subsidy bill on account of indirect subsidy being offered to the end-users as well as for Research & Development and after sales servicing (warranty claims, user surveys etc.)

Stove Selection:

Envirofit has always believed in offering products that suit the needs for all. Over the years Envirofit has invested significantly in research and development, user feedback collection and have developed a diverse range of models (more than 20 models so far) catering to needs of different people as per their food habits / geography / cooking preferences etc. Envirofit with help from seed funding had commissioned a comprehensive market study to understand the requirements and preference of the end-users and potential region to start the stove distribution. The main criteria considered were ease of use, durability and performance of the stoves. Envirofit established a feedback mechanism as part of project to collect user's feedback on the stove design and usability via various mediums such as surveys, public stalls, skit presentations, after sales visits, etc. This helps in overcoming the "Acceptability" barrier. The project stove is indigenously manufactured.

Operation and Maintenance:

After sales service are always integral part of the project design. During the initial phase, Envirofit sold the stoves through retail model. However, the developer explored the institutionalized sales model and roped in MFIs, SHGs, Village level Entrepreneurs, NGOs with a strong focus on after sales services. Such entities already had a strong presence in their regions and were well connected to the potential users. Also, because these entities were already involved in either product sales (MFI, Village Entrepreneurs, etc.,) or social services (SHGs, NGOs, etc.,) in area of health, poverty, women empowerment, it was much easier for them to address demand and cover the "Availability" factor. In addition, the institutionalized sale model helps in managing the after sales services through the partners, who receives all the complaints from the end-users. These partners then escalate the complaints to Envirofit field staff. During the warranty period after sales service is provided free of cost. The Envirofit field staff with different partners (MFIs, NGOs, SHGs, etc) are trained to understand the stove model and its design in detail and hence are able to understand the nature of complaint and address it efficiently.

Women and Clean Stoves:

Women are involved in the PoA in various capacities. Envirofit uses Women entrepreneurs as one of the sales channel. They are actively involved in marketing and sales. Being themselves involved in cooking, they well understand the need for an improved stove and can provide expert feedback on ICS marketed / sold will be able to satisfy the aspirations in their region.

Sustainable Development Benefits:

The project activity generates around 25 permanent jobs and results in a significant improvement of indoor air quality.

Case study 8: Ecological Stoves for Better Living - Micro Scale PoA

GS ID	1221
Country	Bolivia
Project Scale	Micro Scale PoA
Annual emission reductions	7972 tCO2/ annum (VPA1)
Number of stoves installed	2500 (VPA 1) and 50000 for the PoA
Number of Institutional stove (if any)	200 (VPA1) and 1000 for the PoA
Project Developer Profile	www.myclimate.org

Project Description:

This activity is designed to generate GS VERs during a fixed 10-year Gold Standard (GS) crediting life cycle by installing and monitoring around 2,500 domestic stoves and 200 institutional/commercial rocket stoves in areas designated as qualified populations in the country of Bolivia. Due to the current practices, almost negligible voluntary uptake of improved cooking devices and high number of households, institutions and business using inefficient technology (almost all wood cook stoves currently in use in Bolivia are highly inefficient) the scale of change will be significant. More than 10,000 users benefit from this activity. The activity encompasses the use of the stoves for domestic, commercial and institutional purposes.

Project Finance and carbon revenue:

To reduce project finance barrier, Myclimate partnered with municipal governments, agricultural associations, NGO's or relied on direct donations by public to help reduce further the cost to end-user while helping CEDESOL (Coordinating and Managing Entity for the PoA) cover operating costs. Micro financing has not been very helpful since the bulk of the demand was in very remote rural areas and microfinance institutions don't operate there. Without carbon finance obtained in association with the Foundation Myclimate the beneficiaries would not be able to access the program and receive the education and cooking devices. It was also required to provide a price subsidy and after sales service, including year long expanded modular environmental education program.

Stove Selection:

The stoves were selected after more than ten years of experience, holding numerous workshops and consultations in the communities. Myclimate has an integrated Educational Program to tailor the design of the future stoves and the Carbon monitoring guarantee a long term contact and feedback from beneficiaries.

