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Global Alliance for Clean Cookstoves

Timor-Leste Market Assessment

Sector Mapping

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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).
- 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 sixteen such assessments 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, 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.

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- Executive Summary
- Project Approach
- Sector Mapping
  - Macro Environment Assessment
  - Indoor Air Pollution Assessment
  - Consumer Assessment
  - Cookstove Industry Assessment
- Sector Mapping Summary

Sector Mapping

- Timor-Leste is a small but fast-growing country of 1M people and challenged by poor infrastructure, severe health issues, and a dearth of skilled resources
- The country is highly dependent on oil, the majority of the population relies on subsistence living and unemployment rates are the highest in South East Asia
- Government and NGOs have had some successful outreach programs that aim to improve health, education, living conditions and economic well-being
- Indoor Air Pollution (IAP) is caused mainly from using firewood with rudimentary cooking devices and from living in a smoky environment for perceived health and functional benefits
- While there is some awareness of IAP among government and NGOs in recent years, there is very low awareness in the general population
- Efficient cookstove and clean energy programs are still in the early pilot phase and face capacity and cultural challenges to become scalable and sustainable
- Consumer cooking habits and preferences vary based on urban and rural living as well as income levels; strong cultural attachment to smoke, abundant supply of firewood and high clean fuel costs create high barriers to switching from firewood
- The cookstove industry is in a very elementary stage with small scale clay cookstove producers in a few rural areas and a few steel electric and LPG stove importers in the larger cities

Implications for Intervention Options

- There is an urgent need for clean cookstove and fuel interventions to reduce IAP exposure as well as reduce the dependence on firewood as fuel
- A clean cookstove alone may not be enough to reduce IAP exposure, the solution should be holistic to address uses of fire and smoke beyond cooking (i.e. lighting, repellent, drying, traditional practices)
- A clean cooking program should include an awareness program around the dangers of smoke and around the health, economic, and ecological benefits from clean cookstoves
- Government may support a cookstove initiative that aligns with its targets, integrates with existing programs and does not over extend limited government resources
- Several clean cookstove projects were launched in 2011 by NGOs and UN agencies that could benefit from coordination to align goals and strategy, to share learning and avoid duplication of effort
- Consumer segments need to be understood in depth and solutions should be tailored for each segment's needs and access to technology
- Developing a sustainable and scalable clean cookstoves and fuels industry is a long term effort and will require a commitment of 10-15 years

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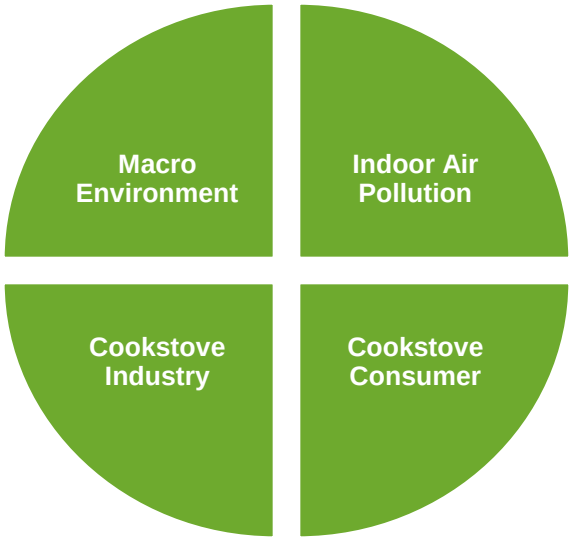
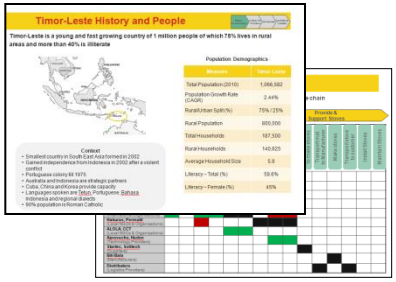
Project Approach

A structured approach first assessed the market for a cookstove and fuels industry and then used the sector mapping output to develop the intervention options and operational plan

Sector Mapping

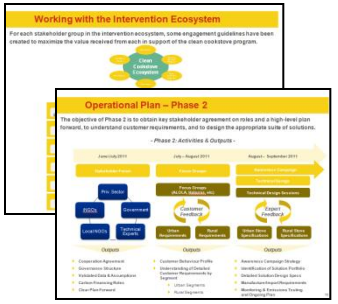




Sector Map

Strategy Development

Identify Intervention Themes → **Develop Recommendations** → **Develop Operational Plan**



Intervention Options And Operational Plan

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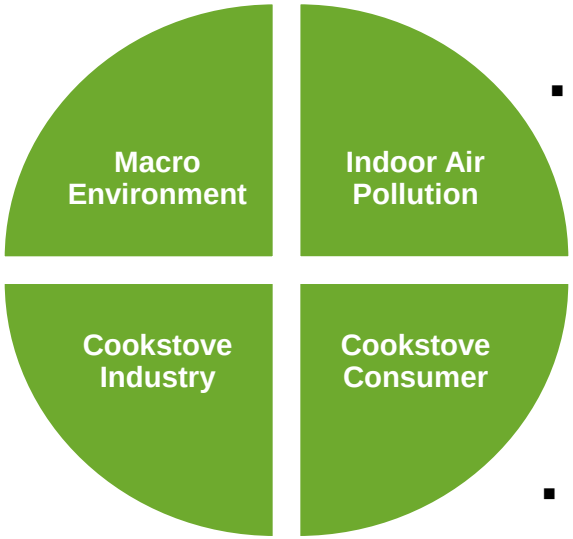
Sector Mapping Approach

Sector Mapping for a clean cooking industry was conducted on four dimensions – macro environment, indoor air pollution, cookstove consumer, and current cookstove industry

- Social: What is the country demographics and population distribution across regions?
- Political: What is the political environment, how stable is government and what political risks will any program face?
- Economic: How much money do the potential customers have and what is their economic cycle?
- Technological: How sophisticated is the infrastructure in the region and what is the plan for progress?
- Environmental: How do ecological conditions impact the success of an IAP programme?



- What is the current IAP exposure profile of the target market? (Primary cause of IAP and size of problem)
- What lessons can we learn from historic IAP programmes?
- What are the opportunities / threats of current and future IAP programmes?

Who are the key actors involved in IAP programmes?

- What cooking devices are currently owned and used within the region?
- Who are the main cooking device designers & suppliers?
- How attractive is the industry from a commercial perspective and what are likely to be some of the industry challenges?

