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Global Alliance for Clean Cookstoves

Colombia Market Assessment

Intervention Options

Accenture Development Partnerships

Introduction

- This Market Assessment was conducted by Accenture Development Partnerships (ADP), the not-for-profit arm of the global management consultancy, Accenture, on behalf of the Global Alliance for Clean Cookstoves (the Alliance). The information in this assessment is accurate as of 2012 when this study was conducted.

- It is intended to provide a high level snapshot of the sector that can then be used in conjunction with a number of research papers, consumer surveys and other sources (most published on the Alliance's website) to enhance sector market understanding and help the Alliance decide which countries and regions to prioritize.

- It is one of eighteen such assessments (as of December 2013) completed by the Alliance to:

    - Enhance sector market intelligence and knowledge.; and
    - Contribute to a process leading to the Alliance deciding which regions/countries it will prioritize.

- Full slate of market assessments include studies in: Bangladesh, Brazil, Colombia, East Timor, Ethiopia, Ghana, Guatemala, India, Indonesia, Kenya, Mexico, Nigeria, Peru, Rwanda, South Africa, Tanzania, Uganda and Vietnam.

- Each assessment has two parts:

    - Sector Mapping – an objective mapping of the sector.
    - Intervention Options – suggestions for removing the many barriers that currently prevent the creation of a thriving market for clean cooking solutions.

- In each Alliance study a combination of ADP and local consultants spent 4-6 weeks in country conducting a combination of primary (in-depth interviews) and secondary research. They used the same Market Assessment 'Toolkit' for each country so that comparisons can be made. The Toolkit is available free of charge to all organizations wishing to use it in other countries.

- **The Alliance wishes to acknowledge the generous support of the following donors for the market assessments: *Barr Foundation, Dow Corning Corporation, Shell Corporation, Shell Foundation,* and the governments of *Canada, Finland,* and *Spain*.**

This market assessment was produced by Accenture Development Partnerships (ADP) on behalf of the Alliance. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the Global Alliance for Clean Cookstoves or its partners. The Alliance does not guarantee the accuracy of the data.

Sector Mapping Summary (1/2)

Colombia is very urbanized with 75% of the 11.5 million households living in urban areas. Its economy is growing rapidly and it is now an upper middle-income country. However, the growth is not evenly divided, and over 45% of the population still lives under the national poverty line. The liberal government has announced plans to combat this issue by adopting the National Development Plan 2011-2014 with the theme of “prosperity for all”.

Due to the accessibility of natural gas in urban areas, there is limited need for improved cookstove (ICS) interventions even among the urban poor. Since the ‘gas massification program’ in the early 1990s, all of Colombia’s cities and some rural areas have been connected to natural gas that is subsidized for the lower income strata. Most of the rural areas, however, are not connected to natural gas, and electricity is rarely used as it is expensive (and sometimes unreliable or absent). Liquefied petroleum gas (LPG) is the fuel of choice for those to whom it is available and affordable, but approximately half of the rural population still cooks over locally gathered wood fuel. Those who use LPG often use wood as a secondary fuel.

For both consumers and the government, there is very limited awareness of the health issues resulting from solid fuel use. Over the last decade, the environmental impacts of wood fuel use have started to receive increased attention. Private companies initiated large scale programs subsidizing the adoption of natural gas and LPG in rural areas, thereby increasing their customer base. There have also been some small scale projects providing improved wood burning cookstoves to poor rural households at virtually no cost. Most of these projects have been led by one of Colombia’s 33 autonomous environmental corporations and they generally also had a large reforestation component.

Scaling these projects and making them sustainable is difficult, as there is practically no market for biomass cookstoves to build upon. Households either cook on freely available stoves such as 3 brick fires or on a fixed stove that costs over $400 USD. As poor households are not accustomed to paying for a cookstove and are likely unable to afford a fixed cookstove, creating a self-sustaining market will require significant changes in both the demand and supply sides of the sector.

Sector Mapping Summary (2/2)

	Findings
Social and Environmental Impact	Health impacts from solid fuel use in Colombia are largely confined to the countryside, where over 50% of households still cook with solid fuels. The more disconnected from infrastructure people are (especially in the south and east), the less access they have to a cheap and reliable supply of clean fuels or improved cookstoves and the more likely they are to use wood fuel gathered at no cost. The combined effect of this is drawing concerns of deforestation and greenhouse gas (GHG) emissions more so than concerns over health.
Consumers	The segment in greatest need of ICS is households that are not connected to clean fuels, as well as those situated in cold areas of the Andes who spend a lot of time in the warm kitchen and consequently suffer from the impacts of indoor air pollution (IAP). Representing only 4% of consumers, this segment has little disposable income and is not accustomed to paying for cookstoves or fuel. This makes it challenging to reach these consumers, though faster cooking time and reduced smoke while cooking could drive interest.
Cookstove Industry	The industry suffers from a dearth of designs, with the most prevalent cookstove construed by hand for $400 USD, which is distributed for free in several different programs. There is therefore no significant market for ICS. The variations in quality of this cookstove type are further obscured by a lack of standards and testing. In addition, there has been a large effort by the private sector to substitute solid fuels for gas.
Carbon Financing	Most carbon financing in Colombia is industrial, with no existing carbon financed cookstove programs. A few relevant biomass programs are in process or have received CDM (Clean Development Mechanism) registration, but the financial benefits of these projects have not yet been realized. There are multiple experienced carbon financing organizations who will have to alter their procedures exclusively for the voluntary market or Gold Standard in the future.

Intervention Options Summary

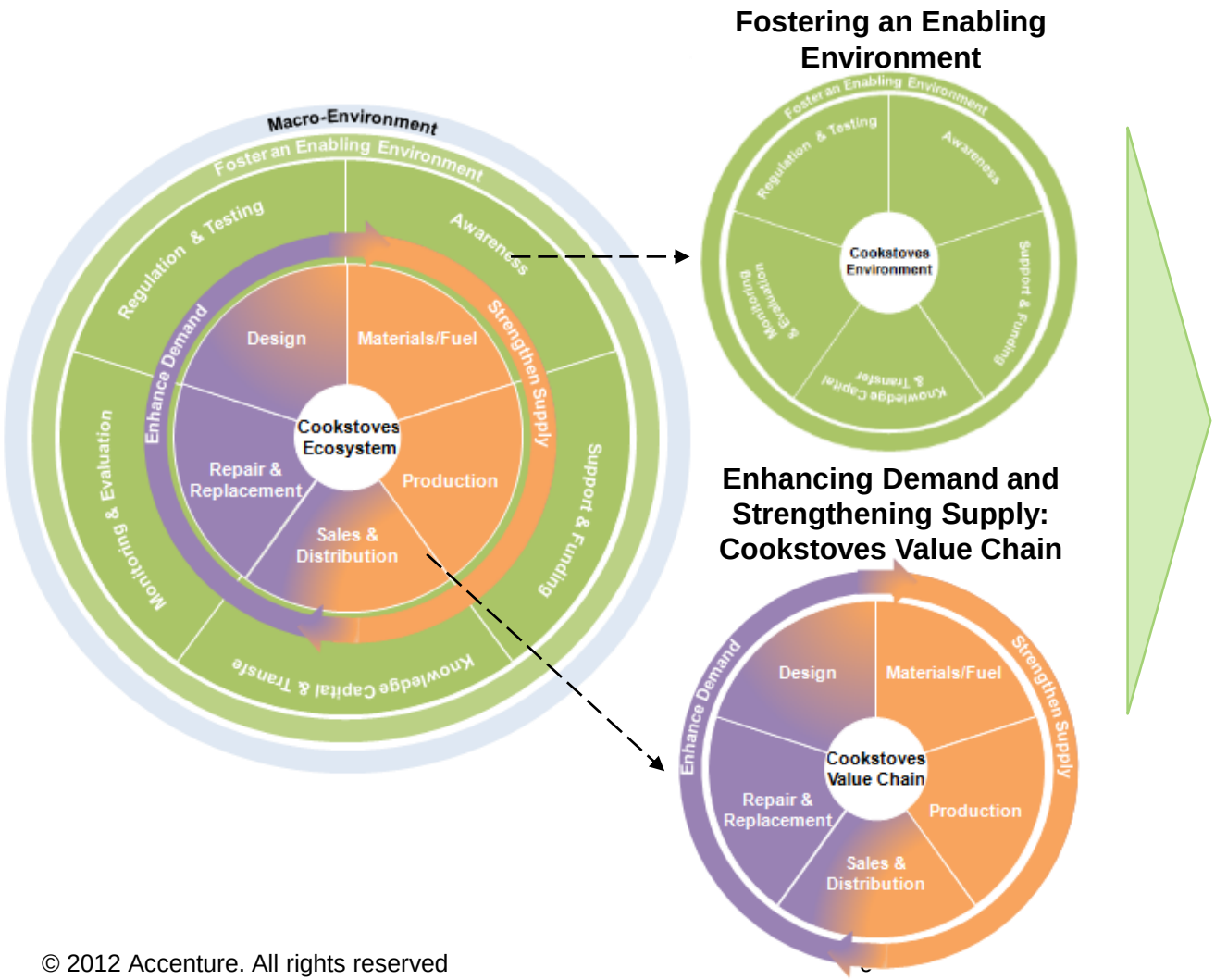
The significant health impact of IAP gives considerable cause for cookstove interventions in Colombia. Now is a good moment to act, as the government and various NGOs and private companies are starting projects that could greatly benefit from international best practices. The Alliance can primarily contribute by fostering an enabling environment in Colombia, and could also nurture the nascent cookstove market by enhancing demand and strengthening supply.

Seven opportunities to create a more enabling environment for the Colombian cookstove sector were identified. Firstly, an international best practice workshop could stimulate and support the various projects that are currently starting up. Setting up a national testing center in one of the experienced universities and creating standards for biomass stoves could provide a framework for the sector. The sector would also benefit from further involvement by the Ministry of Health and the autonomous regional authorities, to respectively increase the attention for IAP and spur regional action. Finally, it is essential to better understand the relevant consumers. Knowledge should be gathered on the energy needs and capabilities of possible target communities, followed by the pilot studies to gain a deep understanding of consumer behavior and preferences.

As there is practically no existing market for biomass stoves in Colombia, there are many gaps in the value chain; six interventions are identified that suit this early phase of the sector. Firstly, the market could benefit from more technology options for rural consumers whose current options are limited to expensive fixed cookstoves. After such designs become available, standardization and mass production can reduce cost and ensure consistent quality. To improve affordability, a successful microfinance program for natural gas customers could be expanded to electricity customers and pay-in-kind models can be explored. For specific segments, continued support of reforestation/ stove combination programs will remain necessary. Finally, innovative use of carbon financing could help to create a market for stove repair and replacement.