Operation and Maintenance:

Local involvement and a close contribution with local entities and villages is key. Subsidies are needed for affordable prices. Following the guidelines of the GS TPDDTEC Methodology provides good bases for the post-sales and maintenance services. Only operating stoves generate carbon credits. This is a high incentive for the implementer to provide good quality.

Women and Clean Stoves:

CEDESOL has learned that women should be the focus of a stove project. They are the primary users. In their projects they participate in the whole value chain, from design considerations to after sales service. CEDESOL has developed an integrated model of cookstove distribution and support that leverages existing community networks to build a more holistic intervention for improved health and development in the community. Working with the local leaders (Dirigentes) and community members, a representative is chosen to participate in the CEDESOL training and support program called the Modular Education Training (MET). This community representative is called an Innovative Leader (IL) and they are responsible for supporting a cluster of 15-20 households that have obtained an ICS. Each cluster of families is referred to as an Environmental Wellbeing Brigade (hereafter, Brigade). Several Innovative Leaders are chosen in areas where large number of families now with ICSs exist. While men are not excluded from participation in the program, currently 95% of the Innovative Leaders and the majority of Brigade members are women.

Sustainable Development Benefits:

Project beneficiaries claim that they save up to an average of one hour daily in fuel collection which allows them to utilize their time efficiently.

"I am using a lot less wood now. Just a little firewood to get the food to boil and then I place it into the solar cooker. I have 2-3 hours to weave while the food cooks. The solar cooker helps me to increase my income".

"It's cleaner. Before, the animals would come up to the stove. Now they can't because it's higher up. I like it because my husband likes it. Before, he had to carry a lot of firewood, and now very little. With my traditional stove, there was a lot of smoke, headaches, sore throat and burning eyes. With this stove, these problems no longer exist."

Felicidad Orellana. Cochabamba district

Case study 9: Improved Kitchen Regimes: Bugesera, Rwanda (VPA)

GS ID	GS1267
Country/ Multi- Country	Rwanda
Project Scale	Micro-scale PoA
Annual emission reductions	10000 tCO2/year
GHGs quantification methodology	GS TPDDTEC, V1.0
Number of stoves installed	1683 (VPA) and
Project Developer Profile	www.co2balance.com

"I like the stove mainly because of its favourable performance in the kitchen: it decreases the quantity of wood used and it gives out less smoke so it keeps the kitchen clean. I encourage the neighbours to buy the same improved cookstove because it helps both for families in the kitchen and the region to preserve more trees."

Cecile Ngendahayo, Stove beneficiary, Female

Project Description:

The efficient cookstoves are based on a design developed by co2balance UK Ltd, and tested independently. It involves the distribution of approximately 1,683 domestic fuel-efficient cookstoves to households within the Bugesera District in the Eastern Province, Rwanda. The majority of families would not otherwise have access to the market for fuel-efficient cookstoves for economic reasons. Wood fuel is in particularly high demand, especially in rural areas where 98% of households rely on wood as their main cooking fuel. Traditionally, families in the Bugesera District cook utilise a three-stone open fire. This method is inefficient and leads to the unsustainable usage of non-renewable biomass in the cooking process. The replacement fuel-efficient stove currently leads to a reduction in the annual usage of biomass for users by 71%.

Project finance and carbon revenue:

Low levels of awareness and high level of poverty amongst end-users were barriers in implementing the project. These were overcome by providing the stove at a highly subsidised rate and investment in awareness raising activities. Carbon financing is needed to fund future stove subsidization, delivery, installation and maintenance of stoves over the course of the programme. The price subsidy is crucial as without it no one would be able to afford the stoves. The developer also invested heavily in designing a stove suitable for local needs.

Stove Selection:

The project developer extensively gathered feedback from community to design an in-house efficient cookstove. Initially several pilot stoves were constructed for road testing. Based on end-user feedback and preferences, the developer selected the final design for cookstove project. Also, it has been observed that based on the user feedback and preferences, the cookstove design has changed over time, moving from a highly efficient design to one that is less efficient but more popular. However, it is critical to account for user preferences to ensure the continuous of the stoves.

Operation and Maintenance:

The developer engaged local community groups for the stovess distribution and construction. There is a post-sale service and a repair mechanism available, however so far the stoves have been performing well. Hands on training and continual engagement through community leaders has ensured this.

Women and Clean stoves:

Local women groups are engaged as nodes to spread awareness about stoves.