- What is the profile of the target population?
- How can the customer population be segmented / categorized?
- How big is each customer segment and what are its characteristics?
- What are the specific needs of each customer segment?

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Intervention Options Approach

Strategy Development was conducted by using sector mapping as an input to identify intervention areas, develop recommendations, and structure an operational plan

Sector Mapping

- Favorable and unfavorable factors contributing to development of a clean cooking industry on following dimensions:
  - Macro Environment
  - Indoor Air Pollution
  - Consumer
  - Current Cookstove Industry

Intervention Themes Identification

- Identify possible interventions to promote a clean cooking industry by:
  - Addressing the unfavorable factors
  - Aligning with the favorable factors

Strategy Development

- Customer Segment Strategy:
  - Identify appropriate technology to serve each customer segment
  - Develop holistic customer strategy including marketing, financing
- Overall Strategy
  - Develop strategy for stakeholder engagement across segments
  - Develop strategy for awareness raising across segments
  - Identify possible NGOs and programs to partner with

Operational Plan Development

- Develop operational plan that includes:
  - Detailed immediate next steps
  - Short term (3-6 months) activities and milestones
  - Long term (6 months – 2 years) high level directional plan

Acknowledgements

Many organizations made valuable contributions to this study with their knowledge of Timor-Leste or experience in clean cookstove and fuel initiatives

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Social Environment

Timor-Leste is a young country of 1 million people of which 75% live in rural areas and more than 40% are illiterate

Fastest growth rate in SE Asia

Population Demographics

Measure	Timor-Leste
Total Population (2010)	1,066,582
Population Growth Rate (CAGR)	2.44%
Rural/Urban Split (%)	75% / 25%
Rural Population	800,000
Total Households	184,000
Rural Households	140,625
Average Household Size	5.8
Literacy – Total (%)	58.6%
Literacy – Female (%)	45%

Context

- Smallest country in South East Asia formed in 2002
- Gained independence from Indonesia in 2002 after a violent conflict
- Portuguese colony till 1975
- Australia and Indonesia are strategic partners
- Cuba, China, and Korea provide capacity support
- Languages spoken are Tetun, Portuguese, Bahasa Indonesia and regional dialects
- 90% population is Roman Catholic

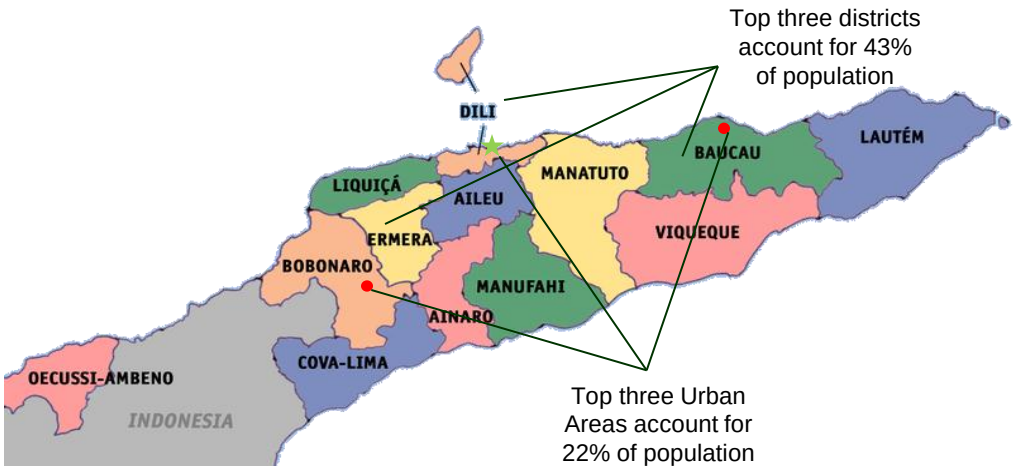
- Implications -

While the country is small in terms of number of households, it is growing fast; early interventions will be more effective

Political Environment

The country is governed by a fairly aligned and stable parliament; suco-level administration is responsible for reaching government programs to people

Timor-Leste District Map



Administrative Map

- Capital city Dili
- Country divided into 13 districts
- Districts subdivided into 65 subdistricts, 442 sucos (villages), and 2,225 aldeias (hamlets)
- Dili, Baucau and Maliana are most populated urban areas
- Dili, Ermera and Baucau are most populated districts

Political Environment

Structure

- Democratic Republic
- The President is the symbolic head of state, elected every 5 years
- National parliament elected every 5 years
- Relevant government ministries are Health, Energy Policy, and Economic and Development
- Suco administration has outreach to people

Current Government

•Current government and opposition parties are committed to national development

•Government has included energy efficient cookstoves and fuels in Strategic Development Plan (2011-2030) as a means to reduce dependence on biomass

Political Risks

- Reelection in 2012, possible change of government not likely to change Strategic Development Plan significantly
- Relationship with Indonesia is still fragile
- UN forces to pull out at the end of 2012

- Implications -

A cookstove program that aligns with the Strategic Development Plan is unlikely to face resistance with a change of government

Economic Region

Timor-Leste is the highest oil dependent country in the world and has the highest unemployment rate in the region

Country Economics

Key Indicators	
GNI Per Capita (2010)	USD 5,303
Petroleum Revenue (2010)	USD 2.17B
Petroleum GNI per Capita (2009)	~USD 910 (38% of total GNI)
Non-Petroleum GNI Per Capita (2009)	~USD 1,406 (62% of total GNI)
Non-Petroleum Economic Growth Rate (2010)	7.5%
Inflation Rate (2010)	4%
General State Budget (2011)	USD 985M
Unemployment (excl. Subsistence Agriculture)	20%
Unemployment (Urban Youth)	40%

Key Indicators	
Poverty Rate	42% of population lives below poverty line
Occupation (2003)*	• Agriculture (81%) • Fishery (1%) • Industry (4%) • Services (11%)
Key Industries	• Petroleum (~1.5B annually) • Coffee Export (6-10M annually)
Financial Services	• 3 foreign banks • 2 MFIs with 18,000 clients

- Implications -

The country needs employment generating activities; a program that stimulates employment will be more easily adopted by local population

Technological and Environmental Environment

The country faces serious challenges in health and infrastructure; the government has identified priorities and has a few programs in place to address them

