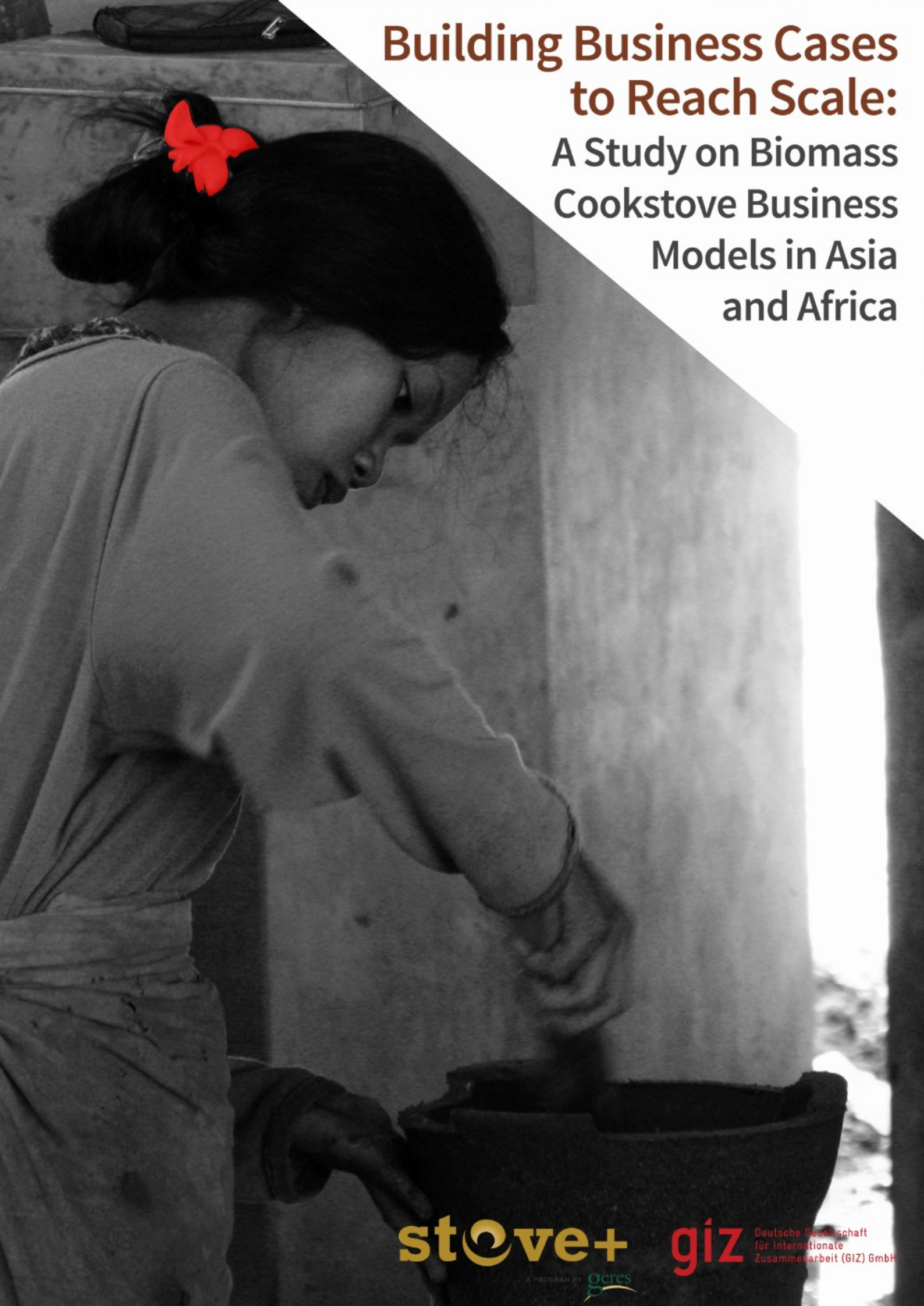
Building Business Cases to Reach Scale:

A Study on Biomass Cookstove Business Models in Asia and Africa



stove+ A PROGRAM BY geres

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Building Business Cases to Reach Scale:
A Study on Biomass Cookstove Business Models in Asia and Africa

Released on October 31st, 2014

Consultants: Sandra Romero Ruiz and Windbaley Savadogo
Reviewers & Editors: Raffaella Bellanca, Olivier Munos, Elisha Moore-Delate and Tina Marie Marchand

Cover Photos: GERES, Cookstove workers in Cambodia and Sierra Leone
Photo Credits: GERES

Published by

stove+ A PROGRAM BY geres

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Table of Contents

ACKNOWLEDGEMENTS

On behalf of GIZ-HERA and Stove*Plus*, we would like to thank all those who were involved in the implementation of this study and the individuals and organizations that participated.

We would like to thank the research team, in particular Sandra Romero Ruiz, Independent Consultant in Agriculture and Environment, for her dedication to the study. A special thanks goes to Elisha Moore-Delate, Stove*Plus* Regional Advisor for West Africa, and Tina Marie Marchand, Stove*Plus* Research and Advocacy Officer, for their technical guidance and contributions to the study. We also thank Windbaley Savadogo, Business Specialist and Independent Advisor, for his research activities in Burkina Faso.

Thank you to all the participating organizations (businesses and programs) and individuals (managers, owners, value chain actors and end users) for their valuable time, comments and inputs. We thank the following organizations for their involvement in the study, welcoming the research team on-site and their presence at the regional workshops in Cambodia and Ghana.

Cookswell Jikos, EnterpriseWorks/VITA, Envirofit India, Envirofit Kenya, GERES Cambodia, GIZ Bangladesh (Sustainable Energy for Development), GIZ Burkina Faso (Reducing Poverty in the Sahel Through Energy Efficiency and Renewable Energies) and Toyola Energy Ltd.

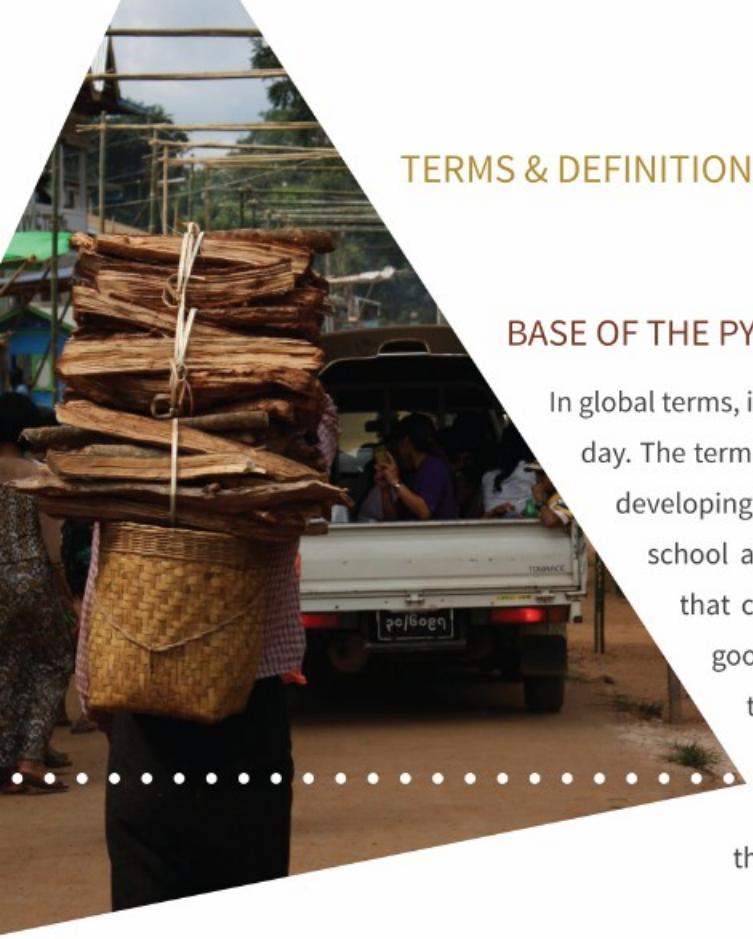
Finally, the team would like to thank Dr. Raffaella Bellanca and Olivier Munos for their technical review and advice which helped improve the study.

Julien Jacquot, Stove*Plus* Manager
Phnom Penh, October 31st, 2014

ABBREVIATIONS & ACRONYMS

ABBREVIATIONS & ACRONYMS	
ACS	Advanced Cookstoves
ADB	Asian Development Bank
AfDB	African Development Bank Group
ARECOP	Asia Regional Cookstove Program
ASA	Association for Social Advancement
BCSIR	Bangladesh Council of Science and Industrial Research
BoP	Base of the Pyramid
BRAC	Bangladesh Rural Advancement Committee (old abbrev.)
CAP	Country Action Plan
CDM	Carbon Development Mechanism
CO	Carbon Oxide
CRS	Catholic Relief Services
CSR	Corporate Social Responsibility
DoE	Department of Energy
DFID	Department for International Development
EdM	Entrepreneurs du Monde
EnDev	Energising Development
EPZ	Export Processing Zone
EU	European Union
EW/VITA	EnterpriseWorks/VITA
FAFASO	Foyers Améliorés au Faso
Franc CFA	Franc de la Communauté Française d'Afrique
GACC	Global Alliance for Clean Cookstoves
GERES	Groupe Energies Renouvelables, Environnement et Solidarités
GHG	Greenhouse Gas
GHC	Ghana Cedi
GIZ	Deutsche Gesellsch aft für Internationale Zusammenarbeit GmbH
GoB	Government of Bangladesh
GVEP	Global Village Energy Partnership
HERA	GIZ Program "Poverty-Oriented Basic Energy Services"
HH	Household
IAP	Indoor Air Pollution
IcoProDac	Improved Cook Stoves Producers and Distributors Association of Cambodia
ICS	Improved Cookstoves
IDEA	Integrated Development Association
IFRD	Institute of Fuel Research Development
IRENA	International Renewable Energy Agency
IRSAT	Institut de Recherche Scientifique Agronomique et Technologique
ISAK	Improved Stove Association Kenya
KCCA	Kenyan Alliance for Clean Cookstoves
KCJ	Kenya Ceramic Jiko
KSh	Kenyan Shilling
LGED	Local Government Engineering Department
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation

MEPMR	Ministry of Power, Energy and Mineral Resources
MFI	Microfinance Institution
MoE	Ministry of Energy
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NLS	New Lao Stove
NPIC	National Improved Cookstove Programme
ODA	Official Development Assistance
PAMF	La Première Agence de Microfinance
PM	Particulate Matter
PV	Photovoltaic
QC	Quality Control
RCPB	Le Réseau des Caisses Populaires du Burkina
RS	Rocket Stove
SEA	South East Asia
SE4ALL	Sustainable Energy for All
SDGs	Sustainable Development Goals
SME	Small-Medium Enterprise
SNV	Netherlands Development Organisation
SZ	SZ Consultancy Services Limited
UNDP	United Nations Development Programme
UNHCR	United Nations High Commissioner for Refugees
USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
USD	US Dollar
VCA	Value Chain Actor
VCS	Verified Carbon Standard
VITA	Volunteers in Technical Assistance
WA	West Africa
WACCA	West African Clean Cooking Alliance
WB	World Bank
WET	Wood Energy Technologies
WHO	World Health Organization



TERMS & DEFINITIONS

BASE OF THE PYRAMID (BoP)

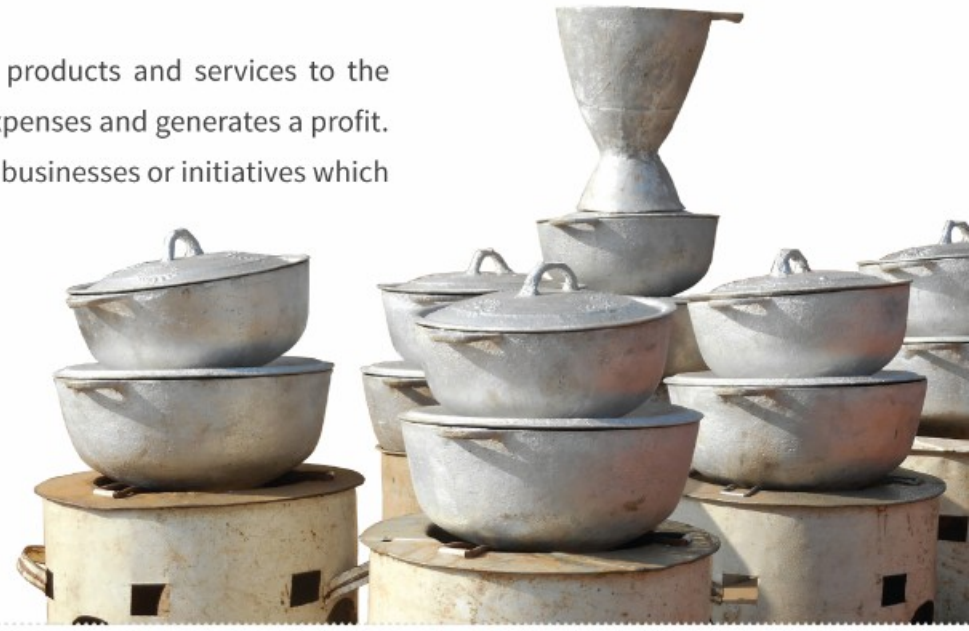
In global terms, it is the 4 billion people who live on less than 2 USD per day. The term "Bottom of the Pyramid" was made popular by those developing new models of doing business, particularly US business school academics CK Prahalad and Stuart Hart, who argued that companies could help eradicate poverty by providing goods and services to this group (Shah 2013). The IFC uses the term "Base of the Pyramid" in the broader sense of poverty that the poor themselves understand and experience; not just the lack of money, but also the lack of access to basic goods, services and income generating opportunities (Masuoka 2011).

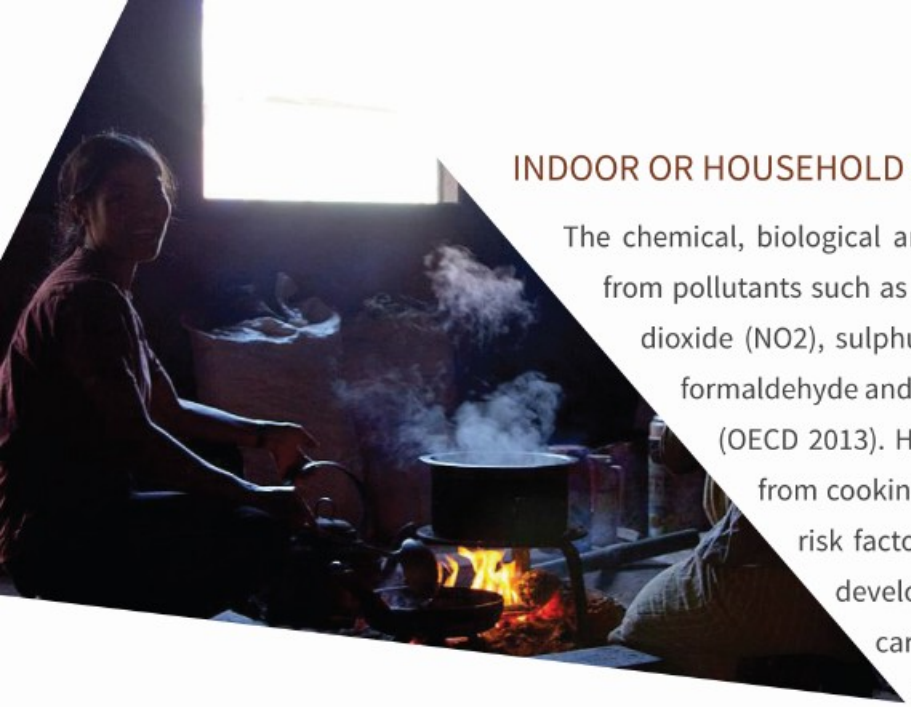
ENERGY DELIVERY MODEL

The combination of technology, finance, management activities, policy support, legal arrangements and relationships required to supply energy to a group of people or end users (in this context to groups of people living in poverty) (Bellanca and Garside 2013). The model also considers the broader environment in which the service is provided, or context of the intervention, which includes the enabling environment and the wider socio-cultural context in which the end users live.

FINANCIAL SUSTAINABILITY

When a business is able to deliver products and services to the market at a price that covers their expenses and generates a profit. In this context, it refers to cookstove businesses or initiatives which are financially self-sustaining.



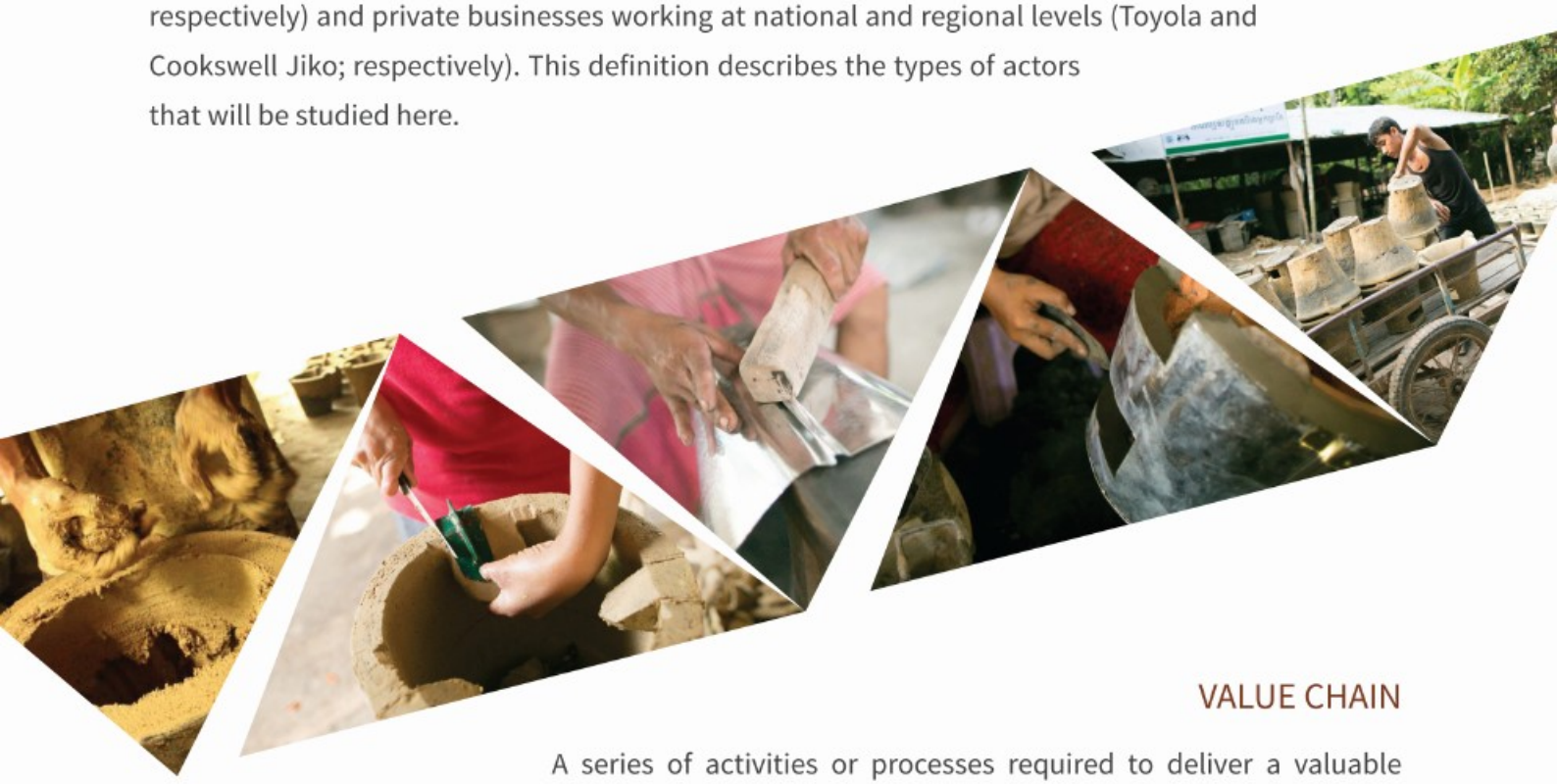


INDOOR OR HOUSEHOLD AIR POLLUTION

The chemical, biological and physical contamination of indoor air from pollutants such as fine particulate matter (PM2.5), nitrogen dioxide (NO2), sulphur dioxide (SO2), carbon monoxide (CO), formaldehyde and polycyclic aromatic hydrocarbons (PAHs) (OECD 2013). Household Air Pollution caused by smoke from cooking and heating using solid fuels is a major risk factor for non-communicable diseases in the developing world, such as chronic lung disease, cardiovascular disease and cancer (Global Alliance for Clean Cookstoves 2013).