Executive Summary

As a result of the Colombia market assessment, 7 intervention options have been identified in the area of Fostering an Enabling Environment and 6 intervention options have been identified in the areas of Enhancing Demand and Strengthening Supply



7 Fostering an Enabling Environment Intervention Options

- Regulation & Testing (2)
- Support & Funding (3)
- Knowledge Capital & Transfer (2)

6 Enhancing Demand and Strengthening Supply Intervention Options

- Design (2)
- Sales & Distribution (3)
- Repair & Replacement (1)

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Executive Summary

As a result of the Colombia market assessment, 7 intervention options have been identified in the area of Fostering an Enabling Environment and 6 intervention options have been identified in the areas of Enhancing Demand and Strengthening Supply

1. Establish solid baseline and continued testing program for stoves and IAP
2. Devise National Standards for stoves and IAP
3. International "Best Practice" Workshop – ***Critical to complete soon***
4. Spur regional action
5. Put IAP on the agenda for Ministry of Health

Proposal Backed by Ministry of Environment & Sustainable Development

6. Determine target communities and segments along the energy ladder
7. Conduct consumer/ user preference pilots

Portions included in Ministry of Environment & Sustainable Development Proposal

8. Spur Stove Design Innovation
9. Standardize and mass-produce efficient designs
10. Expand Microfinance to all poor users of utilities
11. Explore pay-in-kind models with less expensive stoves
12. Continued support of reforestation/ stove combination programs
13. Stimulation of maintenance market through carbon finance

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Agenda

- Executive Summary
- **Project Approach and Background**
- Intervention Options
- Roadmap
- Conclusion
- Appendix

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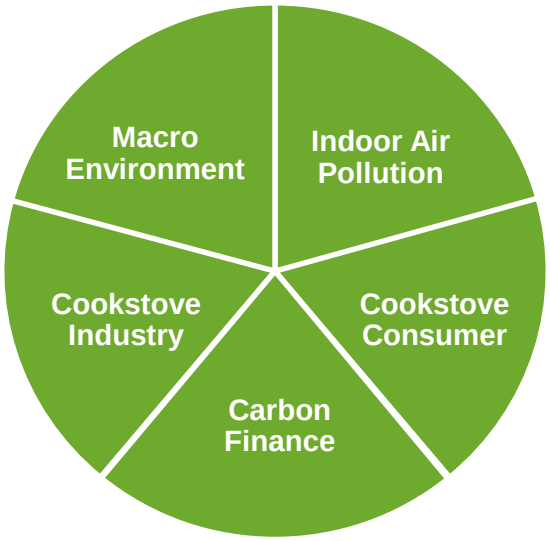
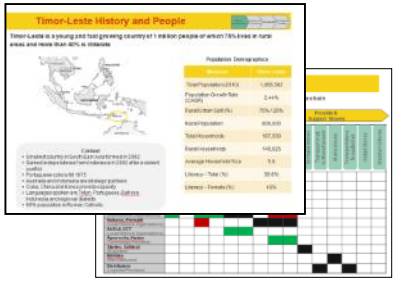
Project Approach

A structured approach for assessing the cookstove industry involves using sector mapping output to develop intervention options and relative roadmap.

Sector Mapping





Sector Map

Strategy Development

Identify Intervention Themes → **Develop Recommendations** → **Develop Relative Roadmap**

Intervention Options And Relative Roadmap

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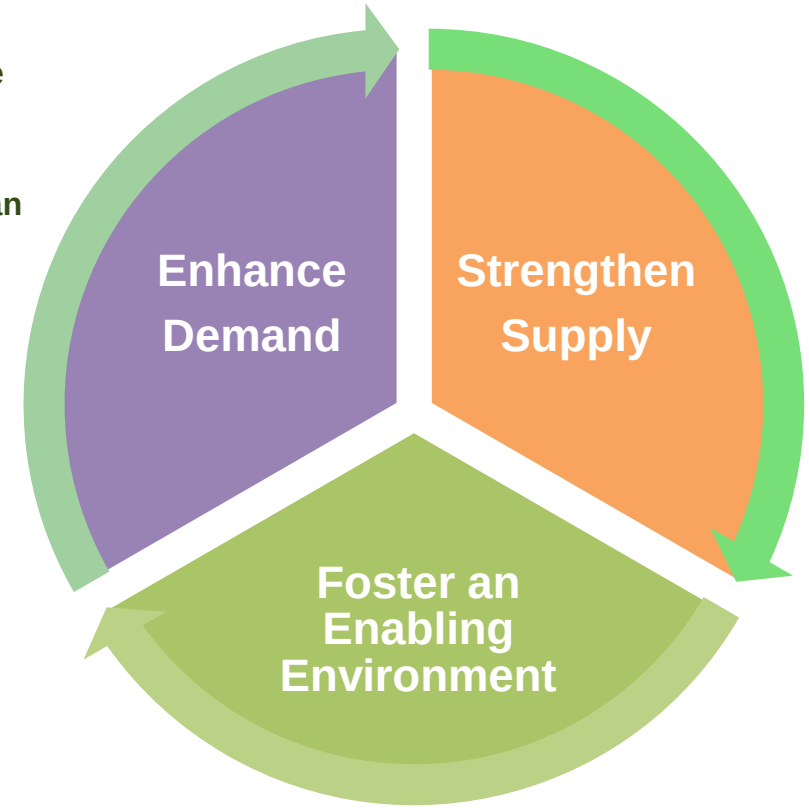
A three-pronged strategy has been developed to spur the clean cookstoves market

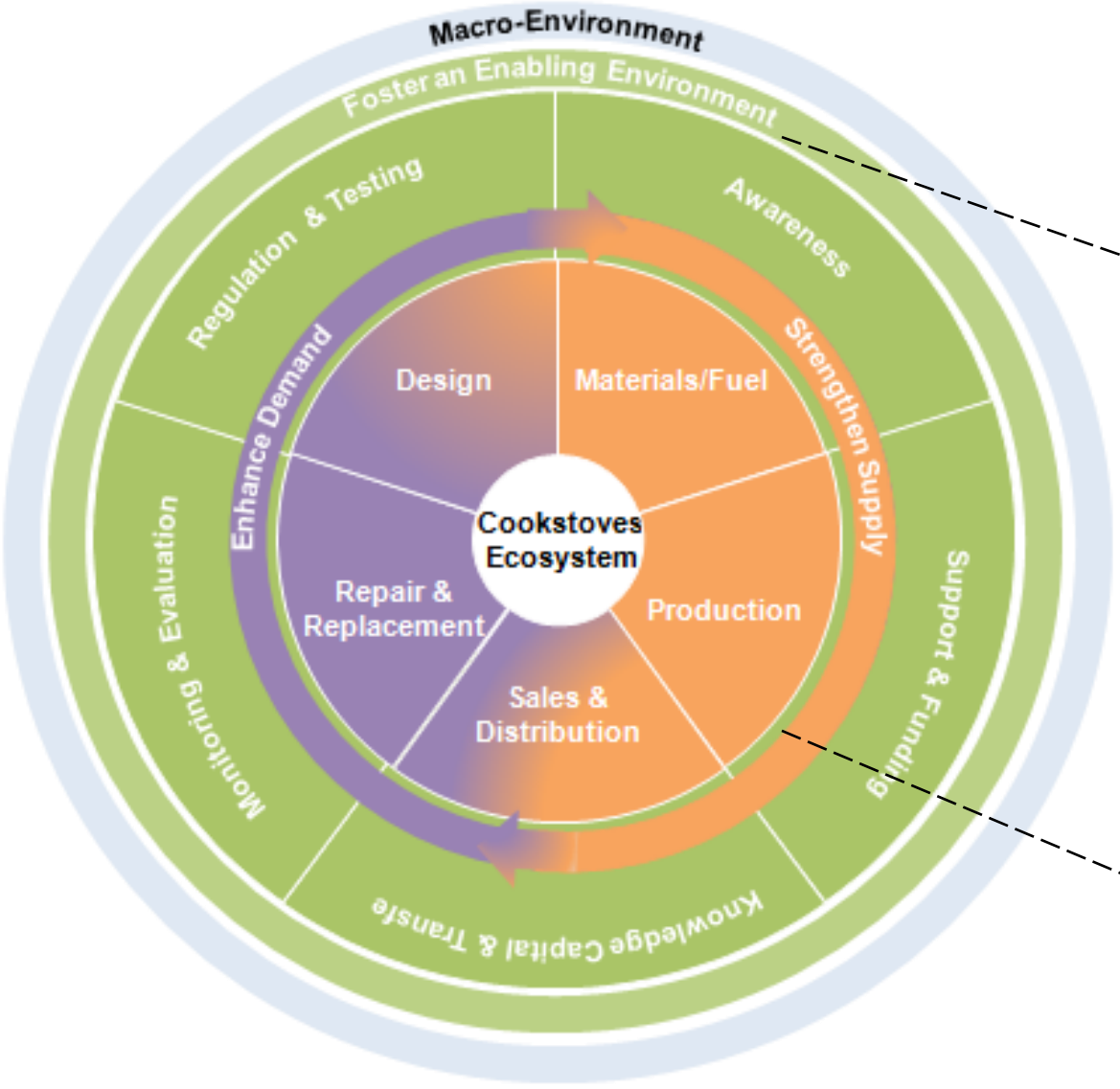
- Understand and motivate the user as a customer
- Reach the last mile
- Finance the purchase of clean cookstoves and fuels
- Develop better cookstove technologies and a broader menu of options



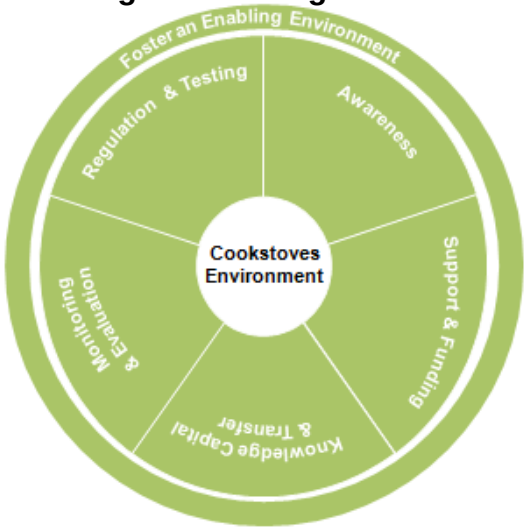
- Finance clean cookstoves and fuels at scale
- Access carbon finance
- Build an inclusive value chain for clean cookstoves and fuels
- Gather better market intelligence
- Ensure access for vulnerable populations (humanitarian)

- Promote international standards and rigorous testing protocols, locally and globally
- Champion the sector to build awareness
- Further document the evidence base (health, climate, and gender)
- Engage national and local stakeholders
- Develop credible monitoring and evaluation systems

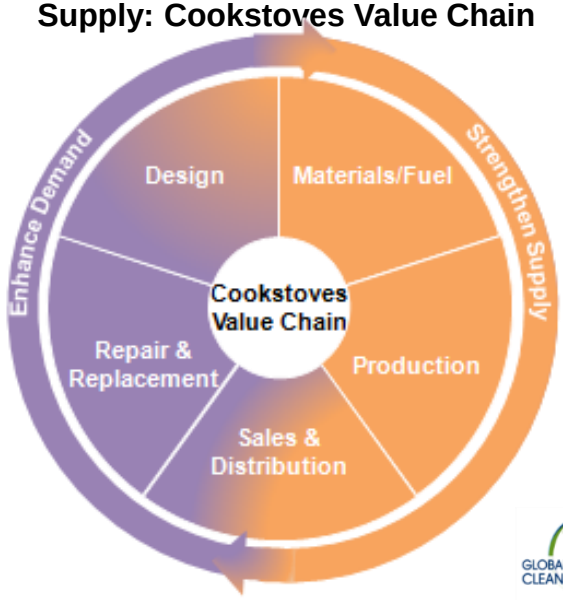
The interventions are analyzed according to their impact on the three-pronged strategy



Fostering an Enabling Environment



Enhancing Demand and Strengthening Supply: Cookstoves Value Chain



Macro-Environment: Not in Scope for Intervention Options

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The Case for Action

The cookstove sector is in development but is ripe for an infusion of best practices and support

What's Happening?