	Health	Infrastructure	Energy	Natural Resources
Current Situation	• Malaria and tuberculosis are top killers and cause 28% of deaths • Infant mortality rate is 45 deaths per 1000 live births • Average life expectancy is 67.95 years, 70.47 years for females	• 70% infrastructure destroyed in conflict • Roads in poor condition and need constant repair • One port and two paved airports • Television and radio reach 50% of population • 500,000 mobile connections	• 38% households, mainly urban, have access to electricity • 6-10% rural households have electricity from 6pm-midnight • 98% households use solid fuels for energy • No subsidies for LPG or kerosene	• Annual deforestation of 110 sq.km., prevalent around Dili • Bayu-Undan is the only oil and gas field in production • Potential oil sources are Greater Sunrise and Kitan-1
Government Priorities	• Access to healthcare • Maternal and infant health • Preventable and communicable diseases including HIV/AIDS	• Road access to all aldeias • Road maintenance • Better communication facilities for rural areas	• Expansion of Electricity Grid • Electricity for rural areas from renewable energy (Hydro, Biogas and Solar)	• Reduced deforestation • Reduced dependence on non-renewable sources such as oil and gas • Reduced fuelwood consumption through fuel substitution and energy-efficient stoves

- Implications -

Serious health and infrastructure challenges do not allow indoor air pollution to be a priority issue; any clean cooking program must accommodate lack of infrastructure

Government Programs

Government has included energy efficient cookstove in its Strategic Development Plan but has not yet launched specific programs to address the issue yet; however there are related programs in rural energy and, maternal and child health

RDTL Strategic Development Plan 2011-2030 (DRAFT)
Section on Energy, Oil & Gas, and Mining

- Target plan is to reduce the average amount of fuel-wood used for cooking in private households by introducing fuel substitution and supporting the use of energy-efficient cookstoves

Energy Programs

- Provide solar and biogas solutions for cooking and lighting in rural areas; program includes technology and training to install, operate and maintain systems
- Increase urban electrification

Rural Health Programs

- Provide health services to communities, with a focus on pre and antenatal care, and environmental health through SISCa program; IAP not yet identified as a health priority by government

Constraints

- The government lacks institutional and personnel capacity to undertake a wide range of tasks
- Projects face challenges during implementation phase

- Implications -

Government may support a clean cooking initiative that aligns with its targets, integrates with existing programs and does not over extend limited government resources

Select Outreach Program

SISCa, the government healthcare program and some other NGO programs have been successful in creating efficient channels to reach people

	SISCa	Cruz Vermelha de Timor-Leste	alola	Cooperative Coffees
Focus	• Health outreach • Mobile Clinics	• Health • Safety	Women's empowerment	Coffee growers' cooperative
Partners	• Ministry of Health • Issue specific partners such as World Bank (Donor), Australian Government (capacity building)	• Cruz Vermelha de Timor-Leste (local Red Cross National Society) • Strong relationship with the Church	• Non-profit operated by Prime Minister's wife • Works closely with Govt. ministries	• Established with the help of USAID • Transferred to Timorese people
Programs	• Provide health services to communities on a monthly basis • Address issues such as 1) registration, 2) nutrition, 3) pre and antenatal care, 4) environmental health, 5) general consultations, and 6) monthly health topics	• Explored cookstoves and coffee husks for fuel as part of existing water sanitation program • Employs network of volunteers • Work in remote and marginalized areas	• Create economic opportunities for women handicrafts industry • Improve maternal and child health ,e.g., breastfeeding promotion • Implement education programs in rural areas • Advocate for women's rights	• Offer Primary level health services to coffee farmers and their families • Provide members with training in bookkeeping, management, English language, and computer skills • Provide consumer goods at wholesale prices to small retail outlets in rural areas

- Implications -

While not directly tied to a cookstove initiative, several organizations can provide critical support to a cookstove program through their awareness and education programs, and outreach network

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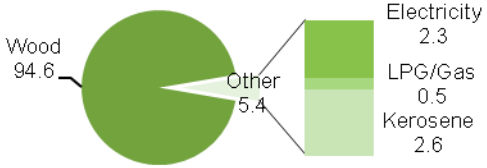
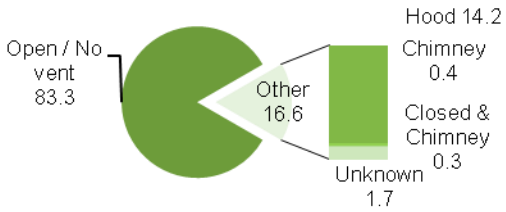
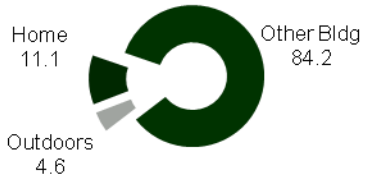
Indoor Air Pollution in Timor-Leste

High IAP exposure in Timor-Leste is caused by a wide-spread usage of firewood and rudimentary cooking devices inside closed structures

IAP Cause	Scenes	Usage (% HH)
Cooking Fuel		
Cooking Device		
Housing Structure		

Total HH = 184K

IAP Effects

- IAP related annual mortality is estimated at 187 ALRI cases (children under 5) and 115 COPD cases (females 30+)*
- IAP related annual morbidity is estimated at 121K ALRI cases (children under 5) and 402 COPD cases (females 30+)*
- The World Bank estimates economic cost of IAP to be $12.5M for Timor-Leste (1.4% of GNI)

- Implications -

There is an urgent need for clean cooking intervention to reduce IAP exposure as well as to reduce the dependence on firewood for fuel

IAP Exposure from Other Habits

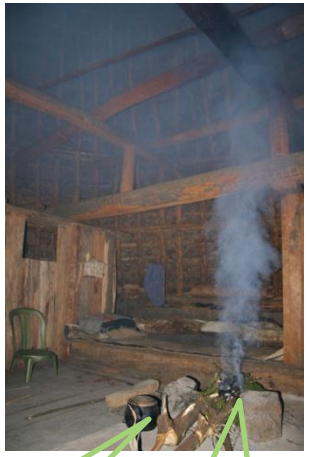
Cooking devices are not the only source of IAP, in rural homes a fire is kept burning for alternate uses

Additional Use for Fire and Smoke

- Provide light
- Provide warmth
- Repel insects
- Dry and strengthen thatched roof
- Preserve grain stored in attic
- Keep new mothers and babies safe and warm
- Ward off evil

Smoke is used to preserve grain stored in attic above the cooking fire

Scene from the same house in a remote area where two fires are used



Additional fire used to create a smoky environment for health and spiritual reasons

- Implications -

A clean cookstove device may not be enough to reduce IAP exposure, the solution design should be holistic to address uses of fire and smoke beyond cooking

IAP Awareness

In a country facing significant health issues ranging from malaria, severe malnutrition, and lack of clean water & sanitation facilities, there is little awareness of the dangers of IAP

	Awareness Level	Awareness Type	Comments from the Field
Government	Moderate	• Dept. of Environmental Health is aware of issue but has other priority issues	"Our health department staff does not consider indoor smoke to be a health problem" *- Ivo Cornelio, Dept. Of Environmental Health*
NGOs	Moderate-Significant	• Significant awareness among international NGOs • Moderate awareness in local NGOs and humanitarian organizations	"My grandmother lived for 100 years in a smoky environment, it is hard to make a case that smoke is bad." *- Local NGO worker*
Humanitarian Sector	Moderate-Significant	• Humanitarian organizations are concerned about the issue of IAP and would like to integrate stoves into existing programs	"We would like to link smokeless stoves to our community programs but need support." *- Humanitarian agency, Program Lead*
Consumer	Minimal	• Awareness limited to the urban rich • Majority of population believes that smoke is beneficial	"Smoke is good – it keeps away mosquitoes and provides warmth, I have gotten used to burning eyes and it does not bother me" *- Homeowner in remote area*

- Implications -

A clean cooking program should include an awareness program around the dangers of smoke and around the health, economic, and ecological benefits from clean cookstoves

Existing Cookstove Programs

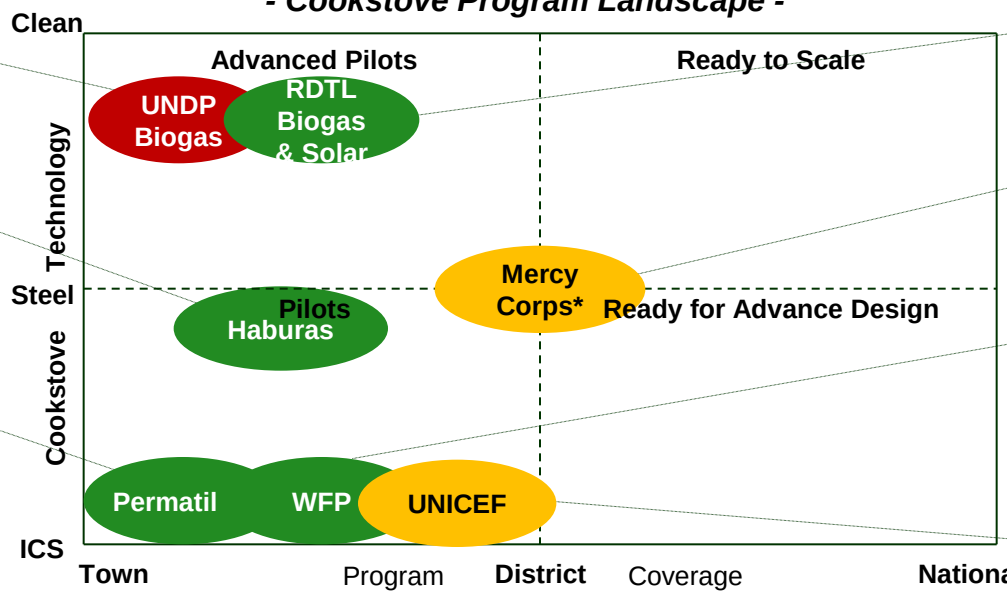
Several organizations have implemented or are about to begin clean cooking fuel and cookstove projects, however the road from pilot programs to a scalable and sustainable industry is unclear

- Biogas lighting and cooking
- 24 plants countrywide

- Efficient clay stoves and biomass briquettes
- Across Dili and select rural areas

- Self-made clay stoves
- Pilot in Turascai, Baucau in June

- Cookstove Program Landscape -



- Biogas and solar for lighting and cooking
- Countrywide

- Efficient stoves, design to be defined
- Dili, Ainaro, Manufahi

- Improved clay and brick cookstoves with zinc chimneys
- 1000 schools

- Improved clay cookstoves
- Schools and rural families

Ongoing
Planned
Closed

Key Constraints

- Right-fit technology, raw materials, and skilled labor
- Lack of capacity to scale program
- High cost of technology (biogas and solar)

Key Lessons

- Visible benefits (money and time saved, electrification, etc.) motivate community
- Community should have sense of ownership for success

- Implications -

Ad-hoc projects may benefit from coordination to align goals and strategies or at the very least to facilitate learning and avoid duplication of effort

Cookstove Program (1/2)

Planning for long term commitment and designing for customer needs are the key lessons from existing cookstove and fuel programs

	Haburas	Permatil	MercyCorps	RDTL
Partners	Priest Don Bosco (metal work training), Trocaire	Oxfam, Caritas, etc. in publishing handbook	E.U. (donor)	Solitech (supplier)
What	• Efficient clay stoves • Biomass briquettes • Metal stoves	• Self-made clay stoves	• Improved cookstoves, technology unidentified	Biogas and solar energy systems for lighting and cooking
How	• Production and retail of clay and metal stoves and biomass briquettes • Roadside training of youth in metal work 	• Provide training for self-made clay stoves using local material • Training handbook, tutorials and demonstrations	• Market-based approach • Establish centers for retail and repair using local entrepreneurs • MFI financing	• Community-owned • Govt. grants to communities based on proposal • Trains community to install, operate and maintain
Financing	• Consumer finances on own	• Consumer builds on own	• Community finances • Microfinance available • Funding for vulnerable communities	• Donor (RDTL) finances
Challenges	• Stoves last 1-3 mos • 15-20% efficiency • Unreliable raw material supply • Fixing orders • Reducing cost of stove	• Resources required to scale process 	• Right-fit technology • Cultural attachment to smoke	• Cost of technology • Lack of technical skills and capacity • Budget is a constraint to scale
Lessons Learnt	• Need long term commitment • People are willing to change provided there is solution continuity • Need to design simple, multi-functional stove	• Community is motivated by visible benefits – time or money savings • Communities can train neighbours • Use demonstrations	• Not applicable	• Community adopts when there is significant benefit such as electricity

Sources: Haburas, Permatil, MercyCorps

Cookstove Program (2/2)

	UNDP	WFP	UNICEF	Trocaire
Partners	Not available	Four national NGOs and WFP	• Ministry of Health/Dept. of Environmental Health • Ministry of Education • National NGOs	Haburas
What	Biogas systems for lighting and cooking	Improved cookstoves in schools	• Improved cookstoves and kitchens • Cookstove industry	Funding Haburas briquettes
How	• Community-owned • Community installs, operates and maintains	• Partner with local NGOs to implement improved cook stoves (clay brick ovens and zinc chimneys to remove the smoke) in schools	• Develop and Test ICS models • Train and build capacity of ICS fabricators and installers • Awareness and marketing	• Stove provider not identified yet, funding briquettes • €25K budget • Awareness through brochures, manual, film, etc.
Financing	• Donor financed	• Donor financed	• Donor financed	• Donor financed
Challenges	• Lack of finance and capacity to repair and maintain	• Limited LPG distribution and safety concerns • Low awareness on IAP • Low local skills & resources • No coordination and standardization in biogas and stove programs	• Dependency on firewood as fuel source due to financial constraint	• Not applicable
Lessons Learnt	• Donor-driven projects are not sustainable, community should have sense of ownership and necessary skills	• Need to focus on capacity building at community level • Need education on issue • Need local support to build and maintain the cookstoves • Leverage on schools or health facilities as entry hub to raise awareness	• Need long-term focus for impact	• Leverage networks such as women's resistance

Sources: UNDP, WFP, UNICEF

Program Participants

Various institutions such as international agencies, government departments, and district organizations have participated in cookstove and fuel programs

Stakeholder Level: *Highest* → *Lowest*

Category	Example Entities	Activities
National Government and Ministries	• Ministry of Energy Policy	Set national agenda, fund programs, provide support for NGO's, capacity building, conduct awareness activities
Foreign Government Agencies	• USAID	Fund programs, provide technical and logistical support
Multilateral Organizations	• UNDP	Fund programs and build capacity
International NGO's	• MercyCorps, Oxfam, WHO, UNICEF, Trocaire, WorldVision	Fund and run programs, provide technical and logistical support, engage and partner with organizations at local level, conduct awareness activities, capacity building
National Organizations	• Haburas, Permatil	Promote clean cookstoves, run programs, engage communities
Suppliers	• Bili Bala	Produce clay cookstoves
District, Sub-District, Suco (Village), Aldeia (Hamlet) Level	• Suco/Aldeia Chief	Provide community-level coordination & support, lend credibility to programs, conduct awareness & training activities

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Customer Segmentation

Consumer choice is largely dependent on their living environment and income level; the rural population living under the poverty line represents the largest share of the market at over 50%

- Market Size in Households by Segment: Timor-Leste -

Geo-demography

Annual Household Income	Rural	Urban	Total (%)	Total (HH)
> $20K	Rural / Very High Income 0.6K	Urban / Very High Income 1.3K	1%	2K
$10–20K	Rural / High Income 7K	Urban / High Income 15K	12%	22K
$5–10K	Rural / Med Income 32K	Urban / Med Income 12K	24%	44K
< $5K	Rural / Low Income 106K	Urban / Low Income 10K	63%	116K
Total (%)	75.0%	25.0%		
Total (HH)	140,625	46,875		184K

Total Timor-Leste Market = 187,500 Households (HH) = 1,066,000 people

Source: Timor-Leste DHS (2010)

Customer Segmentation

Grouping segments by common consumer patterns results in five customer segments that can benefit from a targeted product strategy

- Segment Size as Percent of Total HH in Timor-Leste -

Geo-demography

Annual Household Income	Rural	Urban
> $20K	<1%	<1%
$10–20K	4%	8%
$5–10K	17%	7%
< $5K	58%	5%

- Segment Grouping Pattern: Timor-Leste -

Segment	Description
Segment 1	Affluent: These consumers are in the top 1% of income level and most currently utilize clean-burning LPG, kerosene, and electric cookstoves
Segment 2	Urban Middle-Class: Often holding down regular or semi-regular employment, these consumers are likely utilizing wood for current cooking needs but have the disposable income to purchase an improved solution
Segment 3	Urban Poor: Squeezed by higher living costs in urban centers, these consumers have very limited disposable income but do not face the same level of logistical and awareness issues as the rural poor
Segment 4	Rural Middle-Class: Benefiting from lower living costs in rural areas and often self-employed, these consumers have some disposable income but limited geographic access to cleaner fuels
Segment 5	Rural Poor: Living below the poverty line and sometimes subsistence farming for survival, these consumers currently collect firewood and have higher financial and cultural barriers to a fuel switch

Segment 1 Profile: Affluent

This segment is small, has a large amount of disposable income, and has the highest current penetration of clean burning fuels such as LPG.

Who:
- Married women over 20
- Literate and high school educated
- $20,000+ in annual household income
- Takes care of home, children
- Steady employment or reliant on partner's substantial income

When:
- Cooking occurs 2-3 times a day, with family likely dining out on occasion

Why:
- Stove/Fire used almost exclusively for cooking
- Little or no cultural attachment to smoke
- Aware of health issues of smoke

What:
- Food: Rice, chicken, fish, western foods
- Stove: LPG, Kerosene, or electric and occasional use of wood fire for taste (e.g. BBQ)

Affluent:
1% of Total HH
2K Households
IAP Exposure: Minimal

How:
- Purchase stoves at retail stores
- LPG / Kerosene purchased at retail outlets and likely transported home by self or local entrepreneur
- Connected to electric grid

Where:
- Live in a house or apartment of either concrete or wood; thatch roof unlikely
- LPG/Kerosene/Electric stove in kitchen or separate room
- BBQ or stone fire likely outside for occasional cooking

Switching:
- $$$: Can afford higher priced products and fuels; high willingness to pay
- Will switch if product provides financial or health benefits
- Possible perception issues with LPG safety

Source: Timor-Leste DHS (2010)

Segment 2 Profile: Urban Middle- Class

With a significant amount of disposable income, good access to distribution infrastructure, and low barriers to fuel switching, this segment is both sizeable and attractive for improved cooking solutions.

Who:
- Married women over 20
- Literate with some schooling
- $10-20K in annual household income
- Takes care of home, children
- May be employed or reliant on partner's limited income
- Jobs: service, taxi, clerical

When:
- Cooking occurs 2-3 times a day, with family possibly dining out on occasion

Why:
- Stove/Fire used mainly for cooking, limited insect repellant
- Little cultural attachment to smoke
- Limited awareness of health issues of smoke

What:
- Food: Rice, chicken, fish, western foods
- Fuel: Electric, Kerosene, Wood (majority)

How:
•Improved cookstoves and fuel purchased at retail stores and transported home
•Wood purchased from local entrepreneurs
•Likely connected to electric grid (>83%)

Where:
- Live in an apartment of concrete or wood; may live in shack or improved hut in or around the city
- Cook in house (14%), separate room (79%) or outside (8%)
- Open fire/stove without chimney/hood (majority), with chimney/hood (under half)

Urban Middle-Class:
8% of Total HH
~15K Households
IAP Exposure: Moderate

Switching:
•$$$: Can possibly afford higher priced products and fuels; moderate willingness to pay
•Will switch if product provides financial or health benefits
•Perception issues with safety of LPG

Source: Timor-Leste DHS (2010)

Segment 3 Profile: Urban Poor

With very little money to spare, this segment is very price sensitive and will likely need to see immediate and clear financial, time, or health benefits to any potential cookstove solutions

Who:
- Married/single women over 15
- Partially literate, little schooling
- Under $10K in annual household income
- Takes care of home, many children
- May be employed or reliant on partner's very limited income
- Jobs: fishing, manual labor, taxi

When:
- Cooking occurs 2-3 times a day, with little to no dining out

Why:
- Stove/Fire used for cooking, insect repellant, cultural reasons
- Some cultural attachment to smoke
- Very limited awareness of health issues of smoke

What:
- Food: Rice, chicken, fish
- Fuel: Wood (vast majority)

How:
- Small % may have clay stoves purchased from orgs like Haburas / Bili Bala and transported home
- Wood purchased from local entrepreneurs
- Possibly connected to electric grid (under half)

Where:
- Live in shack or hut in or around the city
- Cook in house (14%), separate room (79%) or outside (7%)
- Open fire/stove without chimney/hood

Urban Poor:
12% of Total HH
~22K Households
IAP Exposure: Extensive

Switching:
- $$$: Cannot afford higher priced products and fuels; low willingness to pay
- May switch if product provides very clear benefits in money or time saved, demonstrations likely required

Source: Timor-Leste DHS (2010)

Segment 4 Profile: Rural Middle Class

Sector Mapping

Who:
- Married/single women over 20
- Literate or partially literate with some schooling
- $5-10K in annual HH income
- Takes care of home, children
- Likely self-employed or reliant on partner's limited income
- Jobs: café/shop owner, artisan, entrepreneur

When:
- Cooking occurs 2-3 times a day, with family possibly dining out on occasion

Why:
- Stove/Fire used for cooking, insect repellant, roof reinforcement, cultural reasons
- Some cultural attachment to smoke
- Limited awareness of health issues of smoke

What:
- Food: Rice, chicken, fish, western foods
- Fuel: Electric (<1%), LPG/gas (<1%), Kerosene (<1%), Wood (97%)

How:
- 3-stone open fire, not purchased
- Wood purchased from local entrepreneurs or collected
- Possibly connected to electric grid (majority)

Where:
- Live in concrete home or improved shack in or near towns
- Cook in house (10%), separate room (86%) or outside (4%)
- Open fire/stove without chimney/hood (<83%), with chimney/hood (>14%)

Rural Middle-Class:
21% of Total HH
~39K Households
IAP Exposure: Significant

Switching:
•$$$: Can possibly afford higher priced products and fuels; low willingness to pay
•May switch if product provides very clear financial or health benefits, demonstrations helpful
•Perception issues with safety of LPG

Source: Timor-Leste DHS (2010)

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Segment 5 Profile: Rural Poor

Relying on subsistence farming or sporadic employment, this segment lies below the poverty line and requires extremely low cost and a large investment to remove logistical and cultural barriers.

Who:
- Married/single women over 15
- Illiterate, little/no schooling
- <$5K in annual household income
- Takes care of home, many children
- Likely subsistence farmer or manual laborer
- Jobs: manual labor, farming

When:
- Cooking occurs 2-3 times a day, almost always cooked by family members
- May not cook when food is unavailable

Why:
- Stove/Fire used for cooking, insect repellant, roof reinforcement, agricultural & cultural reasons
- High cultural attachment to smoke
- Negligible awareness of health issues of smoke

What:
- Food: Rice, chicken, fish
- Fuel: Wood (all)

How:
- Wood collected by family members, some purchased from local entrepreneurs (minority)
- No electricity

Where:
- Live in shack or huts near or away from towns
- Cook in house (10%), separate room (86%) or outside (4%)
- Open fire/stove without chimney/hood (>83%), with chimney/hood (<14%)

Rural Poor:
58% of Total HH
~106K Households
IAP Exposure: Extreme

Switching:
- $$$: Cannot afford higher priced products and fuels; low willingness to pay
- Heavy investment in awareness required for switching , demonstrations likely required

Source: Timor-Leste DHS (2010)

Segment 6 Profile: Institutional

In order to capture the centralized usage of cookstoves by public establishments, a final "institutional" segment was created to cover cookstove usage in places like schools, hospitals, and prisons.

WFP, an Alliance implementing partner, is working with Haburas to develop an improved institutional cookstoves as part of its school feeding program.

- Institutional Segment: Schools[1] -

Level	Number of Schools	Number of Students	Number of Teachers
Primary	749	185,594	4,248
Junior Secondary	109	37,276	1,111
Senior Secondary	41	20,818	618
Total	899	243,688	5,977

- Institutional Segment: Prisons[2] -

Institutions	Number of Prisons	Number of Prisons Guards	Number of Inmates
Prisons	2	200	223

- Institutional Segment: Medical[3] -

Institutions	Number of Hospitals	Number of Healthcare Centers
Medical	11	355

Source: [1] Ministry of Education, Youth, Culture and Sports – Education & Training (2005); [2]2011 International Centre for Prison Studies;

[3] 1994: Robinson, G. "If you leave us here, we will die"

Source: Timor-Leste DHS (2010)

Cookstove Consumer Segments

IAP exposure, requirements from cooking device, barriers to adopt and access to technology vary across regions and across income level

- Attractiveness for Cookstove Program -

Segment	Size	IAP Exposure	Income	Distribution Access	Cultural Barriers	Alt Uses of Fuelwood
Affluent	◔	○	●	●	●	●
Urban Middle-Class	◑	◔	◕	●	◕	◕
Urban Poor	◑	◕	◔	◕	◔	◔
Rural Middle-Class	◕	◑	◑	◑	◑	◑
Rural Poor	●	●	◔	○	◔	○
Institutional	◔	◔	●	●	●	●

Legend:

- ○ Very unattractive conditions
- ◔ Unattractive conditions
- ◑ Neutral conditions
- ◕ Attractive conditions
- ● Ideal conditions

IAP exposure is lower in urban and higher income groups, it is highest in the rural poor

Income and access to finance influences the type of technology that gets adopted

Access to clean fuels also drives adoption, rural regions have poor access to LPG and electricity

Cultural attachment to smoke and preference for smoky flavor is a barrier to adoption of efficient stoves in rural areas

Alternate use for smoke to repel insects and preserve roof and grain are barriers to adopt in rural areas

- Implications -

While not directly tied to a cookstove initiative, several organizations can provide critical support to a cookstove program through their awareness and education programs, and outreach network

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  - Indoor Air Pollution Assessment
  - Consumer Assessment
  - **Cookstove Industry Assessment**
- Sector Mapping Summary

Available Cookstove Cost

Current cookstoves are mainly self made at no cost, clean cookstoves can require significant upfront investment

- Upfront Cost by Product[1] -

Product Costs

- Improved Cookstoves (ICS) are the cheapest option at $2-8, depending on the product and producer
- LPG requires significant upfront investment as the buyer must also purchase a 9kg bottle along with the $50+ unit
- Biogas requires a very large upfront investment but only requires time, opportunity cost of selling livestock, and occasional maintenance as an ongoing cost
- Payment for cookstoves is almost always in cash

- Implications -

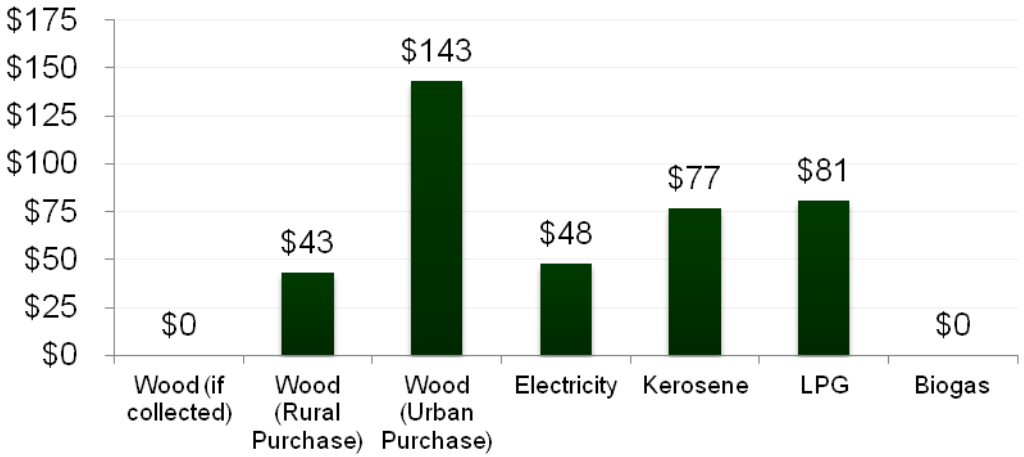
Cookstove technology should be designed to keep the initial price low and should be paired with financing mechanisms such as microcredit or other incentives to bring down costs

Source: [1] MercyCorps E4A Report 2010 and interviews

Available Fuel Cost

Data indicates that the ongoing cost of firewood use in urban areas is actually significantly higher than clean alternatives such as LPG and electricity

- Fuel Cost per Gigajoule (GJ)[1] -



Fuel	Unit of purchase	Cost
Wood	1 week supply / 60 kg bundles	$3 Rural / $10 Urban
Electricity	2A connection + Usage	$2.50/mo, $0.12/KwH*
Kerosene	1-4L bottles	$1/L
LPG	9kg bottle (2 month supply)	$40
Biogas	None	Time input, maintenance

Fuel Costs

- The data shows a compelling economic argument for LPG & electricity use in urban areas where cost of firewood is actually higher on an ongoing basis
- Electricity, where available, is relatively cheap due to significant government subsidies
- Outside of urban centers, electricity is only available 6 hours a day (6pm-12am)
- A current barrier to LPG use is the significant upfront investment ($100 for stove, bottle and deposit)
- Further study should seek to understand why LPG & electricity uptake has been so low

- Implications -

A cookstove program should consider driving penetration of clean fuels in consumer segments where the cost of firewood is high enough to make an economic benefit case for clean fuels

Source: [1] World Bank Scoping Study 2007

*Note that electricity is currently subsidized in Timor-Leste

Current Technology Landscape

Although a detailed technical study was not conducted, ratings were made against a list of high-level product attributes

Product (Stove and Fuel)	Upfront Cost	Current Availability	Secondary Uses	Usability	Durability	Health Benefits
Mud ICS	○	◔	●	●	○	◔
Clay ICS	◔	◔	●	●	◔	◔
Metal ICS	◑	◔	●	●	●	◑
Electric	◑	◑	○	◕	◑	●
Kerosene	◕	◔	◑	◕	◕	◑
LPG	◕	◔	◔	◔	◕	●
Biogas	●	◑	◔	◑	●	●
Briquettes	◔	◔	●	●	N/A	◔

Legend: Score

- ○ **Minimal**
- ◔ **Low**
- ◑ **Medium**
- ◕ **Medium-High**
- ● **High**

While Haburas's briquette program was relatively popular, insufficient raw materials limited supply

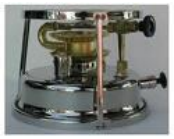
Advanced fuels such as electricity, LPG, and biogas do not address the alternative uses of smoke such as insect repellant, thatch roof reinforcement, cultural attachment, etc

LPG usability takes into account safety concerns around handling and usage

Lower standardization and quality control increases variability of health benefits for mud, clay & briquette solutions