MARKET AGGREGATOR

This term has been used in the Clean Stove Initiative - Indonesia to describe any organization, local or international, private or not-for-profit, that contributes to the sales, distribution and production of a product or service (Apex Consulting Group 2013). In the stove context, there are a variety of market aggregators including international, not-for-profit organizations (e.g. GERES and GIZ), social enterprises working at the international and national levels (Envirofit and EnterpriseWorks; respectively) and private businesses working at national and regional levels (Toyola and Cookswell Jiko; respectively). This definition describes the types of actors that will be studied here.



VALUE CHAIN

A series of activities or processes required to deliver a valuable product or service to the market. In this context, it includes all the activities needed to deliver cookstoves to end users, such as stove design, production, distribution and sales.

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Early efforts to disseminate cleaner and more efficient cookstoves to those at the Base of the Pyramid (BoP) in developing countries were mostly subsidized through ODA and development programs. Many for-profit initiatives, which emerged during the 1990s, succeeded in achieving financial soundness and were able to disseminate ICS technologies while generating local economic value.

This paradigm shift, reframing the energy access gap into a largely untapped market, drives the stove industry today. While it is largely shared among practitioners that a market-based approach is a pre-requisite for sustainable and scalable cookstove dissemination, it is not clear to which extent the level of public and private investments along the overall value chain contribute to the long-term sustainability of market actors.

This study, co-funded by GIZ-HERA and Stove*Plus*, investigates when, how and where public and private investments should be leveraged in the process of an ICS/ACS value-chain consolidation. It aims to bring informed recommendations from the case study analysis of major biomass stove market aggregators to the sector's financers (private and public) as well as practitioners in order to help them improve their investment choices. The study intends to inform institutional donors and government partners, to whom specific investment recommendations and advice will be given, and market aggregators and other participants in the value-chain who can learn from the experiences of others.

The eight cases selected for analysis include: (1) IcoProDac GERES Cambodia, (2) SZ Consultancy Ltd. GIZ Bangladesh, (3) Envirofit India (4) Enterprise Works/ VITA (5) Toyola Energy Ltd. (6) Cookswell Jikos (7) Envirofit Kenya (8) FAFASO GIZ Burkina Faso.

From February to May 2014, independent consultants conducted desk reviews, direct field observations, semi-structured interviews and debriefing workshops for the selected cases. In addition, two regional workshops were held, one in Africa (Accra, Ghana) and one in Asia (Phnom Penh, Cambodia), with the aim of validating information, presenting preliminary results and facilitating discussions on best practices and lessons learned among study participants and regional sector stakeholders.

This case study analysis used the Energy Delivery Model Framework to present and discuss each of the selected business models; an approach increasingly used in the international development context to illustrate the combination of technology, finance and management components required to supply modern energy services to end users (Wilson and Garside 2014). A Business Options Map was then used to identify commonalities and emerging trends among the eight cases, and to uncover links between various business options and investments made along the value chain. The availability and accessibility of reliable financial data was limited in this study; however relevant trends were observed from the experiences encountered across the eight documented cookstove cases.

Conclusions and Recommendations

Where, how and when to invest in a cookstove business model varies according to the type of initiative implemented (NGO supported vs. social enterprise vs. private entity), the particular business phase (start-up vs. scale-up), market readiness, available financing mechanisms (ODA, private funds, carbon finance etc.) and the local socio-cultural context (e.g. level of awareness on ICS). Study participants emphasized that donors and international development agencies should focus their investments on leading large-scale awareness raising campaigns, marketing and promotion throughout the development of the cookstove sector. Local entrepreneurs and private entities do not often have the time (takes many years) or financial resources (high cost) required to lead these efforts. In addition, some market aggregators see it as an ineffective investment; especially since the high costs incurred do not bring any particular competitive advantage to them (i.e. awareness is seen as something that benefits everyone in the sector). Donors were also seen as playing a very important role in removing institutional barriers and involving local government in cookstove dissemination.

In terms of investments made into the business model, study participants had very insightful recommendations on where to invest during the first five years of a cookstove business from conducting market research and building up teams, capacities and infrastructure to re-evaluating products and developing new solutions. Market aggregators stressed the importance of investing all along the value chain, but most importantly starting at the production level (e.g. training producers and standardizing production).

Market aggregators also emphasized the importance of market maturity (a key enabling factor) in the establishment and development of a cookstove business. While study participants claimed it is always best to be a first or early mover in the market, they also recognized that large resources would be needed to create an enabling environment for the value chain. Therefore, many agreed that it would be more strategic to be a quick second in the market. In this way, market aggregators could avoid the same pitfalls and mistakes of the first mover, test out new approaches to reach end users and find ways to streamline production and reduce costs. Some other important factors to consider in the enabling environment include business partnerships opportunities, national policies and political will and local financing opportunities.

Market aggregators remarked that subsidies play a very important role in developing cookstove markets, allowing more consumers to purchase the product and helping to increase stove adoption. With the exception of one case (Cookswell Jikos), all the business models analyzed in this study used subsidies (direct or indirect) to reduce the cost of stoves to end users. For the most part, these subsidies came from carbon finance. Although carbon revenue has been very helpful in subsidizing the cost of stoves, markets aggregators should to be careful not to make this the cornerstone of their business model.

Given the recent downturn in carbon markets, its use could be viewed as an ineffective way to ensure long term commercial viability. Linking up with MFIs and other service providers that provide financial mechanisms is an interesting alternative, yet it is a recent activity in the cookstove sector and something that older businesses have not yet adopted and that local businesses may not be able to pursue on their own. Access to commercial banking remains a constraint for many improved cookstove businesses that are not connected to international entities or donors.

As the sector continues to grow, cookstove businesses will continue to need funds and collateral like any other business which requires working capital to establish themselves in a market and scale-up activities, albeit the financial landscape is changing (e.g. fall of carbon markets, emergence of results/ impact based financing). Amongst this there is still a place for NGOs and development agencies as it is a sector with large-scale impacts on human well-being and the environment, and their efforts would be particularly effective in immature markets where awareness is low or no real entrepreneurs have yet emerged.

1. BACKGROUND

Half of the world's population uses inefficient stoves on a daily basis to meet their cooking needs and an estimated 1.9 million people die each year from exposure to cookstove smoke (UN Foundation 2013; WHO 2014). Improved Cookstoves (ICS), cleaner and more efficient cooking devices, were introduced as early as the 1970s in an effort to reduce fuel consumption and expenses for households and to a certain extent, forest degradation. With increased awareness on the health impacts associated with inefficient cooking, Advanced Cookstoves (ACS) later emerged with a focus on reducing carbon oxides and particulate emissions, thereby reducing indoor air pollution (IAP) and improving human health.

Many programs and businesses have been promoting cleaner and more efficient cookstoves to those at the Base of the Pyramid (BoP) in developing countries. Early efforts to disseminate stoves were mostly subsidized through Official Development Assistance (ODA) and development programs. For-profit initiatives started to appear in the early 1990s and a number of these organizations were successful in achieving financial soundness, allowing them to disseminate technologies while generating local economic value. This paradigm shift, reframing the energy access gap into a largely untapped market, drives current strengthening of the cookstove industry. Despite this shift however, the "last-mile distribution" (serving households in remote areas) remains a major obstacle, limiting the reach of many initiatives to the urban and peri-urban zones. In addition, most of the activities taking place in cookstove value chains are occurring in the informal sector with stakeholders (producers, retailers, distributers etc.) running home-based and sometimes unregistered operations.

In the cookstove sector, it is largely shared among practitioners that a market-based approach is a pre-requisite for sustainable and scalable cookstove dissemination, yet it is not clear to which extent the level of public and private investments (including resources put into capacity building) along the overall value chain contribute to the success and long-term sustainability of market actors. As emphasized by Wilson, Rai and Best (2014), private and public players (donors, governments, investors etc.) are essential in the development and strengthening of pro-poor sustainable energy access markets such as the cookstove sector. However, determining optimal public and private roles is neither clear nor straightforward and there can also be significant overlap.

2. ORGANIZATIONAL CONTEXT

This study is co-financed by the "Poverty-Oriented Basic Energy Services" (HERA) Programme at the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Stove*Plus* Program at Groupe Energies Renouvelables, Environnement et Solidarités (GERES).

GIZ, a German federal enterprise for international cooperation, has supported the dissemination of energy saving technology and adapted energy supply solutions for 30 years, following an integrated approach that focuses on all the aspects of the cookstove value chain. The GIZ-HERA programme promotes access to renewable energies and their sustainable and efficient use. For more information on the GIZ-HERA programme visit www.giz.de/expertise/html/2769.html.

Stove*Plus* is a global initiative of GERES that aims to facilitate access to improved cooking solutions for populations relying on biomass through the provision of technical support services. With 20 years of experience on ICS dissemination in Southeast Asia and West Africa, the team provides comprehensive, holistic and collaborative project support with the aim of delivering targeted solutions, sharing lessons learned from the field, engaging local stakeholders and creating long lasting partnerships. For more information on the Stove*Plus* program at GERES visit www.stoveplus.org.

Synergies with other organizations were pursued, especially with the Netherlands Development Organisation (SNV) and the Global Alliance for Clean Cookstoves (GACC) regarding their "Desk Study and Workshop on Improved Cookstoves Distribution Models". Consultants were in communication with representatives from SNV regarding the study design, cases selected and research gaps. In addition, team members from Stove*Plus* were welcomed at SNV's preliminary results session held during the Global Alliance for Clean Cookstoves' conference in Ghana from April 9th to 11th, 2014. This provided the team with important feedback and recommendations for analyzing cookstove business models. In addition, Stove*Plus* was in communication with the International Institute for Environment and Development (IIED) to better understand their work on the Energy Delivery Model Framework and their recent study "Sharing the load: Public and private sector roles in financing pro-poor energy access" recently released in August 2014.

3. SCOPE OF THE STUDY

3.1 Purpose of the Study

While there have been many case studies focusing on cookstove business models, very few have used the Energy Delivery Model Framework as a method of analysis, which not only includes the assessment of the value chain, but also the wider socio-cultural context and enabling environment. Wilson et al. (2014) note that the lack of in-depth and comprehensive analysis is a major research gap which if pursued could help clarify the effectiveness and risks of different business models and help determine what works where. This kind of analysis would be especially useful to those private and public players who invest in cookstove programs and businesses. Moreover, there are very few studies that focus on financing and investment flows along cookstove value chains as many of them have instead concentrated on stove distribution strategies.

This study seeks to gain insight on the kinds of investments made (what, where, when, how) in each case and how it contributed to the market aggregator's ability to reach scale with their cookstove businesses and programs. The overall goal of the study is to bring informed recommendations from major biomass stove market aggregators to the sector's financers (private and public) and practitioners, helping them make more strategic and effective investment choices to ensure sustained servicing to the BoP. The study also seeks to identify and document key drivers of success, best practices and lessons learned in relation to investment choices.

3.2 Research Question

The main question investigated in this study is when, how and where should public and private investment be leveraged to achieve sustainable large-scale ICS/ACS distribution to end users?

Sub-questions include:

- What does the Energy Delivery Model look like for each case?
- What investment choices were made and where did they occur along the blocks that constitute the Energy Delivery Model?
- What were the outputs or added value of these investments?

3.3 Target Audience

This study intends to inform two major target groups (i) institutional donors and government partners, to whom specific investment recommendations and advice will be given on when and where to invest along cookstove value chains and (ii) market aggregators and other participants in the value-chain who may find inspiration through the cases explored on how to reach scale in a financially sustainable and effective way.

3.4 Research Team

The research team consists of two consultants, one assigned to the Asian continent – Ms. Sandra Romero Ruiz and another to the African continent – Mr. Windbaley Savadogo, who are responsible for conducting desk reviews and collecting field data in their respective regions, as well as assisting in the delivery of the regional workshops. Data consolidation and analysis is at the reviewer level and under the supervision of the Stove*Plus* team.

4. METHODOLOGY

4.1 Case Selection

The market aggregator scope was limited to those actors (either for profit or not-for-profit) involved in the dissemination of improved or advanced biomass cookstoves in Asia and Africa. Three cases were selected from Asia: IcoProDac GERES Cambodia, SZ Consultancy Ltd. GIZ Bangladesh and Envirofit India, and five cases from Africa: EnterpriseWorks/ VITA (Ghana), Toyola Energy Ltd. (Ghana), Cookswell Jikos (Kenya), Envirofit Kenya and FAFASO GIZ Burkina Faso.

Cases were selected based on a set of technical criteria determined by a panel of stove experts from Asia and Africa, with consensus among GIZ, Stove*Plus* and its consultants. Cases fulfilled most, if not all, of the requirements outlined in Table 1. In addition, consideration was given to logistical requirements related to the capacity to collect qualitative and quantitative information within the given timeframe and the level of existing information on national cookstove markets (i.e. presence of market assessment studies). Cases selected by SNV for their study on cookstove business models were also considered in an effort to minimize overlap and avoid participant fatigue. The three cases in common are IcoProDac GERES Cambodia, Envirofit India and Toyola Energy Ltd.

Table 1: Selection Criteria for Cookstove Business Models

1. *They are market aggregators and employ a market-based approach.*
2. *They aim to reach the Base of the Pyramid (BoP).*
3. *They have disseminated over 100,000 stoves in total.*
4. *They have received subsidies or outside investments to reach scale.*
5. *They have tested their stoves in regional testing laboratories and on the field, with WBT (thermal efficiency) and CCT/ KPT (fuel savings) results.*
6. *They have readily available data and a monitoring system in order to prove the number of stoves distributed.*
7. *They have some type of consumer feedback available.*
8. *They have a social and/ or environmental component to their mission.*

4.2 Data Collection

Data collection took place between February and May 2014 and consisted of the following methods and processes:

Study Permission

Participants were formally invited to take part in the study and signed confidentiality agreements with Stove*Plus* and their consultants. At this time, relevant experts and representatives within their organizations were identified to help facilitate field visits and interviews.

Desk Study

A preliminary review of information was conducted using the documents sent by the study participants (e.g. strategy documents, reports, publications, key figures), as well as a number of third party reports and official documents.

Semi-Structured Interviews

Questionnaires were used to lead in-person, semi-structured interviews with relevant program managers, business owners and key actors from stove value chains (e.g. producers, retailers, wholesalers). Questionnaires (available in Annex III) were sent at least one week in advance to the participants, allowing them to prepare their answers and locate hard to find figures. Where permission was given, interviews were recorded and transcribed, otherwise answers were written on the questionnaire sheet. A total of 100 interviews were conducted with 24 in Africa and 76 in Asia.

Direct Observation (field visits)

When possible, on-site observations were made on cookstove value chain processes (e.g. stove production and distribution), with special attention given to management methods and stakeholder behaviors.

Debriefing Workshops

While on location, consultants led debriefing workshops with all the interviewees in order to validate the information collected, especially their interpretation of the value chain. If not possible on location, the validation was done with managers over the phone or by e-mail.

Regional Workshops

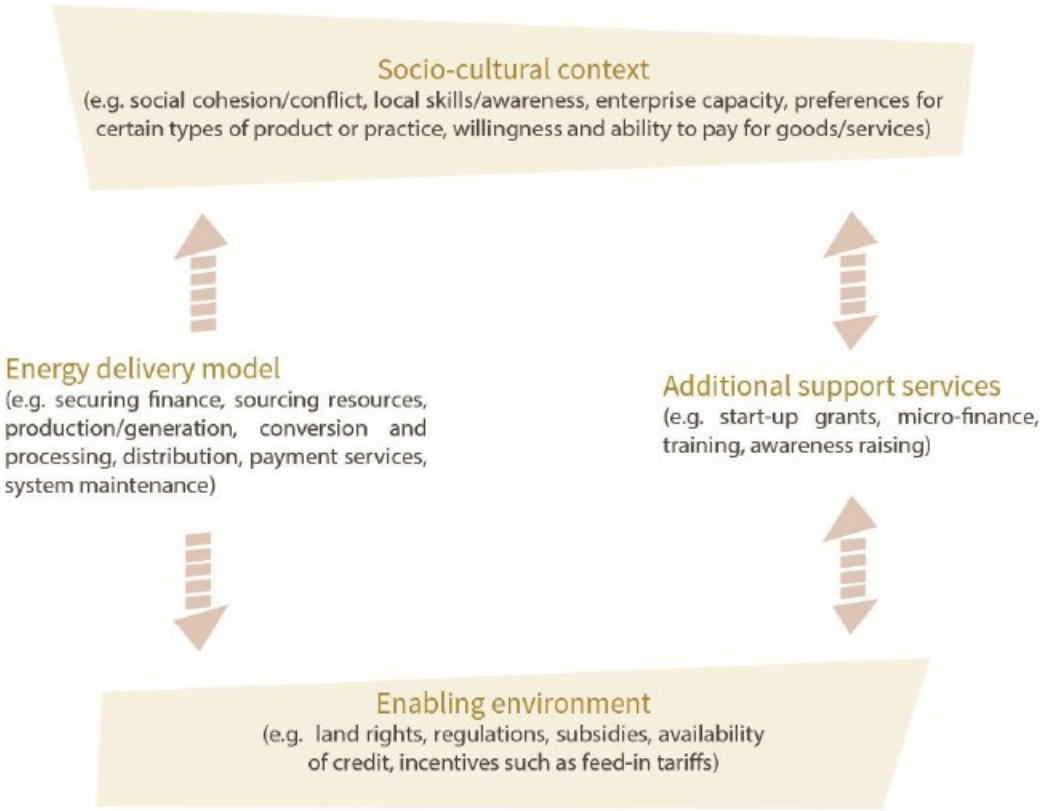
In order to take into account the needs, expectations and views of the sector, two regional workshops were held in May and June of 2014 (Phnom Penh, Cambodia and Accra, Ghana; respectively) with at least one representative from each participating organization. GIZ and other sector stakeholders (e.g. SNV, ARECOP, Ever Green Group, IDEA) were also invited. Preliminary results were shared and discussed, and participants engaged in an open discussion on financing opportunities and risks, investment strategies and areas with a need for financial support.