Activity in the Colombian cookstove sector has been limited, with only one larger initiative, Huellas, driven by a corporation (government entity), and the few large projects driven by private companies focused on gas distribution (Promigas, Ecopetrol)

The recently formed Ministry of Environment and Sustainable Development is spearheading engaging the sector to develop the implementation of a country strategy for cookstoves

So What?

The cookstove situation for unconnected rural populations (IPSE areas) has been largely ignored up until now, while cooking presents serious health and environmental problems in these areas.

As funding for cookstoves programs has been external to the country and on the ground and best practice support from international NGOs (iNGOs) has been limited, necessary in-country knowledge and support frameworks are largely absent.

Why Now?

There are multiple projects around REDD and stoves that are being designed right now. This is the opportunity to infuse best practice into these projects before it is too late.

The Colombian government has made a commitment to meet aggressive poverty alleviation goals, MDGs, and emissions according to the Stockholm Convention

"We are ready for help to design our program, but we are in a rush. If you come in 6 months, it's good. If you come in a year, it's too late"

Current REDD Program

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Fostering an Enabling Environment

Background on the sector

Colombia is very rich in natural resources such as wood and mineral coal, and traditionally these have been used for cooking in rural and urban areas respectively. Also 'cocinol' (white gasoline), a highly dangerous gas that causes many burn victims, was a common fuel in urban areas. In the 1980s major new natural gas reserves were discovered and a large black market arose for the subsidized cocinol. The government implemented a gas massification policy from 1991 onwards. A larger network in combination with a subsidy on gas for the lower income strata greatly increased the use of natural gas, and currently approximately 91% of households in urban areas are cooking on gas, and only 2% on solids fuels.

In rural areas, the story is different. As connectivity to the natural gas network is very low, and many households cannot afford LPG, just over 50% of households still cook on solid fuels – and the majority use wood. Households generally do not have an advanced cookstove, but cook over a 3 brick fire. Only in the last decade have significant efforts been made to alter this situation. The big energy companies, Promigas and Ecopetrol, ran large programs to increase the adoption of natural gas and LPG respectively in 2005-2008. For both programs, the socio-economic impact was well documented by Colombian universities and showed significant improvements in the health situation of impacted communities.

Around this time, some small scale projects were started that provided improved woodstoves to poor rural households (almost) free of cost. The most significant program was started by autonomous environmental corporation CORNARE in Antioquia in 2007.

Funcación Natura's prototype stove

In 2009, Colombian NGO Fundación Natura did research on the efficiency of various stove types during a project in Santander. They came up with a prototype stove, but follow-up has been limited. Otherwise, there have been no major improved cookstove projects by NGOs. Also, the government has not had significant involvement in the rural cookstove sector thus far.

Fostering an Enabling Environment

The market today

Outside of modern gas and electric stoves, there is practically no existing sustainable market for biomass stoves in Colombia. Although there are some workshops that produce fixed and multi-pit movable stoves, their scale is small and their number limited and shrinking.

There also is currently just one cookstove program of a scale of over 1,000 stoves in Colombia, the CORNARE program, which started in 2007 and is still ongoing. This program installs up to 4,000 stoves per year (depending on available funding from its own sources and private sector contributors), while also creating wood orchards at every household. These orchards start providing firewood after 3 years and contain 100-300 trees. The projects selects families based on income level, current fuel source and remoteness and ask them to contribute to the installation cost of the stove. They aim to continue, contingent on funding, until all poor households in the region have an improved stove.

Although there current cookstove sector in rural Colombia is very limited, the topic is experiencing a surge in interest. The Ministry of Environment and Sustainable Development has designed a program to identify target groups, possible solutions, and a program for 20,000 stoves (although implementation is still uncertain). Also, two large REDD programs funded by USAID are considering the inclusion of ICS in their environmental programs aimed at reforestation and clean energy respectively.

There is also interest by the private sector. Multi-national corporation Challenger, a top manufacturer of many electric and gas stoves in the Colombian market, is looking into the possibility of manufacturing cookstoves for the rural market and creating appropriate designs. There are also various carbon finance organizations considering stove projects, but it seems too early for a project due to concerns over additionality and profitability.

Wood orchard in Colombia

Fostering an Enabling Environment

Building the market for the future

The intervention options presented with regard to fostering an enabling environment focus on three areas: Regulation & Testing, Support & Funding, and Knowledge Capital & Transfer.

With regard to Regulation & Testing, there are currently no standards for biomass stoves. Therefore quality (including efficiency and emissions) of stoves is variable, and it is difficult for consumers to discern between different stoves as they look highly similar from the outside. Setting standards will also help future projects to ensure the realization of anticipated benefits regarding reduction of wood consumption and emissions.

Before establishing standards, a solid baseline must be set for stove performance in Colombia. To this extent, testing of the most common stoves should be carried out in all five regions of Colombia by a university with previous experience, such as Universidad Nacional de Colombia. Afterwards, a continued testing program should be established at the university to ensure continuous and accurate information. The availability of this data will help to make a case for future ICS programs and make carbon financing programs more feasible.

Regarding Support & Funding, now is the moment to organize a international “best practice” workshop. Various projects are in their design phases and international experiences are explicitly asked for. When gathering the sector, it is important to also include the Ministry of Health and the autonomous regional corporations. The latter are very influential in the implementation of any environmental projects, while the Ministry could put the topic of Indoor Air Pollution on the agenda in Colombia and make sure that water sanitation programs do not have a worsening impact on IAP. They recently became active on this topic, so it would be highly feasible to build upon that fact.

Finally, the creation of Colombia-specific knowledge capital is a key intervention. There is very limited knowledge on energy use and feasible solutions in rural Colombia. Moreover, consumer demands regarding stoves and fuels are unknown. Research on these topics can greatly help to shape solutions for the cookstove market, including design of more affordable stoves. Such research can also shine more light on gender aspects of cooking in Colombia and the environmental and health impacts by region.

Foster an Enabling Environment

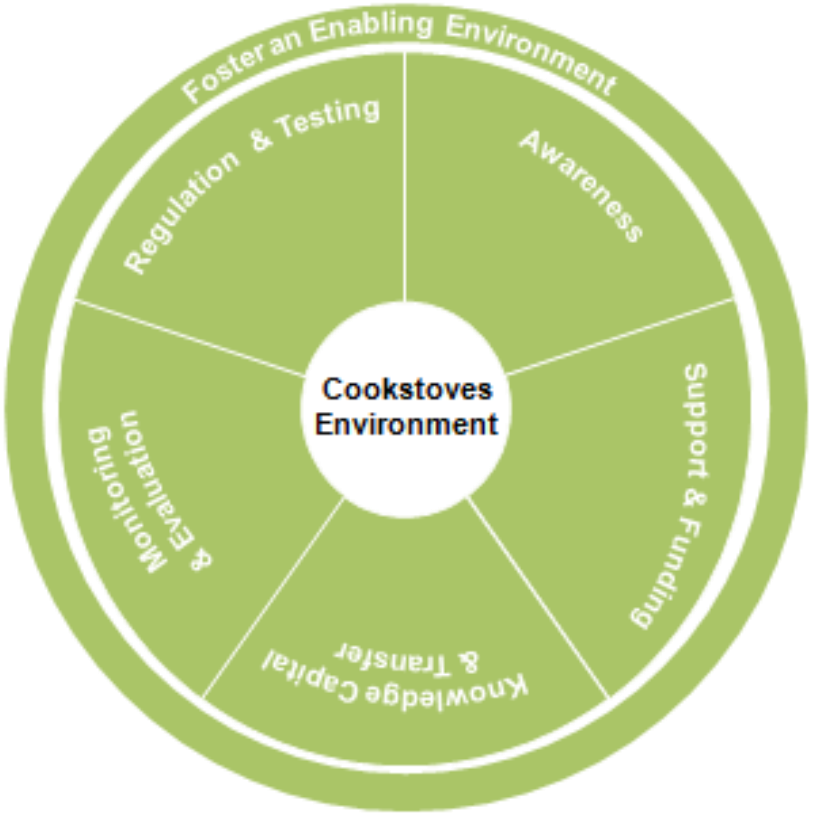
Through gaps identified in the Enabling Environment, intervention options will focus on Regulation & Testing, Support & Funding, and Knowledge Capital & Transfer

Regulation & Testing

- ✘ Indoor Air Quality Standards
- ✘ Cookstove Standards
- ✘ Fuel Standards
- ✘ Standard Enforcement

Monitoring & Evaluation

- ✓ Monitoring implementations
- ✓ Tracking and Quantifying Success



Awareness*

- ✘ Consumer Awareness
- ~ Stakeholder Awareness
  - ~ Government
  - ✓ Private Sector

*Aspects of awareness will be dealt with in combination with Support & Funding Initiatives

Support & Funding

- ~ Government
- ~ INGOs and Associations
- ✓ Local NGOs and Associations
- ✓ Private Sector
- ~ Academics

Knowledge Capital & Transfer:

- ~ Health (IAP)
- ~ Environment
- ✘ Gender
- ✘ Consumer Research

KEY: ✓ Advanced/ Favorable ~ Has Potential/ Neutral ✘ None/ Unfavorable Focus Area

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Regulation and Testing

There is a lack of clarity on Colombian-designed stove performance and quality differentiation, resulting in the lack of a strong case for the contribution of ICS to Colombia's emissions & MDG goals

Situation

There are currently no known policy standards or guidelines for IAP, solid-fuel stoves, or fuels. The stoves used in Colombia are unique to the country and have not yet been fully tested in both the field and lab for emissions, though there are some universities and a testing company (IDEAM) that have emission lab testing capabilities. The Ministry of Environment and Sustainable Development and the Huellas project have provided some general guidelines for fixed-stove production, but there is not yet a specific blueprint with dimensions for the combustion mechanism
As there are no standards, there is nothing to enforce.