Sustainable Development Benefits:

Given that the nature of the activity is micro-scale, the project still improves the indoor air quality of almost 8,000 users.

Case study 10: GHG Emission reduction via use of "Bondhu Chulha" in Bangladesh

GS ID	GS3554 (VPA)
Country	Bangladesh
Annual emission reductions (tonnes/ year)	9655 tCO2/annum
Number of stoves installed	9195
Project Developer Profile	http://bondhufoundation.org/
Type of Organization	NGO

Project Description:

The micro-scale VPA involves the installation and maintenance of domestic improved cooking stoves by Partner Organization and Partner Entrepreneurs, in Bangladesh. It replaces the traditional three-stone stove in the districts of Brahminbaria, Patuakhali, Khulna and Narail of Bangladesh. Bondhu, as the name suggests, is a user friendly stove that burns fuel more efficiently and is designed to draw off smoke and toxins, thus creating cleaner indoor air for women and children.

Project Finance and Carbon Revenue:

There is a big gap between demand and supply of clean cookstoves in Bangladesh. On the supply side, there weren't many manufacturers who were willing to manufacture ICSs as it's a costly and difficult item to sell. The people in Bangladesh are not very aware of ill effects of biomass fuel-based inefficient cooking which makes it quite difficult to sell the ICS. Thus, no manufacturer was ready to set up an ICS manufacturing facility. The project promised subsidy to the manufacturers on each ICS installation. This subsidy was planned to be met against future carbon revenues from the project and grants from multilateral organizations. The project received a commitment (forward ERPA) from a few organizations which was instrumental in driving the project further. The carbon revenue is used the meet the subsidy which has been given to the end-users and manufacturers.

Stove Selection:

One size fits all doesn't work well in cookstove sector. Initially the stoves were built in their original clay design. In 2010, a concrete version of Bondhu Chula that incorporates bits of broken brick was developed. Metal moulds now allow pre-fabrication of standardized stove parts, which can then be quickly installed in a customer's home. The Bondhu Chulas are available in various sizes to suit dynamic customer needs. Customer surveys are carried out for each ICS installed (within first month of installation) to collect feedback from the user.

Operation and Maintenance:

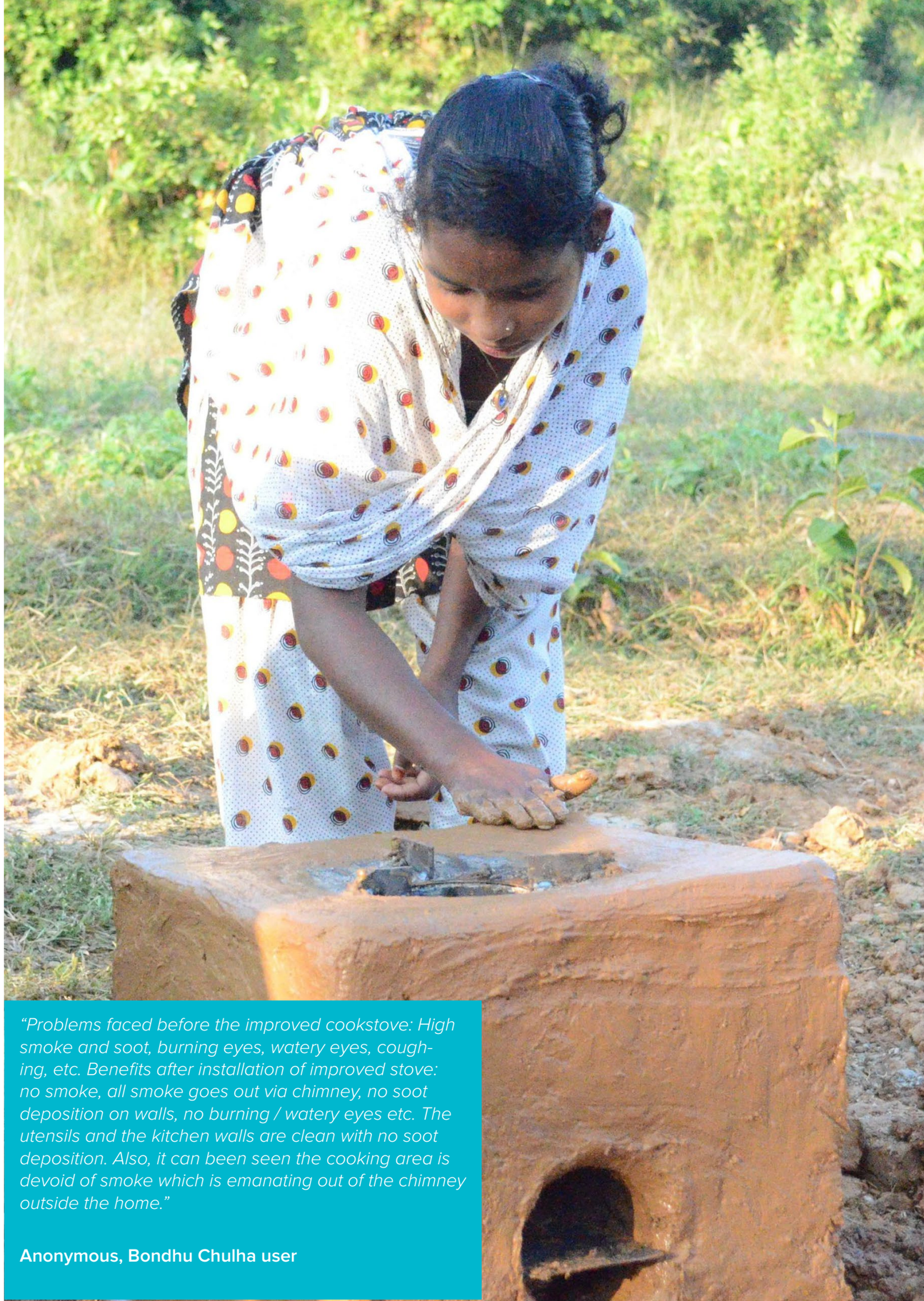
The project uses sanitary shops - micro-entrepreneurs, engaged in making drainage systems and other products out of concrete, as their distribution and supply chain units. These sanitary shops receive training on stove production, obtain the moulds, and then produce and sell these stoves on a commercial basis and provide after sales services. The ICSs come with a 1-year warranty. During the warranty period the stoves are repaired free of cost by the sanitary shop who has installed the stove. Post warranty the service is provided to the user at a price. Since one sanitary shop has a limited area of operation, providing after sales service (decentralized) is not very difficult.

Women and Clean stoves:

The involvement of women in a cookstove project is imperative. As in rural areas in Bangladesh, cooking is primarily done by women, hence women volunteers can easily connect with them. The PoA involves over 1200 female promotional volunteers who hold meetings with the people in rural areas, engage in promotional activities and conduct user trainings in their communities.

Sustainable Development Benefits:

95% users agree that the ICS results in high air quality improvement as the exhaust is transferred out of the house via chimney. On a very conservative basis, the ICS reduces around half a tonnes of fuel wood per stove per household. Approximately 45,000 users benefit from this project.



"Problems faced before the improved cookstove: High smoke and soot, burning eyes, watery eyes, coughing, etc. Benefits after installation of improved stove: no smoke, all smoke goes out via chimney, no soot deposition on walls, no burning / watery eyes etc. The utensils and the kitchen walls are clean with no soot deposition. Also, it can been seen the cooking area is devoid of smoke which is emanating out of the chimney outside the home."

Anonymous, Bondhu Chulha user

GS500: Darfur Efficient Cookstove Project

Annex: GHG quantification methodologies for cookstove activities

Carbon project

Carbon Offset Projects can be an excellent way for understanding the dynamics of implementing a real project on the ground. It can be useful to draw lessons from past successes and failures in order to develop future interventions. All Gold Standard projects must be implemented following best practice rules, consult with local stakeholders, continually reduce greenhouse gas emissions and improve the environment and people's lives. Once certified by the Gold Standard, projects issue carbon credits with independently audited climate and sustainable development outcomes.

Project Scale

There are following different categories of emission reduction projects.

Scale	Project	Programme of activities
Microscale	Micro-scale: A Gold Standard project reducing 10,000 tCO2 per annum or below	Micro-PoA: A Gold Standard micro-programme of activites (mPoA) in which each voluntary programme of activity (VPA) reduces 10,000 tCO2 per annum or below
Small Scale	Small-scale: A project can be termed as small-scale if: Type (i): renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts; Type (ii): energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, by up to the equivalent of 60 gigawatt hours per year; and Type (iii): other project activities that both reduce anthropogenic emissions by sources and directly emit less than 60 kilotonnes of carbon dioxide equivalent annually.	Up to the number of improved stoves that correspond to maximum energy saving level of 180GWhth in total at project level.
Large Scale	Large-scale: A project which exceeds any of the limits described above for Type I, Type II, or Type III activity is termed as large-scale	

Greenhouse gas quantification and monitoring methodologies for clean cookstove activities

A project developer has a choice of various methodologies to tailor their carbon cookstove project. These methodologies differ in terms of applicability criteria, baseline assessment, emission reduction calculation approaches, monitoring requirements etc. The project developer should refer to the detailed methodology for assessing project eligibility, baseline and monitoring requirements, etc. An overview of the most commonly applied CDM and GS methodologies for clean cookstove activities is provided below:

Gold Standard methodologies: Simplified Methodology for Efficient Cookstoves

This methodology is applicable to Gold Standard micro-scale programmes and micro-scale activities that introduce efficient cookstoves to reduce usage of non-renewable firewood or switch from non-renewable to renewable firewood for household cooking. The methodology is only applicable if the baseline fuel is firewood and the baseline cookstove is a three stone fire or a traditional cooking device without a grate or a chimney. In order to allow an estimation of potential emission reductions, a calculation tool is also available for this methodology.

Technologies and Practices to Displace Decentralized Thermal Energy Consumption

This methodology is applicable to Gold Standard programs or activities introducing technologies and/or practices that reduce or displace greenhouse gas (GHG) emissions from the thermal energy consumption of households and non-domestic premises. By far, it is the most commonly applied methodology for ICS activities. It covers a broad range of technologies for examples improved biomass or fossil fuel cook stoves, ovens, dryers, space and water heaters (solar and otherwise), heat retention cookers, solar cookers, bio-digesters, safe water supply and treatment technologies that displace water boiling, thermal insulation in cold climates.

Programme, baseline and monitoring methodology for the introduction of an alternative ignition technique as measure to improve the energy efficiency of domestic coal fires

The methodology is applicable to a project activity that allows the introduction of an alternative ignition technique that causes households to switch from a less efficient ignition technique with significant greenhouse gas emissions to a technique that results in considerably less emissions. The methodology does not introduce coal use to any households who do not use coal at the time of the project activity.

Thermal energy from plant oil for the user of cookstoves

For project activities that use of various plant oils within stoves for cooking and water heating, in households or small enterprises like restaurants or breweries.

CDM Methodologies

- **AMS I.C** – Thermal Energy Production with or without electricity Renewable energy technologies that supply users with thermal energy that displaces fossil fuel use can apply. Examples include solar water heaters and dryers, solar cookers and energy derived from renewable biomass.
- **AMS II.G** – Energy Efficiency measures in thermal application of non-renewable biomass: Project activities that propose the introduction of more efficient devices using non-renewable biomass or the modernization of existing devices that reduces use of non-renewable biomass for combustion. Examples include replacement of existing biomass fired cookstoves or ovens or dryers with more efficient devices. This is one of the most widely used CDM methodology.
- **AMS I.E** – Switch from non-renewable biomass for thermal applications by the user: Project activities that reduce the use of non-renewable biomass by introducing renewable energy technologies are applicable. Examples include biogas cookstove, solar cookers and water boiling using renewable biomass.
- **AMS-I.I.** – Biogas/biomass thermal applications for households/small users: For project activities that allow the generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial, institutional installations (like for supply to households, small farms or for use in built environment of institutions such as schools). Examples of these technologies that reduce or avoid fossil fuel use in the context of ICSs include, but are not limited to biogas cookstoves, biomass briquette cookstoves, small scale baking and drying systems, water heating, or space heating systems.
- **AMS-I.K** – Solar cookers for households: For projects introducing solar cookers to individual households to be used for household cooking purposes (like meal preparation, water heating and baking for household consumption). The use of the solar energy for cooking will reduce or displace the use of the existing traditional cookstove(s) and displace the consumption of fossil fuels (example Kerosene or LPG) or non-renewable biomass.

For inquiries contact us at **info@goldstandard.org**