4.3 Analytical Framework

In this research, a case study approach was used to identify commonalities, trends and best practices among a sample of eight well-documented cookstove business models. A case study is a form of descriptive research (mostly qualitative in nature) that is used to look at individuals, a group of participants or an event. In this context, the cases are meant to illustrate the different ways in which cookstove business models have been implemented in Africa and Asia with a particular focus on investments made along the value chain that helped them reach scale.

Cases follow a historical narrative with a mixture of background information from desk reviews and data collected during field observations, interviews and regional workshops. Each case is presented using the Energy Delivery Model Framework developed by Wilson et al. 2012 (IIED's energy team) to describe the delivery of energy services. This model is an extension of the Business Canvas Model developed by Alex Osterwalder and encompasses the broader environment in which the service is provided. As illustrated below, it includes four major components: i) Socio-Cultural Context ii) Energy Delivery Model iii) Additional Support Services and iv) Enabling Environment.

Figure 1: The Four Building Blocks of the Energy Delivery Model Framework



(Wilson, Wood and Garside, Figure 1, 2012)

The Socio-Cultural Context is the wider social and cultural setting in which the activities and the actors who carry them out are embedded in.

The Energy Delivery Model is the set of activities and group of actors that are required for the delivery of a service. It is defined as the combination of the technology, finance, management activities, policy support, legal arrangements and relationship types needed to supply energy to a group of people or end users.

Additional Support Services refer to any external support that the delivery model might need due to weaknesses in the enabling environment or a need to adapt to specific circumstances in the socio-cultural context (e.g. social funds, loans, training)

The Enabling Environment is the external environment that influences and enables the energy delivery model (e.g. policies, public awareness, market maturity, infrastructure).

For this study, the Energy Delivery Model Framework focuses on the device (i.e. the cookstove) and has been simplified and adapted to the research context as illustrated below in Figure 2.

Figure 2: Simplified Energy Delivery System for Cookstove Business Cases

(Adapted from Wilson et al. 2012)

Still using the Simplified Energy Delivery System (shown above in Figure 2) as a common thread, a Business Options Map is used to categorize the different business models and identify trends across the eight cases. It helps reveal overlapping or cross cutting experiences that allowed cookstove businesses to successfully deliver energy services to end users and reach scale.

Figure 3: Business Options Map for the Analysis of Cookstove Business Cases

As shown in Figure 3, the Business Options Map is divided into the major components of the Simplified Energy Delivery System with supporting services integrated into the value chain, enabling environment and the socio-cultural context. It is important to note that the term "subsidies" is used here to refer to any contribution (direct or indirect – public or private) that reduces the cost of stoves to end users.

4.4 Study Limitations

One major limitation to this study was the availability and accessibility of reliable financial data in relation to investments made along cookstove value chains; a point which will be discussed further in the recommendations. As seen in similar studies, obtaining sufficient financial figures and data proved challenging. In certain cases, data was not shared with the consultants due to privacy concerns and where information was shared, it was either incomplete or existed in various forms (e.g. descriptions, percentages, absolute numbers etc.). This made it difficult to directly compare financial information or perform a financial analysis. As a result, this study relies mostly on qualitative information received from the interviews, field observations and regional workshops.

5. COOKSTOVE CASES

5.1 IcoProDac GERES Cambodia

IcoProDac (Improved Cookstove Producers and Distributors Association of Cambodia) is an inter-professional organization that was created by GERES Cambodia to provide training, networking and support to stakeholders involved in the dissemination of the New Lao Stove (NLS). GERES (Groupe Energies Renouvelables, Environnement et Solidarités) is a French non-governmental, non-profit organization that implements energy and climate related projects in Europe, Africa and Asia. In partnership with local stakeholders and communities, they implement engineering solutions for development, including improved cookstove projects in Southeast Asia and West Africa (More information available at www.geres.eu).

Socio-Cultural Context & Enabling Environment

GERES first began activities on improved cookstoves in Cambodia in 1996. At that time, Cambodia was emerging from a twenty year civil war with international aid focusing on reconstruction (e.g. infrastructure, administrative services and education) and humanitarian assistance. The country was dealing with recurrent famines, the return of displaced people, areas still occupied by Khmer Rouge and the demining of a large part of its territory (Bryan et al. 2009). During these years, biomass accounted for an estimated 82% of the energy consumed in the country by all sectors combined and natural resources were increasingly under pressure (Bryan et al. 2009). Most of the population used three-stone stoves to cook their food; an inefficient clay stove widely used across Southeast Asia due to its low cost and accessibility.

The province of Kampong Chhnang located about ninety kilometers from Phnom Penh had long been known for its high quality clay and fine pottery; a traditional activity dating back over a thousand years. In the mid-1990s, an informal network of clay potters from this region was well-established, producing tailor made cookstoves on demand for individuals, distributers and retailers. Producers were commonly trained by their parents and were chosen based on their skill, quality of the clay and price of the product. There was some consideration given to fuel efficiency; however stove designs focused primarily on aesthetics and finishing. Overall, there was very low awareness on the environmental and health impacts associated with inefficient cooking.

In this context, there were limited opportunities for more sustained and regular production, diversification of products or access to large scale markets (GERES 2014). However, in an effort to reduce pressure on native forests and help the local population take ownership of achieving sustainable management of their resources, GERES implemented the Cambodian Fuelwood Saving Project (CFSP) which would eventually lead to the New Lao Stove (NLS) design and the development of IcoProDac in 2004. The Cambodian Fuelwood Saving Project (CFSP) was implemented in two phases over a period of ten years. The first phase (CFSP I) from 1996-2001 was funded by the European Union and was hosted by the Cambodian Ministry of Environment in the province of Kampong Chhnang. Funds were used to conduct household level energy assessments, design an adapted stove (based on Thai bucket stove) and train 10 "pioneer" stove producers to reach a monthly production capacity between 1500 and 2000.

With political stability still holding and growing private investment in the country, GERES implemented the second phase of their project (CFSP II) from 2002-2006 again with funds from the European Union and this time with the Cambodian Ministry of Energy, Mines and Industry acting as the regulatory authority. Funds were used to further R&D activities, standardize production (stove specific standards and labels), implement quality control measures, set up stove testing facilities, develop an M&E system, raise awareness and promote the stove (e.g. TV, radio, demonstrations), establish a training centre for producers and support the development of IcoProDac. Later in 2007, GERES became the first organization to receive carbon finance for an improved cookstove project. This allowed them to improve their M&E system (tracking and impact reporting), scale-up stove production activities and strengthen IcoProDac (e.g. business management training for members). These investments are summarized below in Table 2.

Table 2: Summary of Investments made by GERES Cambodia into their ICS Activities

INVESTMENT TYPE	YEAR(S) RECEIVED	FINANCER	AMOUNT ALLOCATED	AREAS OF INVESTMENT
ODA (CFSP I)	1997-2001	European Union	900 000 €	Field Assessments Training Producers R&D
ODA (CFSP II)	2002-2006	European Union	1 900 000 €	R&D Testing Laboratory Product Standardization Standards & Labels Monitoring & Evaluation Awareness Raising Marketing & Promotion Training Centre IcoProDac Policy Advice/ Lobbying Operational Costs
Carbon Finance	2007 (for period: 2003-2013)	Carbon credit buyers (VCS)	9 373 000 € (total carbon revenue sold to date with 600kt CO_2eq stock remaining)	Monitoring & Evaluation Training Producers Training for IcoProDac R&D Operational Costs

The socio-cultural context in which GERES began their ICS activities presented many challenges. However, there were interesting elements in the enabling environment which contributed to their success: i) an existing network of producers ii) partnership with the national government and iii) access to carbon finance. GERES built a strong reputation nationally through their privileged partnership with the Cambodian Ministry of Energy, Mines and Industry, and together they were able to develop a national strategy for ICS dissemination and other sustainability issues related to wood energy (Bryan et al. 2009). Also, with an already existing network of stove producers, wholesalers, distributors and retailers, it allowed GERES to work with skilled producers who had existing knowledge on local materials, supplies and end users' needs. Finally, they benefitted from access to the voluntary carbon market which helped generate approximately 9.4 M€ in revenue to date which they re-invested back into the value chain.

The Energy Delivery Model

The dissemination of the New Lao Stove is under the responsibility of the producers, wholesalers, distributors and retailers who are members to the Improved Cookstove Producers and Distributors Association of Cambodia (IcoProDac). At its time of creation, IcoProdac had over 100 members. Today, it consists of 270 members, including 66 producers and 170 distributors.

Production

With over 3 million stoves sold to date, IcoProDac production represents approximately 40% of the Cambodian market

IcoProDac members are responsible for the production of the NLS; a charcoal based improved cookstove with a metal body (mostly imported from Vietnam) and a ceramic liner (locally produced). It is an open source technology that was developed by GERES Cambodia in 1999 and targets urban and peri-urban populations, helping them save approximately 22% of the energy used for cooking compared to traditional stoves. Production is decentralized and mostly artisanal with low mechanization. The level of production is roughly 450 000 stoves per year; an amount which tripled since 2006. With over 3 million units sold to date in total, it represents approximately 40% of the national market. The retail price for the standard (and most popular) size is 20 000 Riel or 5 USD. This fixed price is negotiated and set by IcoProDac. IcoProdac producers cover a number of costs, such as paying workers, production facilities (mostly at the household level), material and supplies for production, basic tools and equipment. Currently, there is no warranty system provided by the producers.

Distribution & Sales

IcoProDac members are also responsible for the distribution and sales of the NLS across Cambodia. As mentioned before, distribution relies on the already existing network of wholesalers, distributors and retailers, and therefore remains quite traditional. They transport stoves by road using ox-carts, moto-carts and sometimes vehicles. One interesting characteristic in Cambodia is that distributors are often the retailers themselves, travelling around the country selling stoves from their carts to individuals or smaller retailers. When all the stoves have been sold, they return to the production facilities (most located in Kampong Chhnang) to fill up the next load. Distributors cover their own costs for transportation and casual workers (though most are family members). There is no after sales service provided by wholesalers, distributors or retailers.

Photo caption from GERES Cambodia - 2014

Additional Support Services

While IcoProDac does not partner with any MFIs, it does have a built in credit facility which provides small loans to its members. This has provided support to the local entrepreneurs who produce and distribute the New Lao Stove. It is important to note that IcoProDac continues to be supported through GERES' in-house expertise and support service unit, although they have progressively withdrawn their involvement in the day to day management of IcoProDac as per their exit strategy which aims to strengthen the capacity of the association to run itself.

GERES was a pioneer in the Cambodian cookstove sector being the first organization to work on the dissemination of improved cookstoves in the country and has greatly contributed to the sector over the last 20 years. Moving forward, GERES Cambodia will focus on sustaining this sector level business model for ICS dissemination with particular attention given to quality control, services to IcoProDac members, lobbying and marketing. They also believe that additional work is needed on awareness campaigns in relation to Indoor Air Pollution (IAP) and deforestation, so as to help the population better understand the risks and threats of inefficient cooking on their health and environment.

5.2 SZ Consultancy Ltd. GIZ Bangladesh

SZ Consultancy Ltd. is a social enterprise that was registered by GIZ Bangladesh in 2008. Its primary objective is to facilitate CDM project implementation, including the dissemination of GIZ's Bondhu Chula cookstove. Their mission is to reach every household using solid fuels with the Bondhu Chula in Bangladesh by 2021. (More information available at www.szbd.info/) The Bondhu Chula Programme is implemented under GIZ's Sustainable Energy for Development (SED) Programme (More information available at www.giz.de/en/worldwide/15127.html)

Socio-Cultural Context & Enabling Environment

Over the last forty years there have been many programs implemented in Bangladesh addressing household energy and indoor air pollution issues starting with a major push in the 1970s and 1980s to reduce pressure on forest resources by the Bangladesh Council of Scientific and Industrial Research (BCSIR) (ESMAP 2010). BCSIR, a government institution focusing on research and development, led the development of the improved cookstove sector in Bangladesh. They developed and piloted various models of improve cookstoves of which all current designs in the market are based on (Accenture Development Partners 2012c). Although their current lack of funding has limited their involvement in the cookstove sector, it laid an important foundation for future initiatives, including GIZ's Bondhu Chula cookstove programme.

GIZ Bangladesh launched their cookstove programme in 2004 and at this time the focus for cookstove initiatives was shifting from saving forests towards improving human health and welfare (ESMAP 2010). Biomass (wood, agricultural waste and dung) was still the most dominant fuel used in the country, accounting almost entirely for the fuel used in rural areas (Accenture Development Partners 2012c). In general, awareness on environmental and health issues related to inefficient cooking (especially IAP impacts from cooking inside the household) was very low. Following the devastating floods of 2004, as well as a series of destructive cyclones, it was a time of increased humanitarian aid and assistance focusing on reconstruction, risk reduction and helping displaced people return to their communities. This certainly made it a challenging context to work in; however there were also some key enabling factors.

When GIZ initiated their cookstove programme, Bangladesh was becoming a pioneer in

microfinance with organizations like Grameen Bank, BRAC and ASA linking financing services to households (and especially women). This presented a significant opportunity for the cookstove sector and in 2011 GIZ partnered with Grameen Shakti, the renewable energy non-profit division of the Grameen Bank Group, to bring loans to their partner organizations (Accenture Development Partners 2012c). Although they no longer have this partnership, their stove manufacturers and retailers benefitted from increased access to finance in the initial stages and their monitoring efforts for loan collection helped increase accountability (Accenture Development Partners 2012c; ESMAP 2010).

Strong political will and government partnerships were also essential, especially for programme coordination at local levels, awareness raising and the adoption of improved cookstoves. The government of Bangladesh implemented several national policies and strategies in support of ICS dissemination and involved a variety of ministries and agencies, such as the Bangladesh Council of Scientific and Industrial Research (BCSIR), the Department of Environment (DoE), the Local Government Engineering Department (LGED) and the Ministry of Power, Energy and Mineral Resources (MEPMR). For example, GIZ Bangladesh's cookstove programme was first implemented with the help of the MEPMR and has been financially supported by the Department of Energy (see Table 3). In particular, their contribution of 2.5 M€ has been used to subsidize the cost of stoves through end user incentives.

Table 3: Summary of Investments Made into the Bondhu Chula Programme

INVESTMENT TYPE	YEAR(S) RECEIVED	FINANCER	AMOUNT ALLOCATED	AREAS OF INVESTMENT
ODA	2006-2014	GIZ	4 000 000 €	Training Partners Awareness Raising Marketing & Promotion Operational Costs Infrastructure/ Equipment R&D
ODA	2012-2014	Government of Bangladesh (Department of Energy)	2 500 000 €	End user incentives (stove subsidy)
Carbon Finance	2011 (For period starting in 2008)	Carbon credit buyers (CDM)	N/A	N/A

Funds from GIZ were invested into R&D (i.e. adapting the stove), training approximately 15 000 people on stove production, installation and maintenance, supporting partners, raising public awareness at the community level, marketing and promoting the stove and supporting their extensive volunteer network. Although they have no reported carbon revenue as of yet, they continue to encourage participation in their carbon program and promote the sales of carbon credits through their website.

The Energy Delivery Model

GIZ Bangladesh, and more specifically SZ Consultancy, took a commercial approach to ICS dissemination. Their initial business model, implemented from 2008 to 2012, was a classical donor-partner model relying on over two hundred and fifty partners (e.g. NGOs, private organizations) for the dissemination of stoves. However, they were not able to reach scale with this model. In October 2012, they implemented a new market approach focusing on nation-wide production and distribution through over five thousand sanitary shops specialized in manufacturing supplies for the construction sector. This significantly increased the adoption of Bondhu Chulas over a very short period of time and is the business model that will be discussed here.

Production & Distribution

SZ Consultancy has a decentralized production system which relies on its partners (sanitary shops) for the manufacturing of stoves. Production is characterized as artisanal/ semi-artisanal with low mechanization. The Bondhu Chula stove was developed as an open source technology by GIZ's technical team. It was based on the traditional Chula stove and adapted from IFRD and BCSIR's earlier ICS designs. It is a concrete 1, 2 or 3 pot fixed stove with a metal body and mud brick coating including an insulated vertical chimney. The stove targets rural populations, helping them save up to 50% of the fuel used compared to traditional stoves and helps reduce hazardous cooking smoke. The level of production is estimated at 80 000 per month. Since 2005, 1.5 million Bondhu Chulas have been sold, of which 500 000 were sold in the last 18 months alone. The price of the stove is fixed at 8 € and includes a one year warranty.

As the stove is fixed and needs some masonry at the kitchen level, distribution is unified with production. Therefore, sanitary shops are not only responsible for production, but also for the installation and maintenance of the stove. They also manage their own

suppliers and cover the costs of raw materials (mostly paid up front). GIZ does provide in-house support to their partners, including training on stove construction and installation, and basic tools for production. Distribution costs, such as transportation, are not covered by GIZ. Their approach is to directly support SMEs.

3-pot Bondhu Chula[1]

2-pot ICS Bondhu Chula[2]

Sales & Promotion

Since 2005, 1.5 million Bondhu Chulas have been sold in Bangladesh, of which 500 000 were sold in the last 18 months alone

SZ Consultancy has an extensive volunteer network of about 1200 individuals (receiving an allowance of 20 €/ month) who promote the sales of Bondhu Chulas in communities across Bangladesh. Volunteers are given promotional materials (brochures, banners, business cards etc.) and sometimes SMEs even provide incentives per sale. According to SZ Consultancy (2014), after sales services are provided for up to five years after the purchase of a Bondhu Chula.

Additional Support Services

As mentioned before, the programme benefits from a subsidy scheme supported by the Department of Environment which helps reduce the final price of stoves for end users. There are also large investments made into marketing, advocacy and awareness raising campaigns. In fact, it is the largest area of investment, representing 30% of the total budget (~2 M€). They run TV advertisements, documentaries, exhibitions, rallies and

[1] *Promotion of Improved Cook Stove in Bangladesh*, presentation by GIZ Bangladesh, 12/12/2008
[2] *Promotion of Improved Cook Stove in Bangladesh*, presentation by GIZ Bangladesh, 12/12/2008

produce a variety of promotional materials (leaflets, calendars, diaries, T-shirts and hats). Rallies are especially successful, with monthly celebrations in villages that have fully adopted the stove. There are currently 32 such villages in Bangladesh.

With a new market-based approach in place, ICS dissemination activities are speeding up for GIZ and SZ Consultancy in Bangladesh. They believe promotion, public awareness and end user education is the secret to their success and ability to scale up. Equally important are the investments made into capacity building which go hand in hand with promotion and awareness raising. Moving forward, they aim to continue supporting ICS market development in Bangladesh until it is mature which they foresee happening around 2017. Their goal is to reach all households (100% adoption) in rural Bangladesh by 2021.

5.3 Envirofit India

Envirofit International is a social enterprise that develops and distributes clean technology solutions to improve health, livelihoods and the environment while enhancing energy efficiency. It was formed in 2003 as a spinoff company of Colorado State University's Engines and Energy Conversion Laboratory. Envirofit sells cookstoves in over forty-five countries around the world and has established manufacturing operations in China and East Africa. Envirofit India is a subsidiary of Envirofit International and works in fourteen states across the country. (More information available at www.envirofit.org)

Socio-Cultural Context & Enabling Environment

India is the world's third largest economy and has the second highest population in the world; however access to energy is still a major challenge. An estimated 67% of all Indian households (~166 million households) rely on solid biomass for cooking and in rural areas it reaches up to 85% (Dalberg Global Development Advisors 2013). Cookstove programs have existed in India since the 1980s, notably the National Program for Improved Cookstoves (NPIC) which lasted from 1984-2002. This government initiative was able to distribute over thirty million cookstoves during that time, and while successful in a few places (mostly Karnataka), it faced challenges with stove quality and program management (Dalberg Global Development Advisors 2013).