Rationale

- Stoves are not generally tested scientifically or in the field for emissions relevant for Colombian government's int'l agreements, leaving the case for ICS unquantifiable - both pre and post project
- Colombian stove designs are unique to Colombia, meaning original testing is required.

Intervention Options

	Involved Parties	Likelihood of Success	Budget	Estimated Time
1. Establish solid baseline and continued testing program for stoves and IAP	Universities, Int'l Testing Center, CARS MESD UPME	Medium	Medium	1 year
2. Devise national standards for stoves and IAP	MESD UPME Icontec Alliance	Medium	Low	1-2 years

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Regulation and Testing

Establishing a baseline and setting up a regular program for testing is key to measuring the health and environmental impact of ICS programs for Colombia, and preparing carbon financing opportunities

- Intervention Options-	- Actions -	- Outcomes-
1. Establish solid baseline and continued testing program for stoves and IAP	• Commission both field and lab tests by a reputable university with previous experience in emissions testing of biomass (e.g., National University of Colombia/University de los Andes/ University of Antioquia) • Reputable external, international agency such as Aprovecho to give advice on best practice testing design • Baseline tests for at least the top-used traditional stove types (Cement 'stone' , three stone on a platform, improved fixed stove, maybe Binde) • Conduct testing in the five main geographical areas of Colombia, to better understand why stove performance and usage differ • This initiative can be well linked to the consumer usage stove-pilot initiative • Testing integrated into long term core activities of the chosen testing center , conducted regularly for new stoves • Replicate health baseline testing by the University of Antioquia study for the Huellas project (lung capacity by stove type). Build in longitudinal follow up for health testing	• Baseline set to support potential future carbon financing opportunities • Scientific basis off which to determine realistic stove standards • Easier to create a case for a future ICS program • Provides concrete case for immediate health imperative of ICS • Promotes clear identification and adoption of Best Available Techniques (BAT) and Best Environmental Practices (BEP) developed from a working group in 2010

Regulation and Testing

Developing national IAP and cookstove standards (based on international standards currently in development) is necessary to set a goal against which progress can be measured

- Intervention Options-	- Actions -	- Outcomes-
2. Devise National Standards (based on Global Alliance-developed global standards) for stoves and IAP	• IAP standards for residences, currently not existing • No currently enforced IAP standards for schools • More specific national cookstove design guidelines for improved biomass stoves • Standards decided on by Ministry of Environment and Sustainable Development under advice from UPME, as recommended in POURE Action Plan leading to 2020 • Alliance to advise or broker advice on appropriate standards to use	• Enables consistent quality to be produced in the market • Ensures the realization of anticipated emission/safety/health benefits • Easier to convince customers of benefits and quality of improved stoves

Support and Funding

With multiple projects in the design phase, the time is now to leverage international organizations for best practices and drum up support among government departments

Situation

There are very strong, experienced, and organized local NGOs and private program implementers operating in Colombia. The result is that international multi-laterals often provide funding, but less hands-on, in-country support for programs. The multiple programs that have recently started have all indicated that they could use infusion of Best-Practice program design from the Alliance – now, not later once the program has started. Additionally, funding specifically dedicated to stove programs both at the national and regional level is insufficient to support the current ambition. Health is not currently a major driver of program action without significant involvement of Ministry of Health.

Rationale

- Multiple stakeholders have all expressed interest in acquiring best-practice program design advice and a lack of international connectivity
- Regional CARS have proven very adept at stove program implementation (e.g. Cornare), but this has yet to spread to other areas of great need
- Health is not the focal point in program activities

Intervention Options

	Involved Parties	Likelihood of Success	Budget	Estimated Time
3. International "Best Practice" Workshop	Players across Colombia Sector International Experts Alliance	High	Low	2-6 months
4. Spur Regional Action	National & Regional Authorities CARS	Medium	High	1-4 years
5. Put IAP on the agenda for the Ministry of Health	Ministry of Health MESD	Low	Low	1-2 years

Support & Funding

An international workshop gives an additional push of vitality, interconnectivity, and best practice to the clean cookstove activities recently initiated in Colombia

- Intervention Options-	- Actions -	- Outcomes-

3. International "Best Practice" Workshop – ***Critical to complete soon***	• Initiate integration of the Colombian stove sector into the global marketplace for clean cookstoves through a sector-wide workshop
	• Players across the Colombian sector
	  • Local NGOs
	  • Private companies
	  • Academics
	  • Government
	• International experts (e.g., GIZ, CARE, etc.) and the Alliance to attend
	• Presentations to be made by experts on the following topics, for which more advice has been requested:
	  • Optimal ICS program design if integrated into REDD initiatives
	  • Effective use of carbon financing for small-scale, subsidized stove programs
	  • Appropriate integration of gender concerns into ICS programs
	  • Creating a market out of subsidies – case studies from other Latin American countries
		• Enabling and inspiring more Colombian organizations to set up or expand their cookstove activities
		• Creates connections throughout the domestic industry
		• Creates connections for Colombia within the global platform for clean cooking
		• Cross-pollination of best practice – also Colombian best-practice that can be integrated globally
		• Results in more effective, optimal spend of funding

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Support & Funding

Additional support and funding across all key, influential stakeholders, especially those that can have the largest implementation impact

- Intervention Options-	- Actions -	- Outcomes-
4. Spur regional action	• At the next meeting of ASOCARS, organize a presentation of Huellas program and gather feedback on the appetite for other CARS to implement similar programs • If the appetite is low, create a plan to address barriers from the CARS perspective • Regional government to secure CSR funding from local private companies • Create national policy mandating a minimum % of the regional budget to be allocated to stove programs, depending on need • Design regional government targets around household particle emissions	• Creates incentives for regional governments to institute stove programs • Defines and dispels regional barriers to stove project implementation • Concentrates implementation action close to the rural areas most in need
5. Put IAP on the agenda for Ministry of Health	• Use the existing working committee as a vehicle to engage the Health Ministry on involvement in IAP standards and programs • Use unique, Colombia based health studies, similar to the one done by University of Antioquia for Cornare, to make a case for the health impact of IAP • Discuss how water sanitation efforts might impact increased respiratory damage if water is being boiled with wood stoves	• Multi-issue prioritization leads to balanced and comprehensive stove programs • More robust health impact and knowledge acquired • Holistic health agenda intertwining water sanitation and respiratory health

Knowledge Capital & Transfer

Country-specific knowledge capital is currently insufficient to support decisions on the best path forward to foster adoption of clean cookstoves and fuels across rural Colombia

Situation

There have been several recent studies looking at measuring the environmental impact of certain stove types (e.g., Fundación Natura) but most recent comprehensive cookstove-specific health or consumer preferences research has been cited as stemming from the 90s, 80s, or even 60s (health). This is leading to a lack of consensus around the facts and figures necessary to design an effective stove programs that successfully hits the segments of the population with the greatest need. Biggest gaps are seen in gender research and research on consumer behavior.

Rationale

- While a basic question on solid fuel use is included in the DHS2010, it is not sufficiently granular to target specific communities with the right solutions for them
- Exact consumer preferences and ways of using new/old stoves are unknown
- Minimal user opinion has been gathered only on one type of very expensive stove

Intervention Options

	Involved Parties	Likelihood of Success	Budget	Estimated Time
6. Determine target communities and segments along the energy ladder	MESD Dept of Planning/DHS	High	Medium	1 year
7. Conduct consumer usage/ preference pilots	National oversight (e.g. IPSE), local implementation with regional coroporations & NGOs (e.g. Amazon Pueblo)	Medium	High	1-4 years

Knowledge Capital & Transfer

The first step is to gather more knowledge about potential target communities and segment them according to their energy needs and capabilities

- Intervention Options-

6. Determine target communities and segments along the energy ladder

Proposal Backed by Ministry of Environment & Sustainable Development

- Actions -

- Conduct comprehensive assessment across all national rural areas regarding usage of cooking fuels - delving into more granular cooking practices beyond merely fuel type and price. (potentially piggy back on next DHS or Census)
- Use this study to segment rural areas
    1. Area within connection vicinity of natural gas
    2. Area affluent and interconnected enough for LPG feasibility
    3. Area with feasible renewable energy options . Identify the most optimal source per area (e.g., solar)
    4. Solid fuels the only feasible action – implement ICS

- Outcomes-

- Build a data-driven consensus on the cookstove situation in Colombia
- Better understand drivers of behaviors and segments
- Target specific segments according to the energy ladder

Knowledge Capital & Transfer

It is essential to have a detailed understanding of the drivers of consumer behavior before a market for cookstoves can be developed

- Intervention Options-

7. Conduct consumer/ user preference pilots

Last point also proposed by Ministry of Environment & Sustainable Development

- Actions -

- Pilot efficient, improved stove types of varying cost, complexity and type to better understand usage preferences, segments, and consumer needs along a wide variety of metrics, incl. gender considerations
- Conduct pilots along two dimensions
  - In communities segmented according to the energy ladder, as per initiative #6
  - In communities across the 5 geographical areas of Colombia to understand usage by geography.
- Could be implemented by high-touch organizations deeply imbedded into village ecosystems (e.g., Amazon Pueblo)
- Train on maintenance and repair
- Take pilot “lessons learned”, by segment, to extend outreach and awareness of benefits of adopting eco-efficient stoves or replacement to other communities in the same segment

- Outcomes-

- Settle on a customer-driven solution to better enable the creation of a cookstove market – a product so good, people will pay something for it.
- Target stoves by segment to increase acceptance, maintenance, and usability
- Improve awareness among consumers about the benefits of clean cooking
- Ensures longevity of project impacts

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

Cookstoves Value Chain

Products in the Market

The Colombian rural cookstove market suffers from a dearth of designs. Although there are many gas and electric stoves available, those that cook on wood have just two types of stove to choose from. Artisans produce large semi-movable and fixed stoves, both of which usually resemble a small kitchen. Semi-movable stoves start at about $50; for this price, the stove will not last very long. Better quality stoves start at about $80, which is difficult to afford for most rural households. Fixed stoves are even more expensive (>$400) and consumers cannot easily discern between variations. The best known version is CORNARE's stove that is 55% more efficient than traditional stoves and has very little emissions if used correctly.

No research has been done on the penetration of different stove types in Colombia.

CORNARE's improved fixed stove

If cheaper stove designs were available, this would make the creation of a significant cookstoves market much more feasible. Innovation in stove design can be stimulated by organizing an industry forum and stimulating more public and private research on the topic.

Availability of Materials & Fuel

There is no shortage of materials to produce stoves from, but they must be transported over sometimes long distances, increasing the stove cost. This contributes to the cost of biomass stoves being out of reach for the rural population. Reducing the cost of materials potentially could be a way to address this, but this does not seem very feasible.