Additional Technology Considered

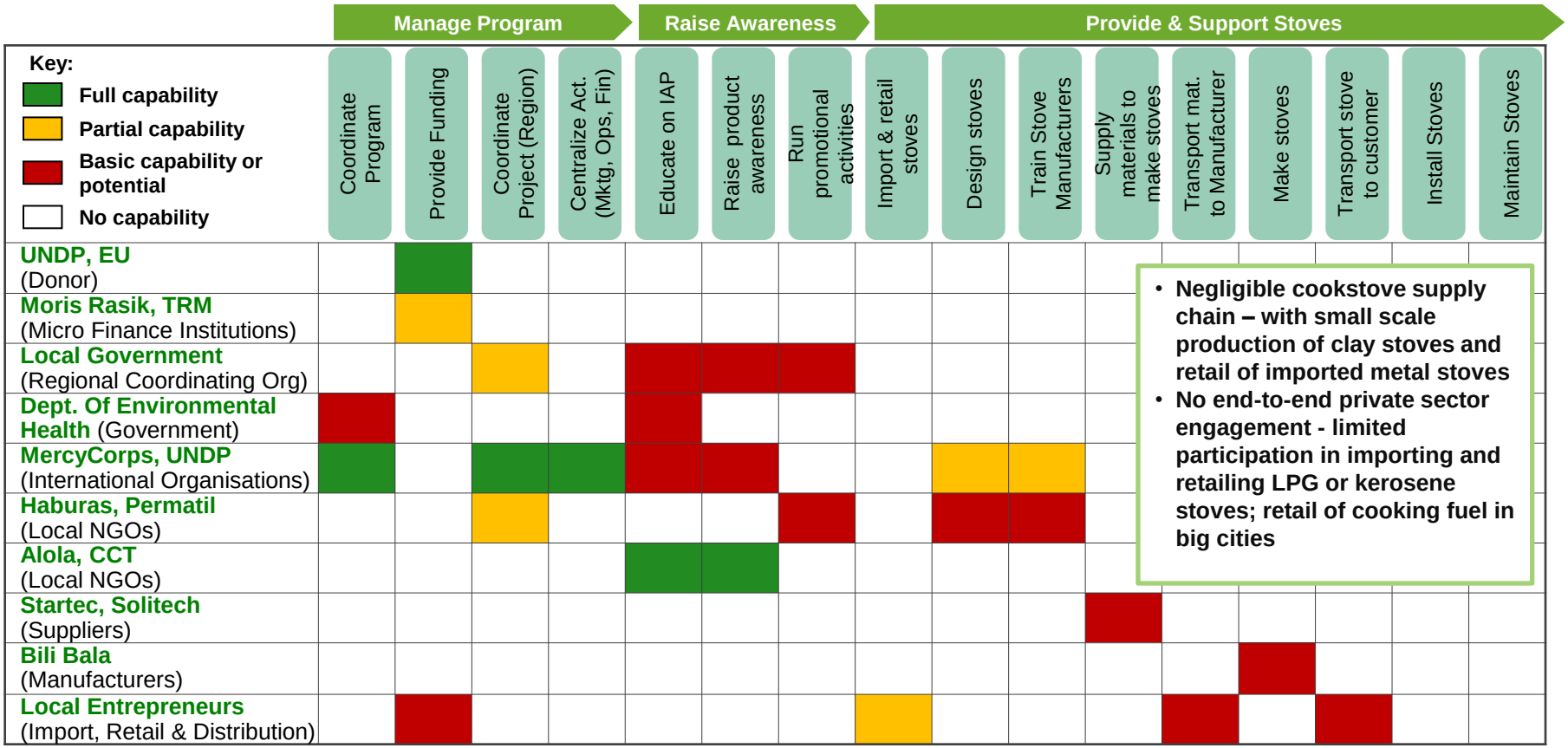
Other cooking devices / fuels may also be attractive alternatives to the current cookstoves being used

Technology		Attractiveness	Pros	Cons
Metal ICS using Firewood		◕	▪ High fuel-efficiency ▪ Low switching cost as it burns firewood ▪ Low manufacturing cost ▪ Can be imported until local production capacity is built ▪ Firewood in abundant supply	▪ No existing supply – production, distribution and retail
Metal ICS using Charcoal		◑	▪ High fuel-efficiency ▪ Low manufacturing cost ▪ Can be imported ▪ Safer than firewood as less smoke released and easier to handle ▪ Charcoal production can be an income generating industry	▪ No existing supply – production, distribution and retail ▪ Low existing charcoal usage ▪ No existing supply – production, distribution and retail ▪ Risk of increased deforestation from inefficient charcoal production
Ethanol		◔	▪ Clean burning fuel ▪ Can be imported until local production capacity is built ▪ Ethanol production can be an income generating industry	▪ No existing Ethanol production ▪ Requires high investment in Ethanol production ▪ High cultural barrier to switch ▪ Risk increasing existing food shortages
Solar		◑	▪ Clean burning fuel ▪ Can be imported until local production capacity is built ▪ Fuel is free	▪ High cultural barrier to switch ▪ Limited usage

● High
◕ Medium
◑ Low
◔ Minimal

Cookstove Industry Value Chain

The cookstove industry in Timor-Leste is very immature with basic small-scale capabilities to import, produce, distribute and retail cookstoves



- Implications -

Developing a sustainable and scalable clean cookstove and fuels industry is a long term effort and will require a commitment of 10-15 years

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Summary

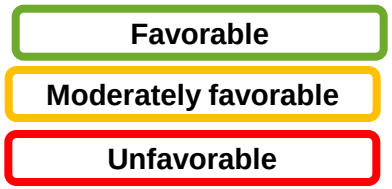
While the macro and IAP environment can be considered favorable, the consumer is not ready and the components for an industry are currently very weak

MACRO ENVIRONMENT
- + Govt. committed to development
- + Several national policies or programs that are related or compatible to clean cookstove program
- + Govt. wants to promote energy efficient stoves
- + Political risks low
- + Some success stories for NGO intervention
- - Govt. lacks technical and resource capacity
- - Very limited MFI reach

IAP
- + IAP levels create need for intervention
- + Primary causes are cooking fuel and device
- + Some pilot programs by international and local NGOs
- - Minimal consumer level awareness
- - High alternate use of fire and smoke in rural areas
- - Not enough IAP research available

CONSUMER
- + Clean fuel usage in some segments
- - No culture of burning in cooking device and fuel in many rural areas
- - Very low affordability in rural areas and in urban poor
- - Strong preference for traditional cooking method
- - Cultural attachment to smoke in rural areas

COOKSTOVE INDUSTRY
- + High unemployment creates low cost labor opportunities
- - Negligible supply chain
- - Abundant firewood, poor availability and affordability of clean fuels
- - Lack of robust raw material
- - Poor manufacturing skills and capacity
- - No private sector engagement



- Implications -

Coordinate favorable factors such as the Government and NGOs to develop a solution that addresses consumer needs and can be commercialized into an industry

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Glossary of Terms

Below is a list of commonly used acronyms used throughout the report and presentation:

ALRI – Acute Lower Respiratory Infection

CDM – Kyoto Clean Development Mechanism

CF – Carbon Finance

DNA – Designated National Authority

EU – European Union

GACC – Global Alliance for Clean Cookstoves

GJ – Gigajoule

GIZ – Gesellschaft für Internationale Zusammenarbeit

HH – Household(s)

IAP – Indoor Air Pollution

ICS – Improved Cookstove

CVTL – Cruz Vermelha de Timor-Leste (local Red Cross National Society)

iNGO – International Non-Governmental Organization

LPG – Liquid Petroleum Gas

MFI – Microfinance Institution

NGO – Non-Governmental Organization

COPD – Chronic Obstructive Pulmonary Disease

Q# – Quarter

RDTL – Democratic Republic of East Timor

SISCa – Servisu Inegrado Sude Communita (Integrated Community Health Services)

TL – Timor-Leste

UN – United Nations

UNDP – United Nations Development Program

UNICEF – The United Nations Children's Fund

USAID – United States Agency for International Development

USD – US Dollars

WB – The World Bank

WFP – World Food Program