As early as 2003, Envirofit International began developing engineering solutions to solve global energy and health challenges, starting with the production and sale of retrofit kits for two-stroke motorcycle engines in the Philippines (Envirofit International 2014). In 2007, they shifted their attention to clean cookstoves and piloted their first cookstove program in India in 2008. At that time, there was a surge of activity on improved cookstoves. With enormous market potential and a rich diversity of cooking habits across the country, there was space for many market actors. In addition, there was increased awareness on IAP (a major issue in India affecting about 400 million people – mostly women and children), and donor and multilateral initiatives were just starting to target the cookstove market providing new opportunities for growth. In this context, Envirofit India entered a maturing market with space for a more advanced[3] cookstove that could help reduce IAP and

[3] Envirofit's cookstove has been described as an "intermediate" stove technology by the GACC; however in this study it is referred to as an "advanced" cookstove due to its tested IAP results.

improve human health. They also took the opportunity to partner with the Shell Foundation's Breathing Space Program which helped them establish their business.

Financial information on the investments made into Envirofit India and along its value chain were not shared in this study; however according to an article written in the New York Times (HAAG 2008) the Shell Foundation was said to have "invested 10 million USD in Envirofit's effort to produce 300 000 stoves on a pilot scale and had plans to invest 25 million USD more to sponsor the stove effort." Since 2012, they have been benefiting from carbon finance (VERs, CERs & Gold Standard) which they promote on their website and also hold a loan from IntelleGrow for an 18 month period (2013 - 2014). Envirofit has reported making investments into R&D, quality control and assurance (testing, inspection, patenting), monitoring and reporting (for carbon credits) and training for production units, HR and partners.

Energy Delivery Model

Production

Envirofit India has an outsourced, centralized production system that is highly mechanized. Up until 2013, stoves were outsourced from China and then exported to India. More recently, Envirofit shifted production activities to Kenya and has now based its production in India, outsourcing entirely out to Toolcraft Precision Tools M.I.D.C in Maharashtra. Outsourcing production from China had a number of limitations including higher prices. With the business shift, costs went down by 60% (according to information received during the interviews). This occurred for a number of reasons: import taxes, currency exchange rates, USD fluctuation and transportation. Having a centralized production facility and operations helps them guarantee and control the quality of their final product, the volume of production and reduces the cost of monitoring and evaluation.

Since 2009, a total of 400 000 stoves have been produced and distributed throughout Southern India

Envirofit's stoves are patented technologies (an area requiring considerable investment) developed in collaboration with engineers at Colorado State University. Envirofit developed two stove models for the Indian market: (i) a fire wood portable rocket stove, (B-1200 wood) and (ii) an institutional stove. The stoves are targeted to remote rural populations, helping them save 50% of the fuel used compared to traditional stoves

and reducing Carbon Oxide (CO) and particulate matter (PM) by 59% and 44%; respectively (Colorado State University 2010). Since 2009, a total of 400 000 stoves have been produced and distributed throughout Southern India. The portable rocket stove sells at a fixed price of 30.5 USD and includes a two year warranty.

Distribution & Sales

Like production, distribution is also outsourced. Distribution covers India, Nepal, Bangladesh and more recently Cambodia, and is managed through a diversified dealer's network from a classic multi-tiered commercial distribution network to savings groups, producer's cooperatives, NGOs and MFIs. For example, they distribute with MFIs who offer cookstoves together with a number of other basic household items (e.g. bicycles, telephones, water filters). The clients of the MFIs purchase the stove through installments which they pay on a monthly basis. The partner (the MFI in this case) pays upfront for the stove as requested by Envirofit. Interested partners submit an inquiry if their business plan projections forecast a minimum of 1000 stoves sales per month at project maturity and are financially capable of high volume purchases.

All partners are specialized in their field of work (manufacturing, logistics and distribution, microfinance etc.) and Envirofit India assists them with supply management and support in marketing and distribution, such as training on cookstove use and demonstration, training materials in the regional language, monitoring stove usage on the field, supporting warranty claims and assisting with the development of carbon based programs. They also have a dealer education program (online knowledge platform) and offer cash incentives for MFI staff. All investments made along the value chain are supported by commercial loans and microcredit with MFIs.

Additional Support Services

One interesting additional supporting service has been the online sale of cookstoves. Envirofit currently sells their products (stove and stove accessories) internationally through Amazon and Evan's Outdoor Store (www.evansoutdoorstore.com). As a result, they have been able to sell in over forty-five countries.

Envirofit India believes the key to reaching scale is offering a high quality product at a price that end users can afford, leveraging large-scale distribution networks and establishing strong partnerships that can help over major challenges (price, awareness, credibility etc.). For

example, their outsourced business model has allowed them to reduce costs on awareness raising. Awareness remains a challenge in India, especially penetrating the last mile – the most remote populations, yet they believe donors, multilateral bodies and governments have an important role to play in leading massive awareness campaigns on IAP which would benefit the entire cookstove sector.

5.4 Enterprise Works/ VITA Ghana

EnterpriseWorks/ VITA is a not-for-profit organization that combats poverty through economic development programs based on sustainable, enterprise-oriented solutions. The organization is a merger between EnterpriseWorks, Volunteer in Technical Assistance (VITA) and Relief International. It is officially recognized as a division of Relief International. (More information available at www.enterpriseworks.org)

Socio-Cultural Context & Enabling Environment

Ghana was the first independent country in West Africa and of the West African Anglophone countries it is one of the wealthiest and stable nations in the region. It is a country that is relatively resource rich, though plagued by many of the same issues prevalent throughout Africa such as poor rural infrastructure and high levels of poverty. In terms of endowment and utilization, biomass remains (mainly woodfuels and to a lesser extent crop residue) the most important primary energy resource in Ghana accounting for an average of 81% of primary energy (Edjekumhene and Cobson-Cobbold 2011). Charcoal is the main cooking fuel for approximately 1.3 million households, with 53% of urban and 14% of rural households depending on charcoal to meet their cooking energy needs (Edjekumhene and Cobson-Cobbold 2011).

Energy access is a top priority for the Ghanaian government and they are attributed to having launched the development of the improved biomass cookstove sector in the 1990s with the Ahibenso coalpot program[4]. While the introduction of this government program may have set the initial stage, it was EnterpriseWorks' activities on the Gyapa stove that most Ghanaian cookstove businesses attribute the creation of widespread awareness on

[4] Other sources have noted that the Ahibenso stove was a GIZ initiative

improved cookstoves among the larger population in Ghana. The Gyapa cookstove was one component of their "Small Scale Irrigated Horticultural Enterprises Energy Enterprises for Improved Natural Resources Management" project. The project was designed to support the efforts of USAID and the government of Ghana to promote sustainable increases in private sector income generation and improve the management of natural resources (EnterpriseWorks 2002). As the ultimate objectives of the program were to create long term jobs and income, the project applied a market led approach to cookstove market development and intended that the value chain costs be included in the overall price to the consumer. Thus any subsidy was in the form of support to the value chain.

The Gyapa cookstove component of the project had an allocated budget of 1.8 Million USD for four years which was invested into:

- Identifying the best stove for the country's cooking habits and resources
- Developing local skills in improved cookstove production
- Providing those trained with access to grants and finance for improved equipment and machinery
- Identifying and training all value chain actors that would contribute to the delivery of improved cookstoves to the customer/ end user
- Facilitating transportation and dialogue through the distribution system
- Developing the brand Gyapa (meaning "good fire") with a recognizable logo and catch phrase ("already cooked") selected from potential consumer focus groups
- Creating and conducting a nationwide marketing campaign to educate consumers on the benefits of the Gyapa improved cookstove

To accomplish this, EnterpriseWorks/ VITA identified key Ghanaians who already had some existing skills, in ceramics and operations for example, to help develop the skillsets of their targeted low income or jobless beneficiaries who were intended to be the majority of the Gyapa improved cookstove producers. Throughout the entire training and initial production process, EnterpriseWorks/ VITA stressed quality control and standardized production. Once the capacity to produce stoves at standard was demonstrated, they launched marketing activities to stimulate demand. The marketing campaigns included radio, television, posters and promotions. All Gyapa stoves were given Gyapa labels with contract information and a phone number. Table 4 summarizes the investments made into the Gyapa stove value chain, including public and private funding.

Table 4: Summary of Investments made by EnterpriseWorks/ VITA into the Gyapa Stove

INVESTMENT TYPE	YEAR(S) RECEIVED	FINANCER	AMOUNT ALLOCATED	AREAS OF INVESTMENT
ODA	2002-2006	USAID	1 800 000 USD	Training Producers Awareness Raising Marketing & Promotion Operational Costs Infrastructure/ Equipment
Pre-financing (for carbon finance)	2007	JP Morgan, Climate Care	150 000 USD	Generation of carbon revenue
Carbon Finance	2008- 2014 (retroactive from 2007)	Carbon Credit Buyers (VCS)	2 500 000 USD	Monitoring and Evaluation
Private	2006-2008	Shell Foundation	400 000 USD	Quality Control Marketing and Promotion Operational costs Credit facility Working Capital Transportation
Award	2007	USEPA	200 000 USD	Re-invested in value chain

In 2005, EnterpriseWorks merged with VITA, bringing their extensive experience empowering entrepreneurs in the private, public and community sectors in developing countries and facilitating technical information exchange. Despite starting off as a USAID funded project, the timeframe and requirement to spend funds within that specific timeframe resulted in a standstill at the end of 2008 when funding from the Shell Foundation and the United States Environmental Protection Agency (USEPA) was expended. Realizing that donor funding was coming to an end, EnterpriseWorks/ VITA spent the end of 2008 ensuring sound linkages between value chain actors so that stove production could continue in their absence. EnterpriseWorks/ VITA was also in the process of a merger with Relief International which was finalized in 2009. In conjunction with this, they were working on developing a sustainable business model for Gyapa stove activities and decided that it should break off as its own business and become Gyapa Enterprises.

It is important to note that traditional financing, through commercial banks or commercial lending institutions, has not been a viable option for many cookstove businesses operating in Ghana. The inability to predict monthly sales, the actual return on investment per stove sold, the lack of collateral and credit history and the somewhat informal economy are all factors in why commercial banks hesitate to loan to cookstove entities. Since 2013, the Global Alliance for Clean Cookstoves' representatives in Ghana has been working to find ways to encourage commercial banks to increase loan opportunities. These opportunities did not exist at the time of this study.

Energy Delivery Model

Production

EnterpriseWorks/VITA's production system has increasingly become decentralized as the enterprise has grown and expanded in geographic scope. At project inception in 2002, production focused on two main areas, Accra and Kumasi. Today, it covers Takadori, Greater Accra, Kumasi and Sunyani. Production equipment is a mix between artisanal and mechanized; using scissors, rails and folding for stove metal body work (see photos below) to using mechanized wheels, hydraulic presses and LPG ovens to produce ceramic liners. Some metal workers have purchased paint sprayers to improve the overall finishing of the finalized stoves.

Artisanal metal production

Motorized wheel

Hydraulic ceramic liner press

Liner from hydraulic press

(Photos by Elisha Moore-Delate)

The Gyapa stove is an adaptation of the Kenyan Ceramic Jiko (KCJ) with a metal body and ceramic liner (locally produced). It mainly targets the urban population in Ghana using charcoal, helping them save about 30% of the fuel used compared to traditional stoves. The Gyapa stove is trademarked in Ghana and no other cookstove entity is allowed to use the brand name. However, the design itself is not patented. The production level is roughly 132 000 stoves per year with an overall production of 484 860 since 2007. The stove comes in three different sizes with a retail price ranging from 6.5 USD to 25 USD, and currently has a warranty system in place.

Gyapa stove production is roughly 132 000 stoves per year with an overall production of 484 860 since 2007

Distribution & Sales

EnterpriseWorks/ VITA's original distribution system included warehousing where ceramic liners would be stocked for metal workers and small retailers. However, many of the primary value chain actors preferred to deal directly with each other and cut out the warehousing and its associated costs. Today, distribution is mostly outsourced through the existing stove distribution network of ceramicists, metal workers and retailers. EnterpriseWorks/ VITA plays a limited role in distribution, maintaining two trucks in Kumasi and Greater Accra and supplying limited transport between value chain actors focusing primarily on the link between metal workers with finalized product and the retailers. This allows them to provide some quality checks at the end point before it reaches the customer.

Gyapa retailers often sell multiple cooking devices that range from LPG stoves and cylinders to traditional charcoal stoves. Those that are formally part of the Gyapa value chain commit to using Gyapa receipts that include customer information, provide the one year warranty on the product and help track stoves for carbon related monitoring. Transportation that is not provided by EnterpriseWorks/ VITA is the responsibility of the two parties to negotiate or include in the price of their sales; in many cases the metal workers tend to pay for transportation to the retailers.

Additional Support Services

EnterpriseWorks/ VITA offers a loan system for value chain actors. Value chain actors are obliged to pay upon delivery or purchase of raw materials as well as stoves for most

retailers. If they are part of the Gyapa trained retailers they can get reimbursed upon customer payment when they return the carbon copy receipts to EnterpriseWorks/ VITA. If they are new or just interested in selling, but do not have relationships with the rest of the value chain, they purchase the stoves and then add on their costs. In some cases, value chain actors with long established relationships facilitate credit to one another.

Additional funding was essential to the development of the business and most notably private funding received from the Shell Foundation (400 000 USD) which helped scale up and put more stoves on the market, as well as a government award from the USEPA (200 000 USD). This award acted as a complimentary fund to help Gyapa Enterprises and its cookstove value chain transition towards a long term sustainable business in Ghana.

EnterpriseWorks/ VITA has been highly recognized for their success with the Gyapa stove and is seen as a pioneer in the Ghanaian cookstove market. They set the foundation for market actors that would follow after them, including Man and Man Enterprises and Toyola Energy Ltd. Access to finance for upgrading equipment and stock material remains challenging and with the downturn in the carbon finance market, having carbon as a central component of their business places the business model at risk. However, with new players such as Envirofit and Cookclean introducing more advanced designs, there may be new markets for the Gyapa stove.

5.5 Toyola Energy Ltd. Ghana

Toyola Energy Ltd. is a for-profit business that supplies improved cookstoves and other energy systems to low-income households in Ghana. Their mission is to profitably and sustainably serve Ghana's urban poor and low income rural households with energy efficient biomass stoves and provide solar lanterns and small solar home systems to off grid communities to reduce their dependence on kerosene lanterns. (More information available at www.toyolaenergy.com)

Socio-Cultural Context & Enabling Environment

Toyola Energy Ltd. was founded in 2006 by Suraj Wahab and Ernest Kyei. These founding partners were initially part of EnterpriseWorks/ VITA's Gyapa value chain, providing logistical and stove production services. Consequently, they worked under the

same socio-cultural context as EnterpriseWorks/ VITA (section 5.3). However, it should be noted that the enabling environment differed from EnterpriseWorks/ VITA as the activities of the enterprise provided the right learning and training environment to start Toyola.

In addition to personal investments, Toyola received two loans amounting to 170 000 USD from E+Co which helped them develop their business. E+Co, a business innovation hub, was founded as a not-for-profit institution in the 1990s and invested in small enterprises providing clean energy to BoP customers. It has been recently restructured as a for-profit entity (innovation hub no longer active); however up until 2012 it had invested approximately 40 million USD on over 250 enterprises.

In partnership with E+Co, Toyola pursued carbon credit generation through the sales of its stoves. Toyola developed their carbon asset at a time when it was popular to apply a "buying down the price of the stove" concept. Applying this concept, they sell the stove at a reduced price or for a lower profit margin, in exchange for the carbon reductions that their customers generate. Though the exact revenue share between Toyola and their carbon finance partner is not known, during the peak of carbon prices, Toyola made an estimated 154 000 USD[5] from carbon credit and 396 000 USD from selling approximately 61 000 stoves. Toyola sites using the carbon revenue for expansion, working capital to fund their production and distribution system and their customer repayment plan, which allows their customers to pay for the stoves in installments. They also invest in quality control, monitoring and evaluation (for carbon credits), training for units (metal workers and ceramicists), training new sales agents and evangelists, paying for the production of stoves in large numbers and receiving payments in small returns, and marketing and promotional material. A summary of investments made by Toyola in their cookstove value chain is detailed below in Table 5.

[5] Figures were calculated from the information provided in the Ashden Awards (2011) case study

Table 5: Summary of Investments Made by Toyola in their Cookstove Value Chain

INVESTMENT TYPE	YEAR(S) RECEIVED	FINANCER	AMOUNT ALLOCATED	AREAS OF INVESTMENT
Personal	2006	Self-invested	N/A	N/A
Private	N/A	E+Co	70 000 USD	Training Producers Marketing and Promotion Operational costs Infrastructure/ Equipment
Private	N/A	E+Co	100 000 USD	Training Producers Marketing and Promotion Operational costs Infrastructure/ Equipment
Carbon Finance	N/A	Carbon credit buyers	154 00 USD (in 2009)	Working Capital Subsidizing price of stove
Other **(re-invested from solar company profits)**	---	---	---	Off-setting cost of stoves

Energy Delivery Model

Production

Toyola has a centralized production system with five full-time employees in five production centres (4 in Ghana and 1 in the Republic of Togo). Production occurs through a mix of artisanal and mechanized production processes. In terms of sourcing, Toyola relies on the same raw materials as the Gyapa stove except that the ceramic liners are sourced and produced in the Eastern region of Ghana at KT Ceramics (fully owned by Toyola). Toyola also works with more than 170 independent self-employed artisans trained by Toyola in making the metal stove bodies. The final stove assembly, when the ceramic liner is sealed into the metal body and the stove finished with paint and labelling/branding, occurs only at Toyola production centres. All inputs, production facilities, clay, metal, equipment are financed by Toyola.

Toyola coal pot stove production is roughly 100 000 stoves per year with a total of 400 000 units sold between January 2009 and May 2014.

The Toyola Coalpot stove is adapted from the Gyapa stove and is a version of the Kenyan Ceramic Jiko with a metal body and ceramic liner (locally produced). Their newest model has the metal body outsourced to China while Toyola awaits the arrival of their new equipment. The imported outer body of the stove is assembled locally and is completed with a local ceramic liner. The design is not patented and thus an open source technology. It targets urban populations in Ghana using charcoal, helping them save 30% of the fuel used compared to traditional stoves. The level of production is roughly 100 000 stoves per year with a total of 400 000 units sold between January 2009 and May 2014. The stove comes in three different sizes ranging from 8 USD to 25 USD. They also sell industrial models from 31 USD to 94 USD (prices are all subsidized by carbon finance).

Distribution, Sales and Maintenance

Distribution and sales is managed through a sales agent network (referred to as "evangelists"). Distribution starts from Toyola production centres where stoves are loaded into Toyola vehicles. Evangelists ride with the Toyola driver and deliver stoves directly to the customer. Evangelists and retailers pay for the vehicle's gas and the evangelists receive commission plus one stove to sell themselves for every ten stoves sold. Approximately 95% of stoves are sold directly to users through evangelists who testify about the stove's ability to reduce charcoal and save money. The remaining 5% of sales are through conventional retailers – from small shops up to supermarkets.