Regarding the availability of fuel, Colombia is very rich in resources. About 55% of the country is covered with forest and large oil and gas reserves are present. The government's gas massification programs have ensured that all urban households have access to natural gas, but for most rural households this is not the case. Most rural households do have access to electricity, although not always reliable. However, the high price of electricity makes it an unpopular fuel to cook on. Colombia's proximity to the equator makes solar a possibility, but the country is often cloudy and there is no match with the diverse cooking culture. Wood, however, is plentiful in most areas, although in some Caribbean areas a shortage is presenting itself and concerns over deforestation are rising.

Cookstoves Value Chain

Production

Most produced biomass stoves are fixed stoves, manufactured in situ by a local artisan who usually also works on different types of products. There are also some artisans producing movable stoves on a small scale. Both the fixed and movable stoves lack quality assurance, leading to variations in efficiency and emissions.

Industrial scale production only takes place for gas and electric stoves; over 20 brands are active in the Colombian market. However, as one of the largest producers (Challenger) indicated they are looking into producing stoves for rural areas, this might change in the future.

Stove workshop in Bogotá

Sales & Distribution

As the only common improved stove type is very expensive (>$400) and there are no credit opportunities for most rural population segments, buying a stove is out of reach and there is hardly any market in these areas. Even if credit were available, some segments are simply too disconnected, poor and ultimately still operating on a sustenance/trading system to be able to participate in the market for durable goods. Therefore, market mechanisms for financing and alternative payment models need to be explored to incubate the beginnings of a stove market in rural Colombia.

There currently is a successful microfinance program for rural households run by Promigas. They are financing the gas connection for households, and consequently give out small loans if the household proved its reliability. The entire program is integrated in existing administration and operations, making it a very profitable venture. However, as the natural gas coverage in rural areas is limited, a way to expand the availability of credit would be to have other utility companies (such as electricity) run a similar program.

Cookstoves Value Chain

For those that cannot afford a stove even with credit, pay-in-kind models could provide a solution. Payment with harvested wood, baby animals or otherwise for a inexpensive stove should be explored.

While making these efforts to create a market for stoves in rural areas, support of reforestation/ stove combination programs should be continued to provide an expensive fixed stove to the households where this is the only option.

Another aspect to take into account is that distribution often will further drive up the already high stove prices. As many rural areas are not reachable over road, transport over waterways or sometimes even by foot is necessary. This implies that local production is preferable when possible. If this is not possible, it is essential to consider distribution conditions in the design of the stove.

Due to the difficulty to reach some regions in Colombia, these areas have been largely ignored in stove projects so far of both private companies and NGOs. However, it is important to note that these areas inhabit some of Colombia's most vulnerable populations.

Waterway distribution in the Amazon

Repair & Replacement

While developing a stove market, the market for repair and replacement should not be overlooked. Continued repair and replacement are essential to reap continued benefits of improved stoves and can increase the feasibility of using carbon finance.

Current stove programs experience the difficulty that despite multiple trainings and reminders, people do not like to maintain their stoves and clean their chimneys. Also, once a program is over, it stops providing employment to local stove artisans. Both challenges could possibly be solved by creating long-term maintenance programs funded by carbon finance. This approach seems particularly feasible if a PoA can be set up.

Enhance Demand and Strengthen Supply: Cookstoves Value Chain

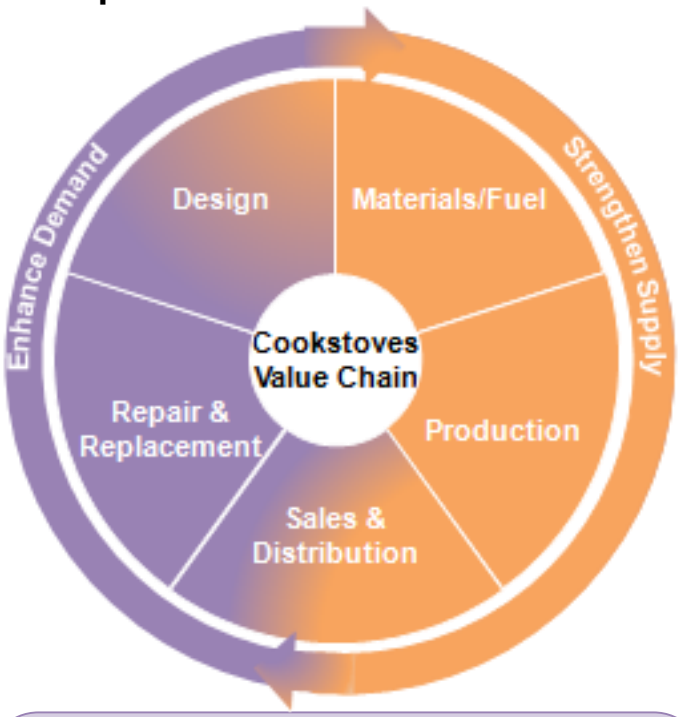
Through gaps identified in the cookstoves value chain, intervention options will focus on Design, Sales & Distribution and Repair & Replacement

Design

- ✘ Stove Type
  - ~ Fixed
  - ✘ Portable
  - ✘ Biogas Digester
  - ✘ Solar
- ~ R&D
  - ✓ Private
  - ✘ Gov't/Academics

Repair & Replacement

- ~ Supply of Repair Skills and Parts
- ✘ Post-sales Service



Sales & Distribution

- ~ Financing Purchasing (micro-credit)
- ~ Carbon Financing
- ✘ Customer Segmentation
- ✘ Last Mile Distribution
- ✘ Reach Vulnerable Populations

Materials/Fuel

- ✓ Stove Raw Material Supply
- ✘ Stove Raw Materials Cost
- ~ Fuel Value Chain
  - ✓ Biomass
  - ✘ Clean Coal
  - ✘ Solar/Biogas
  - ✓ Petro based
- ✓ Cost of Clean Fuels

Production*

- ~ Scalability
  - ~ Handmade
  - ~ Masons
  - ✓ Factory
- ✓ Producer Fragmentation
- ~ Producer Financing
  - ~ Access to Capital

*Aspects of Production will be dealt with in combination with Design

KEY: ✓ Advanced/ Favorable ~ Has Potential/ Neutral ✘ None/ Unfavorable Focus Area

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Design

The market, especially lower income segments, could benefit from more ICS technology options in addition to the primary wood fuel design currently available for a high price

Situation

There is currently only one basic type of ICS on the market and others have not been tested for efficiency, user acceptance, or produced. However, Challenger, the biggest stove producer, is working on design innovations and several academics are studying new biomass stove solutions

Rationale

- Though recipients of the standard improved stove are satisfied, it is unknown if an equally efficient, consumer friendly but cheaper stove option would be viable
- In the vacuum of stove standards and customized, handmade design of each stove, stove efficiency can differ based on a wide variety of designs

Intervention Options

	Involved Parties	Likelihood of Success	Budget	Estimated Time
8. Spur Stove Design Innovation	Stove Manufac-turers Academics	Medium	Medium	1-3 yrs
9. Standardize and mass-produce efficient designs	Stove Manufac-tuers CARS Local Artesian	Medium	Medium	2 yrs

Design

Spurring design innovation, standardization, and mass production of less expensive stoves improves availability and marketability

- Intervention Options-	- Actions -	- Outcomes-

8. Spur Stove Design Innovation	• Conduct a forum on stove design in conjunction with the stove industry workshop proposed in intervention #3, originally suggested by Challenger
	• Publically and privately fund researcher on new stove designs
	  • Focus on providing a cheaper stove that is a) efficient up to new standards, b) meets user requirements
	  • Explore innovative new designs, like scaling the recycled solar stove, energy pellets, household gasifiers, etc.
		• Discover stoves that are a better fit for the needs of the market
		• Collaborate to avoid design work duplication
		• Provide a cheaper stove solution, making it more feasible to start a stove market

9. Standardize and mass-produce efficient designs	• With support of new efficiency and stove standards and specifications from intervention #2, standardize production among
	  • Mass manufacturers (e.g., Challenger) manufacture critical combustion components for efficiency
	  • SMEs – (like Construc-todo)
	  • In-home artisans trained in train-the-trainer programs
		• Increase availability of new clean stove designs
		• Reduce price of stove components and materials
		• Improve standardization of stove efficiency
		• Expand SME knowledge and capability

Sales & Distribution

Market mechanisms for financing and alternative payment models must be explored to incubate a market for ICS in Colombia

Situation

Given the expense of the stove type on the market ($500+) and the lack of microcredit to many population segments, the stove is out of reach. Even with microcredit, some segments are simply too disconnected, poor and ultimately still operating on a sustenance/trading system to be able to participate in the market for durable goods

Rationale

- Promigas Brilla has a very successful microcredit program, but it only applies to customers of Promigas
- There is higher electricity connectivity
- The most remote, poor population segments conduct economic activity through trading, not currency
- Subsidized programs have been successful, and might be the best solution where no market can exist

Intervention Options

	Involved Parties	Likelihood of Success	Budget	Estimated Time
10. Expand Microfinance to all poor users of utilities	Promigas, Other utilities	High	Low	1 yr
11. Explore pay-in-kind models with less expensive stoves	Local and iNGOs	Medium	Medium	1-4 yrs
12. Continued support of reforestation/ stove combination programs	Govern-ment, regional, CARS	Medium	High	continued

Sales & Distribution

The market for ICS cannot grow until the populations most in need not only see a cookstove as a desirable product, but also as an affordable product

- Intervention Options-	- Actions -	- Outcomes-
10. Expand Microfinance to all poor users of utilities	• Expand programs similar to the successful Promigas Birlla microcredit program to areas outside of the natural gas connection area • As there is a much higher connectivity to the electricity grid and other utilities, expand microcredit system through the electric companies for improvements to the household, including a clean or improved cookstove (not necessarily an electronic stove)	• Improved spending power for lower two strata of the population • Ability to grow credit history • First step in market for cookstoves – getting people used to purchasing one
11. Explore pay-in-kind models with less expensive stoves	• Provide populations that still largely depend on a trading economy (instead of currency) with stoves through a program that uses pay in kind. • Distribute stoves that are useful but cheaper, as per discovered in intervention #7 • For example – pay for stove with a portion of food crops, baby animals, or additional forest wood. • There is an example to follow from Peru, whereby stoves are given together with farm animals, and payback is with baby farm animals	• Initiate market-based thinking around clean cooking amongst last-mile consumers • Provide cleaner stove solutions to more people

Sales & Distribution

In the medium term, before a market for stoves can be developed, subsidization of reforestation and stove combination programs remains necessary

- Intervention Options-	- Actions -	- Outcomes-
12. Continued support of reforestation/ stove combination programs	• As in Intervention 4, encourage regional governments and CARS to expand successful model of stove program to other regional areas, whereby more efficient stoves are provided in conjunction with an obligation to grow orchards for fuel wood • Continue to require contribution from customer for installation of the stove	• Support populations that demand expensive fixed stove model but do not have the resources to fully finance this

Repair & Replacement

While developing the market for ICS, it is necessary to create a market for repair and replacement to reap continued benefits and increase the feasibility of carbon finance

Situation

Despite multiple trainings and reminders, people do not like to maintain their stoves and clean their chimneys. However, programs do not have continued finance for regular education initiatives. Once a program is over, the local stove artisans run out of work.

Rationale

- Carbon Financing is difficult through traditional subsidized programs as it is difficult to prove the additionality
- Typical stoves distributed are very expensive, making it difficult to finance the program entirely through carbon credits
- Stove artisans do not have regular, reliable and continued work

Intervention Options

	Involved Parties	Likelihood of Success	Budget	Estimated Time
13. Stimulation of maintenance market through carbon finance	Carbon Finance Consultants (intl/local), Program Designers	Low	Low	1 yr

Repair & Replacement

Innovative use of carbon financing could support continued maintenance and thereby increase the impact of subsidized stove programs

- Intervention Options-	- Actions -	- Outcomes-
13. Stimulation of maintenance market through carbon finance	• Programs could be set up individually (if well over 25,000 stoves) or as part of a PoA with dispersed stove programs • Credits are likely insufficient to fund stove installation • However, credits could fund a program to turn from a 3 year installation program into a 30 year maintenance program, employing the same artisans who installed the stoves	• Ensures long-term impact of stoves not only around emissions, but also around health, gender, and economics • Provide stove artisans with regular, reliable and continued work • PoA increases available funding from carbon finance for stove programs

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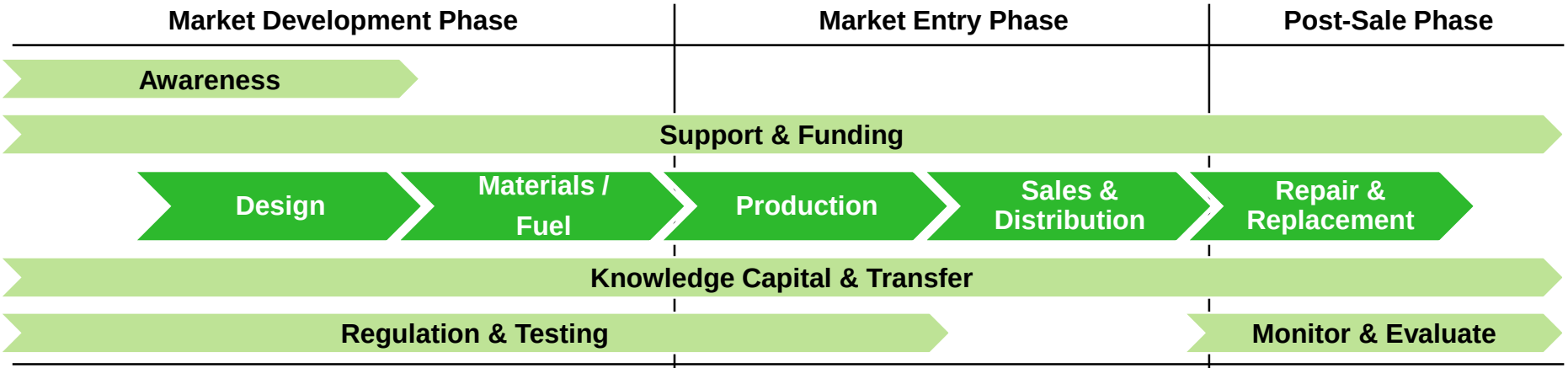
Intervention Options Relative Roadmap Overview

The cookstove value chain is a sequential process and contains interdependencies. Similarly, the Enabling Environment Framework components should be done in lock-step with the value chain



- **Regulation & Testing**
  - Establish solid baseline and continued testing program for stoves and IAP
  - Devise national standards
- **Support & Funding**
  - International "Best Practice" Workshop
  - Spur Regional Action
  - Put IAP on the agenda for the Ministry of Health
- **Knowledge Capital & Transfer**
  - Determine Target Communities and Segments along the Energy Ladder
  - Conduct Consumer usage/ preference pilots
- **Design**
  - Spur stove design innovation
  - Standardize and mass-produce efficient designs

- **Sales & Distribution**
  - Expand Microfinance to all poor users of utilities
  - Explore pay-in-kind models with less expensive stoves
  - Continued support of reforestation/ stove combo programs

- **Repair & Replace**
  - Stimulation of maintenance market through carbon finance

Key

Cookstove Value Chain Component

Enabling Environment Framework Component

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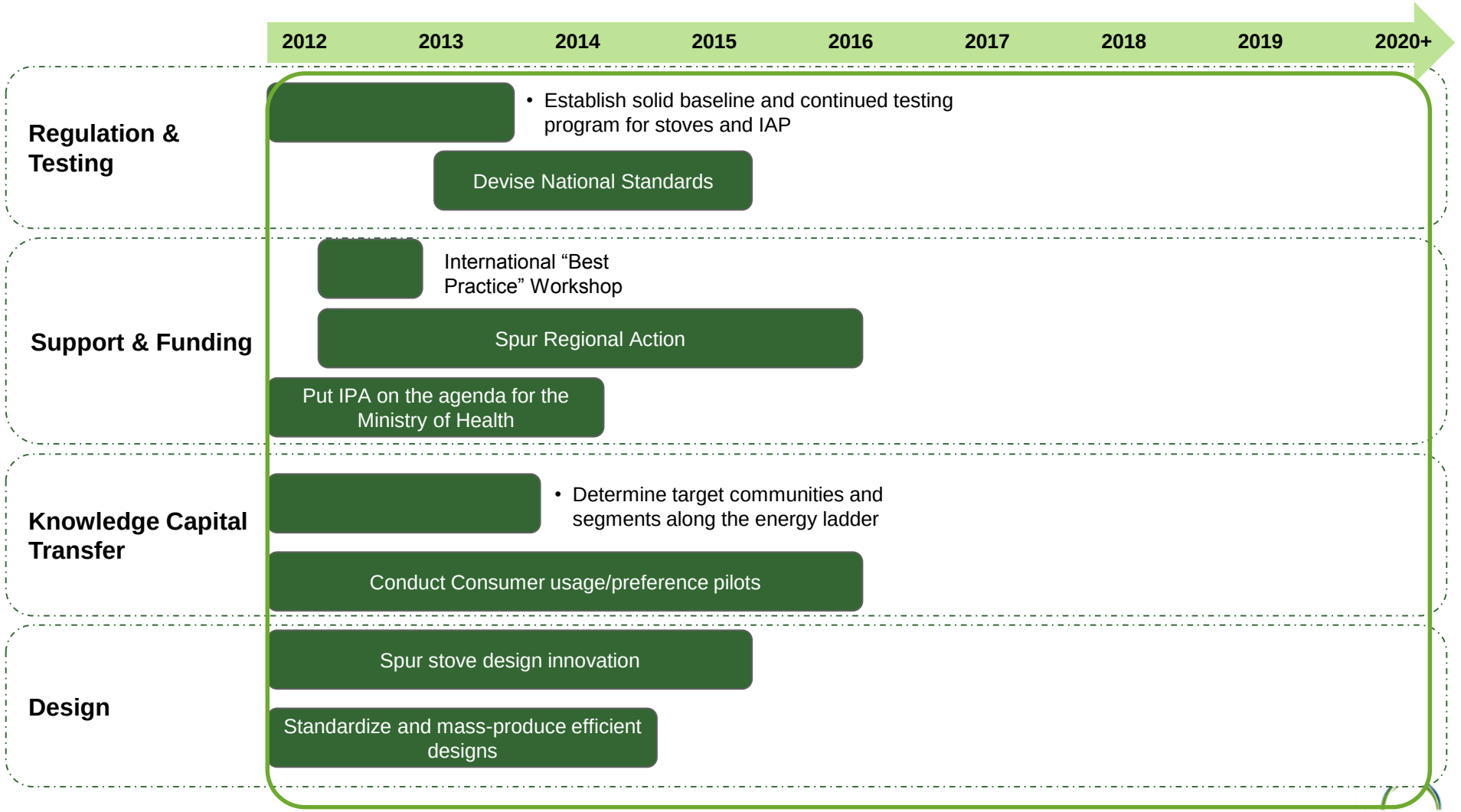
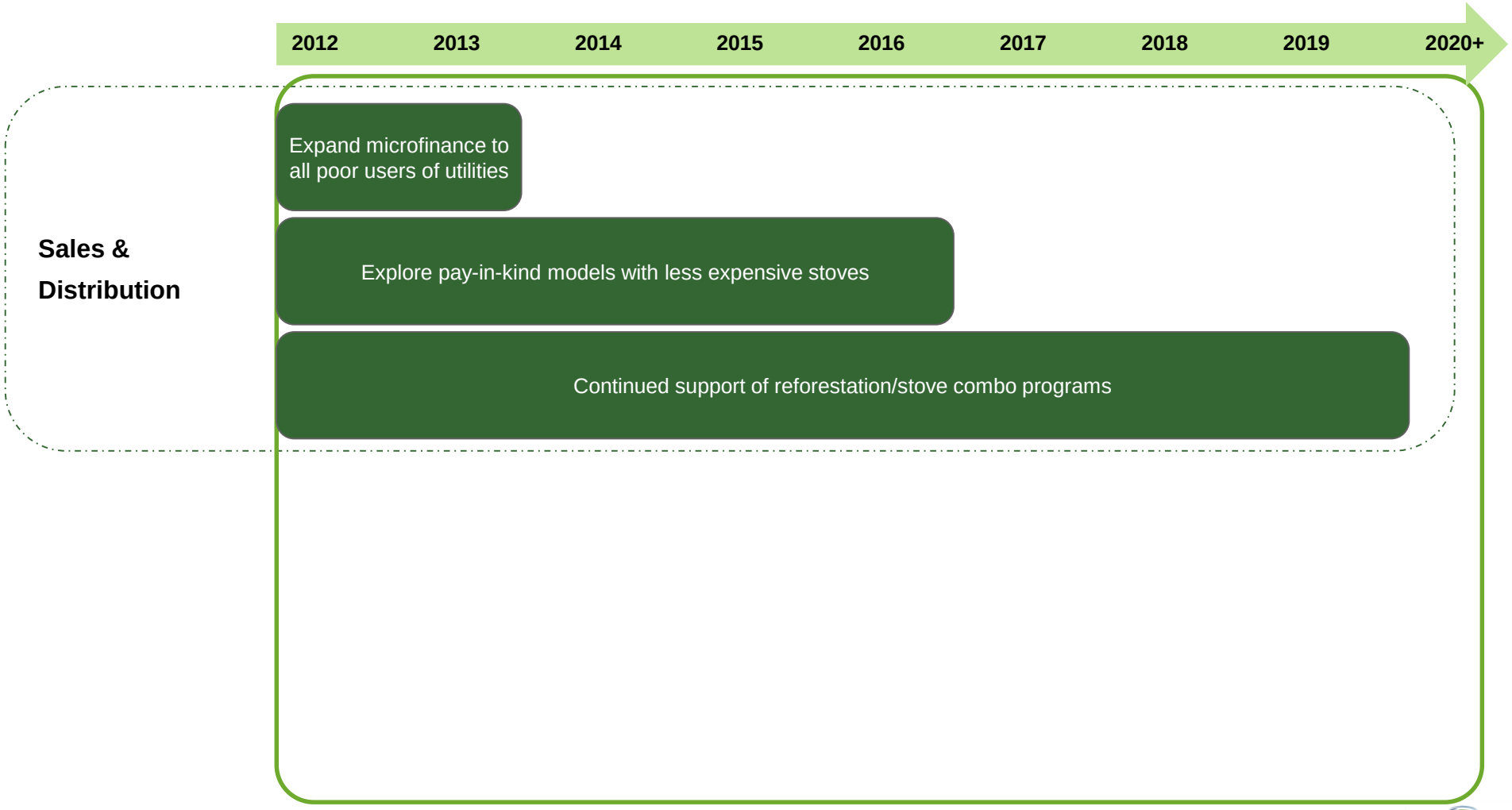
Market Development Relative Roadmap

In the Market Development Phase, intervention options will focus on cultivating a market-based environment to support cookstoves.