Toyola Driver & Evangelist delivering stoves

Toyola Vehicle Visibility & Promotion

Evangelist receiving 1st payment

(Photos by Elisha Moore-Delate)

In addition to sales, evangelists help manage Toyola's commercialization by using their links with communities to expand sales in nearby villages. While they record and monitor

customer information including repayments, they also inform Toyola if and when stove repairs are needed.

Additional Support Services

Toyola differs from the other cookstove companies in that it does not distribute through fixed retail points or stores, but rather through door-to-door delivery. This is needed for their customer payment system which allows customers to pay in installments, usually three payments over a month. Evangelists note down customer information and fill in the notebooks used to help with monitoring and evaluation for the carbon component. This payment system gives those living in rural towns and villages the opportunity to purchase the stove outright and start saving fuel and money.

Toyola Energy Ltd. presents an image of a viable local energy business. In eight years, Toyola has gone from a single production unit to a multinational one, developing a franchise system in three countries (Ghana, Togo and Nigeria) with a diversified range of energy products (stove, solar PV, etc.). With the falling price of carbon credits and new improved cookstove players in Ghana, Toyola has chosen to enter new markets, allowing them to balance out costs across their organization.

5.6 Cookswell Jikos Kenya

Cookswell Jikos is a Kenyan based company which sells a range of improved stoves and other cooking devices in Central and East Africa, and more recently is selling their charcoal ovens in the European Union. Founded in 1992 as a family business by one of the contributing designers of the Kenya Ceramic Jiko (KCJ), it has become an innovative company that produces cooking devices that appeal to Kenyans across all social classes. (More information available at www.cookswell.co.ke)

Though often viewed as an African economic powerhouse providing agricultural and food commodities to the world economy, Kenya faces severe climate change issues that stand to impact the economy and seventy five percent of the population which rely on agriculture and natural resources to sustain their livelihoods. Biomass demand accounts

for 68% of primary energy consumption and over 90% of household energy needs (Republic of Kenya 2011). With a total population of about 40 million and an urban population that represents 22% of total population (1.7 million households) the improved charcoal cookstove industry has plenty of room for growth (Index Mundi 2011).

Kenya has a long lived and highly developed stove sector compared to other African countries. The most recent figures suggest that somewhere between 30% and 40% of Kenyans have an "improved" stove of some type.[6] The quality of other improved cookstoves in the Greater Nairobi market varies, but in general the baseline for improved cookstoves is much higher than the rest of Africa.

This is the result of several factors:

- The diverse range of improved cookstove actors from local artisans, carbon developers, large national players to multinational companies that import stoves
- Many consumers know of the Jua Kali, a local market with hundreds of local artisans that produce and sell stoves, but also produce stoves on direct order. It is more centrally located and prices can be negotiated. The quality varies, but customers can purchase exactly what they want to their own specifications. Staff turnover from local improved cookstove companies including Cookswell Jikos has resulted in local imitations (with similar efficiencies, but much less durability)
- The current official standards only enforce quality across a small fraction of the market, mostly the formal market
- Other improved cookstove models can be purchased in local areas like street sides, supermarkets through credit unions and through networks of project implementers, such as CARE.

Within the Kenyan and East African market awareness about improved cookstoves already exists. Versions of the Kenyan Ceramic Jiko have existed in the region since the 1980s and are almost the baseline for charcoal cookstoves in East Africa. They are even pirated and sold on the local market like Jua kali. What is clearly seen in Kenya is that there is a large demand for stoves and consumers like having lots of choice (e.g. Envirofit, EZY, Burn, Ecozoom stoves etc.).

6 This includes legacy stoves, handmade and of variable quality, advanced biomass stoves that are mass manufactured to high technical specifications, and effective improved stoves, which are cheaper versions of the advanced biomass stoves with comparable quality (USAID and Winrock 2011).

Kenya has a long history in contributing to the development of improved cookstoves through large internationally funded programs. The Kenyan Ceramic Jiko (KCJ) was developed between 1982 and 1983 as part the Kenyan Renewable Project funded by USAID. This project was followed by World Bank funding that paid Kenyan consultants who participated in the USAID program to adapt the stove model to Somalia, Tanzania and Malawi. Cookswell Jikos was established by Maxwell Kinyanjui (founder and ex-head) and the initial investment required to implement the cookstove program came from family funds and indirectly through a consultancy implemented by USAID's program.

As such, it is the only case seen in this study which did not use any subsidies to reach scale. Cookswell Jikos now operates as a typical SME using reinvested profits from the sale of stoves and other products. The majority of their investment is allocated towards training, equipment and raw materials, marketing and promotions (sales centres and online pages), internal quality control and assurance systems, external quality control and assurance systems and ICS product certification.

Energy Delivery Model

Production

Cookswell Jikos has a centralized production system based in Kitengela, an industrial area on the outskirts of Nairobi. Production for all of their products is mostly artisanal with electricity only used for welding certain parts for ovens and two burner stoves. All the resources used during the production process are locally procured and Cookswell Jikos is responsible for paying the resources upon receipt of delivery to their production facility. The workers who produce the stoves and other cooking devices are independent contractors and are paid per piece.

The level of production for the KCJ is roughly 12 000 stoves per year with a total of 264 00 sold since the beginning of the business

Cookswell Jikos produces multiple stoves and in various sizes, but their primary product is the Kenya Ceramic Jiko (KCJ) consisting of a ceramic lining and metal body (locally produced). It was developed in the early 1980s by Maxwell Kinyanjui as an open source technology. It targets urban and rural populations relying on charcoal, helping them save up to 50% of the fuel used compared to traditional stoves. The level of production for the KCJ is roughly 12 000 stoves per year with a total of 264 00 sold since the beginning of the business. The retail price for the KCJ is between

5 USD and 45 USD, depending on the size and includes a one year warranty.

Metal worker with stoves & ovens

Ceramic worker

Improved Charcoal Ovens ready for shipment

(Photos by Elisha Moore-Delate)

Distribution

Cookswell Jikos has two shops, one at the factory and another in Nairobi located on Lower Kabete Road where stoves are sold directly to end users. They distribute wholesale volumes through their partner Musaki Enterprises whose principal role is to fulfill long term contracts with major clients like the supermarkets Nakrumatt and Chumi. These supermarkets are chains that even have branches and sell the stoves in places like Rwanda. Thus, their products can be found throughout the East Africa region.

Additional Support Services

Like many businesses in Kenya, Cookswell Jikos uses M-PESA, which allows for mobile payments. Stoves can be purchased and paid for via telephone and then delivered to the customer. This is used by the urban population to buy stoves for themselves and also to send stoves back to their families in rural areas.

The KCJ stove has been well-established in the Kenyan cookstove market, a familiar name in the household and it has had much influence on stoves in the Africa region (including Ghana). As the market continues to rapidly mature in Kenya, Cookswell Jikos faces increasing competition within the improved and advanced cookstove industry. In the past five years a number of advanced cookstove manufacturing facilities have been set up in Kenya including Ecozoom, Burn and Envirofit Kenya.

5.7 Envirofit Kenya

Envirofit International is a social enterprise that develops and distributes clean technology solutions to improve health, livelihoods and the environment while enhancing energy efficiency. It was formed in 2003 as a spinoff company of Colorado State University's Engines and Energy Conversion Laboratory. Envirofit sells cookstoves in over forty-five countries around the world and has established manufacturing operations in China and East Africa. Envirofit Kenya is a subsidiary of Envirofit International. (More information available at www.envirofit.org)

Socio-Cultural Context & Enabling Environment

Envirofit International started their activities in Kenya in 2009 and it was officially registered and established in 2011. The value and potential for a viable market in East Africa and the ability to scale up in the region allowed them to select Kenya as an appropriate location for their first production facility outside of China. In addition, by basing their operations in Kenya it allows them to send stoves to Tanzania, Somalia, Ethiopia, Uganda, South Sudan, Rwanda, Burundi and the Democratic Republic of Congo. While there is much competition in the Kenyan cookstove market, Envirofit is among the new players who are introducing more advanced cookstove with focus on reducing indoor air pollution.

As mentioned before, there was difficulty in obtaining financial information in relation to investments made along the cookstove value chain. However, investment sources and strategies can be linked to those discussed in section 5.3 for Envirofit India (Shell Foundation and carbon finance). Envirofit views the carbon revenue allocation as mostly subsidizing the channel margin for the carbon credit generating products as well as clearing the bill of material costs. The subsidy also covers costs related to monitoring and evaluation.

Energy Delivery Model

Production

Envirofit Kenya has a centralized and highly mechanized production system that is able to manufacture at high volumes. The production facility plays an important role in Envirofit

International's global activities, producing a minimum of 6600 stoves per month in their factory (as of April 2013). They planned to increase this production to 13 200[7] stove per month by mid-2013. The majority of Envirofit Kenya's production materials are sourced from China and then assembled at their factory on the outskirts of Nairobi. All staff involved in the production line are employees of Envirofit Kenya's factory and are paid by Envirofit Kenya according to Kenyan labor laws.

Envirofit's level of production in Kenya is between 60 000 and 70 000 stoves per year and since 2009 they have sold a total of 360 000 stoves

Envirofit Kenya has developed four stove models: two firewood stoves and two charcoal stoves. Soon they will be producing two more stoves (one wood and one charcoal) specifically for a high volume distribution partner. These stoves are designed and tested by engineers at Colorado State University. As with Envirofit India, stoves in Kenya are patented. The price of the stove varies on the model and place of purchase (not fixed by Envirofit). For example, the wood stove sells in supermarkets for about 21.5 USD. The level of production is between 60 000 and 70 000 stoves per year and since 2009 they have sold a total of 360 000 stoves. Interviews with Envirofit International's leadership and Acting Managing Director indicated that the facility has the capacity to produce between 15 000 and 20 000 stoves and that to make the business break even they need to produce a minimum of 70% of their production capacity, or 10 500 stoves per month.

Envirofit Kenya provides a five year warranty to consumers who agree to register their stove and the warranty. The registration form gives Envirofit the rights to carbon reductions made by the consumer when using an Envirofit stove and gives the consumer the rights to a repaired or new stove if it stops functioning.

Distribution & Sales

In Kenya, Envirofit International has two entities, Envirofit Kenya as noted above and a shelf company, Clearskies Solutions. Clearskies Solutions is owned by Envirofit and is a downstream asset, incubating the market and working more closely with the distributors. This company plays a large part in the roll out of their institutional stove which focuses on building an institutional channel and providing after sales services. Out of the factory,

[7] Calculations are based off of daily production rates and projections as stated by Ron Bills (2013)

Envirofit operates by focusing on moving high volume. Clearskies helps reinforce the distribution system.

As seen in India, Envirofit works with distribution partners. In order to become a partner individuals or entities must be willing to fill out the carbon sheets and must agree to it. They must have visibility and traceability and therefore prefer to work with dealers who have direct sales or retail outlets that can complete the carbon sheet. In addition to these individual partners, Envirofit Kenya has several corporate partnerships that permit them to sell high volumes of stoves within Kenya and regionally. One of their corporate partnerships allows them to subsidize the price of the stove to the consumer and to benefit from co-branding (associating their name with a brand that is already well known and trusted in the country).

It is the wholesale distributors who sell onwards to individual end users. Envirofit Kenya has warehousing space directly connected to their factory where wholesale clients come and make direct, high volume purchases. These large wholesale distribution partners do not appear to offer credit or financing to the end user. It is only the MFIs or organizations linked to MFIs that may offer credit for stove purchases to the end users.

A big part of Envirofit Kenya's business model is establishing formal partnerships with all kinds of organizations, corporations, distributers, supermarkets, MFIs or Credit Unions and NGOs. These partnerships are formalized with contracts and MOUs. They also have had carbon partners like Paradigm Project and now manage their own carbon assets through their East Africa POA. As part of Envirofit International, Envirofit Kenya has the support and international pressure to make sure that it provides the services it promises to the end user.

Additional Support Services

As mentioned before, online sales through Amazon and Evan's Outdoor Store has increased Envirofit's sales and international reach.

Envirofit Kenya believes that in order to establish a viable commercial cookstove market, the Global Alliance for Clean Cookstoves and international donors should focus funding and investments on:

- Developing and promoting acceptable and minimum standards for stove

performance

- Promoting public awareness of cookstoves and the positive benefits they hold
- Working with governments to provide tax breaks, tax support or some type of relief for organizations that are setting up businesses which help governments improve their country's environment and the health of their citizens
- Providing loans or funds for working capital

5.8 FAFASO GIZ Burkina Faso

FAFASO (Foyers Améliorés au Faso) is an improved cookstove project implemented under GIZ's "Reducing Poverty in the Sahel Through Energy Efficiency and Renewable Energies" in Burkina Faso. Their objective is to disseminate energy saving stoves for private and commercial users and that it is done so in a sustainable way by training stove producers and introducing marketing structures. (More information available at www.foyers-ameliores-faso.org and www.giz.de/en/worldwide/19120.html)

Socio-Cultural Context & Enabling Environment

Burkina Faso is a West African landlocked Sahelian country surrounded by Mali, Niger, Benin, Togo and Ivory Coast. With an estimated population of 16.93 million inhabitants, it remains one of the poorest countries in the world (World Bank 2013). Burkina Faso is a fuel scarce country with more than 80% of energy supply coming from the traditional sources of wood and charcoal. A growing population is also increasing the demand for wood, leading to impacts on the environment and people's livelihoods (GIZ Burkina Faso 2014) With 46.7% of the population struggling below the poverty line (World Bank 2013), direct intervention to address household energy issues has become a priority for the government and international NGOs.

Improved cookstoves first emerged in Burkina Faso during the 1970s. At the time that the FAFASO project was launched in 2005, there were a number of producers already trained in making improved cookstoves and the population had a high level of awareness on the advantages of using improved cookstoves (Reikat 2010). This was largely due to the fact that cookstoves had been previously disseminated for free or at highly subsidized prices

across the country. However, this proved unsustainable and as a result GIZ decided to implement a market-based approach to ICS dissemination in order to ensure that the price in which stoves were sold could be maintained in the long-term (Reikat 2010).

In 2005, the Dutch Ministry of Foreign Affairs launched the Renewable Energy Cooperation Program. This program aimed to increase access to energy and technology to about 10 million people worldwide. During the same year the Ministry and GIZ signed an agreement allowing GIZ to implement twenty-three projects composed of energy and environmental activities across twenty different countries. FAFASO was established as part of this agreement. In December 2011, FAFASO then benefited from additional funds from the EU, allowing them to continue the program. Investments were made on training stove producers, purchasing materials in bulk, implementing quality control measures (label and standards), running a nationwide marketing campaign (incl. TV, billboards, radio, public demonstrations, posters and trade fairs), mobilizing institutional clients and the development of a commercialized value chain (Reikat 2010).

Energy Delivery Model

Production

In Burkina Faso, Roumdé stove production is roughly 50 000 stoves per year with an estimated 450 000 stoves sold since 2006 in Burkina Faso

FAFASO has a decentralized production system that relies on low mechanization. Between 2006 and 2010, GIZ supported and trained about 313 tinsmiths, 314 masons and 180 potters. GIZ states to have impacted about 1300 individual business owners (men and women). FAFASO promotes three different types of improved charcoal and fuelwood stoves primarily produced from local resources, namely clay and metal sheeting.

Stoves have been sold under the brand Roumdé and were developed as open source technology by IRSAT, a Burkina based stove testing laboratory and research centre, in association with FAFASO senior experts. The stoves target both urban and rural populations using charcoal and wood, helping them save up to 45% of fuel compared to traditional stoves. The level of production is roughly 50 000 stoves per year with an estimated 450 000 stoves sold since 2006. The price of the stoves depends on the model, but generally ranges from 2 USD to 45 USD. There is no warranty system for the stove.

Distribution & Sales

Distribution is managed by producers themselves directly or through commissioned retailers. Retailers are trained in how to sell directly to end users and to help stimulate demand GIZ organizes trade fairs where stove producers can directly sell to end users. In addition, GIZ has created linkages with official and institutional clients (NGO and social partners) who commission stoves directly from producers (e.g. Plan, SNV, UNHCR, EdM, CRS, the National Assembly).

Due to the history of distributing stoves for free in Burkina Faso, a strong emphasis of the FAFASO project has been the development of a market-based model and thanks to GIZ and other NGOs, FAFASO's associated business owners are currently benefiting from a 95% ICS market share. However, as funding comes to a close in 2015, project managers are actively looking for additional funding to continue project activities and continue making a positive impact on the environment and livelihoods of those living in Burkina Faso.

6. CASE STUDY ANALYSIS

Categorizing Cookstove Business Models

The selected cases all have certain features in common as they were chosen according to the same set of technical criteria (e.g. they are all improved biomass stoves employing a market-based approach and with a social mission to their business). However, beyond this they can be categorized in a variety of ways according to their technology, business type and geographical region.

Cookstove Technology:

Improved Cookstoves: Those stoves that demonstrate reductions in fuel (wood or charcoal), but may not necessarily reduce indoor air pollution (e.g. IcoProDac GERES Cambodia, SZ Consultancy GIZ Bangladesh, EnterpriseWorks/ VITA, Toyola Energy Ltd, Cookswell Jikos and FAFSO GIZ Burkina Faso)

Advanced Cookstoves: Those stoves that have verified and significant improvements on indoor air pollution and demonstrated fuel reductions (e.g. Envirofit Kenya and India).

Business Type:

Type 1: NGO Supported Producer Associations (e.g. IcoProDac GERES Cambodia and FAFSO GIZ Burkina Faso)

Type 2: NGO Supported to Registered Social Enterprises (e.g. EnterpriseWorks/ VITA and SZ Consultancy GIZ Bangladesh)

Type 3: Social Businesses (or B Corporations) (e.g. Envirofit Kenya and India)

Type 4: Local For-Profit Entities (e.g. Toyola Energy Ltd. and Cookswell Jikos)

Geographical Region:

Asia: IcoProDac GERES Cambodia, SZ Consultancy GIZ Bangladesh and Envirofit India.

Africa: EnterpriseWorks/ VITA, Toyola Energy Ltd, Cookswell Jikos, Envirofit Kenya and FAFSO GIZ Burkina Faso.

For the comparison of cases using the Business Options Map, it is represented by region and in the order they were presented in the previous chapter.

Table 6: Cookstove Business Models in Asia – Where they fall within the Business Options Map

COOKSTOVE BUSINESSES →	CASE 1: ICOPRODAC GERES CAMBODIA	CASE 2: SZ CONSULTANCY GIZ BANGLADESH	CASE 3: ENVIROFIT INDIA
Value Chain			
Product	-Single Product -Low Technology -Open Source	-Single Product -Low Technology -Open Source	-Single Product -High technology -Patented
Production	-Decentralized -Delegated -Low tooling technology	-Decentralized -Delegated -Low tooling technology	-Centralized -Delegated -High tooling technology
Distribution	-In house -Some facilitation -No business partnership -National	-In house -Facilitation -Business partnerships -National	-Outsourced -Limited facilitation -Business partnerships -National
Marketing & Promotion[8]	-End user focused -Above and below the line marketing	-End user focused -Above and below the line marketing	-Donor focused -Some below the line marketing
Enabling Environment			
Policy[9]	-National strategy	-National Action Plan -Incentives	-National Strategy + Clean Energy Fund
Sector Maturity	-Maturing Sector -Pioneer	-Maturing Sector -Contributed to sector maturity	-Mature Sector -Contributed to sector maturity
	-Indirect subsidy (to value chain) -ODA, Carbon finance	-Direct subsidy -ODA, Carbon finance	-Indirect subsidy (to value chain) -Private, Carbon finance

[8] This includes word of mouth, demonstrations, manuals sold with the stove, marketing on vehicles and boxes

[9] No policies are in place nationally that offer tax reductions that are contributing to social goods such as avoided deforestation, improving household health and livelihoods

Financing		-MFI	-MFI partners	
Socio-cultural Context	- High biomass use (>80% total) -Environmental and health concerns - Low consumer awareness	- High biomass use (99% in rural) -Environmental and health concerns -Growing consumer awareness	- High biomass use (>75% in rural) - 400 000 million affected by IAP -Growing consumer awareness	

Table 7: Cookstove Business Models in Africa – Where they fall within the Business Options Map

COOKSTOVE BUSINESSES →	CASE 4: ENTERPRISE-WORKS/ VITA	CASE 5: TOYOLA ENERGY LTD.	CASE 6: COOKSWELL JIKOS	CASE 7: ENVIROFIT KENYA	CASE 8: FAFASO GIZ BURKINA FASO
Value Chain					
Product	-Single Product -Low Technology -Open Source	-Single Product -Low Technology -Open Source	-Multiple Products -Low to medium technology -Open source (only ovens are patented)	-Multiple products -High technology -Patented	-Multiple products -Low technology -Open source
Production	-Decentralized -Delegated -Medium tooling technology	-Centralized -Integrated -Low to medium tooling technology	-Centralized -Integrated -Low tooling technology	-Centralized -Delegated -High tooling technology	-Decentralized -Delegated - Low tooling technology
Distribution	-In house -Some facilitation -Informal business partnership -National	-In house -Facilitation -No business partnerships -Regional	-Outsourced -Limited facilitation -Business partnerships -Mainly national, some international	-In house and outsourced -Facilitation through Clear Skies -Formal business partnerships -National and International	- In house - Some facilitation - Business partnerships -National
Marketing &	-End user focused -Above and below	-End user focused -Below the line	-End user focused -Below the line	-Donor/ End user focused	-End user focused -Above and below the

Promotion[10]	the line marketing	marketing	marketing	-Below the line marketing	line marketing
Enabling Environment					
Policy[11]	-National Strategy	-National Strategy	- National Strategy - Kenya Bureau of Standards	- National Strategy -Kenya Bureau of Standards	National Strategy
Sector Maturity	-Maturing Sector -Pioneer	-Maturing Sector	-Mature Sector -Contributed to sector maturity	-Mature Sector	-Maturing Sector - Contributed to sector maturity
Financing	-Indirect subsidy (to value chain) -Carbon finance -Loans to value chain	-Indirect subsidy (to value chain) -Private (loan), Carbon finance -Customer payment system	-No subsidy -Family investments generated from ODA funds	- Direct subsidies through channel margin and & CSR agreements -Private, Carbon finance	-Indirect subsidy (to value chain) -ODA
Socio-cultural Context	- High biomass use (>81% in total) -Environmental and health concerns - Consumer awareness	- High biomass use (>81% in total) -Environmental and health concerns - Consumer awareness	-High biomass use (>90% for HH) -Environmental and climate change concerns -Consumer awareness	-High biomass use (>90% for HH) -Environmental and climate change concerns -Consumer awareness	-High biomass use (>80% in total) -Fuel scarcity issues -High awareness

[10] This includes word of mouth, demonstrations, manuals sold with the stove, marketing on vehicles and boxes

[11] No policies are in place nationally that offer tax reductions that are contributing to social goods such as avoided deforestation, improving household health and livelihoods

Analysis and Discussion of Cases

Cases from Asia: IcoProDac, SZ Consultancy and Envirofit India

In Table 6, cases from the Asia region are summarized according to the business options map. These cases do not represent the entire cookstove sector in Asia; however it does highlight the diversity of cases found in the region from NGO supported, decentralized systems that aim to build capacity among existing value chain actors to private enterprises that focus on outsourced production and distribution through more formal business partnerships.

In terms of the product, all of the cases in the Asia region were found to promote a single stove and only within the national scope (a major difference compared with the cases seen in Africa). Production and distribution are generally decentralized with in-house support and facilitation by supporting NGOs, with the exception of Envirofit India who takes an outsourcing approach to reach higher volumes of stoves. In terms of marketing, cases generally focus on the end user with a mix of above the line and below the line marketing, except for Envirofit India which has more donor focused marketing strategy.

In terms of the enabling environment, governments played an important role in nurturing the development of the sector (e.g. through research and pilot projects). However, the most substantial role was in Bangladesh where the government partnered with GIZ to make the cost of stoves more affordable to end users. As for their entry into and contribution to the sector, it varies among the cases and has significant links to investments made. First and early movers, such as GERES Cambodia and GIZ Bangladesh spent much more of their budget on raising awareness at the end user level compared with Envirofit India which entered into a relatively mature market. This of course is also a reflection of their entry strategy, mission and specific project objectives.

In terms of financing mechanisms, most received indirect subsidies which were invested into the value chain itself (mostly on training producers/ partners and quality control measures), with the exception of SZ Consultancy in Bangladesh which used direct subsidies to reduce the cost of the stove. Microfinance at the end user level was seen in some cases; SZ Consultancy and Envirofit India through their MFI partners. While IcoProDac did not partner with any MFIs, the association included a credit facility for its members (i.e. producers and distributors). As for the source of investments, the NGO

supported cases (IcoProDac and SZ Consultancy) received ODA while the social enterprise Envirofit India relied on private funds. All cases were registered for carbon finance, although carbon revenue received for Envirofit India and SZ Consultancy are unknown and therefore could not be directly compared. It is worth mentioning the substantial amount of carbon revenue received by GERES Cambodia (about 9 M€ to date) which went into strengthening the IcoProDac association and scaling up dissemination activities.

Overall, the market aggregators in the Asia region focused their investments on training partners, quality control, monitoring and evaluation, marketing and promotion and raising awareness. As IcoProDac was working with an already existing network of stove distributors in Cambodia, their investments on training went mostly into production units. Comparatively, investments on training for Envirofit India focused on partners at the distribution and retail levels (production outsourced), while SZ Consultancy trained all actors along the value chain as sanitary shops were responsible for production, distribution and sales. Envirofit India and IcoProDac were seen to invest more on R&D and implementing quality control measures, (stove standards, labels, patents etc.), while SZ Consultancy focused more on awareness raising with massive, nation-wide public awareness campaigns.

In all the three cases, cookstoves were introduced in countries with high biomass use (above 75 %), with concerns over environmental and health issues and generally low awareness on the benefits of improved cookstoves.

Cases from Africa: EW/VITA, Toyola, Cookswell Jikos, Envirofit Kenya, FAFASO

In Table 7, cases from the Africa region are summarized according to the business options map. These cases do not represent the entire cookstove sector across Africa (East, Central and West), yet the higher number of cases in this region is more representative than those seen in the Asia region. In Africa, there was also a high diversity of business models seen from NGO supported, decentralized value chains (FAFASO) to centralized systems led by social enterprises (Envirofit Kenya) and private entities (Toyola and Cookswell Jikos).

In terms of product, there was a mix of single and multiple stove models, but generally all open source (except for Envirofit Kenya). There does not seem to be any relationship

between single/ multiple products and the geographical scope in which they operate. For example, Toyola's coalpot stove is distributed regionally, while FAFASO's multiple stove models are only sold within Burkina Faso. Although, it must be noted that, with the exception of Toyola, for the cases which sold stoves internationally (Envirofit Kenya and Cookswell Jikos), they sold a variety of stoves as well as other energy products (oven, BBQs etc.) and had patents or complex designs to protect their product in the international market. In this region, business partnerships played an essential role in distribution, marketing and promotion.

There was limited focus on above the line awareness raising in the region. Billboards, television, radio and songs were primarily used by EnterpriseWorks/ VITA and FAFASO. In Ghana, other actors benefited from EnterpriseWorks/ VITA's early efforts on public awareness for the end user and attributed it to helping mature the improved cookstove market. In general marketing and awareness was not an area of great investment and in fact above the line marketing was often avoided in order to reduce costs.

In Africa, the enabling environment was more closely linked with the maturity of the cookstove sector and time of entry rather than government support. With the exception of EnterpriseWorks/ VITA and Cookswell Jikos who were pioneers in their primary cookstove sectors, most cases entered into maturing markets that had medium to high consumer awareness on the advantages of using improved cookstoves. Cookstoves were also made more accessible through customer payment systems as seen in the case of Toyola, and through innovative mobile payment solutions and delivery services as seen in the case of Cookswell Jikos. National policies on energy access were seen in Kenya, Ghana and Burkina Faso; however none were directly related to improved cookstoves and were not seen to greatly influence the cases analyzed. Only Kenya had the presence of national stove standards, although the cases analyzed here started before their development and therefore was not part of their enabling environment.

In terms of financing mechanisms, most of the cases received indirect subsidies which were put into the value chain itself, with the exception of Envirofit Kenya which used direct subsidies from CSR agreements and Cookswell Jikos which did not receive any subsidies or outside financial support. There were no MFI partnerships seen in the region and only Toyola offered an end user payment system to facilitate stove purchases. As for the

source of investments, they were mostly private funds, with the exception of FAFASO which received ODA. Again, this is directly related to the goals and objectives of each business or organization and may also be related to the fact that subsidies and donor reliance are negatively perceived in Africa (a point noted during the interviews).

Three businesses registered for carbon finance, EnterpriseWorks/ VITA, Toyola and Envirofit Kenya, and it was used to subsidize the cost of stoves for end users. Cookswell Jikos presents a very unique case in that it did not receive any public or private funds, but rather developed through its own personal investments. However, it must be mentioned that these personal investments were made possible through ODA funds received from a previous consultancy contract with USAID.

Market aggregators in the Africa region mostly focused their investments on training partners, marketing and promotion, quality control and monitoring and evaluation (especially where carbon revenue was present). Investments on training occurred at design and production levels, but there was a greater focus on training partners on distribution, promotion, sales and post-sale maintenance (e.g. Toyola's delivery sales through Evangelists, Envirofit's formal business partners and Cookswell's retail stores). Quality control measures included certifications, trademarks, brands and patents. For all of the cases, branding was an important tool for creating separate identities from similar products, especially given the high number of low quality imitation stoves in the region.

In all the five cases, cookstoves were introduced in countries with high biomass use (above 80%), with concerns over environmental and health issues and where consumers had some initial level of awareness on improved cookstoves.

Cross-Regional Trends

Energy Delivery Model – Value Chains

Overall, there were an equal number of cases using decentralized and centralized production systems. Most of the cases, except for Envirofit Kenya and India, promoted improved cookstove designs relying on artisanal/ or semi-artisanal methods of production and low mechanization. These technologies were observed to be open source. Envirofit on the other hand promoted more advanced cookstoves protected by patents. In terms of

distribution there was high variation, but for the most part cases were seen to have in-house distribution with some level of facilitation by the company or organization. Business partnerships were emphasized at the distribution level, and were more commonly seen in the cases in Africa. As for marketing, most of the cases targeted end users rather than donors and very often included both above and below the line marketing (e.g. TV ads and community level rallies).

The Enabling Environment

All the cases analyzed operate in countries with national strategies or action plans on energy access, albeit not always directly related to improved cookstoves but rather woodfuel or off-grid energy development. However, at the time that these businesses emerged many of the national policies did not exist and therefore was not a major factor in the enabling environment. Where ODA was involved, governments were often present as regulatory authorities or project partners (IcoProDac GERES Cambodia, SZ Consultancy GIZ Bangladesh and FAFASO GIZ Burkina Faso). The case of SZ Consultancy was quite unique in that the local government was the only one out of all the cases analyzed to provide incentives for cookstove dissemination. In other cases, governments played an initial role in research and development, public awareness and sometimes led national programmes or pilot projects themselves. Government involvement was an important factor in the early development of cookstove markets, but even more relevant was market maturity and access to finance.

Other than IcoProDac, Cookswell Jikos and EnterpriseWorks/ VITA which were pioneers in Cambodia, Kenya and Ghana, many cases entered maturing markets with some level of awareness on improved cookstoves. This time of entry was not by chance; in fact it was observed that many businesses preferred to enter after the first or early movers. These were strategic decisions which allowed entities to reduce risks and reduce costs.

Access to finance was another important enabling factor in the development of businesses and their ability to reach scale. Except for Cookswell Jikos, all the cases analyzed received financial support (ODA, private funds, loans, carbon finance) which helped them develop their businesses, build up value chain actors, scale up production activities and reduce the cost of stoves to end users. There were a mix of financing mechanisms used across the eight cases; however the three NGO supported cases (IcoProDac, SZ Consultancy and FAFASO) all

received ODA while the remaining social enterprises and private entities relied on private funds. Carbon finance was the most common financing mechanism employed across the cases with 6 out of the 8 of the businesses selling carbon credits (Cookswell Jikos and FAFASO are not registered for carbon finance). Carbon revenue was seen to be especially helpful in subsidizing the cost of stoves to end users (e.g. Envirofit Kenya) and scaling up activities (e.g. IcoProDac GERES Cambodia). Beyond this, end user purchases were sometimes facilitated through payment systems or MFIs (half of the cases).

The Socio-Cultural Context

As only improved or advanced biomass cookstove cases were selected for the study, it is in line with the fact that the businesses were developed in countries with high biomass use (over 75% of total energy consumption). They were also countries that had increasing concerns about depleting forest resources, climate change, fuel scarcity and human health. Where advanced cookstoves were introduced, there were increasing concerns on the effects of indoor air pollution on human health and especially women and children cooking in these hazardous environments. In all cases, local cooking habits were taken into account and stove designs were adapted to the local needs so that the end user could be reached.

7. CONCLUSIONS & RECOMMENDATIONS

The aim of this study was to bring informed recommendations from the case study analysis of major biomass stove market aggregators to the sector's financers (private and public) and practitioners to help them improve their investment choices along cookstove value chains.

Recommendations are shared here and presented in five major themes:
(1) Considering the Enabling Environment (2) When to Enter a Cookstove Market: The First Mover's Advantages & Disadvantages (3) Investment Areas for the first 5 years of a Cookstove Business (4) The Role of Subsidies in a Market-Based Approach (5) Carbon Finance: The Changing Financial Landscape (6) Increasing Transparency & Data Integrity.

Considering the Enabling Environment

Investment plans vary among business models which itself is deeply influenced by the baseline situation or the local context at the time of investment. Before investing in a cookstove business model, the enabling environment should be carefully assessed with specific attention given to:

Maturity of the Cookstove Sector: Market maturity refers to a certain level of development within a sector, encompassing local awareness and competition among products or services for a particular segment of the population. Market maturity is a very important enabling factor which influences the ability for market aggregators to scale up their cookstove activities. It also plays an important role in encouraging private investment in the sector. The more mature the market, the more private investments are favored.

Business Partnership Opportunities: Business partnerships at distribution and retail levels were seen in many of the cookstove cases (especially in the Africa region) and it may be an effective way to reach the last mile distribution at a low cost. However, before investing a risk analysis should be performed to assess partnership opportunities, how to set them up and under which conditions.

National Policies and Political Will: The absence of a driving environment at the policy

level can be a limitation to any business initiative. Therefore, it is important to assess the national policies, regulations and mechanisms (e.g. incentives, stove standards) in place which may either support or challenge cookstove initiatives.

Local Financing Opportunities*:* Before investing and depending on the business strategy, local financing opportunities towards value chain actors and end users through investment funds, banking systems and microcredit should be assessed to ease financial partnerships with locally based entities.

Taking these four major enabling factors into account will help assess the risks and opportunities associated with implementing a cookstove business model within a particular social, economic and political context.

When to Enter a Cookstove Market: The First Movers Advantages & Disadvantages

Cookstove businesses make very strategic decisions about when to enter a market and this is influenced by the business opportunities, market readiness and financial risks at a particular time and place. To be a pioneer or early mover, resources must be allocated to create an enabling environment for the value chain. If the market is not yet mature, market actors must spend funds on gathering stakeholders including government, to support market development and commercialization. This was the case for GERES Cambodia, GIZ Bangladesh, EnterpriseWorks/ VITA and all the other initiatives that have taken over a decade to reach scale. The rewards for all of them have been positive; however now that they have laid the foundation for cookstove markets there are many new players that are starting to enter these markets and stand to compete for the same market share.

When looking at the case studies in a chronological sequence and taking into consideration the challenges and successes that each of them had, there is an ideal sequence that occurs for investments and market development. Ideally, in nascent or immature markets NGOs and ODA funded projects lead initiatives on marketing, basic cookstove technology and dialogue with governments. As markets mature, private businesses develop and other organizations like the GACC or country cookstove alliances take on the role of connecting private businesses with both public and private entities. There are critical periods where each business develops and where investments can be

made. These periods are much the same as any business, and cookstove initiatives that promote market led approaches should look at both small individual artisanal producers and middle mechanized businesses in much the same way.

During this study, many of the participants stated that it is best to be the first to enter a market, but that huge initial investment is required to do so. This initial investment is not only needed to establish a business, but also to implement large-scale awareness raising campaigns (an activity incurring some of the highest costs in cookstove projects). Participants noted the importance of awareness raising in the success of ICS dissemination and that it is an essential activity which benefits every actor in the market. In reality, most private entities cannot afford this type of marketing and advocacy. For example, in Africa about six months of this type of marketing costs an estimated 100 000 USD and can take six months of preparation prior to roll out. Media campaigns also need to be implemented in tandem with product availability. Thus it requires a lot of work for one entity as retailers must be trained on the product; producers must be producing the product and consumers getting informed on the product all at the same time.

As a first mover or early player in the market, initial investments should focus on research and development, raising awareness on the product and its benefits to consumers, making the product widely available and accessible to consumers, assessing risks and accessing finance for business development. One negative aspect identified in being the first to enter a market is that financing institutions may not understand the value or potential of the product which can make access to finance even more challenging. As a quick second, if the first entity was successful, there is at least an available product to demonstrate market potential to financing agencies. Consequently, the majority of study participants believed it would be more effective to be a quick second in the market.

Entering the market after an organization or entity has already invested in the sector, would allow new market players to research what the first mover has done, avoid the same pitfalls and mistakes, test out new approaches to reach the consumer and find ways to streamline production and reduce costs. If the product varies from the earlier product even by a bit, additional marketing on how it is similar to the first product (but better or added benefits) should be carried out. Negative marketing is not recommended as it harms the cookstove market as a whole.

Being a quick second has many advantages and if businesses enter in a way that is complementary to the earlier movers, they can even coordinate with other entities who want to enter to see how they can target the market and ensure widespread availability of improved cookstove products. Coordination would also be needed between the first market mover and those that follow. Working together would allow them to coordinate with larger non cookstove entities to bring their products to new consumers. For example, as one private entity they may not have enough products available to target a large MFI or NGO who has clients/ beneficiaries with available funds to purchase the products, but together they could provide their partners' clients with products and choices. Also, a private entity may not have the reputation to approach larger commercial organizations like supermarkets and mobile phone companies that sell products via SMS and companies or even large retailers that sell complementary cooking devices, like pots and pans. As a platform of multiple stove products, this is more achievable.