Market Entry Phase Relative Roadmap

In the Market Entry Phase, intervention options will focus on supporting manufacturers to get their cookstoves to end users, including scale-up activities.



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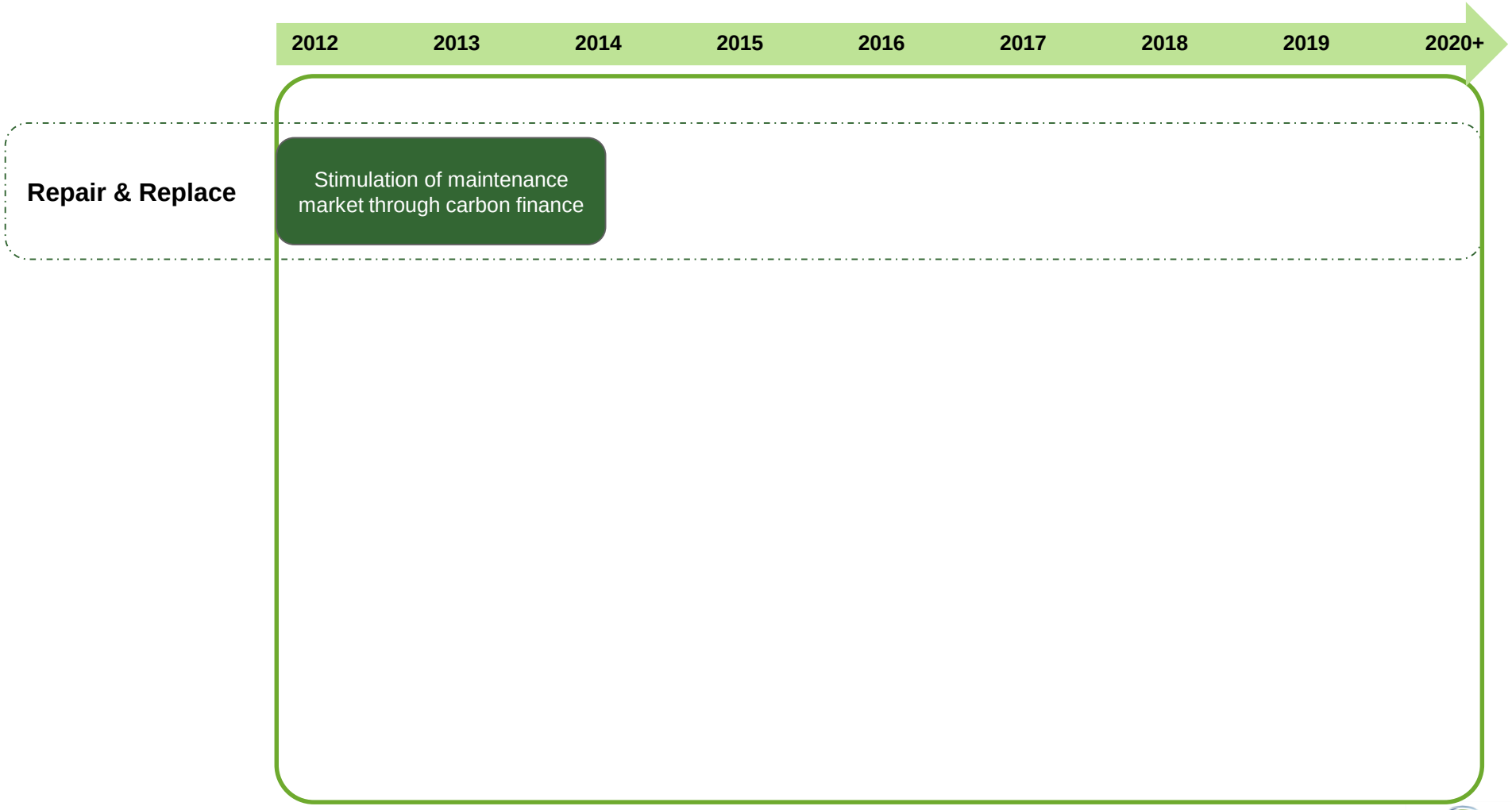
Post-Sale Phase Relative Roadmap

In the Post-Sale Phase, intervention options will focus on supporting repair and replacement of cookstoves, as well as monitoring and evaluating the program.



GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

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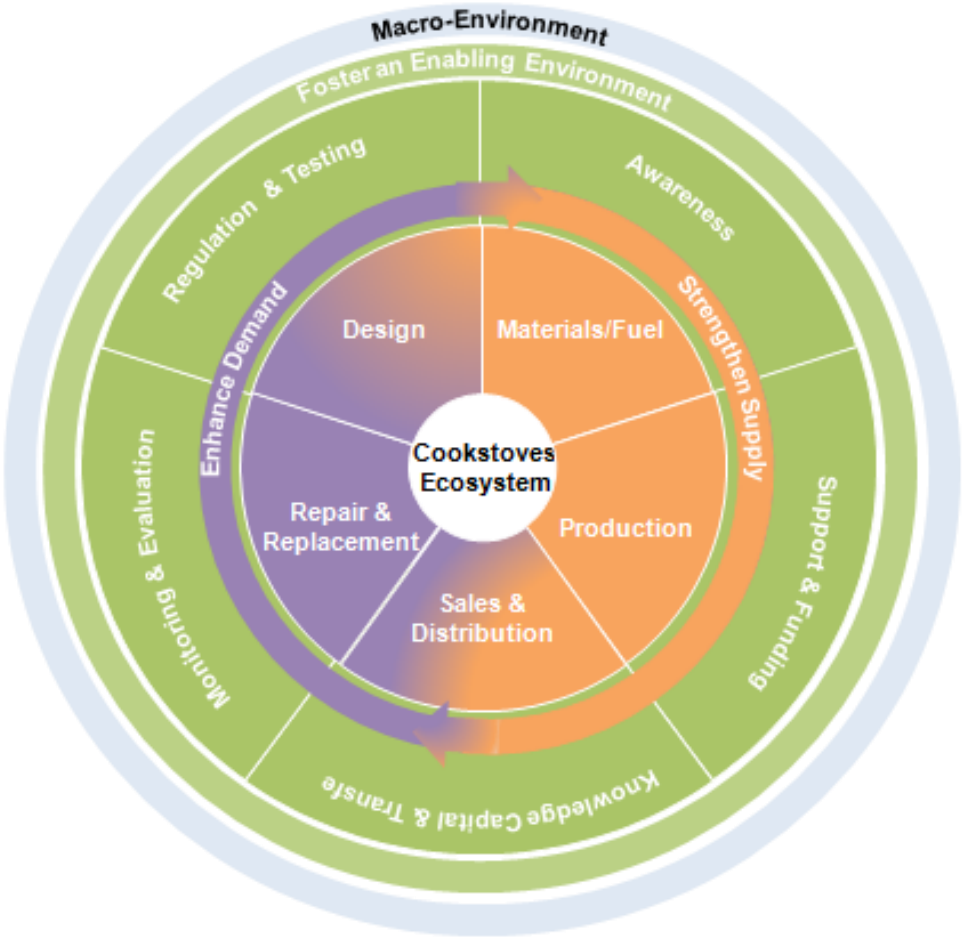
Conclusion

Once the sector is armed with better information about the cookstove situation in Colombia, it can start to build targeted, effective programs and work on establishing the beginnings of a market



Enabling Environment

- Once the sector is armed with more consensus-building, data-driven information about the cookstoves situation in Colombia and international best practices, the cookstove sector will be more broadly supported, design more effective programs and the sector will be better positioned to establish and maintain testing/standards

Cookstoves Value Chain

- As there currently is no market for biomass stoves, it will be challenging to create one. A start can be made by creating affordable, customer centric designs and by putting a stove within the financial reach of the target population. An additional sustainable market can be built around repair and replacement of stoves

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

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Case Study A: Negative Carbon Farm

Appendix

- **Organization:** UTA Foundation - TOSOLY Finca Ecológica
- **Region:** Santander - Oiba
- **Stove:** Colombian improved wood, biogas, biomass gasifier from Ankur Scientific Energy Technologies, Pvt Ltd (India)
- **Price:** Biogas Installation: $200. Biogas plastic replacement (after 3yrs) aprox $100
- **Funding:**
  - ✓ Formerly SITA (Sweden) funded project here and in Colombia. Now looking for more donors.
- **Stoves Distributed:** Few stoves in immediate area
- **Best Practices:**
  - ✓ The farm is fully integrated, using inputs from the farm as fuel for biomass gasifier, biomass wood, and biogas energy. The outputs of these three stoves, along with solar energy, meet all of the energy needs of the farm.
  - ✓ Cheap UVA resistant plastic Biogas system produces gas for cooking and hot water
  - ✓ Biomass gasifier runs the farm machinery such as sugar cane millers and coffee grinders, takes the input of sugar cane residue
  - ✓ Biochar from gasifier is combined with effluent from biogas to produce extremely effective fertilizer
  - ✓ Testing is also being done for a personal use portable gasifier stove, as per the one in Colombia, using rice husk

Industrial Biomass Gasifier for household farmers

Source: Interview and site visit

Case Study B: Promigas Rural Natural Gas Program

Appendix

- **Organization:** Fundación Promigas, funded by Colombian gas distribution company Promigas
- **Region:** Caribbean coast toward Pacific coast
- **Stove:** 2-burner natural gas stove
- **Price:** Subsidized 38% of the cost of a natural gas connection , which was $370 at the time. Financed the rest of the cost against interest
- **Funding:** GPOBA (World Bank) for one project, Dutch government for the other
- **Stoves Distributed:** 34,100 (GPOBA), 10,700 (Dutch Government)

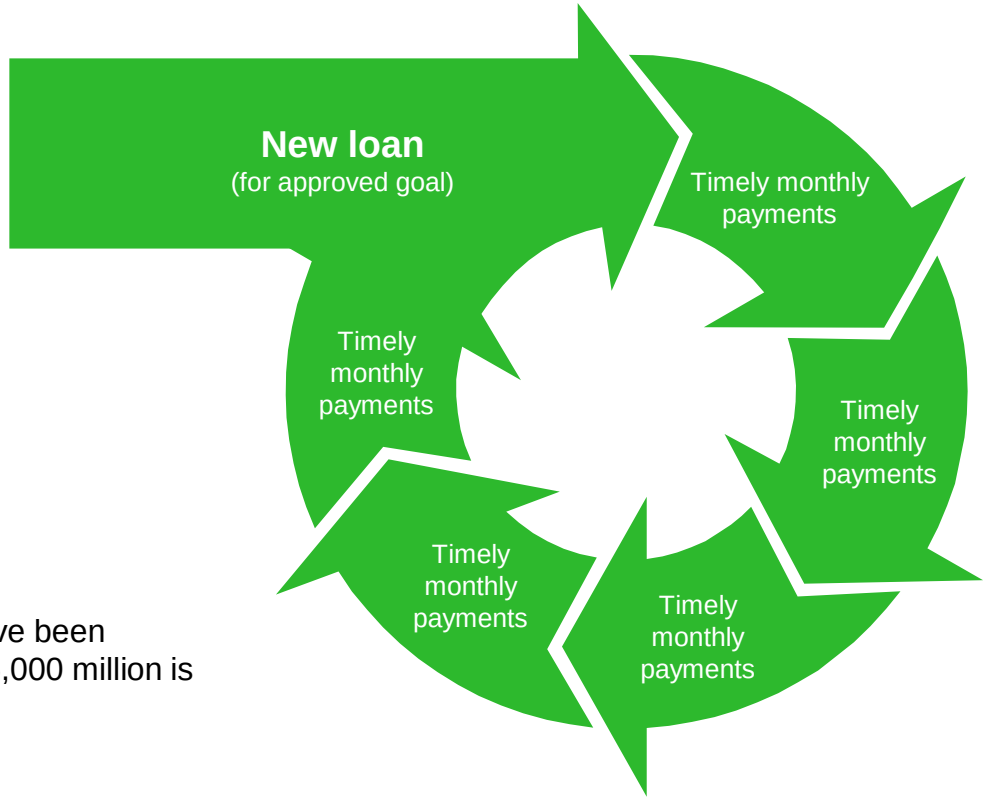
	Before project	After project
Children with respiratory illness	36.5%	12.6%
Adults with respiratory illness	23.1%	9.5%
Fuel expenses vs. HH revenue*	7.6%	2.4%
Expense per meal	$9.40	$3.62

- **Best Practices:**
  - ✓ Created a sustainable market for their fuel and converted more customers, while improving quality of life in rural areas
  - ✓ Used local subsidiaries with relevant knowledge to implement the program
  - ✓ Financing allowed families to begin to establish credit and ‘own’ their stove
- **Results:**
  - ✓ Frequency of households reporting a household member hospitalized due to respiratory illness fell by 75%
  - ✓ Avoided 64,689 DALYS and 87 deaths through both projects
  - ✓ Firewood consumption reduced, preserving up to 34 hectares of forest or mangrove swamp land
  - ✓ Overall, the economic rate of return of the project over ten years is estimated to be 62%
  - ✓ Economic burden of disease reduced 32% (For every $1 invested in subsidies, the government saved $1 in burden of disease treatments; the payback period is 5 years)
  - ✓ 79% of households stated life quality improved, 84% stated community developed

Source: Interviews

Case Study C: Promigas Micro financing: Brilla

- **Organization:** Promigas Brilla Program
- **Region:** Everywhere that Promigas operates
- **Stove:** No stove: Micro financing credit scheme
- **Price:** Cost of credit is the highest allowable rate in Colombia, approximately 28% interest per year, payable over a maximum of 5yrs (depending on the type of investment)
- **Funding:** No funding required, as the program is self-financing and provides 72% operating margin to Promigas
- **People assisted:** Currently 650,000 households have been reached, alone in 2011 it was 180,000 HH. COP 566,000 million is the total amount of loans given so far



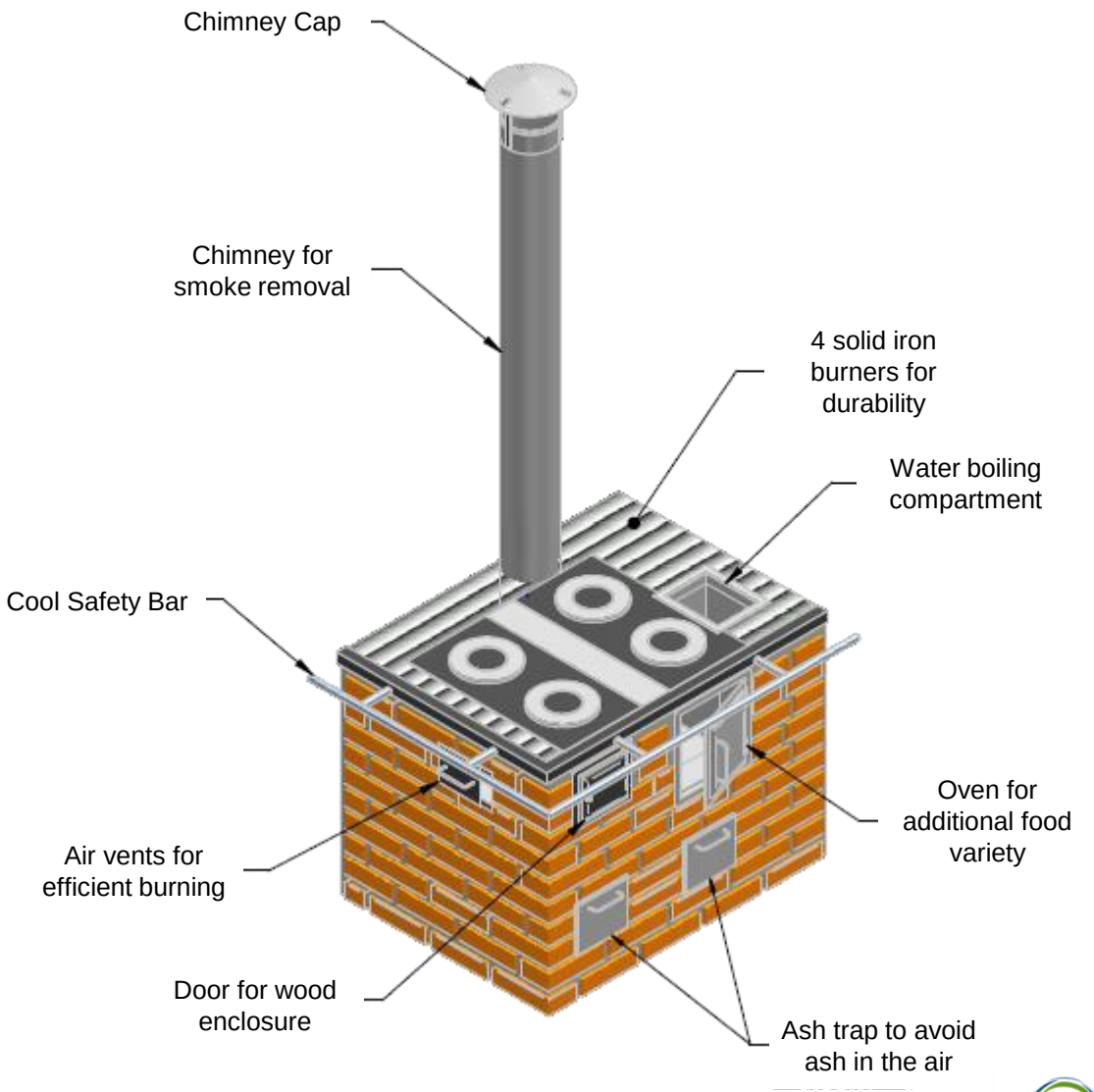
- **Best Practices:**
  - ✓ Promigas uses their existing billing network to provide micro financing to existing disadvantaged customers of natural gas. It is profitable to administer this, because they already have the billing system
  - ✓ Micro finance bills get added to the existing natural gas bill
  - ✓ Only customers who financed their stove installation and made all their payments in time are eligible (this is their 'credit rating'; this provides a serious incentive for people to pay their bill in time
  - ✓ People can take out a maximum loan $500 (1mil pesos) and take out a new loan once it is paid back
  - ✓ The program only finances products that make a difference in the quality of life – not just anything. Examples are computers, construction materials, and currently piloting university tuition

Source: Interviews

Case Study D: Huellas (1/2)

- **Organization:** CORNARE, one environmental 'corporation'
- **Region:** Antioquia
  - ✓ Sonson
  - ✓ Algeria
  - ✓ San Francisco
  - ✓ San Luis
  - ✓ Cocorna
  - ✓ El Carmen de Viboral
  - ✓ San Carlos
  - ✓ San Rafael

- **Stove:** Fixed stove from a company in Bogota
- **Price:** 800,000-2 million pesos per stove, not affordable for poor families, so stoves are given out for free
- **Funding:** Local government and CORNARE, Finlandia, ISAGEN, EPM, Argos, Viva, Municipios y Comunidades
- **People assisted:** 2007-2011 – 14,000 + fixed stoves and as many orchards



Source: Interviews Huellas project report

Case Study D: Huellas (2/2)

- **Best Practices**

Reforestation

Combines more efficient stoves with fuel wood production. Orchards are planted that take 3 years to grow, providing a family with a sustainable and continuous supply of fuel wood

Aptitude Development Strategy

Households are trained on care and **maintenance** prior to the project, during construction, and post-project. Still, people dislike cleaning the chimney

People are also trained on the need to save wood and trees

Local workers are trained in proper stove construction that ensures better emissions

- **Impact:**
  - ✓ Reduce fuel consumption by 55% compared to traditional stoves.
  - ✓ Reduce particulate emissions to the atmosphere of the home by 92% due to the cooking process.
  - ✓ Reduce CO2 emissions generated by households by 86%.
  - ✓ Reduce pressure on natural forests with wood consumption savings of 70,200 tons annually
  - ✓ Analyze the potential to mitigate global warming in the joint project of reforestation, avoided deforestation and wood energy to establish a larger (national or regional).
  - ✓ Improve the situation of women: Cooking hours reduced by 8, less violence in the home due to home being cleaner
  - ✓ Hypothesis of improved lung capacity.

Source: Interviews Huellas project report