It must be noted that in markets like Kenya and Ghana, where there are already multiple improved cookstove products, there is an opportunity to divide and conquer the markets. Some entities, who have limited product lines but may be strong in distribution or identifying new markets, could take the lead on improving the distribution systems and others with stronger production capacity, thereby ensuring that the supply can meet the demand. If instead of coordinating they are competing, each entity must find a way to establish themselves in the market without confusing the consumer or diminishing the value of improved cookstoves to the consumer through negative advertising or confusing marketing messages.

In conclusion, it was stated by participants that whether you are the first mover or not, as soon as you have a proven business plan to replicate, a mature product and enough local partners, there is no reason to delay entering the market. Although, attention does need to be given to the high costs associated with being a first mover, especially on marketing, promotion and public awareness.

Investment Areas for the first 5 years of a Cookstove Business

Where, how and when to invest in a cookstove business model varies according to the type of initiative implemented (NGO supported vs. social enterprise vs. private entity), the

particular business phase (start-up vs. scale-up), market readiness, available financing mechanisms (ODA, private funds, carbon finance etc.) and the local socio-cultural context. However, it was often emphasized by study participants that donors and international development agencies should focus their investments on leading large-scale public awareness campaigns at the beginning of cookstove market development and continue these efforts throughout its growth for the benefit of all the sector stakeholders. Local entrepreneurs do not often have the time or financial resources to lead this type of activity and for some business owners it is seen as an ineffective investment as it incurs high costs and does not bring any particular competitive advantage (i.e. awareness is seen as a public good). Donors were also seen as playing a very important role in removing institutional barriers and involving local government in cookstove dissemination activities.

In terms of where, how and when to invest in the business model, study participants stated that first investments must be done along the entire value chain, but most importantly starting at the production level. During the first five years of establishing an improved cookstove business the market aggregators recommend investing in the following areas:

Year 1 – Initial Investment

- Market research on raw materials, suppliers and prices, potential consumers, potential product price and potential partners (this includes consumer testing on product, price and their needs etc.), and areas/populations to initially target
- Research on what type of related products are in the market and what the entities that produce the products have done successfully and failures – to avoid them
- Equipment, infrastructure & raw materials
- Purchasing vehicles or partnering with a transporter
- Staff recruitment & training
- Launching production
- Establishing a management team and board to help develop the business

Year 2

- Large scale marketing and awareness, including public demonstrations
- Local partnerships in the initial target areas
- May need to provide inventory finance to retail shops or establish credit

mechanisms to ensure there are supplies available in target areas

- Logistical costs and general operational costs

Year 3

- Leveraging partnerships and establishing new ones – costs are related to allocating staff to do this
- Collateral for commercial loans to further develop market/ enlarging business
- Machinery or new technology to streamline production
- Seasonal marketing & public demos

Year 4

- Enhancing staff capacity through additional training, especially if there are new products or equipment
- Revisiting products and looking at variations to improve it
- Developing or adding new products – as new players with new products will have entered the market
- Seasonal marketing & public demos

Year 5

- New equipment for new product line (between year 4 and 5)
- Additional marketing for new product lines
- Release of new products at scale
- Seasonal marketing & public demos

Participants noted that each year suppliers and the cost of materials should be re-evaluated for cost, quality and availability. This is something that takes time and some funds, but is a necessary step for sustainable growth. Some participants stated that further investments should be done in R&D to develop new technologies and design stoves that will help improve their establishment in the market.

The Role of Subsidies in a Market-Based Approach

In this study, almost all the cases analyzed used subsidies to reduce the cost of stoves, mostly indirectly to the value chain and at other times directly to the end user. Study

participants remarked that subsidies play an important role in developing cookstove markets. A positive point of using subsidies is that it allows more consumers to purchase the product. This can help increase adoption, access new markets and use mechanisms (in this case carbon finance) to leverage other finance. Some negative points were also mentioned, for example that it can impact competition and stifle potential for long-term commercial development. This can spoil the market for future sales, push out players who cannot afford to subsidize stoves, does not instill the real value of stoves to consumers and often comes with heavy requirements that may be equally costly (e.g. carbon finance). Therefore, attention needs to be given not only to whether subsidies should be used or not, but the manner in which they are used.

Some recommended alternatives include:

- Government tax alleviations for new businesses that sell products that benefit the public like cookstoves (reduce deforestation, improve respiratory health etc.)
- Free testing for the cookstove industry and publicly available information for consumers. This would allow standards to be enforced and real efficiencies to be known
- Establishment of a trust or fund to act as collateral so businesses could get access to working capital
- Tax breaks or tax relief periods where producers could import large quantities of material & equipment tax free (3 months of the year for example)

Carbon Finance: The Changing Financial Landscape

Carbon markets have steadily fallen since 2011 and the collapse of the United Nation's "flexible mechanisms" including the Clean Development Mechanism (CDM) has been especially severe. The spot price for CERs (Certified Emissions Reductions) on the European Energy Exchange is currently 0.35€ per tonne of carbon dioxide (in August 2013 it was 0.61€.) The UN flexible mechanisms now accounts for 1% of the value of the world's carbon markets and investment in new CDM projects has ground to a halt. The voluntary market prices are around the same as the EU Emission Allowances (EUAs) at approximately 5€. While this may be a good thing for many of the cookstove businesses that were studied in this document, the price matters less in a market that is facing a huge

over supply of both CERs and VERs. For cookstove business like Gyapa, that received more than 400,000 VERs in 2013 this is foreboding news and will have a significant impact on their business model and long term sustainability.

The markets however are not viewed quite as pessimistically in Ecosystem Marketplace's 2013 report on the state of the voluntary carbon markets, stating that "voluntary buyers also funneled 80 million USD to Gold Standard certified offsets from projects that distribute clean cookstoves and water filtration devices" (Ecosystem Marketplace 2013). Also, international organizations such as the Nordic Environment Finance Corporation in its capacity as the facility manager of the NEFCO Norwegian Carbon Procurement Facility (NorCaP) (GACC 2014a) and the World Bank are launching initiatives to help purchase or auction these surplus credits in an effort to rally or recover the CDM markets (Carr 2014). This as of yet, will not benefit those selling credits on the voluntary market. The majority of the cookstove programs studied use the Gold Standard Voluntary market, though some are registered for both CER and VER projects. Therefore at this moment, businesses and organizations (unless they have a direct private buyer) have put themselves at risk if carbon finance is the cornerstone of their business model.

Taking into consideration the recent downturn in carbon markets and the extent to which cookstove initiatives rely on carbon revenue to subsidize the price of stoves, its use could be viewed as an ineffective way to ensure long term commercial viability. Linking up with MFIs and other service providers that provide financial mechanisms is an interesting alternative, yet it is a recent activity in the cookstove sector and something that older businesses have not yet adopted and that local businesses may not be able to pursue on their own. Access to commercial banking remains a constraint for many improved cookstove businesses that are not connected to international entities or donors.

Increasing Transparency and Data Integrity:

As mentioned before, a major limitation to this study was the availability and accessibility of key figures and financial data. The lack of transparency on the actual number of stoves sold and public and private investments made prevented the thorough evaluation of what actual investments led to the cases' success. In addition, information is increasingly being removed from public viewing, though it should be becoming more accessible especially

where it concerns public funds. This raises questions in reporting and monitoring for carbon credits, and also about emerging results based financing or grants and how donors will put parameters in order to verify the results. Therefore, it is highly recommended that organizations and business (public and private) improve their reporting and increase transparency. For future studies, it would be more effective to concentrate on a fewer number of cases which can commit to sharing an adequate level of financial information in order to perform more rigorous analysis.

Final Thoughts & Questions…

Throughout the discussions held during the regional workshops one particular question arose: If stoves are selling and businesses are making money, why do they need any funding or collateral? Many entities claim that a major challenge in the cookstove industry is consumer finance. For example, an organization like Toyola has addressed this issue by allowing consumers to pay in installments. While this has led to increased sales, much of their capital does not return immediately and does not return in large predictable installments. As a result, they continue to need more working capital to support the system. However, other organizations claim that to reach scale in a sustainable manner, they need working capital as any business does when it is starting off.

Another question that arose was the role of NGOs in the cookstove sector. In particular, why NGOs act in the ICS market and not on other similar devices, and what the advantages are of employing this type of intervention. A response to this is that in general other cooking devices are not attributed to such wide scale impacts on human welfare and the environment and therefore NGOs have an important part to play in the improved cookstove industry, though perhaps in immature markets where awareness is low or no real entrepreneurs are identified. They also can serve to provide market linkages or lobby for some of the partnerships that would help private entrepreneurs reach scale more quickly, such as working with MFI's to provide energy loans or creating public/ private partnerships with mobile phone companies.

Cookstove initiatives around the world are working towards a common goal of fostering the adoption of improved cookstoves in 100 million households by 2020. To do so, it is recommended that cookstove players carefully review their value proposition including

these relevant questions raised by Bellanca and Garside (2013):

- What value are we bringing to the end user?
- Which one of their problems are we helping to solve? If it is cooking only then what are the real differences between what we provide and the three stone stove from the end users' perspective?
- How do we help end users understand the differences?
- Which end user needs are we satisfying?
- What bundles of products or services are we offering to each customer segment?
- Are we creating any social and environmental risks?
- How is the broader community (the global BoP) benefitting?

ANNEX I – REFERENCES

Accenture Development Partnerships. (2012a). "Global Alliance for Clean Cookstoves: Ghana Market Assessment – Sector Mapping" Retrieved from: http://www.cleancookstoves.org/resources_files/ghana-market-assessment-mapping.pdf

(2012b). "Global Alliance for Clean Cookstoves: Kenya Market Assessment – Interventions Options" Retrieved from: http://www.cleancookstoves.org/resources_files/kenya-market-assessment.pdf

(2012c). "Global Alliance for Clean Cookstoves: Bangladesh Market Assessment – Sector Mapping" Retrieved from: http://www.cleancookstoves.org/resources_files/bangladesh-market-assessment-mapping.pdf

Albi, Emily and Andrew E. Lieberman. (2013). "Bringing clean energy to the base of the pyramid: The interplay of business models, technology and local context" *Journal of Management for Global Sustainability* (2): 141-156.

Apex Consulting Group. (2013). "The case for biomass cookstoves in Indonesia" Retrieved from: http://www.apex-cg.com/csi-indonesia/

Ashden Awards. (2011). "Case study summary: Toyola Energy Limited Ghana" Retrieved from: http://www.ashden.org/files/Toyola%20winner.pdf

Bryan, S., V. Vorn, J.F. Rozis, Y.I. Baskoro, G. Madon and M. Brutinel. (2009). "Dissemination of domestic efficient cookstoves: Looking back at a ten year programme combining development, fight against climate change and environmental protection" (GERES Report) Retrieved from: http://www.geres.eu/images/publications/publi-nls-en.pdf

Bellanca, Raffaella and Ben Garside. (2013). "An approach to designing energy delivery models that work for people living in poverty" (IIED Report 16551). Retrieved from: http://pubs.iied.org/16551IIED.html

Bensch, Gunther, Michael Grimm, Katharina Peter, Jörg Peters and Luca Tasciotti. (2013). "Impact evaluation of improved cookstove use in Burkina Faso – FAFASO" *International Institute of Case Studies.* Retrieved from: http://www.government.nl/government/documents-and-publications/reports/2013/03/01/iob-impact-evaluation-of-improved-stove-use-in-burkina-faso.html

Bills, Ron. (2010). "Interview with Ron Bills, Chairman and CEO of Envirofit" *Boiling Point* (58). Retrieved from: http://www.hedon.info/View+Article&itemId=10226

Carr, Mathieu. (2014). "World Bank fund to buy emission reductions using options" Retrieved from: http://www.bloomberg.com/news/2014-09-15/world-bank-fund-plans-to-buy-emission-reductions-using-options.html

Colorado State University. (2010). "Emissions and Performance Report" Retrieved from: http://www.envirofit.org/images/products/pdf/b1200/B1200Cert.pdf

Cooper, Ansulie and Michael Kubzansky. (2013). "m-Enabled inclusive business models: Applications for health" (SHOPS Project – Abt Associates) Retrieved from: http://www.shopsproject.org/sites/default/files/resources/m-Enabled-Primer.pdf

Dalberg Global Development Advisors.(2013). "Global Alliance for Clean Cookstoves: India Cookstoves and Fuels Market Assessment" Retrieved from: http://www.dalberg.com/documents/Dalberg-india-cookstove-and-fuels-market-assessment.pdf

Domrei Research and Consulting. (2013). "Cambodia Market Assessment: Sector Mapping" Retrieved from: http://www.cleancookstoves.org/resources_files/cambodia-market-intervention.pdf

Downes, J. and J.E. Goodman. (2003). "Dictionary of finance and invesment terms" New York: Barron's Educaitonal Series Inc.

E+Carbon. (2009). "Project design document for gold standard voluntary offset project: Improved household charcoal stoves in Ghana (GS-VER-PDD)" (The Gold Standard).

ECOFYS. (2006). "Gyapa's project design document for gold standard voluntary offset project (GS-VER-PDD)" (The Gold Standard).

Ecosystem Marketplace. (2013). "2013 Voluntary carbon markets report" Retrieved from: http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=9789

Edjekumhene, Ishmael and Jacqueline C. Cobson-Cobbold. (2011). "Low-carbon Africa: Ghana" (Christian Aid Report) Retrieved from: http://www.christianaid.org.uk/images/low-carbon-africa-Ghana.pdf

EnterpriseWorks. (2002). "Small scale irrigated horticultural enterprises energy enterprises for improved natural resources management project (Quarterly Report)" Retrieved from: http://pdf.usaid.gov/pdf_docs/PDABX075.pdf

EnterpriseWorks/VITA. (2014). "Who we are" Retrieved from: http://www.enterpriseworks.org/display.cfm?id=2&sub=1

Envirofit International. (2014). "About us: Who we are" Retrieved from: http://www.envirofit.org/about/?sub=who-we-are

(ESMAP) Energy Sector Management Assistance Program. (2010). "Improved Cookstoves and better health in Bangladesh: Lessons from Household Energy and Sanitation Programs" Retrieved from: www.hedconsulting.com/wordpress/wp-content/uploads/2012/02/improved_cookstoves_better_health.pdf

(GACC) Global Alliance for Clean Cookstoves. (2012). "Business Plan" Powerpoint Presentation, p. 29.

(GACC) Global Alliance for Clean Cookstoves. (2013). "Factsheet: Cookstoves and non-communicable diseases" Retrieved from: http://www.cleancookstoves.org/resources/fact-sheets/cookstoves-and-disease-1.pdf

(GACC) Global Alliance for Clean Cookstoves. (2014a). "NEFCO 2nd call for proposals: Purchase of carbon credits form vulnerable CDM projects" Retrieved from: http://www.cleancookstoves.org/funding-opportunities/nefco-2nd-call-for-proposals.html

(2014b). "Ghana: Poised for big changes to clean cooking" Retrieved from: http://www.cleancookstoves.org/blog/ghana-poised-for-big-changes.html

Gaul, Micro. (2009). "Subsidy schemes for the dissemination of improved stoves: Experiences of GTZ HERA and Energising Development" Retrieved from: http://fsg.afre.msu.edu/promisam_2/references/Gaul_2009_Stove_Subsidies.pdf

(GERES) Groupe Energies Renouvelables, Environnement et Solidarités. (2014). "New Lao Stove : An improved cookstove for improved lives" Retrieved from: http://www.cambodia.geres.eu/our_projects/new_lao_stove

(GIZ) Deutsche Gesellsch aft für Internationale Zusammenarbeit GmbH. (2012). "Sustainable energy for development: Improved cooking stoves save lives" Retrieved from: http://www.giz.de/en/downloads/giz2012-en-cooking-stoves-bangladesh.pdf

(GIZ) Deutsche Gesellsch aft für Internationale Zusammenarbeit GmbH. (2014). "Reducing poverty in the Sahel through energy efficiency and renewable energies: Project description" Retrieved from: www.giz.de/en/worldwide/19120.html

Haag, A.L. (2008). "Stove for the developing world's health" *New York Times* Retrieved from: http://www.nytimes.com/2008/01/22/science/22stov.html?pagewanted=print&_r=0

Index Mundi. (2011). "Factbook: Demographics, Kenya Population" Retrieved from: http://www.indexmundi.com/kenya/population.html

Kees, Marlis and Lisa Feldmann. (2011). "The role of donor organizations in promoting energy efficient cookstoves" *Energy Policy* 39(12): 7595-7599.

Kossoy, Alexandre and Pierre Guigon. (2012). "State and trends of the carbon market 2012" (World Bank Report) Retrieved from: https://wbcarbonfinance.org/docs/State_and_Trends_2012_Web_Optimized_19035_Cvr_Txt_LR.pdf

Lambe, Fiona, Marie Jüisoo, Carrie Lee and Oliver Johnson. (2014). "Can carbon revenues help transform household energy markets: A scoping study with cookstove programmes in India and Kenya" (Stockholm Environmental Institute Report) Retrieved from: http://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-PR-2014-01-Cookstoves-carbon-markets-India-Kenya.pdf

Lang, Chris. (2014). "Global carbon markets have shrunk in value by 60% since 2011" Retrieved from: http://www.redd-monitor.org/2014/01/09/global-carbon-markets-have-shrunk-in-value-by-60-since-2011/

Masuoka, Toshiya. (2011). "Reaching the base of the pyramid through inclusive business models" (International Finance Corporation Report) Retrieved from: http://www.ifc.org/wps/wcm/connect/c33c47804a1ad35e9e409e02f96b8a3d/IFC%2BMDG%2BPresentation%2B%2528E%2529.pdf?MOD=AJPERES

Odongo, Ponciano. (2013). "US Eco-Stove Firm Eyes EA from Nairboi Hub" *Business Daily* Retrieved from: http://www.businessdailyafrica.com/US-eco-stove-firm-Envirofit-eyes-East-Africa-from-Nairobi-hub/-/1248928/1761876/-/item/1/-/4v8q1e/-/index.html

OECD. (2003). "Glossary of statistical terms: Indoor air pollution" Retrieved from: http://stats.oecd.org/glossary/detail.asp?ID=1336

Reikat, Andrea. (2010). "The preferred stove for the preferred woman: The Roumdé story in Burkina Faso" *Boiling Point* (58): 9-12. Retrieved from: http://www.hedon.info/TheRoumdeStoryinBurkinaFaso

Rammelt, Monika. (2013). Lessons learned from scaling cookstove programmes: Micro perspectives from decentralized energy supply, The complexity of cleaner cookstoves: Challenges ranging from improving livelihoods to managing carbon credits" (GIZ-HERA Report) Retrieved from: http://climpol.iass-potsdam.de/sites/climpol/files/wysiwyg/files/rammelt_lessons_learned_in_cookstove_dissemination.pdf

Republic of Kenya. (2011). "Scaling up Renewable Energy Program (SREP): Investment Plan for Kenya" Retrieved from: http://www.climateinvestmentfunds.org/cifnet/sites/default/files/Kenya%20SREP%20Investment%20Plan%20-%20Endorsed.pdf

Saidi, Raouf and Rahul Barua. (2011). "Markets for clean cookstoves: A think piece for development cooperation positioning" *Energy: Inspiration for the Future – Essays in honour of Jos Bruggink's retirement from ECN*: 66-79. Retrieved from: https://www.ecn.nl/fileadmin/ecn/corp/Nieuwsbrief/2011/2.Special_Edition_JB_110926.pdf

Shah, A. (2013). "Global issues: Poverty and stats" Retrieved from: http://www.globalissues.org/article/26/poverty-facts-and-stats#fact14

Shell Foundation. (2014). "Shell Foundation Programmes in India" Retrieved from: http://www.shell.com/ind/environment-society/society-tpkg/shell-foundation.html

Siegel, J.G., N. Dauber and J.k. Shim. (2005). "The vest pocket CPA" New Jersey: John Wiley & Sons Inc.

SZ Consultancy Ltd. (2014). "Our products: What is Bondhu Chula?" Retrieved from: http://www.szbd.info/page.php?page_id=12

USAID and Winrock International. (2011). "The Kenyan Household Cookstove Sector: Current State and Future Opportunities" Retrieved from: http://www.relwa.org/sites/default/files/Kenya-Stoves-Assessment-web.pdf

UN Foundation. (2013). "Global Alliance for Clean Cookstoves Factsheet" Retrieved from: http://www.unfoundation.org/assets/pdf/global-alliance-for-clean-cookstoves-factsheet.pdf

World Bank. (2013). "Data: Burkina Faso" Retrieved from: http://data.worldbank.org/country/burkina-faso

(WHO) World Health Organization. (2014). "Indoor Air Pollution and Health" Retrieved

from: http://www.who.int/mediacentre/factsheets/fs292/en/

Wilson, Emma, Neha Rai and Sarah Best. (2014). "Sharing the load: Public and private sector roles in financing pro-poor energy Access" (IIED Report) Retrieved from: http://pubs.iied.org/16560IIED.html

Wilson, Emma and Ben Garside. (2012). "Sustainable energy for all? Linking poor communities to modern energy services: Working Paper 1" *IIED Linking Worlds Series* Retrieved from: http://pubs.iied.org/pdfs/16038IIED.pdf

ANNEX II – METHODOLOGY GUIDELINES

This guide is intended to inform researchers on the specific methods used to conduct the study so that it may be replicated in the future for other cookstove business models.

Desk Review

The systematic desk review started with the search for studies that were analyzing improved cookstove Interventions where our case studies were included or the context and/ or country to be visited (published in English, French or Spanish). An in-depth review was also conducted of the project design documents (PDDs) for 8 cookstove projects in Cambodia, India, Bangladesh, Kenya, Ghana and Burkina Faso.

The research team reviewed a number of third party reports and official documents. Secondary data was collected from public sources, particularly websites and reports. The easiest data source was peer-reviewed scientific publications, being both concise and rigorous. Efforts were made to search for so-called 'grey literature' studies or reports available from development organisations and institution's websites, together with portals of donor governments (especially GIZ). This helped reduce positive-result publication bias and provided more complete information on project set-up, interventions and costs, compared to journal articles. The number of studies found after the first key word search, and after the first screening of title and abstract is presented per source in the table below.

Keywords: Improved cookstoves, clean cookstoves, ENVIROFIT, GERES, COOKSWELL, SZ - GIZ Bangladesh, GIZ FAFASO, TOYOLA, EnterpriseWorks, business models, value chain, carbon finance.

Table 8: Keyword Search Results for Desk Review

Keyword Search	Web Address	Screening Title & Abstract
	Intermediate Portals & Knowledge Sharing Platforms	
95	http://www.cleancookstoves.org	34
87	https://energypedia.info/wiki/Main_Page	30
45	http://www.gvepinternational.org	10
12	http://www.se4all.org	2
7	http://www.hedon.info/tiki-index.php	4
	Study Cases	
15	ENVIROFIT http://www.envirofit.org	14
35	GERES http://www.geres.eu/en	28
18	SZ - GIZ http://www.szbd.info/index.php/index_sz/news_details/28	16
3	TOYOLA http://www.toyolaenergy.com	2
1	COOKSWELL http://www.cookswell.co.ke	1
1	ENTERPRISEWORKS http://www.enterpriseworks.org/display.cfm?id=3&sub=15	1
5	FAFASO https://energypedia.info/wiki/File:GIZ_2011_Fiche_FAFASO_roumde.pdf	4

	Some Stakeholders in ICS industry	
10	http://practicalaction.org	8
25	http://www.snvworld.org	18
2	http://praktidesign.com	2
	Donors	
2	AfD http://www.afd.fr/lang/en/home	2
6	EU http://ec.europa.eu/index_en.htm	3
45	GIZ http://www.giz.de	35
15	Energy Community http://www.energy-community.org/portal/page/portal/ENC_HOME	6
	CSR	
5	http://www.shellfoundation.org	3
	Multilateral Institutions	
23	http://www.adb.org	7
3	http://www.afdb.org/en/	1
5	http://www.unep.org	4
45	http://unfccc.int/2860.php	38
41	http://www.worldbank.org	20
3	http://www.un-energy.org/cluster/energy_access	1
	CARBON FINANCE	
23	Gold Standard http://www.goldstandard.org	13

13	VCS http://www.v-c-s.org	6
35	RECS http://www.recs.org	18
52	CDM http://cdm.unfccc.int	38
	ACADEMIC RESOURCES	
53	http://www.iisd.org	23
21	http://www.odi.org.uk	3
18	http://www.sei-international.org	4
	CONSULTING GROUPS	
4	http://www.apex-cg.com	4
2	http://www.wri.org	2

In-depth Interviews

The research team conducted in person semi-structured interviews with program managers, business owners and key actors from the value chain (e.g. producers, retailers, wholesalers etc.) of major cookstove initiatives. Two types of questionnaires were developed (in English) to guide the interviews: i) Questionnaire for Program Managers/ Business Owner and ii) Questionnaire for Business Units in the value-chain (see Annex III).

Interview Guide

This Interview Guide sets out some common standards and procedures used in the cases analyzed and across both regions.

Preparing for the Interview

Questionnaires are shared with interviewees in advance as there are responses expressed in numerical terms which may take time to obtain. All other questions provide qualitative data, information, and opinions. The interview has a list of questions and key points to be covered and the interviewer should work through them in a methodical manner. Similar questions are asked of each interviewee, although supplementary questions can be asked if appropriate. The interviewees can respond how they like and do not have to 'tick a box' with their answer, although there are some questions to which a fixed range of answers are possible.

Sampling

With a relatively small number of interviewees it is important to ensure that appropriate and relevant interviewees are selected. In this study, the team was investigating a narrow, but specialized subject and therefore employed a targeted approach with a small number of key interviewees. The team was interested in the opinions and experiences of stove experts or people with direct experience working in the cookstove value chain. Therefore, random sampling was not used in this study.

The Interview

Requesting permission to interview individuals and organizations is an important first step. Interviewees should sign the interview sheet and that the organization or business being analyzed should have already given consent to the research team in the form of a

confidentiality/ non-disclosure agreement.

Before starting the interview, introduce yourself and explain the aim of the interview. Adhere to academic ethics by ensuring that the interviewee is fully aware of the purpose of the research. Inform them about the duration of the interview and try not to exceed that time (approximately 1.5 hours). The questionnaire has been designed with a specific sequence; questions and topics have been grouped in themes and they follow a logical structure and flow. Make sure that you can easily move back and forth between question or topic areas, as interviewees may naturally move on to another subject. As you go through the questionnaire, make sure the interviewee understands you. Ask if they need clarification on certain points. Do not ask leading questions and encourage interviewees to give honest answers. These methods below can be used to help clarify details:

Probing Questions: You can employ direct questioning to follow up with what has been said and to get more detail. "Do you have any examples?" or "Could you say more about...?"

Specifying questions: Such as "What happened when you said that?" or "What did he say next?"

Interpreting questions: "Do you mean that...?" or "Is it correct that...?"

Silence: Through pauses you can suggest to the interviewee that you want them to answer the question!

Recording the Interview

In semi-structured interviews, recording the responses is recommended. This can be by digital recording or note taking (with the informed consent of the interviewee). In either case, the interview process is a flexible one with emphasis on the answers given by the interviewee. If they agree to be interviewed, but decline to be recorded you may still go ahead with the interview with point form note taking.

Transcription of the Interview

Once you have completed the interviews, transcribe your notes by copying what was said into a word-processing document. Transcribing can take a very long time. For example, a

ten minute interview could take one hour or more to transcribe. If you only have a short time in which to complete the research, make sure you do not over estimate the number of people you can interview and transcribe.

Once you have completed the interview process, reflect on how it went. Was there anything you could have done better? Do you need to add any questions or topic areas? Is there anything you should have explained to the interviewees?

The Questionnaire

Questionnaires are more rigid than interviews. However, in this study the research team left room for the interviewee to come up with their own answers for most of the questions. In the most general section "History of the Initiative" it is important to give some more explanation, as well as in the Financing section as they are especially relevant parts of the questionnaire.

In the first section, information about the timeline of the initiative is required (starting date and brief history of the initiative). They are encouraged to explain this in terms of when they started to develop the business, launched production, started selling stoves, numbers per year, financial inputs, stream-lined production, observed increases in stoves sold and critical turning points in stoves sold or financial inputs. It is important to ask if other stove businesses preceded them and if so the types of media and marketing mechanisms employed and the how much time passed before starting their businesses.

Other important points include:

- Their historical contribution and relevance in the cookstove market
- Were they first movers/ pioneers, quick second or followers.
- Their competitiveness in the current market
- When and if they were able to break even
- Factors in their ability to become a functional, independent and profitable business

For question no. 27 concerning their business figures (e.g. stove output, revenue etc.), it is asking about the previous 5 years only. This information may be difficult to obtain as a result of limited availability of data and access. Significant effort is also needed to get additional information on the tipping point of each of the business models. Market aggregators see the tipping point as a threshold that, once reached, will result in

additional sales. In some cases, a tipping point is simply an addition or increment that in it might not seem extraordinary, but that unexpectedly is just the amount of additional change that will lead to a big effect.

Direct Observation (Field Visits)

Observation was selective, looking at a few value chain activities (e.g. production, distribution) when it was feasible and paying special attention to management processes and stakeholder behaviors. The consultant in Asia collected primary data during the month of April 2014 and the consultant in Africa during the months of April and may with the help of regional experts from Stove*Plus* West Africa.

Debriefing Workshop

The research team organized debriefing workshops in each region with each participating organization/ company at the end of every field visit (whenever it was possible) to share preliminary findings and receive feedback and validation on the representation of their business model.

Regional Workshops

In order to take into account the needs, expectations and views of the sector, two regional workshops were held with representatives from all the organizations and companies consulted. The aim was to gather study participants and other relevant sector stakeholders in each region to share the preliminary results, validate the methodology and findings and to obtain further recommendations for the study.

The workshops took place over a two day period with one day dedicated to local field visits (e.g. production facilities of one of the participating cases) and the other focusing on the presentation of the study. During the morning session, participants were introduced, the goals and objectives of the study were reviewed and the results were presented. Afternoon sessions were dedicated to questions, comments, group exercises and discussions.

For workshop locations (Cambodia and Ghana), the organizers considered both the location of the participants and the ease of travel, thereby optimizing travel routes and reducing visa/ entry issues.

ANNEX III – QUESTIONNAIRES

Questionnaire 1: Program Manager/Business Owner

"Building Business Cases to Reach the Scale: A Study on Biomass Cookstove Business Models in Asia and Africa"

Interviewer:	**Interviewee:**
Interviewer's Tel:	**Position:**
Date:	**Organization:**
Location:	**No. Of employees:**
Product:	**Address:**
Contact Person:	**Telephone & email:**

History of the Initiative

1.	Describe Timeline of the Initiative (Starting date and brief history of the initiative)
2.	What were the main challenges and opportunities you encountered when implementing your initiative?

BUSINESS MODEL

3.	What are the business units (i.e. stakeholders - producers, wholesalers, distributors retailers) in the value chain and what roles do they play?
4.	What type of activities and level of support is given to these business units? Please specify
5.	Why did you choose to develop your business model in this way?
6.	What were the challenges and opportunities associated with this choice?

PRODUCT DEVELOPMENT

7.	What was/is your organization's role in product design and manufacturing?
8.	What is your production performance and efficacy (number of stoves produced per month or year)?
9.	Which one of these best describes your production activities? (Industrial, semi-artisanal, artisanal)

10. Has your production system changed since you started? How and why and through what means?
11. What are your strengths and weaknesses in the Production?
12. What are your strengths and weaknesses in the Distribution?
13. Do you provide a product warranty? If so for how long?
14. How do you maintain product quality and provide after sales services?
15. How do you obtain the consumer feedback?

MARKET ACCESS AND TRENDS

16. Who are your target consumers, by socio-economic group? • Lowest income • Intermediary income • Highest income • Each kind of group
17. Who are your target consumers, by geographic region? • Urban • Peri-urban • Rural • All of them
18. Who are your buyers (consumers, wholesalers, retailers, humanitarian actors, etc.)?
19. What is the final price of the product for the final consumer? (If free for consumer, please explain who assumes the cost)
20. How are the prices set? (Please, add comments to explain and justify the response)

FINANCING

21. Please detail in the table below the financing mechanisms employed since the beginning of your activities.

Type of financing mechanism (carbon credit, results based finance,	When did you receive it?	Who was the financer?	Where in the value-chain was it used? (retailers, producers, etc.)	How much was allocated?	How were these investment choices made?	What was the output(s) of these investments?

microcredit, lease, awards,etc.)						

22. What risks or constraints did you face in obtaining and implementing the financial resources?
23. Do you make revenue from your activities? If so, do you re-invest it back into the value-chain? How and where?
24. What are your Business Revenue main sources? - Please describe importance, amounts and percentage of each form and related concerns • Products Sale • Post-purchase support providing • Licenses/ Patents Permits Delivery • Subsidy from Partners
25. Do you have a need for additional financing at the moment? If so, what would it be used for? Where do you go when you need funds for your program?
26. How do you ensure that your investments lead to financial sustainability of business units in the value-chain?

27. What are your business figures during the five previous years (annually)? (All of them)

Indicators	2009	2010	2011	2012	2013
Output (No. Of stoves produced, sold, etc.)					
No. Of customers/clients					
Revenue/ from Sale					
No. Of employees					
No. Of suppliers					
Registered Capital					

INVESTMENTS

28. Please detail in the table below the investments made in the following fields:

	Description	Percentage or Monetary value (if possible)
Research and Development		
Capacity Building		
Facilities and Infrastructure (physical capital)		
Standards, labels & patents		
Promotion and marketing		
Public awareness and advocacy		
Business Development / Governance		
Others		

SUSTAINABILITY

29. Which phase is your business model in; and what are next steps? For example, expansion/scale up, replication, phase out, other
30. What do you think are the most important factors contributing to sustainable cookstove business models?
31. Do you believe your program is financially sustainable? Why or why not?
32. Could you describe some best practices and lessons learned on your financial investment choices?

Questionnaire 2 – Business Units in Value Chain

"Building Business Cases to Reach the Scale: A Study on Biomass Cookstove Business Models in Asia and Africa"

Interviewer:	**Interviewee:**
Interviewer's Tel:	**Position in the business:**
Type of business:	**Organization:**
Date:	**No. of employees:**
Location:	**Legal status:**
Product/ Service:	**(registered or not)**
Address:	**Contact Person:**
Telephone:	**Email:**

BUSINESS UNIT *(to all business units)*

1.	Describe the timeline of your business (Starting date and brief history) what were you doing before, why did you decide getting involved in this type of activities? *(All of them)*
2.	What are your business activities and services? *(All of them)*
3.	Where are your main activities taking place (workshop at home, workshop independent from home, factory, industrial site)? *(All of them)*
4.	Why did you choose to develop your activities in this way? *(All of them)*
5.	What is your relation with other businesses in the cookstove sector (producers, distributors, wholesalers, retailers) and how do you interact? *(All of them)*
6.	Do you sometimes collaborate with other businesses to produce and/or deliver customer orders? *(All of them)*
7.	What were the main challenges and opportunities you encountered when developing your business? *(All of them)*

PRODUCT DEVELOPMENT *(ask to any business unit whenever applicable)*

8.	Did you have to invest in product design? Did you have to invest in manufacturing activities? And if so, how much and how did you do it? *(Producers)*
9.	Which one of these best describes your activities? (Industrial, semi-artisanal, artisanal) *(Producers)*
10.	Do you provide a warranty for the product you deliver? *(Producers)*

11.	What other products do you produce/sell? What percentage does each product represent in terms of your gross revenue? *(All of them)*

MARKET ACCESS & TRENDS *(To all the business units)*

12.	Who are your target consumers (the ones who use the stove), by socio-economic group? *(All of them)* • Lowest income • Intermediary income • Highest income • Each kind of group
13.	Who are your target consumers (the ones who use the stove), by geographic region? *(All of them):* • Urban • Peri-urban • Rural • All of them
14.	Who are your buyers (consumers, wholesalers, distributers, retailers, humanitarian actors, etc.)? *(All of them)*
15.	How much do you sell your product (unit cost) to your buyers? *(All of them)*
16.	How are the prices set? (Please, add comments to explain and justify the response) *(All of them)*
17.	Which are the strengths and weaknesses of your business? *(All of them)*

FINANCING

18. Please detail in the table below the financing mechanisms employed since the beginning of your activities. *(All of them)*

Source of Financial capital (microcredit, lease, charity, family or friends, etc.)	In which type of activities did you use it?	Why did you decide to invest there?	What amount did you receive?	Rate of reimbursed loan	How did it benefit your business?

19.	Do you get credit from raw material suppliers? What are the terms? *(Producers)*
20.	Do you get financing from your buyers (distributors, wholesalers, and retailers make advanced

	payment when ordering? What are the terms? *(All of them)*
21.	Do you extend credit to your buyers, to whom and in which conditions? *(All of them)*
22.	Do you make revenue from your business? If so, do you re-invest it back into your activities? How and where?
23.	Do you need additional financing at the moment? If so, what would it be used for? *(All of them)*
24.	What additional support do you need? (Training, promotion, networking, etc.) *(All of them)*
25.	What are your Business Revenue main sources? - Please describe importance, amounts and percentage of each form and related concerns *(All of them)* • Product Sale • Post-purchase support providing • Licenses/ Patents Permits Delivery • Subsidy from Partners

26. What are your business figures during the five previous years (annually)? *(All of them)*

Indicators	2009	2010	2011	2012	2013
Output (No. of stoves produced, sold, etc)					
No. of customers/clients					
Revenue/ from Sale					
No. of employees					
No. of suppliers					
Registered Capital					

INVESTMENTS

27. Please detail in the table below the investments made in the following fields:

	Description	Percentage or Monetary value (if possible)
Research & Development		
Capacity Building		
Facilities and Infrastructure (physical capital)		
Identifying suppliers		
Standards,		

labels and patents		
Promotion & marketing		
Post-sales support		
Business Development		
Business Membership organizations		
Others		

SUSTAINABILITY

28.	Do you believe your business is profitable (do you earn money)? Why or why not? *(All of them)*
29.	Which phase is your business in? (Start up, expansion, scale up, etc.) And what are your future plans? *(All of them)*
30.	After your investment choices were done, all results were positive? Or were there results not profitable for your business? *(All of them)*

CONTACT INFORMATION

Stove*Plus*: Info@stoveplus.org

GIZ-HERA: hera@giz.de

stove+ A PROGRAM BY geres

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH