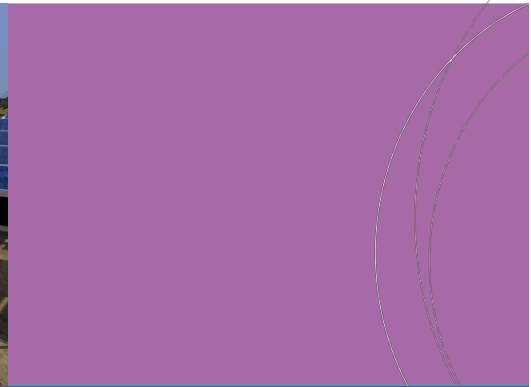


Access to Energy in Low-income Communities in the Latin America and Caribbean Region: Lessons Learned and Recommendations



This report was prepared by Arc Finance, the Basel Agency for Sustainable Energy (BASE) and Poch Ambiental in 2013, as part of a study commissioned by the International Finance Corporation (IFC), in partnership with the Finnish Ministry for Foreign Affairs.

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ACRONYMS AND ABBREVIATIONS

CDM	Clean Development Mechanism
CO ₂	Carbon dioxide
DALY	Disability-Adjusted Life Years
DC	Direct current
ECAMI	Communications Companies [<i>Empresas de Comunicaciones</i>]
GHG	Greenhouse Gas
IDB	Inter-American Development Bank
IDEAAS	Institute for Development of Alternative Energies and Self-Sustainability [<i>Instituto para o Desenvolvimento de Energias Alternativas e da Auto Sustentabilidade</i>]
IEA	International Energy Agency
IFC	International Finance Corporation
IRR	Internal Rate of Return
KfW	German government-owned development bank
kW	Kilowatt
kWh	Kilowatt-Hour
LAC	Latin America and the Caribbean (LAC)
MFI	Microfinance Institution
NAMAS	Nationally Appropriate Mitigation Action
NPV	Net Present Value
PoA	Programme of Activities
PV	Photo Voltaic
ROI	Return on Investment
SHS	Solar Home Systems
SME	Small and Medium Enterprises
SWOT	Strength, Weakness, Opportunity, Threat
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
WHO	World Health Organization

EXECUTIVE SUMMARY

This report draws from three different sources. First, from an in-depth analysis of the business models, financing approaches, product offerings and expansion strategies of three distinct organizations that provide clean energy services in rural Latin America and the Caribbean (LAC): IDEAAS (Brazil); EMPRENDIA (Argentina/Peru); and ECAMI (Nicaragua). Second, from a series of workshops that took place in Brazil, Nicaragua and Peru, which included the organizations analyzed, as well as other players in the Latin American finance and energy space. Third, from best practices and lessons learned globally, which the project team believes are relevant to the project and its participants.

The report has six sections: 1) Project objective and methodology; 2) Introduction; 3) Case studies; 4) Best practices; 5) Proposed new products and services; and 6) Lessons learned.

The first two sections lay out the background for the project, placing it in the context of energy access for the rural communities in LAC as a whole, and the countries studied in particular. The introduction also lays out the barriers faced by the organizations studied, including financial, business model, technology-related and country-level barriers.

The case study section provides a general overview of each of the organizations that were analyzed and includes an organizational description, an analysis of market demand, customer segmentation, competitors, and obstacles faced. The case studies also outline the results of the SWOT analysis, an assessment of financial sustainability and a cost benefit analysis of the products being sold from the client's perspective. The material for this section is drawn from individual case studies produced on each of the organizations and presented to the organizations in 2011.

The section on best practices draws out specific examples identified in the analysis of each of the organizations. These are practices that could be of value to other organizations operating in the rural clean energy space, especially those that are operating in similar environments to the ones studied. The consulting team highlighted these practices in the individual case studies and during the final project workshop in June 2012.

The section on proposed new products includes recommendations for each of the organizations on new products that they might include to enhance their businesses. The recommendations relate to diversifying the products sold and to suggestions on new financial products that the organizations might consider adding to enhance operations. These recommendations were provided to each of the organizations in the individual case studies presented in 2011 and were discussed during the three workshops of the project.

The section on lessons learned draws on lessons specific to each of the organizations studied, and on lessons learned globally that the team deemed relevant to the project. The team included generic as well as specific context-related lessons. The more generic lessons were included to highlight basic good business practices (such as conducting market studies before developing new products or having a robust business plan in place) from which the organizations analyzed may benefit.

1 PROJECT OBJECTIVE AND METHODOLOGY

1.1 OBJECTIVE AND DESCRIPTION

The objective of this project was to analyze three companies' business models that promote access to clean energy in rural areas in the LAC region, with the aim of providing recommendations to improve their operations and to facilitate their expansion and replication. More specifically, the recommendations focused on the incorporation of new products and services that could create additional revenue streams for the analyzed organizations, with the goal of improving their financial viability.

The project had the following components:

- Research on the obstacles facing rural clean energy providers;
- Analysis of existing clean energy business models;
- Development and incorporation of new products and services to improve business models;
- Carbon finance analysis;
- Mechanisms to expand reach; and
- Lessons learned.

This project was focused on the following three organizations, which provide clean energy services in rural areas of LAC: 1) IDEAAS (Brazil), 2) EMPRENDA (Argentina/Peru), and 3) ECAMI (Nicaragua). The three companies represent diverse organization types, differing in terms of business model and geographic location.

This initiative was also aimed at helping IFC to better understand the role it could play in expanding access to rural clean energy in LAC and to identify specific projects for follow-up support.

The report focuses primarily on lessons learned from the analysis of the three organizations and on the recommendations that were derived from these lessons. Its main objective is to share experiences and disseminate "best practice" recommendations in order to improve the ability of organizations to provide access to affordable, clean energy for rural areas in LAC.

1.2 METHODOLOGY

This project was based on an analysis of three organizations operating in different geographical areas of LAC, each with a unique business model. A team of development experts carried out the analysis, which included an assessment of each organization's target markets, a financial analysis, a cost-benefit analysis comparing clean energy products with more conventional energy sources and a SWOT (Strength, Weakness, Opportunity, Threat) analysis.

In addition, recommendations were made as to specific new products and services, improvements to each business model, and potential partnerships that could strengthen each organization.

This report summarizes the different business models, examines the findings, and provides information on the lessons learned. It provides recommendations for participants that would like to engage, or are already engaged in, supporting access to clean energy in rural areas in LAC.

2 INTRODUCTION

2.1 BACKGROUND INFORMATION

Access to affordable, modern energy services is important both for an individual's health and well-being and for a country's economic prosperity and development. However, according to the International Energy Agency's (IEA's) "World Energy Outlook 2011", globally there are some 1.3 billion people without access to electricity and 2.7 billion without access to clean cooking facilities. In LAC, over 31 million people -- 7% of the regional population -- live without grid-connected electricity, while 85 million --19% of the population -- are without clean cooking facilities. Most of these people live in rural areas and depend on wood, kerosene, candles, expensive disposable batteries and other rudimentary, and often more costly, forms of energy.¹

According to the IEA report cited above, generated electricity would need to increase by just 2.5% in order to provide electricity to all people on the planet by 2030. Similarly, providing full energy access to the world's population (including electricity and clean cooking practices) would only increase global energy demand by 1.1%. Fossil fuel demand would rise by just 0.8% and CO₂ emissions by 0.7%. If provided, access to clean, modern energy services would radically improve the lives of the poor by fostering access to education, promoting gender equality, supporting environmental sustainability, preventing premature deaths from respiratory diseases, and accelerating global economic growth and prosperity.

In order to provide universal modern energy access by 2030, substantial investments are needed by both the public and private sectors. The IEA report estimates that it would be necessary to invest US\$ 48 billion per year. However, the annual investment in 2009 to extend modern energy services was just US\$ 9.1 billion.² Today, IEA estimates that US\$ 14 billion is being invested annually, so investment would need to increase by US\$ 34 billion a year in order to reach the 2030 target. In the case of LAC in particular, an investment of US\$ 300 million per year would be required to provide clean electricity, whilst an investment of US\$ 200 million per year would provide clean cooking solutions for rural poor families.³

There is an important role for public and private sector investors in addressing this challenge. All sources of funding would need to grow significantly, with the private sector requiring the largest increase. Public finance (including financing provided by multilateral and bilateral institutions) would need to develop innovative mechanisms to incentivize and leverage greater private sector investment as well as encourage the development of replicable business models. National governments would have to adopt conducive regulatory environments, strong governance frameworks and invest in internal capacity building.⁴

In each of the countries studied during this project, there were significant challenges to accessing energy in rural areas. Nicaragua has one of the lowest rates of electricity coverage in the LAC region; only about 52% of its population has access to electricity. Peru fares slightly better; 80% of the population has access to electricity, but approximately six million people do not have such access. While Brazil has higher overall levels of access to electricity, in certain rural areas, including the Amazon region, only 70% of households have access.⁵

¹ www.iea.org/topics/energypoverty/

² www.iea.org/newsroomandevents/pressreleases/2011/october/name,20316,en.html

³ <http://alainet.org/active/50130&lang=es>

⁴ Energy and Poverty: Myths, Links, and Policy Issues, Jamal Saghir, World Bank.

⁵ Latin America and the Caribbean Region Energy Sector – Retrospective Review and Challenges, ESMAP.

In many rural areas in LAC, expansion of the electric grid may take decades to establish, and may not be economically feasible given the prohibitive costs of expansion efforts in areas such as the mountainous Andes or the Amazon jungle. Cost is not the only challenge: other factors include potentially negative environmental effects in parts of the Amazon.⁶ The cooking stoves used in rural areas are often quite primitive and have poor combustion efficiency. In some cases, this has resulted in excessive biomass use and unsustainable forest management practices that have contributed to higher levels of deforestation seen in many developing countries, including those in LAC.⁷ For lighting, households without electricity generally rely on kerosene lamps that are expensive to maintain and inefficient at transforming energy into light. Communications in these areas are often limited to radios powered by expensive dry cell batteries. Many low-income households spend a large percentage of their income on these inefficient and unhealthy energy solutions. At the end-user level, access to clean energy products and services, as well as access to finance to purchase these products, are key factors that need to be addressed.⁸

Today, there are reliable alternatives to grid electricity and carbon-based fuels that are not dependent on the expansion of grid electricity systems. These include a range of reliable renewable energy systems that can provide energy services for rural areas. Given the availability of these resources, it is now possible to speed up the transition to clean and modern energy services by accelerating the development of off-grid renewable systems.⁹

Past attempts to market and sell home solar systems in rural areas were hampered because the solar systems market was an overly narrow one. The technologies were often too expensive for end-users, there was a lack of product diversity and it was difficult for businesses to survive. However, solar businesses are realizing that by expanding their product ranges and offering products beyond solar home systems, they can develop more stable and sustainable business models; additional products increase income streams, which in turn mitigate risk. Today rural energy service providers can incorporate a wide variety of other products and services, such as improved cooking stoves, efficient lamps/LEDs, water purification systems, solar crop dryers, solar water heaters, water pumps that use wind or solar energy, biodigestors and greenhouses, among others.¹⁰

In parallel, there has been growth in the development of new end-user financing mechanisms that poor people can use to purchase products or pay for services. Microfinance has played an important role in improving the economic opportunities available to the poor in LAC, but the experience to date with loans for energy services and products has been limited. However, there is growing interest by microfinance institutions (MFIs) in this sector and evidence that multilaterals will provide support for MFIs to experiment in this area.¹¹ For example, the Inter-American Development Bank (IDB) has been encouraging microfinance lending for clean energy in LAC through initiatives like Ecomicro¹² (a facility specifically designed to encourage MFIs to begin clean energy lending) and Climatescope¹³ (an online publication that lists all MFIs in LAC that are engaged in green lending).

There are also other mechanisms such as remittances, microleasing and pay-as-you go metering systems for off-grid areas that may offer more promising financing options for poor consumers in the future. Pilots promoting the use of remittances for clean energy have already been launched in

⁶ Development Effects of Electrification: Evidence from the Geologic Placement of Hydropower Plants in Brazil, Molly Lipscomb University of Colorado, Boulder; A. Mushfiq Mobarak, Yale School of Management; Tania Barham, University of Colorado, Boulder

⁷ Renewables 2010: Global Status Report. Page 49.

⁸ Project description. Access to finance, rural clean energy, IFC.

<http://www1.ifc.org/wps/wcm/connect/6e53428048926445b84ffe81dd77ebd3/A2F-Rural+Clean+Energy.pdf?MOD=AJPERES>

⁹ Evaluating the potential of small-scale renewable energy options to meet rural livelihoods needs. John Byrne, Aiming Zhou, Bo Shen, Kristen Hughes Center for Energy and Environmental Policy, University of Delaware, Newark, DE 19716, USA

¹⁰ ENERGY FOR DEVELOPMENT, The Potential Role of Renewable Energy in Meeting the Millennium Development Goals. REN 21.

¹¹ Innovative Financing for Development: A New Model for Development Finance? January 2012. UNDP.

¹² www.ecomicro.org

¹³ climatescope.fomin.org/

Haiti¹⁴ and Bolivia¹⁵. Microleasing efforts have been piloted in several LAC countries, including Brazil and Honduras. Pay-as-you go metering systems are being piloted in Nicaragua.

Several small-scale clean energy devices have the potential to generate carbon credits. These carbon credits may help the expansion and promotion of renewable energy technologies in rural areas by producing additional revenue to make the technologies more affordable. However, the current methodology for carbon funding is complicated and not viable for small projects. There are some organizations that have been able to provide carbon credits through the Clean Development Mechanism (CDM) or the Voluntary Carbon Market, utilizing bundling approaches, such as Programmes of Activities (PoA). Carbon credits may provide a way to generate additional revenue streams to achieve the dual goal of alleviating poverty and reducing greenhouse gas emissions. Another alternative could be Nationally Appropriate Mitigation Actions (NAMAs) in order to obtain additional revenue streams. The proposed NAMAs are voluntary, are administered by the government and can be proposed at a local, sectoral or national level. They can be directed towards capacity building, emissions reductions, and technology transfer. These actions should allow developing countries to adapt and receive support from developed countries to define actions appropriate to the national reality.¹⁶

2.2 DEFINITION OF RURAL CLEAN ENERGY

Rural Clean Energy

“Rural clean energy” refers to the energy consumed in rural areas that is produced using sustainable resources. This includes renewable energy technologies, such as solar, small scale hydro power plants, small wind turbines, biomass and biogas, and energy efficiency devices, such as more efficient cook stoves and more efficient energy consumption devices (lighting, TV, ventilator, etc).

The energy needs in rural areas include energy for productive applications (e.g. agriculture, small retail shop, or workshops) and household consumption (for cooking, provide lighting, powering a radio or charging a mobile phone).¹⁷ The renewable energy technologies for rural areas are usually very small devices, which should be adapted to the local (and sometimes extreme) weather conditions, dust, and other environment factors that could affect the performance and lifetime of the devices.

Energy Poverty

According to the IEA, “Energy poverty” is the lack of access to modern energy services. Energy poverty normally refers to communities and families that live in developing countries and cannot afford to pay for basic energy services; by extension, it infers that their basic living needs are not being met.¹⁸

According to one group of international rural development experts¹⁹, a person lives in “energy poverty” if he or she does not have access to at least the following:

- (a) The equivalent of 35 kg to 100 Kg of liquefied petroleum gas (LPG) for cooking per capita per year from liquid and/or gas fuels or from an improved supply of solid fuel sources and improved (i.e., efficient and clean) cooking stoves.

¹⁴ <http://haiti.mifcommunity.org/document/financing-sustainable-energy-through-remittance-flows-haiti-and-dominican-republic>

¹⁵ <http://www.ndf.fi/index.php?id=157>

¹⁶ Carbon finance: a guide for sustainable energy enterprises and NGOs. GVEP.

¹⁷ Power to the People, Centre for Development Finance, World Research Institute.

¹⁸ Towards an ‘Energy Plus’ Approach for the Poor. UNDP.

¹⁹ Expert Advisors Workshop Indonesia, 2008. http://practicalaction.org/smoke//text/advocacy/docs/region_south_asia/energy-poverty-in-sri-lanka-2008.pdf

- (b) Access to electricity for lighting, between 20 KWh and 120kWh per capita per year), as well as access to drinking water, communication, improved health services and improved education.²⁰

An “improved energy source” for cooking requires less than four hours of labor per week per household to collect fuel, meets the recommendations of the World Health Organization (WHO) for air quality (maximum concentration of CO of 30 mg/M³ for 24 hour periods and less than 10 mg/ M³ for periods of eight hours of exposure), and has an overall energy conversion efficiency higher than 25%.²¹

Most rural areas in developing countries rely on traditional biomass, such as charcoal and coal, and traditional non-renewable energy sources, such as kerosene, candles, disposable batteries, and diesel for energy sources.²² In developing countries women are usually responsible for gathering energy resources; they typically spend many hours a day harvesting energy and cooking, which can lead to chronic fatigue. As a result, they cannot pursue productive paid work.

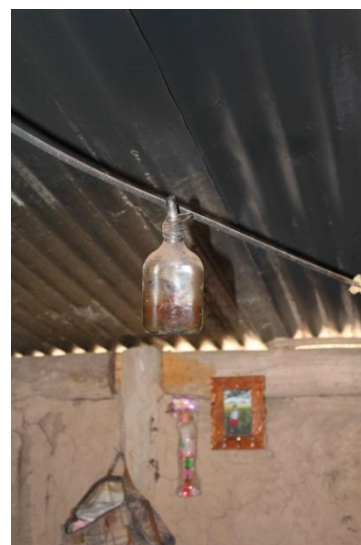


Figure 1: Kerosene lamp burner

Moreover, women and children who spend long periods of time in the kitchen are exposed to high levels of indoor air pollution caused by burning traditional biomass. The WHO has identified indoor air pollution as the cause for 2.7% of deaths and disability from major diseases, injuries, and risk factors. According to the WHO, indoor air pollution from solid fuel use accounts for more than 1.6 million deaths and 39 million Disability-Adjusted Life Years (DALYs)²³ every year.²⁴

Energy plays an essential role in the realization of the United Nations’ Millennium Development Goals, and the overall achievement of development. There is a direct relationship between the lack of energy services and many poverty indicators, such as life expectancy, illiteracy, infant mortality, and fertility rates.²⁵

Energy Poverty in Latin America

There are large variations in electrification rates across and within regions. East Asia and the Pacific have an access rate of 90%, and the Middle East has 89%. By contrast, South Asia has an electrification rate of 68.5% and Sub-Saharan Africa only 30.5%; the populations without electricity in these two regions account for 83 % of the total world population without electricity. Sub-Saharan Africa has by far the lowest urban and rural access rates at 60% and 14%, respectively. In South East Asia, many of the people who lack electricity live in densely populated areas, whereas, in Sub-Saharan Africa these populations are more dispersed.²⁶

The situation in Latin America is distinct, it has an overall access rate of 93.2% (98.8% in urban and 73.6% rural), but there are 31 million people without electricity.²⁷ Unlike South Asia, most of the

²⁰ Integrating Energy Access and Employment Creation to Accelerate Progress on the MDGs 2012. UNDP.

²¹ UK Parliamentary Office of Science and Technology. “Access to energy in developing countries,” December 2002 Number 191. <http://www.parliament.uk/documents/post/pn191.pdf>

²² Rural Energy in Developing Countries. Jose Goldemberg. UNDP.

²³ DALY = Disability-Adjusted Life Years, a measure combining years of life lost due to disability and death.

²⁴ World Health Organization. Indoor Air Pollution, Health and Burden of Disease. <http://www.who.int/indoorair/info/briefing2.pdf>

²⁵ Keeping the promise: realizing the Millennium Development Goals for persons with disabilities towards 2015 and beyond. Report of the Secretary-General. United Nations.

²⁶ Addressing the Electricity Access Gap. Background Paper for the World Bank Group Energy Sector Strategy. June 2010.

²⁷ World Energy Outlook. 2011 International Energy Agency. Access to Electricity.

<http://www.worldenergyoutlook.org/resources/energydevelopment/accesstolectricity/>

people without access in LAC are located in isolated communities or areas with low population density; therefore, providing them with access requires a different approach and a business model, with different cost implications.

2.3 BARRIERS

Rural clean energy providers face a range of barriers in developing countries, regardless of whether they work in rural or urban areas. The barriers include the following:

A. Financial Barriers

Lack of appropriate end-user financing mechanisms. The majority of potential clients in off-grid rural areas are families with low power purchasing capacity and unstable incomes. Many depend on cyclical activities that provide “lumpy” income streams, which make it difficult to develop end-user financing mechanisms that match their ability to pay. These types of customers need mechanisms to pay in small increments and to match their payment patterns with their erratic income flows.²⁸

Risk aversion of potential financing entities. Financial institutions (including microfinance institutions) have limited knowledge about market opportunities in the rural clean energy sector and how to develop financial instruments for this sector. Their risk aversion to invest in rural clean energy is a key barrier to increasing end-user financing.²⁹

Access to working capital. Small and Medium-sized enterprises (SMEs) in developing countries have significant challenges in accessing capital to expand and grow. They often face unfavorable financing conditions and a lack of regulatory support, which impede their growth and competitiveness and make survival more difficult. They also find it challenging to access capital that is appropriate for their stage of development (for example, newer companies that are experimenting with a new business model may need grants or soft loans, whereas more established companies likely need debt).

Liquidity constraints. SMEs in developing countries that sell energy equipment or products often face short-term liquidity problems that compound their financial vulnerability due to the fact that they need to purchase inventory prior to effecting sales. These SMEs need access to bridge funding to enable them to manage these financing constraints.³⁰

B. Business Model Related Barriers

Misguided business models. In the past, rural clean energy has been highly dependent on donor funds or government subsidies, and this has limited the development of strong and profitable market-based business models. Well-meaning but arguably destructive attempts have been made to stimulate the clean-energy market by providing technology subsidies. However, the effect has been to discourage potential buyers to buy at market prices, resulting in market spoilage.³¹

Inability to achieve economies of scale. SMEs providing clean energy services in developing countries have difficulty benefiting from economies of scale (i.e. where a company is able to decrease its costs and increase its competitiveness when the number of installed units or the services

²⁸ Rural Finance, Compiled By Tariq Md. Shahriar Institute of Microfinance (InM)

²⁹ CleanStart Microfinance opportunities for a clean energy future. UNDP.

³⁰ Improving the Competitiveness of SMEs in Developing Countries. The Role of Finance to Enhance Enterprise Development. UNCTAD.

³¹ Sustainable Energy For Equitable Development: Contribution to the World Bank Group's Energy Strategy Review and Development Bank Information Center.

provided increases).³² Because of the advantages of economies of scale, large firms tend to dominate many markets, and it is a challenge for smaller firms to become profitable.

Low population density. In LAC, often the most needy clients (small communities) are located in isolated areas with low population density that are difficult to reach. It is common to find families living in small clusters far away from one another. This situation makes the logistics of product disbursement and the collection of payments more complicated and costly. The sale, installation and maintenance of solar products are also more difficult under these circumstances.

Lack of adequate distribution channels. In rural areas energy businesses often find it difficult to reach their clients because they are dispersed geographically. Typically, potential rural clients are located in areas that have no paved access routes, and where energy transmission lines, phone, and Internet access are unavailable. To distribute energy systems from the origination point to the rural destination point is costly and logistically challenging. For example, in northwestern Argentina where EMPRENDA provides its services, it is necessary to have a four-wheel drive car and drive several hours in order to reach clients. Where IDEEAS is expanding in Brazil, potential clients who live near the Amazon River in Rio Tapajos can only be reached by boat and it takes several hours to reach the communities where they live. In Nicaragua, the potential clients of ECAMI live in small communities that are located in remote areas with very difficult access.

High operating costs. An important barrier for rural clean energy is the challenge of keeping operating costs low while increasing the volume of sales (number of clients). Difficult access and low population density can increase costs substantially, and this in turn affects the prices of the products. This barrier is particularly relevant for LAC due since households without access to energy are located in isolated, and difficult to reach communities/areas.

Poor management and corporate governance. Inferior managerial skills and a lack of corporate governance for SMEs in developing countries can also lead to businesses failure. Strong corporate governance provides companies with a set of rules, regulations and structures to achieve optimum performance, and a lack of these elements can undermine a company's success.³³

Lack of institutional capacity. SMEs have a number of institutional barriers, including: limited experience with planning comprehensive, integrated energy systems at the village level; weak networking with other energy companies, distributors of technology, and financial institutions; limited experience and knowledge of best practices in rural areas amongst different projects and stakeholders; and inadequate coordination (and alliances) between potentially complementary partners and initiatives. There are a number of reasons why financial Institutions are not financing these types of projects, but the lack of internal capacity to evaluate financial risks is a key factor impeding financing.³⁴

Social, cultural and gender barriers. Many rural areas have their own cultural and social values that are different from other regions. The products selected, and the business model chosen must take into account the values, cultural traditions and concerns of local communities, especially women, in order to ensure the sustainability of the business model, and the acceptance and correct use of the technology by the local people. Awareness about the costs and benefits of various clean energy systems is still lacking at the community level.³⁵

³² Barriers to Renewable Energy Technologies From Powerful Solutions: Seven Ways to Switch America to Renewable Electricity, UCS, 1999

³³ High-Growth Enterprises: What Governments Can Do to Make a Difference. OECD.

³⁴ Renewable Energy for Rural Livelihood (RERL) Programme.

³⁵ Energy and Gender in rural sustainable development. Yianna Lambrou and Grazia Piana FAO.

C. Technology Related Barriers

Technology. Clean energy technology presents operational limitations and some disadvantages when compared with conventional energy sources or energy provided by the grid.³⁶

- a) There are few industry norms for quality control in operations, service, technical specifications, or business approaches.
- b) There is a broad and growing range of energy needs and technology solutions that require deep analysis, making it is challenging for SMEs to stay current.
- c) Clean energy systems can present specific technical limitations. For example, solar home systems require energy from the sun to operate and charge the batteries. When the batteries are discharged and there is no sun to recharge the batteries, the system cannot function. This means the user has to control and manage the way the energy is used, which grid-connected users are not required to do.
- d) The performance of the system can be affected by other factors, such as the location of the system, the existence of pollution or other kinds of resource obstructions.

The clean energy sector is a relatively new market, and the availability of reliable and cost-efficient technology is not widespread. Most of the devices have to be imported, and some of them are not designed for rural environments. However, in the last few years, the prices of solar photovoltaic panels have been trending downward, which is helping to make solar energy more affordable to rural clients. The price of solar-PV modules dropped from more than US\$ 4 per Wp in 2008 to just under US\$ 1 per Wp as of January 2012, and is expected to continue decreasing in the future.³⁷

D. Country-Level Barriers

Vulnerability to macroeconomic instability. SMEs in developing countries are more vulnerable to shifts in macroeconomic conditions than larger companies that have the ability to mitigate macroeconomic instability in a range of ways, including relocation to another country if necessary. Larger companies tend to be more diversified, while the sales and operations of an SME normally depend on the economic performance of just one market segment. If that segment experiences challenges, it can destroy the small businesses in that sector.³⁸

Lack of enabling regulation. One of the most important business constraints reported by SMEs in developing countries is complying with existing government regulations or the lack of any coherent regulatory framework for rural energy access. Some SMEs face what they consider to be “over-regulation”, meaning inefficient, costly and lengthy registration and reporting procedures that hinder SME development. Other SMEs note that they operate in countries that lack regulations enabling providers of clean energy technologies, such as solar energy, to operate on a level playing field with larger, more traditional energy generators, and that there are insufficient tax or tariff incentives to encourage clean energy companies. This lack of enabling regulation, smart subsidies and incentives, and a clear government-endorsed framework for the rural energy sector adds further challenges to the promotion of clean energy in rural areas.³⁹

Contradictory government policies. A government’s stated plans regarding increased rural energy in isolated areas can either support or undermine SMEs in the energy sector. When a government announces an electrification or energy support program in a specific region, the interest of potential clients in clean energy home systems decreases considerably. For example, the Brazilian government announced a program to provide all Brazilians with access to electricity, diminishing the market

³⁶ Barriers to Renewable Energy Technologies From Powerful Solutions: Seven Ways to Switch America to Renewable Electricity, UCS.

³⁷ McKinsey - Solar power: Darkest before dawn. May 2012.

³⁸ Report on Support to SMEs in Developing Countries Through Financial Intermediaries. Dalberg, 2011.

³⁹ Policy Framework for Investment, OECD.

potential of IDEAAS. In Peru, the government has announced plans to extend the electricity grid in certain rural areas, which has discouraged potential clients from acquiring a clean energy system to solve their current needs. Even a campaign “promise” from a political candidate can influence the market.

The following table shows a summary of the barriers faced by each of the three organizations. These barriers have been addressed in a different manner by each organization.

Barrier	EMPRENDA (Argentina)	IDEAAS (Brazil)	ECAMI (Nicaragua)
A. Financial Barriers			
Lack of appropriate end-user financing mechanisms.	■	■	■
Risk aversion of potential financing entities.	■	■	■
Access to working capital.	■	■	■
Liquidity constraints.		■	
B. Business Model Related Barriers			
Difficulties in achieving economies of scale.	■	■	
Low population density.	■	■	■
Lack of adequate distribution channels.	■	■	
High operating costs.	■	■	
Poor management and corporate governance.		■	
Lack of institutional capacity.	■	■	■
Social, cultural and gender barriers.	■	■	■
C. Technology Related Barriers			
Technology.	■	■	■
D. Country-Level Barriers			
Vulnerability to macroeconomic instability.	■	■	■
Lack of enabling regulation.	■	■	■
Contradictory government policies.	■	■	■

3 CASE STUDIES: EMPRENDA, ECAMI, AND IDEAAS

This report includes an analysis of three organizations with different business models that are operating in different countries in LAC.

The following section provides a summary description of the three organizations.

3.1 IDEAAS

ORGANIZATIONAL DESCRIPTION

The Institute for the Development of Natural Energy and Sustainability (*Instituto para o Desenvolvimento de Energias. Alternativas e da Auto Sustentabilidade* - IDEAAS) is a non-profit organization based in Brazil. It was founded by Fabio Rosa, the current CEO, in 1997.

The main objective of IDEAAS is to develop and provide high-efficient and low-cost clean energy solutions for rural and remote areas in Brazil. IDEAAS is primarily focused on two main activities:

- Developing business models that are economically self-sustainable in the long run.
- Developing and using low-cost clean energy technologies.

IDEAAS is a small organization, mainly managed by the CEO and a small team. The company has developed several rural projects with the support of a number of grants. These grants allowed the organization to pilot its business models, develop market assessments in rural areas to understand local needs and test clean energy systems and components on the ground.

CEO Fabio Rosa was also the founder of other agencies and companies, such as “*Sistemas de Tecnologia Adequada Agroeletrô*” (STA). Founded in 1992, STA manufactures and assembles some of the components used in IDEAAS systems. Rosa’s skills, ingenuity and the flexibility of his organizational model have fostered the adoption of new technologies and services tailored to local conditions. The generation of ideas and entrepreneurship are IDEAAS’ great strengths.

Throughout his professional career, Rosa has developed successful technological solutions and business models for rural areas. In São Paulo, Brazil, he devised a low-cost way to distribute electricity to remote, rural areas. In 1996, the state government implemented his program in 425 municipalities, investing about US\$ 230 million to connect approximately 240,000 rural families to the grid by using a network extension single-phase, ground return system. The 30 percent reduction in investment costs allowed many more miles of network to be built and connect more users. This system also had an impact on public policy in Brazil, as the National Bank of Economic and Social Development (BNDES) extended a special line of credit to families who wished to connect to the network. In addition, the technology is included as part of the government’s “Standards of Power Distribution.”⁴⁰

Rosa has also been involved in the development of solutions for the livestock, agriculture, and forestry sector, again focusing on both economic and environmental benefits. For example, he implemented a low-cost system to control livestock grazing areas using photovoltaics to power electric fences.

The services and activities of IDEAAS have evolved and adapted to changes in the political and social environment. The privatization of Brazil’s electrical system, the extension of the grid to new areas,

⁴⁰ IDEAAS and PSA: Replication in the Amazon, Stanford University, 2007

and the governmental policy to provide electricity to all Brazilians are among the factors that have allowed IDEAAS to find new areas of opportunity.

The IDEAAS business model, as it is currently framed, aims to provide clean energy in rural areas by leasing energy systems to clients. Clients have to pay a monthly fee equivalent to the costs of a non-renewable energy system. IDEAAS assumes responsibility for the system's performance and for battery replacement at the end of its lifetime. The client has to pay an initial fee to cover a small portion of the initial investment in the system and the installation of the equipment, equivalent to 40 percent of the total system cost.

IDEAAS serves two different customer segments: big companies that are operating in rural areas with no access to the grid, and thus requiring small-scale energy solutions, and poor families living in rural communities who likewise have no grid access. In both cases, IDEAAS uses a leasing model to serve its customers.

Currently, IDEAAS is focused in two regions: Rio Grande do Sul, and Tapajós in the Amazon. In both regions access to potential clients is very difficult, requiring special vehicles and several hours of travel.

The clients in the two regions are distinctly different. In Rio Grande do Sul, the main client is a private company dedicated to planting and tending pine trees for pine resin extraction, Ambar Florestal. In the Amazon, the clients are a diverse set of individual users in two small communities.



Figure 2: IDEAAS focus regions

Río Grande do Sul Model

The Ambar Florestal Company has huge tracts of land where the company is growing about four million pine trees. Resin extraction is done manually and requires employees to go to each tree to collect the resin. The land used for pine resin extraction is far removed from urban areas and the

grid. It is about four hours drive from the city of Rio Grande, requiring a four-wheel drive car to get there.

Due to the transportation time and distance, the company built small cabins for workers so they can remain on company property Monday through Friday. There are several communities scattered throughout a forested area where it is hard to supply electricity, making off-grid systems attractive.

Each cabin has two air-conditioned rooms with lighting and electricity sufficient to connect a radio or television with a direct current (DC-12V). Typically, each house has the following equipment:

- A 60W solar panel
- A 1500 Ah car battery, Brazilian-made
- A battery charger, manufactured by STA, a company owned by Fabio Rosa
- Four 5W lamps, which are adaptable
- Two 12V electrical sockets for a television, radio or cell phone charger
- Wiring, boxes, conduits and circuit breakers.

The power systems were designed and developed by IDEAAS. They are simple to assemble, install and maintain, thereby significantly reducing costs. The battery and controller are placed in a small, sealed container, which protects against dust and improper handling. Both the lamps and regulator are designed to be easily changed if they melt or need replacement. The system has different types of inputs and contacts in order to avoid confusion with system connections. Each of the systems has a logbook, which indicates the date of installation, the serial number of each piece of equipment, as well as the various maintenance and part changes of the system (batteries, controllers, panels, etc.). In addition, each team has clear instructions on the basic use of the system.

IDEAAS is responsible for the operation and maintenance of equipment, as well as battery replacement, and IDEAAS is committed to increasing the energy production capacity of 10W panels, since efficiency diminishes with time.

Amazonia Business Model

IDEAAS also provides leases for solar systems in two small communities, Santí y Maripá, which are located on the Banks of the Río Tapajós in Amazonía. In these cases, individual customers are the clients.

In developing the Amazonía Project business plan, IDEAAS needed to determine the energy needs of the inhabitants and their ability to pay. IDEAAS also needed to know the implications, risks and difficulties involved in developing isolated solar energy systems for these communities. IDEAAS selected a person from within the community to supervise the correct use of the systems and to carry out small maintenance activities. For this activity, the IDEAAS representative gets use of a solar system lease-free. Maintenance and service teams are organized through strategic alliances with local distributors (retailers), who distribute replacement components and batteries to customers. The distributors communicate and coordinate with IDEAAS once this has been done.

The biggest problem the model has faced is user non-payment of the leasing fee. In the community of Santí, only 15 percent of customers made their payments, while in the community of Maripá 80 percent of customers made their payments. It was very difficult for IDEAAS to charge users with overdue lease payments and to communicate with the user or community representative due to the complexity of accessing these sites. There were several key issues that contributed to the non-payment of the leasing fee in the Amazonian project, including the lack of procedures and mechanisms for recovering overdue payments, the lack of appropriate market research (size and potential market), and the lack of a formal business plan prior to implementation efforts. In addition, there are relatively few clients in the Santí, and Maripá region, and with this small number of

systems, it was difficult to cover the operational expenses of implementing a self-sustainable post-sale business approach.

IDEAAS is currently working with the Ventura Institute on a project to test new technologies and solutions for the Río Tapajós region. The project includes the development and testing of a prepayment system (a prepaid card), which would automatically stop electrical service when a user does not pay, thereby greatly reducing the risk of nonpayment.

IDEAAS' partnership with the Ventura Institute includes testing various Pico PV Technologies in order to identify more affordable technologies for Amazonian families living in rural communities. In addition, the organization is testing solar pumping systems in order to replace those running on diesel generators. The goal is to install two pilot solar pumping systems and 90 Pico PV systems, mainly to light education-related activities for children. The IDEAAS–Ventura Institute partnership involves creating a parallel, non-profit consulting company that would be responsible for providing energy services and technology solutions, which could coexist and support IDEAAS's activities.

The use of diesel generators to produce energy is common in the isolated regions in the Amazon, because diesel generators require a very low initial capital investment in comparison with renewable energy technologies, and people understand the technology better.

Unique Value Proposition

IDEAAS is an innovative organization that accurately identifies energy needs and implements creative technology solutions to meet them. IDEAAS has developed and adapted local system components to provide a reliable and cost-competitive systems. For example, IDEAAS is using a car battery made in Brazil and has developed a charge controller that extends the lifetime of the battery by up to five years. The charge controller is designed and manufactured by IDEAAS. The company is currently designing and producing the prepaid card to activate and manage the solar systems discussed above. The intention is to recharge the prepaid card at a local selling point (grocery store, bank, or other type of business).

CEO Rosa has demonstrated that existing technologies can be adapted using local materials and labor to build systems that fit local conditions and needs. IDEAAS has managed to reduce system costs through self-assembly and manufacturing some system components itself. This has had a positive impact on sales.

IDEAAS has been able to identify obstacles for customers in purchasing products and has developed different funding mechanisms to address these barriers. The leasing model is one mechanism used by IDEAAS, but other mechanisms, such as barter, have also been used.

IDEAAS' technological developments, such as standardizing the production of battery controllers, have resulted in extended battery life, reduced cost of controllers, and controllers better adapted to the needs of its systems.

Organizational Structure

IDEAAS is a non-profit organization with the following structure.

- **Director General of the company.** Fabio Rosa directs IDEAAS's strategy, develops business proposals, coordinates with the team, deals with clients and operates the learning center.
- **Administrative secretary.** This person manages finance, administration, and accounting and is responsible for managing purchases, payments, banking, billing and taxes for all of IDEAAS' activities.

- **Operations management.** The person is in charge of solar panel sales, serves customers, installs systems, and performs technical training, equipment maintenance and service.
- **Installation and maintenance.** A team of contractors installs new equipment, provides technical training and performs systems maintenance, as required.
- **Dealers.** Dealers are entrepreneurs working in partnership with IDEAAS to provide service and maintenance in the Amazon region. In addition, these small businesses sell some parts and system components.

MARKET DEMAND

The demand for isolated generation products (such as the products handled by IDEAAS) has decreased significantly due to the government policy of increasing electrical access to off-grid areas. However, the power grid is not reaching less accessible areas, such as communities in the Amazon, protected reserve areas, or large private areas.

Isolated Communities

In the case of communities located on the banks of the Amazon, IDEAAS estimated that there are about 12,000 communities, many of them meeting their energy needs through small diesel generators. In the Tapajós River area, IDEAAS estimates its potential market is about 7,000 families.

Private Areas

There are also large tracts of private property (usually for companies dedicated to the exploitation of natural resources), which have energy needs that cannot be satisfied except with isolated systems. Similar to the IDEAAS project in Rio Grande do Sul, IDEAAS has an opportunity to establish a new project in the Amazon for a private company called the ORSA Group.

ORSA Group Project

The ORSA Group owns a land area of 1,500,000 hectares, where IDEAAS has planned the installation of about 120 solar systems of varying capacity, up to 700W per system (12 times higher than the systems installed in Rio Grande do Sul). 700W should be sufficient capacity to provide electricity to an office with lighting, refrigeration, computers, and a communications system.

For this project, IDEAAS has proposed the same leasing model it used with Ámbar Floresta, that is: ORSA Group will pay its lease to the IDEAAS team, who will perform the maintenance and operation of the system. This project's volume is greater than what IDEAAS has handled to date. Ámbar Floresta has about 13 kWp of installed capacity from its 224 isolated systems (on average 60Wp each); in the case of the ORSA Group project, the installed capacity would be 84KWp, about six times that of Rio Grande do Sul.

IDEAAS would undertake a process similar to the one it used in its other projects. First, it will conduct a market study to define the project's needs and the best technological solutions; then a lease price would be set to define the amount of payments by the customer. As in the case of Ámbar Floresta, this project would receive grants to cover the initial costs. IDEAAS would arrange an in-kind donation of solar panels (the cost of the panels is about 40% of the cost of system), and a cash donation to implement the market study and business model by the Renewable Energy and Energy Efficiency Partnership (REEEP), a Vienna-based non-profit organization that aims to accelerate the marketplace for renewable energy and energy efficiency, especially in developing countries.

The ORSA Group project is attractive to IDEAAS because 150 communities, i.e., potential clients, are settled on the grounds of the company. The ORSA Group project would allow IDEAAS to station a local team, which could serve not only the ORSA, but the communities in the region as well.

CUSTOMER SEGMENTATION

Based on experience to date, there are two types of customers to which IDEAAS can offer its solar system services: private companies and individual users.

Client	Characteristics
Private Companies	<ul style="list-style-type: none"> • Large companies typically devoted to natural resource exploitation. • Work places with difficult access set away from the grid. • Organizations seeking affordable and sustainable solutions to energy needs related to their activities. • Entities that require large volumes of off-grid installations due to the dispersion of their activities.
Individual Users	<ul style="list-style-type: none"> • Low-income families • Isolated communities away from the grid. • People for whom conventional energy sources are expensive (diesel generator, candles, kerosene, batteries, etc.) • Individuals whose energy requirements are mainly for lighting, TV/Radio (satellite), and cell phone charging. Higher income families also seek solutions for refrigeration and pumping systems. • Families that require a single solar system that provides a specified number of hours of electricity per day, mostly at night.

The characteristics of the two types of customers are quite different. While their solar solutions have similar technologies and their leasing arrangements function under the same principles, the business models require a slightly different strategy. The leasing collection system offered to businesses is very simple, as it is done with a single client, a single invoice for all systems, with standardized maintenance and service contracts. In addition, there are several ways a company and IDEAAS can communicate – telephone, Internet, courier – and a customer can be visited quickly. In contrast, the logistics, sales, installation and service for individual customers is more complicated. The difficulty of establishing collection systems for payback significantly increases operating costs.

On April 2012, ANEEL (The Brazilian Energy Regulatory Agency) approved new regulations that aim to reduce barriers to enable the production of renewable energy from small-scale projects and incorporate these systems into the grid. This measure includes the addition of a net metering program (*Sistema de Compensação de Energia*), which allows small-scale generation systems of less than 1 MW to offset their electricity bills with credits from the energy they provide to the grid. Exploring the business of installing net metering systems could be an additional way for IDEAAS to diversify its clients (customer segmentation) so as to include those with access to the grid (currently it is focused only on off-grid clients).

COMPETITORS

Currently, IDEAAS has no direct competitor that offers rural solar systems under a financing scheme. However, there are competing solutions:

- The Brazilian government’s “Light for All” project has been expanding the grid significantly and is seeking to reach isolated communities.

- Conventional generation systems, such as diesel generators, disposable batteries or candles and kerosene, are cheap to install, but are expensive to operate. Users see these solutions as affordable and easily accessible, with little attention to operating costs.

Over time, IDEAAS has adapted to overcome these challenges and find a value-added niche market. Its leasing service is a response to the barrier posed by the high, up-front investments usually required by solar equipment: by offering a leasing option, users do not require investing a big chunk of their capital. "Light for All" does represent a threat to IDEAAS' activities, particularly with regard to potential customers in isolated communities. If the government's electrification plans come to the communities where IDEAAS operates, its solutions may be more economical than IDEAAS' because of subsidies or other benefits.

OBSTACLES

There are several obstacles to the expansion of the IDEAAS' business model.

Obstacles	Characteristics
Political	<p>While the Brazilian Government's policy of providing electricity for all is a laudable public sector goal, it represents an obstacle for private sector companies like IDEAAS that are focused on serving the off-grid market.</p> <p>The government program does not define technologies it is supporting but is likely to invest in power generation by conventional means, such as large power plants or diesel generators, which represent a smaller investment than sustainable power generation systems.</p>
Socio-economic	<p>Potential customers are usually single, low-income families living in underserved communities. Their income levels limit the size of the solar system they can afford, so that the system purchased only covers part of their energy needs.</p> <p>Solar power systems require care and basic knowledge on the part of users. Although general knowledge of photovoltaic generation systems exists, users require more information to ensure proper operation and extend the life of the equipment. As a result, IDEAAS needs to educate users on the proper use of its systems and this means additional IDEAAS resources, which increases operating cost.</p>
Geographic	<p>IDEAAS' potential customers are in hard to reach locations, which require special transportation and time. The logistics of sales, installation and after-sales service involves significant challenges.</p>
Operating	<p>Solar systems have limitations in generating capacity, and this restricts the type and amount of electricity-consuming equipment that can be connected, and the number of hours of equipment operation per day. Users must manage system usage themselves and require training.</p>

SWOT ANALYSIS

An analysis of the Strengths, Weaknesses, Opportunities, and Threats faced by IDEAAS was carried out by the team. The following is a summary of this analysis.

INTERNAL FACTORS	
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Capacity for technological innovation, and adaptation according to needs. IDEAAS is flexible, allowing for innovation and entrepreneurship. 	<ul style="list-style-type: none"> • The business model depends heavily on donations.
<ul style="list-style-type: none"> • Ability to reduce component costs of systems by producing them themselves, or acquiring them nationally. 	<ul style="list-style-type: none"> • A small organization with few resources, vulnerable to change.
<ul style="list-style-type: none"> • Extensive experience and expertise in renewable technologies, as well as with key stakeholders (manufacturers, distributors). 	<ul style="list-style-type: none"> • The business model currently depends mainly on a single customer. Services in the Amazon are minimal and the model is not currently self-sustaining.
<ul style="list-style-type: none"> • Extensive experience and knowledge of: the target market, user characteristics, challenges, obstacles, and solutions for rural electrification. 	
<ul style="list-style-type: none"> • Business is diversified, so it is not economically dependent on only leasing solar systems. 	
<ul style="list-style-type: none"> • Business has an important history in rural electrification; it is well-known worldwide for its leadership in innovative solutions in rural Brazil. 	

External Factors	
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Well positioned to offer leasing systems to companies with large areas that are outside the scope of the network. 	<ul style="list-style-type: none"> • The government's program "Light for All" is advancing, decreasing the potential market for IDEAAS.
<ul style="list-style-type: none"> • Has the ability to expand its business model to another private company, the ORSA Group, which would allow it to strengthen its operation and better distribute fixed costs. 	<ul style="list-style-type: none"> • The current business model does not allow long-term sustainability for IDEAAS' operations. The company needs to develop a strategy to generate the necessary resources.
<ul style="list-style-type: none"> • The government program "Light for All" can be a great opportunity to offer solar systems leasing to the government. 	<ul style="list-style-type: none"> • IDEAAS depends on Fabio Rosa. If he ceased to lead the organization, IDEAAS may fold.
<ul style="list-style-type: none"> • The component costs of solar systems have dropped in price, making systems more competitive with the price of the grid-supplied electricity. 	
<ul style="list-style-type: none"> • Its business model could be replicated in other areas and outside Brazil. There are areas that require electrification that are closer than the Tapajós River project. 	

How can the organization use its strengths to capitalize on identified opportunities?

IDEAAS has the expertise and capacity to offer its systems to corporate clients with similar characteristics such as the ORSA Group and Ambar Florestal. It is important for IDEAAS to identify and research potential new corporate clients. According to information provided by IDEAAS, there may be up to 400 companies like Ambar Florestal and ORSA Group that need services similar to those

offered by IDEAAS.

IDEAAS has the opportunity to offer its services to ORSA Group, which can help to consolidate its operations. IDEAAS has the expertise to identify systems appropriate to ORSA's needs and has the basic operational capacity to provide them. For companies such as ORSA Group and Ambar Florestal, the leasing model is attractive because the lease cost can be deducted as a business expense (not an investment) attracting corollary tax benefits. In addition, from a maintenance perspective, the leasing model means that the company can rely on IDEAAS to ensure the proper functioning of the systems (especially the battery).

The government program "Light for All" could serve as an opportunity for IDEAAS to offer its isolated solar lease services, as it may be a better economic option for the government than other solutions. Moreover, to achieve the coverage goals of "Light for All" requires some coordination of individual participation and self-generation systems, for which the IDEEAS model could be an ideal vehicle. IDEAAS has some past experience (both positive and negative) working with the government; the main recommendation is that IDEAAS does not "compete" with the government program.

Finally, IDEAAS can replicate its model in other countries in the region, such as Bolivia, Paraguay, Argentina, Uruguay and Peru, where rural populations are not connected to the grid.

How can the organization use its strengths to minimize identified threats?

The government's effort to extend the national grid under its program "Light for All" could be viewed as a threat to IDEAAS' current operations. However, IDEAAS is well positioned to offer solutions to the government for its program. It can consolidate its operations with private clients, who provide economic stability thus enabling IDEAAS to serve more individual users.

The economic stability of the model depends largely on the ability of IDEAAS to increase its revenue stream, which can be done either by increasing the price of leasing or through securing more donations. To do this IDEAAS will need research other potential private customers but recommendations on this is outside the scope of this study.

A critical challenge for IDEAAS is that it depends so much on Fabio Rosa. Ideally, business operations should be able to run independently of him. This would allow Fabio to dedicate himself to growing and consolidating IDEAAS' activities. The dependence of an organization on one person creates a "key person risk" and is fairly typical in small businesses. It is important for IDEAAS to move beyond this and lay the foundation for creating an organizational structure conducive to growth. The formation of an advisory board or administrative board could help move the organization in this direction. IDEAAS' prestige and network contacts locally and internationally give it access to valuable potential board members, and the board should include people, experiences and interests that are sympathetic to those of IDEAAS.

What weaknesses need to be addressed in order to capitalize on the opportunities identified?

The business model depends heavily on donations. IDEAAS could use these donations to create a more sustainable business model, such as creating a revolving fund for continued implementation of solar projects.

IDEAAS does not have enough full-time staff. While realistic economic modeling suggests a cautious approach to human resource and capital investment until IDEAAS' economic situation has stabilized, or its number of customers has increased, a temporary solution might be to contract interns or request foundation support to cover the salary of some operational staff.

IDEAAS should conduct market research to identify potential large-scale company clients so as to

expand the number of customers.

COST-BENEFIT ANALYSIS OF IDEAAS’S SOLAR HOME SYSTEMS (SHS) FROM THE CLIENT’S PERSPECTIVE.

The solar home systems that IDEAAS offers to its clients are cost-competitive when compared with conventional energy solutions. The tables below show a cost analysis of the solar home systems for a small community (8 houses with 16 rooms) against a cost analysis of a diesel generator solution.

The energy requirements for each “community” are around 7-8 KWh per day. A comparison was made between the solar home systems and a diesel generator with the characteristics described in table 12.

Table 1: Technical Specifications of a Diesel Generator	
Model	MDG -5000 CLE
Brand	MotoMil
AC Frequency	60 Hz
AC Voltage	110/2220 V
Nominal Power	4000 W
Maximum Power	5000 W
Fuel	Diesel
Approximate Consumption	2.5 lts/ hr
Fuel Tank Capacity	12.5 liters
Non-stop Operational Hours	6 hours
Operational Noise Level (at 7 mt)	94 dB

The diesel generator has the following related costs.

Table 2: Annual Cost Analysis of a Diesel Generator			
			Annual Cost (R\$)
Lifetime depreciation cost	R\$ 3,000	Useful life: 3.9 years	759
Cables, and minor components	R\$ 1600	Useful life: 10 years	160
Maintenance, oil change, spark plugs, filters, labor costs	Estimated		795
Fuel cost	Estimated		6,799
Fuel transportation to 250 Km	Estimated		1,328
TOTAL (Reales)			R\$ 9,685
TOTAL (US\$ equivalent)⁴¹			US\$ 2,604

The next table shows the annual cost analysis of 8 solar home systems that are needed to provide electricity access for the community.

	Cost R\$	Lifetime (years)	Annual Cost	Cost for 8 systems (for 16 rooms)
Panel 60W	560.00	10	56.00	448
Battery 150 A - automobile	370.00	3	123.00	986.00
Charge controller	100.00	5	20.00	160
Cable, and minor components	200.00	10	20.00	160
COST (Reales)			R\$ 219	R\$ 1,755
COST (US\$ equivalent)⁵			US\$ 107	US\$ 962.97

If the annual costs of both technologies are compared, diesel costs US\$ 5,314/year whereas solar home systems cost only US\$ 963/year. Solar home systems represent a much better solution, and provide enough margin to allow for a sustainable leasing system. The annual cost of diesel generation would represent the equivalent in rent of R\$ 100/month (US\$ 49) for the solar equipment.

3.2 EMPRENDA

ORGANIZATIONAL DESCRIPTION

EMPRENDA is a microfinance organization based in Argentina. EMPRENDA was founded by young entrepreneurs with the aim of helping low-income families in the northwest rural region of Argentina. It provides microfinance loans to improve the quality of life of families in the region.

EMPRENDA began operations in 1999, starting as a project that offered a first round of rural microcredit in San José Boquerón (province of Santiago del Estero). In 2001, the project became an institution known as El Ceibal, a non-profit organization that provided microcredit and other social services. The same year, the Social Investment Fund (FIS) - the financial arm of El Ceibal- was established with the objective to expand and consolidate microcredit services.

In 2003, FIS opened an office in Buenos Aires to serve the urban area and in 2005, and it opened a second branch in the district of Lomas de Zamora. That same year, FIS was formally established as a for-profit entity. In 2008, Grupo ACP acquired a majority stake in FIS, and the new organization was rebranded as EMPRENDA. Currently, EMPRENDA has nine offices located in six provinces, of which seven are in urban areas and two in rural areas. It has 69 employees, an active portfolio worth US\$ 5.53 million and around 3,600 customers (Dec. 2012 data). The company serves clients in both urban and rural areas. In the latter, it provides microcredit and solar energy technology, mainly to poor families.

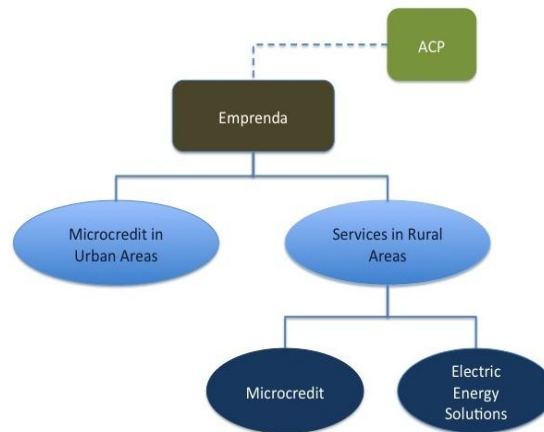


FIGURE 3: EMPRENDA'S ACTIVITIES

EMPRENDA serves northwestern Argentina, including the regions of Santiago del Estero, Chaco and Salta. Population density is low, and many villagers have no access to the grid. EMPRENDA has two offices in rural areas (Toco Pozo and Boquerón). The rural offices consist of both administrative staff and credit counselors who are trained to promote and install energy products, as well as perform credit evaluations of potential customers.

EMPRENDA's potential clients meet their energy needs in various ways. Rechargeable batteries, kerosene, and candles are the resources most frequently used to meet lighting and communications needs. According to calculations made by EMPRENDA, 70 percent of households in the region use kerosene lamps, 100 percent use rechargeable batteries, 10 percent use electric generators, and 20 percent use candles and gas lamps. The maximum monthly expense per family is AR\$ 92 (Argentine Pesos, equivalent to US\$ 21), and the minimum monthly expense is calculated to be AR\$ 42 (or US\$ 9.62).

EMPRENDA offers rural customers low-cost solar systems that supply lighting and electricity, and it provides credit to customers to help them buy these products. EMPRENDA offers a range of products:

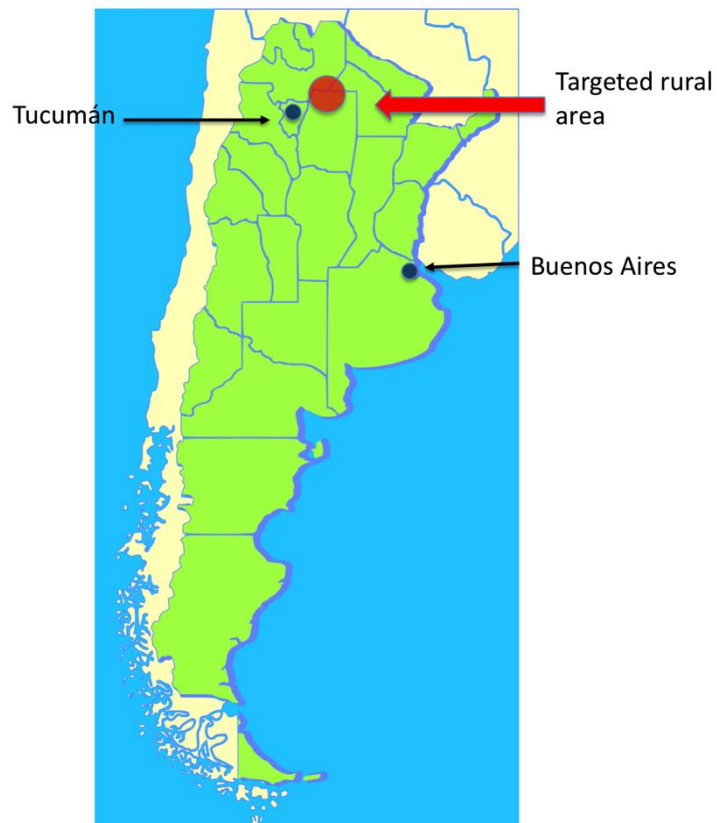
- Comprehensive solar home energy systems comprised of a solar panel, battery, controller wiring, and installation. The capacity of these systems is tailored to the needs of the client and their ability to pay.
- Small integrated solar systems (Pico PV) that are ready to use and do not require installation (such as mobile phone chargers and portable lanterns). Pico PV systems are low-capacity compared to comprehensive solar generation systems; but provide a good, low-cost solution for specific lighting, cell phone charging and radio playing requirements.
- Spare parts components such as batteries, inverters, charge controllers, and lights. These sales are usually made to customers who already have an EMPRENDA system.
- EMPRENDA is considering offering solar water heaters, which would consist of a water storage tank, hydraulic installation, solar panel, and small pump.

EMPRENDA has a team of people with multidisciplinary capacities, composed of local residents who have been trained by EMPRENDA. The organization's sales agents evaluate a potential client's creditworthiness and sell a system to him or her, where appropriate and possible. However,

EMPRENDA is also familiar with the solar energy technology itself, its design and installation, and can make minor repairs to the systems being sold.

The geography and rough roads in the areas of Argentina in which EMPRENDA operates require sales agents to use cross-country motorbikes to visit clients. Given the geographically dispersed population and the distances between clients, the agents spend most of their time traveling. This arrangement is not cost-effective for the organization and presents a barrier for expanding the client-base into more remote areas. EMPRENDA has installed around 2,000 systems in the region, but has not yet managed to reach financial self-sufficiency.

Figure4: EMPRENDA focus regions



In 2009, EMPRENDA and VIVENCIA (a Peruvian housing corporation), both members of the ACP group, established a partnership to promote solar energy products in Peru. The objective was to provide solar systems to rural families in Piura, located in the northern Peru. More specifically, the objective was to build a network of local micro-franchises that could carry out the sales, installations, and after-sales service required.

The business model in Peru has faced several barriers:

- a) Difficulty engaging good local partners (micro-franchises).
- b) Technical problems with the products offered (Pico PVs), which have undermined the product's market penetration. Some clients experienced equipment failures (such as not being able to charge the battery, or lamp damage because of dust), which created a negative perception about the quality of Pico PVs with other potential clients.
- c) Government plans to expand the provision of electricity, which has slowed market development. Clients prefer to wait for grid access even if these are undefined or potentially long-term government plans.

MARKET DEMAND

Argentina has a population of 41.8 million, of which 4 million live in rural areas. Twenty-eight percent of these families, or around 270,000 households, have no access to electricity. In Northwest Argentina, the lack of access to electricity is a serious problem. In the province of Jujuy, more than 30 percent of the population lives without electricity; in the province of Salta, more than 25 percent of households have no access.⁴² There is also a great need for energy in the rural areas of neighboring countries – such as in Bolivia, Peru and Paraguay – which represent potential markets for EMPRENDA.

⁴² "Energía limpia para el Noroeste Argentino" (Clean Energy for Northwest Argentina) www.amartya-ar.net

Table 4: Market Potential in Argentina and Neighboring Countries							
Country	Population	Rural Population	Households	Households without access to electricity %	Households without access to electricity No.	Population without electricity	Data collection Year
Argentina	39,000,000	4,000,000	952,381	28.6%	272,302	1,143,670	2003*
Bolivia	8,274,325	3,109,095	690,910	75.1%	518,652	2,333,935	2001
Peru	26,152,265	6,730,364	1,542,691	76.4%	1,179,000	5,143,674	2005
Paraguay	6,010,000	2,235,000	455,351	22.2%	100,921	495,351	2004

* Most recent data from the government

Growing EMPRENDA’s potential market depends largely on its ability to cover more territory or to increase sales and loans to existing customers. In the area of Santiago del Estero, EMPRENDA has about 3,000 customers, which represents around 50 percent market share. In some areas near the rural office and the homes of its assessors, market penetration may reach as much as 90 percent, though penetration is reduced in more distant homes. For example, in the village of Taco Pozo, where EMPRENDA has an office, the penetration rate is approximately 40 percent (1,200 clients with an average of 4 persons per household), but the penetration rate is lower in other EMPRENDA territories (Villa Nueva Esperanza and Monte Quemado).

Operating in a large coverage area with difficult access and low population density is a major barrier to expanding service to a larger territory. EMPRENDA’s clients are concentrated in communities that are located far away from each other, and this represents a great logistical challenge. EMPRENDA’s one office in the town of Boquerón covers about 20,000 km², an area equivalent to half of the Netherlands or Switzerland, and is served by 3 or 4 credit officers, who spend much of their time traveling on motorbikes to visit clients.

CUSTOMER SEGMENTATION

EMPRENDA customers in rural areas can be sorted into two groups:

- a. Higher-income families, in which several family members pool money, or have some business of their own; and
- b. Low-income customers who have temporary employment, sell coal, work as agricultural laborers, or live on government assistance (most customers).

Higher income families tend to consume more energy and usually have one or two solar systems and generators. For cooking, they use gas and have a gas fridge. Typically, their houses are built with durable materials such as brick; they use energy for productive activities (water pumping for irrigation, woodworking machinery) and also have a TV and satellite dish.



Figure5: EMPRENDA’s clients

Low-income families use kerosene for lighting, disposable batteries, and usually they pay someone to charge their cell phones. For cooking, they typically use coal and firewood. Often they do not have a job or steady income. Their houses are built with fragile materials. They lack education; the majority of adults have only attended primary school. These customers can generally only afford a small-scale EMPRENDA solar system: this is enough to provide light, connect a radio or charge a phone. In the event that the family does not have sufficient financial resources to buy a solar system, they are offered the Pico PV, which is cheaper.

In one rural area a Focus Group of EMPRENDA clients was conducted. The meeting helped to identify the main characteristics of EMPRENDA's customers and gauged their interest with respect to new products. The group consisted of users served by the offices of Boquerón. The meeting began with nine clients and ended with 20 participants, who were incorporated gradually over the course of the session. The participants were particularly interested in learning about new products offered by EMPRENDA.

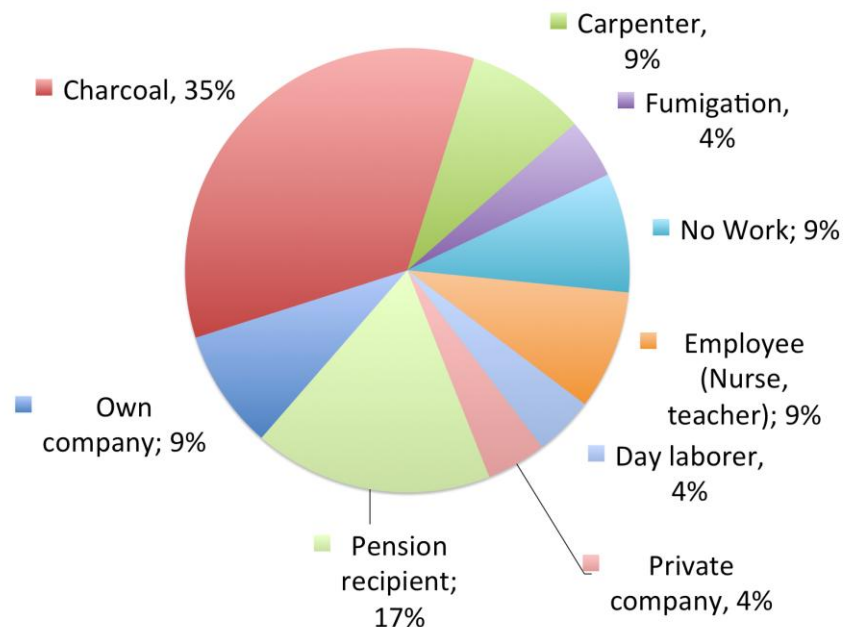


Figure 6: Occupations of EMPRENDA clients

While not statistically representative of the total population, the meeting revealed the following:

- Out of a total of nine customers, all have electricity (light and radio), two have gas refrigerators, and only one has a TV.
- The nine customers receive no remittances or money sent from a relative. Usually, it is the other way around: these customers send money to support relatives.
- Some invest an average of two hours a week in collecting firewood for cooking.
- 63 percent of EMPRENDA clients have a storage tank for rainwater, which was built under a government social program. Those who have no storage tank drink river water (untreated).
- In general, customers have the radio on all day. The day begins at 6:30 am and ends between 11:00 pm and 12:00 am. Of the nine EMPRENDA customers surveyed, 22 percent have a generator that they use to watch TV that also serves as a backup system. 16 percent have 12V fans, and 44 percent of the clients indicated they were interested in acquiring a fan.

- During the meeting, EMPRENDA customers expressed interest in acquiring new products. 5% of the meeting participants have bought LED lights, and the rest of the participants (95%) showed a great interest in this technology. The consultants also found that seven people have televisions, and ten users are interested in purchasing a low-cost, low power-consuming television, suitable for use with an EMPRENDA solar system.
- Of the 20 users, ten cook with gas; the rest cook with firewood. Gas tanks have 10 kg capacity, which lasts a month (if only used for cooking) and costs about AR\$ 28 to 35 pesos to fill.

COMPETITORS

Currently, EMPRENDA controls most of the market in the area, and there is no competitor with a micro-credit scheme that also offers solar systems. However, there are small businesses that offer solar home systems and, according to EMPRENDA, there are isolated efforts by some organizations to sell solar home systems on credit.

There are some retail stores in small towns that sell home solar systems similar to those offered by EMPRENDA. These stores usually do not offer credit, do not have a presence in rural areas, and do not offer services such as installation and maintenance. When they do offer credit, they do so on "normal" commercial terms, which generally preclude low-income people. In addition, there were some issues with the quality of the equipment offered.

OBSTACLES

Certain challenges complicate EMPRENDA's business model in rural areas.

Obstacle	Characteristics
Geographic	Reaching a dispersed, diffused population in difficult terrain entails high transaction costs.
Socio-economic	Low-income customers can only afford to cover part of their basic energy needs. Isolated power systems require care and basic knowledge on the part of users. Capacity-building is required for the correct use of solar systems.
Market-based	EMPRENDA offers two types of service to clients: energy products and microcredit. 70 percent of customers who currently are served by EMPRENDA already have some kind of energy system. The market size is shrinking.
Administrative	Selling energy products in rural areas is a new enterprise for the ACP Group, and this requires internal support. The ACP Group needs to understand the benefits and challenges of such an undertaking in order to help strengthen this activity.
Technological	The solar systems and equipment EMPRENDA sells are relatively new technologies, with new brands and products continually coming into the market. Selling untested products in this dusty region, where summer temperatures can reach 50°C (122°F) is hazardous. Equipment that fails in these conditions affects EMPRENDA's reputation and causes customers to default on their loan payments. Renewable energy generation systems require large initial investments, and recovery times are long.

EMPRENDA faces a number of internal obstacles, including:

Obstacle	Characteristics
Increasing awareness	There is a lack of awareness in the ACP Group of the opportunities and

of the opportunity benefits that the rural solar energy business can offer. Greater collaboration and synergy among ACP Group members could lead to interesting opportunities for the group as a whole.

Lack of internal resources EMPRENDA has developed a market for solar systems and has gained experience in marketing products and services related to solar systems (technology, maintenance, etc.). The learning curve has been costly and time consuming. EMPRENDA would benefit from employing an expert to evaluate and test new technologies to incorporate for marketing, and a market strategist specialist to help with market analysis and product development.

SWOT ANALYSIS

A Strengths, Weaknesses, Opportunities, and Threats analysis on EMPRENDA was undertaken. The following is a summary of this analysis.

Internal Factors	
Strengths	Weaknesses
<ul style="list-style-type: none"> Has a significant presence in the northwest of Argentina (near San Santiago del Estero), offices in the area. 	<ul style="list-style-type: none"> Inaccessibility, low population density and limited human resources restrict activity range. Although potential customers are there, it is unprofitable to reach them with current resources and strategies. The current government support mechanisms for energy access in these remote areas is inadequate.
<ul style="list-style-type: none"> Knowledge and experience in managing microfinance and technical aspects and administrative proficiency (procurement, inventory, installation, warranties). It has a well-trained team. 	<ul style="list-style-type: none"> Does not have an engineer (internal-external) that specializes in energy technologies for rural areas. There are few people trained in technology assessment. System and technology selection is carried out on a trial-and-error basis.
<ul style="list-style-type: none"> Meets the needs and characteristics of target customers. 	<ul style="list-style-type: none"> There is a need to strengthen the promotion and marketing of products. New distribution channels need to be explored.
<ul style="list-style-type: none"> Part of ACP Group, a sound and well-positioned agent in the financial sector. EMPRENDA and ACP Group have similar goals and missions. 	<ul style="list-style-type: none"> ACP Group has no experience in the management of energy products. EMPRENDA needs to involve ACP to help it to recognize the benefits of increasing its experience in and knowledge of this sector.
<ul style="list-style-type: none"> Internationally recognized as a pioneer in putting together micro and sustainable energy solutions. 	<ul style="list-style-type: none"> Much of EMPRENDA's market already has solar systems. EMPRENDA should offer new products that meet customer needs (such as fans, refrigerators, more efficient televisions) and extend its range of service to maintain sales.
<ul style="list-style-type: none"> Has a team of committed people with an entrepreneurial spirit. 	<ul style="list-style-type: none"> Credit officers in rural areas are inefficient because of the distances between clients. Credit officers undertake too many disparate tasks, such as credit evaluation, sales, equipment installation, and equipment

	maintenance. They should specialize more, though this also has drawbacks in terms of efficiency.
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External Factors	
Opportunities	Threats
<ul style="list-style-type: none"> If possible, acquire a small MFI that has a rural presence. This could expand the scope to provide more energy solutions. Nonetheless, it is not clear if such MFI exist in these other areas 	<ul style="list-style-type: none"> EMPRENDA’s growth depends heavily on the economic development of its customers. There is a need for education and economic opportunities, especially for young people. If these issues are not addressed, the population will decline and EMPRENDA’s market may disappear. The same is true for the ACP Group.
<ul style="list-style-type: none"> Expand the product line to sell to existing customers: there is interest in other appliances that can be connected to a solar system. Also, it can offer integrated energy services for productive activities. 	<ul style="list-style-type: none"> Solar technology is advancing rapidly, with new manufacturers arriving on the market. Many new products have not been tested under the adverse climatic conditions found in EMPRENDA’s market area.
<ul style="list-style-type: none"> There are other countries (Peru, Bolivia, Paraguay, etc.) that have a need for energy solutions for areas not connected to the grid. EMPRENDA’s business model must be adapted to the social, economic and governmental policies of each area. 	<ul style="list-style-type: none"> The electric grid is expanding gradually, and eventually will connect to EMPRENDA’s customers. However, there are no known plans for extension of the power supply in the medium or long-term.
<ul style="list-style-type: none"> EMPRENDA has experience with, and is well-positioned to offer services within the ACP Group. 	<ul style="list-style-type: none"> EMPRENDA’s operations are not economically sustainable if there is no increase in sales and/or reduction in costs,. Due to the dispersed nature of the end-user clients, it is difficult to increase sales without increasing costs.

HOW CAN THE ORGANIZATION USE ITS STRENGTHS TO CAPITALIZE ON THE OPPORTUNITIES IDENTIFIED?

The EMPRENDA model can be replicated in other regions. EMPRENDA can capitalize on its experience with microcredit and solar systems, staff training, customer support, marketing, credit assessment and loan recovery to build a network of distributors to increase its sales radius, strengthening solar systems sales at a lower operating cost. This can help EMPRENDA gain entry into new geographic areas.

However, one of the biggest obstacles in rural areas is population dispersion. Replicating EMPRENDA’s business model in areas with higher population density could mean lower transaction costs and greater profitability.

EMPRENDA’s capabilities can be capitalized on by the ACP Group, specifically energy services. This service can be added to the many other services offered by different members of the ACP group.

To use its skills and resources more efficiently, EMPRENDA should conduct careful market research to examine the market potential that exists in a given area. Market research should be focused on identifying the requirements and characteristics of target customers. EMPRENDA may be able to conduct this market research in partnership with the organizations with which it already has strong relationships.

EMPRENDA can use its strengths to bid on government tenders for rural electrification programs. The organization has the experience and it is in a very good position to offer rural energy services to the government.

HOW CAN THE ORGANIZATION USE ITS STRENGTHS TO MINIMIZE THE THREATS IDENTIFIED?

EMPRENDA has experience in financing productive activities and is sensitive about the inherent social benefits in its work. EMPRENDA could use its expertise and network to promote productive activities that generate economic growth for its customers, increasing the income of the households it serves. The international recognition of the ACP Group and EMPRENDA can help build partnerships with organizations specializing in supporting productive projects in rural areas.

The arrival of the electrical grid to the area is a potential threat, and EMPRENDA should consider offering new products and services (such as more efficient appliances – like refrigerators, fans, television sets, stoves) and equipment that can be used in productive activities, such as water pumps, water filtration systems, power tools, etc. EMPRENDA has high adaptability, which allows it to offer new products and services to customers.

WHAT WEAKNESSES NEED TO BE STRENGTHENED IN ORDER TO CAPITALIZE ON THE OPPORTUNITIES IDENTIFIED?

EMPRENDA should assess its efforts in promotion and marketing. Much effort is spent traveling to clients in their homes to sell them microcredit or energy products. EMPRENDA could instead attract customers to its offices where it could offer focused sales events. This would increase its area of operations and may increase the number of customers.

EMPRENDA should consider getting support from a local research center, university or independent engineer to strengthen its technical knowledge. Technical support would be useful to evaluate products before purchase, plus researchers could offer technical recommendations on components (batteries, lamps, etc.), system configurations, installation, etc.

EMPRENDA's operations in rural areas are limited by dispersed population. Market research is required to expand without significantly increasing operating costs. One solution is to build a network of local distributors (e.g. franchises).

ACP Group's support is essential. To become a sustainable business, EMPRENDA must increase sales and maintain or reduce financial and operational costs. This will be difficult without ACP Group's support. EMPRENDA can benefit from ACP Group's human resources, technology and operations expertise. The ACP Group can also capitalize on the knowledge and experience of EMPRENDA.

3.3 ECAMI

ORGANIZATIONAL DESCRIPTION

Empresas de Comunicaciones (ECAMI) is a Nicaraguan company that was founded in 1982 by Mr. Lacayo. Nicaragua is one of the poorest countries in Latin America with a GDP per capita of US\$ 3,000. Nicaragua has a population of 5.6 million people, of which one third live in rural areas. Just 30% of the rural population - 2.7 million Nicaraguans or 467,500 households⁴³ - has access to electricity. Although ECAMI started out selling radio communication systems, in the mid 1980's they began to sell renewable energy systems to meet the pressing energy access need in Nicaragua.

ECAMI is a family-owned company whose current core business is the sale, design, and installation of renewable energy systems, mainly solar home systems. ECAMI has grown significantly in recent years. It has opened several branches across the country. At the moment it has seven offices in Nicaragua and one office in Tegucigalpa, Honduras. The company has around 50 employees and annual sales of around US\$ 3 million.

Each branch has three staff members: one branch-administrator and accountant, one installation and technical manager, and one sales manager. Most branch personnel are residents of the branch location.

Most of ECAMI's systems are small solar systems of around 50W. From the inception of the renewable energy program until year-end 2011, ECAMI had installed of 11,500 solar systems. From 2004 - December 2011, ECAMI had installed more than 2,100 solar home systems, more than 400 solar systems for health centers, schools, and rural offices, over 70 systems for telecommunications, and 40 systems for urban and tourist areas. Most of its clients (90%) are based in rural areas.

ECAMI provides services to three different customer segments:

- a) Projects for private companies, governments, NGOs, or other organizations.
- b) Distributors that resell and install their products, with some short-term financing from ECAMI.
- c) Private customers, normally rural families.

ECAMI has an internal procedure to build the capacity of its staff, namely in selling, installing and maintaining the renewable energy systems. For example, it has developed training materials (booklets, flyers) in Spanish and in different local dialects to train customers on the use and maintenance of the renewable energy systems. Locals are hired to provide basic maintenance services to the solar home systems of their communities, and the customer compensates the local-technician for the maintenance service.

ECAMI has managed to build strong supplier-relations with international companies, and some of them are already providing short-term supplier credit to ECAMI. These relationships are providing a range of benefits to ECAMI, including discounted prices and shorter delivery periods. Partly as a result of these relationships, ECAMI is a profitable and financially independent company.

In 2003, the World Bank's Global Environmental Facility and the United Nations Development Programme (UNDP) implemented a program called the Off-grid Rural Electrification Project (PERZA), with the aim of encouraging microfinance institutions and energy companies to provide credit in off-grid rural areas. Under this program, some microfinance institutions financed products sold by

⁴³ CEPAL Data, in 2004 there were 5,8 persons per household

ECAMI. During the project, PERZA focused on catalyzing the sale, financing, and installation of domestic solar systems. One of the best-selling products was a system that cost about US\$ 600. PERZA subsidized these systems by US\$ 150 and the customer covered the remaining US\$ 450 with the help of microcredit. From 2003 to 2008, ECAMI installed 3,500 solar panels.

The PERZA program succeeded in mobilizing the market and engaging microfinance institutions in the project. Between 2004 and 2009, the market for microfinance in Nicaragua grew significantly, quadrupling in size. However, in 2009, a social movement called "No pago" (No pay) took hold, and many customers stopped paying their loans. Naturally, this caused losses for many microfinance institutions, to the extent that some disappeared. Since then, financial institutions have been more cautious about offering loans.

Currently, ECAMI makes mostly cash sales, but it has also sold products to clients who used microloans to make payments. Over the years, ECAMI was able to structure a series of successful partnerships with microfinance organizations in Nicaragua, however, due to the "no pago movement" microfinance in Nicaragua has become quite complicated and political, making it risky for ECAMI to consider client purchases through microloans. In an effort to continue reaching this client group and to allow those clients to pay in smaller increments, ECAMI is currently in the process of incorporating a financial instrument that will enable it to provide credit to its clients directly.

The Inter-American Development Bank (IDB) is financing the development of this instrument through a long-term concessional loan. The IDB soft loan will create a revolving fund of US\$ 907,000 over nine years at a Libor-based rate, plus a spread that yields an annual rate of no more than five percent. The IDB is providing financing of US\$ 700,000 and ECAMI is providing US\$ 207,000 in counterpart funding. In addition, the IDB is providing US\$ 250,000 for technical assistance, and ECAMI is providing US\$ 73,200 in counterpart funding. The total fund is US\$ 907,000 and the total technical assistance funding amounts to US\$ 323,200. The agreement with the IDB includes a set of internal procedures that aims to strengthen ECAMI's internal operations. The advantage of the IDB agreement is that ECAMI has access to a soft loan and technical assistance to consolidate its credit and collections department. As of December 2012, ECAMI had structured and implemented the financing procedures, and it is expected to start lending in 2013.

MARKET DEMAND

According to the Economic Commission for Latin America and the Caribbean (ECLAC), Nicaragua has the lowest electrification rate in the region: only 52.1 percent (lower, if one takes into account the illegal connections). In other words, more than 2.7 million Nicaraguans do not have access to electricity (equivalent to 467,500 households), of which an estimated 160,000 homes are outside the reach of the grid: the national grid is only required to serve households that are within 150 meters of its existing network. Several regions of Nicaragua are outside the range of the power concessions: half of the region of Rio San Juan, the South Atlantic Autonomous Region, the North Atlantic Autonomous Region, and two-thirds of the regions of Jinotega, Matagalpa, Boaco, and Rio San Juan. The eastern part of the country has very scattered electrical access, and purchasing power is very low.

The potential market for ECAMI depends largely on its ability to serve low-income people who are not connected to the grid, to reach remote areas, to provide an accessible mechanism for potential customers (low-income families) to buy their products, and to serve middle and upper class clients, and companies (such as hotels, telecommunication companies and other industries).

Opening new branches allows ECAMI to serve a larger number of customers, but lower income people who cannot afford a solar system continue to be unserved. In the past, ECAMI began selling

lower-priced products with a smaller capacity, known as “peak-PV” equipment. These solar systems are typically no more than 10W, or enough to power a single device, such as a cell phone, solar lantern or solar radio. These devices do not require specialized technical installation as they are pre-assembled and set-up by the user. However, it has been difficult for ECAMI to persuade people to accept these products, even though they cost much less than a solar home system. Clients prefer to save and buy a solar home system rather than spend money on a US\$100 system that seems fragile and “toy-like”. With lighting and a large solar panel, the solar home system can cost around US\$ 600.

Most clients prefer big systems as they believe that they will work better, have greater capacity and are more robust. Advances in solar technology have in fact made smaller systems more efficient. Another example of consumer distrust is in high-efficiency stoves. People do not buy them, even though they burn less wood, because they are influenced by the appearance of the stoves: they are compact and visually unimpressive, lacking the heft of traditional solutions (a grill on stones).

CUSTOMER SEGMENTATION

ECAMI has different types of customers, and each type requires a different sales process. ECAMI categorizes clients in three ways: individual customers, mainly retail sales; projects, often for private companies, government entities or cooperatives; and distribution companies.

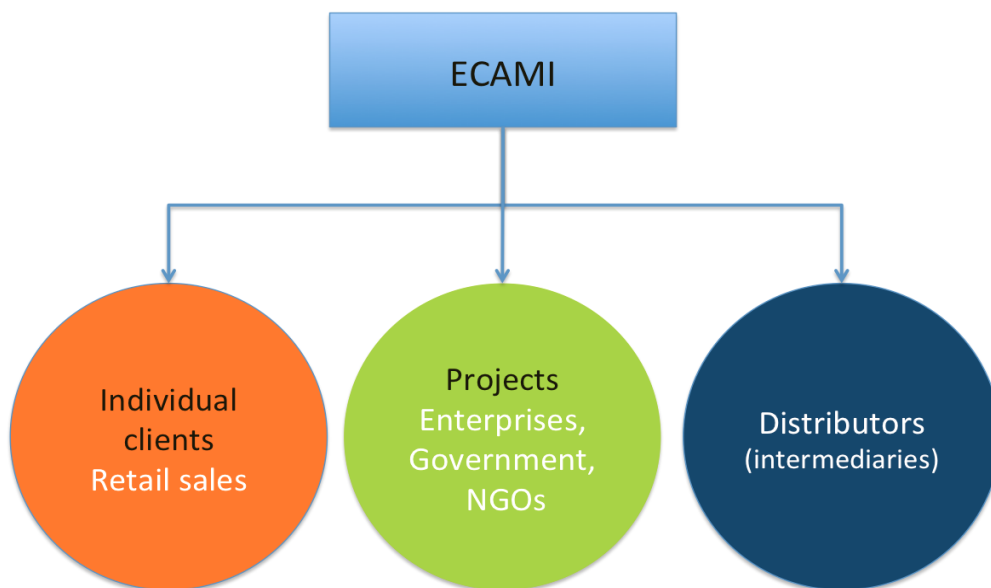


Figure7: Types of ECAMI customers

1. **Retail Sales:** Individual customers are served in every branch. They usually come to a branch to ask for system prices, and the branch staff prepares a cost and technical proposal. If the client approves it, it translates into a sale and the system is installed. Most clients are engaged in agriculture, so their income cycles fluctuate, and many are low-income families. ECAMI also caters to individual customers in urban areas, although the products offered are different, such as solar water heaters.
2. **Projects:** These involve the design and installation of power generation systems. The projects are geared at private companies (hotels, telephone companies, etc.), the government (schools, hospitals, municipalities), and NGOs with social projects and independent people.

Government projects usually require competitive bids, for which several companies will submit a technical and financial proposal. Municipal projects are mainly taken care of by ECAMI's branch staff, who are continuously looking for opportunities to service these regional entities. ECAMI is currently negotiating a contract with the government of Nicaragua to install a 1.4 MW solar plant, which would involve an investment of about US\$6 million and would be one of the largest solar electricity plants in Latin America.

Cooperatives or social committees are another type of repeat customer. These entities negotiate a volume of equipment and pricing to benefit their members, and ECAMI coordinates with the cooperative on product delivery, installation and training.

The projects for private companies include various types of businesses. For example, ECAMI clients Telefónica and Claro (phone companies in Nicaragua and Honduras) require communication antennas and renewable energy systems.

3. **Distributors:** A distributor is typically a person or company that regularly purchases products from ECAMI for resale and receives a special discount. Becoming a distributor requires an internal approval process in which ECAMI analyzes the purchase history of the person or company that wants "distributor" status. S

Branch sales depend heavily on the socio-economic conditions in the area and the ability of branch staff to convince the customer. The staff of each branch is specialized in serving different customer types. There are branches where there are more sales to one customer type over another. For example, in the El Rama branch, 92.5 percent of sales are retail sales to private customers, while in the Matagalpa branch retail sales represent only 28 percent.

Although most of the installations are in rural areas that are not connected to the grid, the customers that pay for these systems are, for the most part, government agencies or NGOs aiming to improve living conditions among the rural population. According to information provided by ECAMI, 80 percent of customers are government agencies or NGOs and 20 percent are individuals.

COMPETITORS

As ECAMI has grown, it has gained market share. The company with which ECAMI competes most directly is TECNOSOL, also from Nicaragua and founded in 1998. TECNOSOL has 17 branches in the country and is expanding into El Salvador and Honduras.

The products and services TECNOSOL offers are similar to those of ECAMI, with products ranging from small-scale wind turbines, hydro micro turbines, solar hot water systems, and solar electricity generation. TECNOSOL has 75 employees and annual sales of US\$3.1 million. From 2005 to 2009, the company grew at an average rate of 40 percent annually. TECNOSOL's clients are 50 percent private,

20 percent NGOs or social services agencies, and 35 percent governmental or public agencies, such as social services.

Most services offered by TECNOSOL are domestic solar systems, ranging from 50WP to 100WP. TECNOSOL has sold about 40,000 domestic solar systems, and another 1,000 systems for schools, health centers, and small shops. TECNOSOL promotes its products through its branches, advertising (radio, bus posters, billboards), and through its network of existing customers.

TECNOSOL offers its systems for cash, and has no credit to finance its equipment. However, it has worked with some MFIs or cooperatives that offer credit to sell solar systems to their customers and members. There are other smaller companies that offer solar systems; however, they are not significant competition for ECAMI.

Obstacles

ECAMI's business model faces the following obstacles:

Obstacle	Characteristics
Geographic	Customers who require power generation systems are usually found in remote, inaccessible areas. The costs of handling the dispersed populations are high. Promotion, installation, and service require a sound logistics strategy.
Socio-economic	There is a large market of low-income families living in underserved communities. Their low income limits their ability to purchase solar systems. Isolated power systems require care and basic knowledge on the part of users. Capacity building is required for the correct use of solar systems.
Technological	Solar systems and equipment are relatively new, and brands that have not been tested under rural conditions are continually coming to market. Many products fail, which causes disruption and non-payments.
Economic	Renewable energy generation systems require large initial investments and have long recovery times. Low-income people therefore require financial support.
Regulatory	There is no regulation on rural electrification or on the minimum quality that a service must offer. There is a wide range of quality in the market including some low-quality (and low-cost) technologies that distort the market and competition.
Competitors	ECAMI currently faces strong competition, mainly

from TECNOSOL⁴⁴ who is also trying to grow and gain market share.

SWOT Analysis

An analysis of the Strengths, Weaknesses, Opportunities, and Threats of the ECAMI business model was carried out with the following conclusions:

INTERNAL FACTORS	
STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> Proven track record and large market share. 	<ul style="list-style-type: none"> There is need for mechanisms that facilitate business growth. One way is to provide credit to make systems more affordable. Staff members do not have experience in evaluation and risk analysis, nor in structuring financial instruments.
<ul style="list-style-type: none"> Currently expanding by opening new branches. This allows ECAMI better access to its target market. The majority of clients are in rural areas. 	<ul style="list-style-type: none"> An expanding family business always involves adjustments: this includes hiring new, non-family staff with greater responsibilities. Growth can result in internal "crises" that must be resolved
<ul style="list-style-type: none"> Extensive experience and knowledge about different renewable energy technologies (particularly solar). 	
<ul style="list-style-type: none"> Staff is well trained to sell, design, and install systems. 	
<ul style="list-style-type: none"> Has worked with several manufacturers and technology distributors and built partnerships with suppliers to provide credit (up to 60 days), with preferential terms. 	
<ul style="list-style-type: none"> Having different types of clients and not relying on a single type of customer allows ECAMI to reduce its risk and increase sales. 	

EXTERNAL FACTORS	
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> Market size is intriguing. There is great need in both Nicaragua and its neighboring countries. 	<ul style="list-style-type: none"> Nicaragua is highly vulnerable to external economic and climatic factors, as well as political issues, which can have a significant impact on small businesses like ECAMI.
<ul style="list-style-type: none"> Most ECAMI customers are NGOs, government entities, or individual clients with purchasing power. The current percentage of low-income customers is very low. If ECAMI can create mechanisms to facilitate the purchase of products by poorer people, sales could increase significantly. 	<ul style="list-style-type: none"> The competition is also trying to grow and gain market share. TECNOSOL is one of the major competitors.
<ul style="list-style-type: none"> EMCAMI has opened 6 branches (in addition to the central office) that have yielded promising financial returns, and has allowed proximity to its customers. ECAMI should continue with its expansion plan of 15 branches in strategic locations. 	

⁴⁴ TECNOSOL is ECAMI's main competitor, and started operations in 1998. TECNOSOL has a network of branches in several cities in Nicaragua, and is mainly focused on solar PV products. TECNOSOL has a big share of the market (annual turnover in 2010 was US\$3.1 million).

How can the organization use its strengths to capitalize on identified opportunities?

ECAMI has expanded its operations in Nicaragua and is now operating in Honduras. Its growth strategy has been very successful. Through market research, the company must identify areas where there is the greatest opportunity, and analyze the areas where it will face the most competition. The branch expansion to neighboring countries can be a good option, although it is important to conduct market research on market size, the sales potential of the systems in other places, as well as to produce a business plan indicating the resources and additional investments required. The incorporation of a financial instrument (loan or lease) could significantly increase ECAMI’s sales. The company could expand the number of individual and private clients (companies/municipalities) if it had different payment instruments.

How can the organization use its strengths to minimize identified threats?

ECAMI has several types of customers (projects, distributors, individual customers), which allows it to diversify risks. Also, the company can mitigate its country risk if it further expands to other countries in the region. Competition has been present in Nicaragua for several years and ECAMI has been dominating the market. However, it is important to monitor the evolution of the competition and measure the performance of ECAMI against its competitors.

What weaknesses need to be addressed in order to capitalize on the opportunities identified?

ECAMI is a small family company, like the vast majority of companies in Latin America, and it is important for it to start laying the structural foundation to guide planned growth. For example, ECAMI should consider having an external advisory council that meets regularly to provide recommendations on its performance and strategic decisions.

Growing businesses must have a plan for growth and expansion that allows them to forecast the investments and additional resources they will require and predict sales potential. A good business plan requires market research to identify areas of greater opportunity and where the company should focus its attention. ECAMI has a good grasp of what happens in the market, and this will be helpful in developing a solid plan for expansion.

The incorporation of a financial instrument to fund ECAMI products would require additional staff with specialized skills in finance, risk assessment, and structuring financial instruments. ECAMI does not currently have these capabilities. ECAMI would need to hire staff to help it structure the financial instrument, identify risks, mitigate risks, establish credit assessment methodologies, and develop procedures and loan recovery methodologies.

COST-BENEFIT ANALYSIS OF THE ECAMI SOLAR HOME SYSTEMS (SHS) FROM THE CLIENT’S PERSPECTIVE

The solar home systems that ECAMI offers its clients are cost-competitive when compared with conventional energy solutions (kerosene, disposable batteries, carbon, etc.). The following tables show the cost analysis of one SHS model for a family compared to conventional resources. According to information provided in a World Bank report, the costs of conventional energy resources per family in Nicaragua were estimated as shown below.

Table 5: Monthly Energy Costs for a Rural Family in Nicaragua		
Average Kerosene Consumption per Family for Lighting Purposes		
Kerosene Consumption per Lamp ⁴⁵	0.04	lt/hr
Lamp Usage per Day	4	Hr
Number of Lamps per Family	4	

⁴⁵ <http://illuminationhq.com/news/adverse-effects-of-kerosene/>

Cost of Kerosene	24	\$/liters (Córdobas)
Currency Exchange	21	\$/ US\$
Kerosene Consumption per Month	19.2	Liters
A. Monthly Cost of Kerosene Lamps	21.94	\$/Month

Average of Used Batteries per Family for Power Radio		
Cost of Disposable Batteries	4	US\$
Batteries Lifetime	100	hrs
Hours Use of Batteries per Day	4	hrs
B. Monthly Cost of batteries to Power Radio	4.8	US\$

A+B. TOTAL (Batteries + Kerosene)	26.74	US\$
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The total cost of using batteries and kerosene per month is US\$ 26.74/month or US\$320.9/year. The cost analysis of a 50W system is estimated in the next table.

Table 6: Analysis of Annual and Monthly Cost of a SHS 50W				
System Cost	US\$ 444			
Component	Cost	Lifetime (years)	Annual cost	Monthly Cost
Photovoltaic Panel	240	20	12	1.0
Battery	126	3	42	3.5
Lamps	21.6	1	22	1.8
Cable, and Minor Components	8.88	10	1	0.1
Inverters/Controllers	48	6	8	0.7
TOTAL (US\$)	444.48		84.5	7.0

The cost benefit analysis can be estimated by comparing the investments and cost incurred through the use of a photovoltaic SHS with those associated with conventional resources, as illustrated in the table below.

Table 7: Cost-benefit Analysis of a 50W Photovoltaic SHS vs. Conventional Resources						
Variables						
Inflation ⁴⁶	6%					
Discount rate ⁴⁷	14%					
Annual PV SHS cost ⁴⁸ (US\$)	444					
Annual Costs Conventional Resources (US\$)	320.91 Per year					
Annual Amortization Cost (US\$)	84.48 Per year					
Cash flow	0	1	2	3	4	5
Initial Investment PV SHS	-444					
Annual Costs Conventional Resources (US\$)		321	339	357	377	398
Annual Amortization Cost (US\$)		-84	-89	-94	-99	-105

⁴⁶ CIA World Factbook.

⁴⁷ PERZA Project information.

⁴⁸ PERZA Project information.

Balance	-444	236	249	263	278	293
PV	-444	207	192	178	164	152
NPV	-444	-237	-45	132	297	449
TIR	49%					

The previous table shows that the Net Present Value (NPV) becomes positive in the third year, meaning that the payback period would be between the second and third year, and the user would have an IRR (Internal Rate of Return) on his investment equal to 49%. It is important to mention that this analysis does not take into account the social benefits (health, environmental, etc.).

4 BEST PRACTICES

4.1 IDEAAS

Adoption of Leasing Model

IDEAAS has implemented a leasing business model to motivate rural clients to change from traditional energy sources to clean energy. IDEAAS sets a monthly leasing fee that is equivalent to the amount the clients would pay per month for traditional sources such as kerosene, batteries, and diesel. IDEAAS is responsible for the system and battery performance during the leasing period. This model reduces customers' perceived risks regarding the performance of the technology, which is one of the main barriers preventing clients from investing in these technologies. Another important barrier that can restrain the uptake of solar energy technologies is the relatively high upfront investment costs of the systems. IDEAAS' leasing model allows clients to access these technologies with just a small initial capital investment, and subsequent small monthly payments. Moreover, by leasing instead of buying, rural clients save on sales tax that would otherwise have to be paid if purchasing the system. They also get the benefit of any technology upgrades that happen during the leasing period and are not left with obsolete products.

Use of Local Components

IDEAAS uses local components for its systems, which reduces costs for the end-user as it allows the company to carry a smaller stock (particularly important regarding the batteries, as the lifetime of batteries decreases with time regardless of whether they are used or not), and facilitates the management of the components through warranties (leading to quick-response times and fewer systems failures).

IDEAAS has managed to adapt, develop and manufacture certain components that provide technical solutions that are more suitable to local conditions. Some of these components include:

- a) Sealed plastic box to protect components.
- b) Special socket and plug connectors that prohibit bad connections and facilitate component replacement.
- c) Adaptation of commercial compact fluorescent lamps (CFLs).
- d) Use of a cheaper automotive battery, rather than a special solar battery.
- e) Development and manufacturing of the battery charge controller (suitable to extend the lifetime of the battery).
- f) Design and development of a pre-paid card system (to manage monthly payments).



Figure 8: System components

Customer Diversification

IDEAAS provides services to a number of different types of customers so as to distribute costs and reduce risk. Customers include: a) companies that require energy solutions in rural areas, and b) poor families that live in rural areas. These two different client segments allow IDEAAS to build a robust platform and spread its operational costs, which puts IDEAAS in a good position serve poor families. The financial risks and the transactional and operational costs of serving individual poor families are higher than providing services to big companies. The main differences between company clients and poor family clients are:

- a) **Cost distribution.** Each client requires individual attention and management (regardless of the number of systems). In the case of company clients, they normally require several systems to cover their needs, which allow costs to be spread among several systems; for poor family clients, all operational and transactional costs are allocated to just one system.
- b) **Financial risk.** The purchasing capacity and payment uncertainty is higher with poor families than with company clients. Monthly payment collection is easier with a company client (that owns several systems) than with several clients who have just one system each and are located in remote areas.



Figure 9: Houses for workers

4.2 EMPRENDA

Providing microcredit and solar energy solutions

EMPRENDA has integrated the provision of micro-credit and solar energy solutions under the same organizational structure. It has built a team of agents who are trained to assess a client's capacity to re-pay, while selling the products and installing and maintaining the solar energy systems. This multidisciplinary approach has allowed EMPRENDA to position itself in the region as the leading provider of solar energy products. The microcredit support allows EMPRENDA to reach “poor families” that are not able to pay in cash for solar systems, providing a mechanism to pay in smaller installments over a longer period of time.



Figure 10: Solar home systems provided by EMPRENDA

Train and employ local residents

The EMPRENDA agents and administrative staff who operate in the rural areas consist, in part, of local residents who have been trained to service rural clients. This practice has allowed EMPRENDA to maintain low operating costs while increasing market penetration and building trust among potential clients. Rural staff members (all local residents) are familiar with local needs, understand the local market, and are able to identify local market opportunities. EMPRENDA’s management team provides oversight.

Leveraging a leading microfinance network

EMPRENDA has a solid international reputation and has benefited from the recognition it has achieved as one of the few microcredit organizations that is providing renewable energy solutions. EMPRENDA is a member of ACP Group (*Grupo ACP*), which provides the organization with greater visibility and access to an extensive global network of potential donors and investors.

4.3 ECAMI

Branches and organization structure

ECAMI has several branches across Nicaragua. The branches are located strategically in small towns that are close to potential clients and configured to showcase the different products, each with a small stock of products to sell.

Customer diversification

ECAMI has managed to diversify its customer base to three different segments: a) Projects with private companies, NGOs, or government entities; b) Distributors who re-sell and install its products; c) Private customers for retail sales. Each branch is dedicated to serving clients and finding business opportunities in each of these segments. This practice has allowed ECAMI to reduce its dependency on one segment and position itself as a leading solar energy provider in Nicaragua.

Marketing

ECAMI invests in marketing and advertising campaigns promoting the benefits of clean energy systems. It uses TV, radio, and print ads to promote its services. This practice has supported ECAMI's market positioning, facilitated the introduction of new products, and led to market share growth.

Trained local resident provides maintenance service

In order to keep costs low, ECAMI has established a mechanism to train local technicians to carry out small maintenance tasks for his or her community. Each client served remunerates the local technician for his or her service. This practice allows ECAMI to reduce costs when providing after-sales services.

Product selection

ECAMI has established a successful procedure to identify new products in the market and test them before they get launched to the public. This allows ECAMI to offer products that it knows and understands, and that perform well under environmental stressors, such as dust and extreme weather conditions.

5 PROPOSED NEW PRODUCTS AND SERVICES

5.1 IDEAAS

IDEAAS still faces challenges in refining its business model and requires enterprise clients in order to expand services into poor rural areas. More clients would allow IDEAAS to strengthen its service structure, reach greater economies of scale, become more competitive and distribute its operational costs so that services for poor families are more affordable.

IDEAAS could identify complementary products and services that could be offered both to big companies and poor families. One potential growth area and client-base for IDEAAS could be telecommunications companies, which are expanding their network coverage by installing antennas. These antennas require energy, and normally they are located in places where there is no grid-access. IDEAAS can steer the location of these antennas closer to rural areas in order to extend a minigrid from the antenna to provide services to rural families. In this model both parties (enterprises and rural families) benefit from a shared service and it can be more cost-efficient for them. In addition, IDEAAS can benefit from the new energy policy that aims to promote small scale renewable energy projects, which includes the "Net Metering Program".

The consulting team suggested that IDEAAS build a network of local micro-franchise distributors to sell and install their energy products and services. This would help IDEAAS reach clients it cannot otherwise reach (owing to geography) and to expand its market penetration. This would also increase the number of products IDEAAS can sell and help the company reach greater economies of scale, allowing it to be more competitive when selling/purchasing technology. It would also allow IDEAAS to concentrate more efforts on technology development (such as the prepaid card, and the controllers they manufacture), and improve its manufacturing processes (a handmade production process at the moment) in order to be more cost-competitive.

In order to build a solid network of micro-franchise distributors, IDEAAS needs to develop a methodology to source, evaluate, train, and manage a broad range of distributors.

IDEAAS was also advised to expand the number of products/system solutions it currently offers its clients. At the moment it only provides Solar Home Systems (SHS). However, there is market potential for more efficient cook stoves, water pumps, and solar water heaters.

IDEAAS receives an important share of its income from donations to develop projects in the Amazon and to expand its leasing business model to poor rural families. The team advised IDEAAS to establish a revolving fund that would allow it to recover funds and expand its business model. Currently IDEAAS does not have a system to recover donated funds and reuse them.

In addition, the team suggested that a formal corporate governance structure would help IDEAAS fulfill its goals and responsibilities, and attract more donors and investors. IDEAAS is an organization co-founded and managed by CEO Fabio Rosa, and the organization's strategic decisions, responsibility, and actions are fully dependent on Rosa. This non-for profit organization can be strengthened with a governance body that includes board members that bring more resources, more projects, and capacity to expand the work that IDEAAS has been doing.

IDEAAS has established important alliances with international organizations; however, it was recommended that it also strengthen its relations with local government entities that are working to achieve universal electricity access for all of Brazil. IDEAAS's business model could be a feasible solution for the government's needs in rural areas with difficult access.

REVOLVING FUND

It is suggested that IDEAAS establish internal mechanisms to cover initial investments (including subsidies) in order to expand the leasing model. This could be achieved through a revolving fund. The fund would be augmented with part of the profit from the lease payments IDEAAS receives monthly: part of this lease would be used to pay operating costs, and the other to finance the revolving fund.

The revolving fund would help IDEAAS decrease its dependence on donations and grants and allow it to recuperate its initial investments. At the moment IDEAAS has a reserve fund that is used to replace the batteries of the system at the end of the lifetime of the battery. IDEAAS has received (and continues to receive) donations in cash and in-kind, which have helped to establish the leasing model. These donations are used to cover part of the initial investment for solar systems used on the leasing contracts. By definition, the donations do not to be returned, and as a consequence IDEAAS does not need to reflect the amortization of the systems in its cash flows.

The main objective of a revolving fund would be to support IDEAAS in establishing a mechanism to recover part of the donation received, by taking advantage of this money as if it were working capital. The revolving fund would be in effect a reserve fund, which would be "fed" from a small portion of the monthly leasing fees that are paid to IDEAAS.

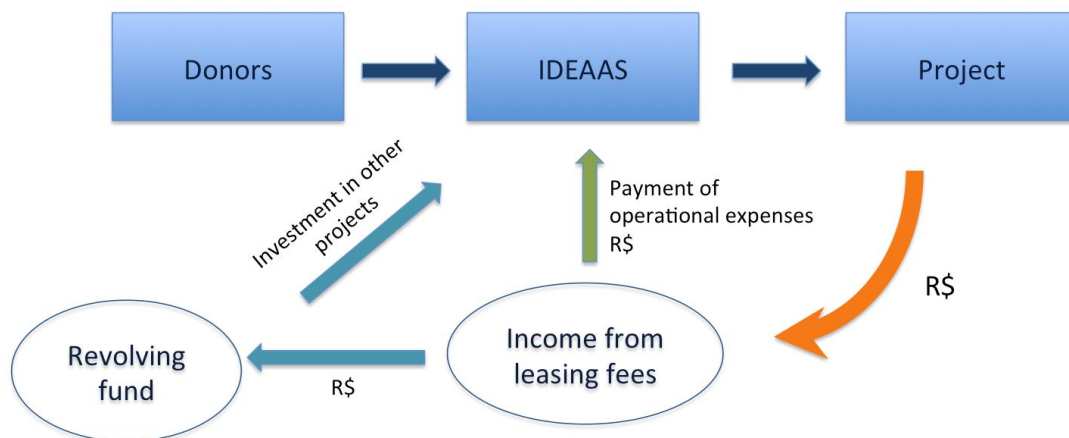


FIGURE 11: REVOLVING FUND

CELL PHONE COMMUNICATION COMPANIES/MINI-GRID

These companies are continuously extending their communications network through relay towers, which require electricity to operate. When expanding in the Amazon, an area not yet fully connected to the grid, radio and telephone companies have to find alternative sources of electricity. IDEAAS could install solar energy solutions into these companies' towers. Additionally, if IDEAAS could propose installing these towers near an isolated, low-income community, it would provide an ideal opportunity to form a mini-grid that could provide electricity both to the tower and to the neighboring area. Residents would have to pay a price for electricity to IDEAAS, while IDEAAS would simultaneously receive income from its lease to the telecommunications company.

LINE OF CREDIT

For IDEAAS to become self-sustaining, it should form a line of credit to expand its business in renewable energy systems leasing. To do this, IDEAAS should ensure the price of its leases is high enough to cover its costs. To cover the costs of credit, an acceptable leasing fee for a 60W systems would have to be above R\$ 80 a month.

NETWORK OF INDEPENDENT DISTRIBUTORS

For IDEAAS to cover more territory and expand to new regions, it should develop a network of local distributors and installers. IDEAAS currently has some small distributors in the Rio Tapajos area, but this network should be made larger. IDEAAS should develop a methodology to recruit, train and manage vendors. These should be local people, micro-entrepreneurs, who would be trained to sell, install and provide maintenance in isolated areas. This would have the advantage of reducing or even eliminating the need for permanent staff in each area, keeping fixed costs from increasing. Systems could be sold for cash or on a lease model, where the dealer receives part of its revenue from the lease in order to maintain interest in its collection and maintenance. Other challenges include the transport of equipment and communication with distributors. Distributors located in urban areas must be notified, otherwise, coordination would be complicated. Transportation systems should be coordinated with organizations or enterprises already engaged in the transport of goods or people in the area. The Amazon River has public transportation that can be used to inexpensively transport components and people.

EXPAND TECHNOLOGIES AND ENERGY SOLUTIONS

The IDEAAS leasing business model can be extended to other technologies, including mini hydraulic pump systems or even small water purification systems. Companies may be interested in "renting" technology solutions for energy or water, which would allow them to concentrate on their core businesses rather than on operating systems and power generation equipment. Companies that are in isolated areas such as the Amazon have many needs, among which are: electricity, thermal energy, water treatment, and waste management. IDEAAS is in a position to propose solutions to meet some of these needs. In addition, companies often prefer to lease systems instead of investing capital, as this diverts resources from growing a company's productive areas and allows them to cancel operations if they need to.

RATES

The rental prices of the services offered by IDEAAS should be re-evaluated. At this time, the lease does not cover fixed costs or amortized equipment, which puts IDEAAS' operation at risk.

5.2 EMPRENDA

EMPRENDA has been working to grow its sales and customer base and has been expanding its services to other regions in Argentina; however, in order to maintain and expand its services, it needs to increase its revenues. EMPRENDA was advised to incorporate less-costly independent micro-franchise distributors that can diversify its sales channels, and not just rely on its own sales force. The independent distributors can increase the sales force without increasing EMPRENDA's fixed costs. These distributors could be trained to sell, install and provide minor maintenance.

The figure below shows how the independent distributors can be integrated into EMPRENDA's rural branch structure.

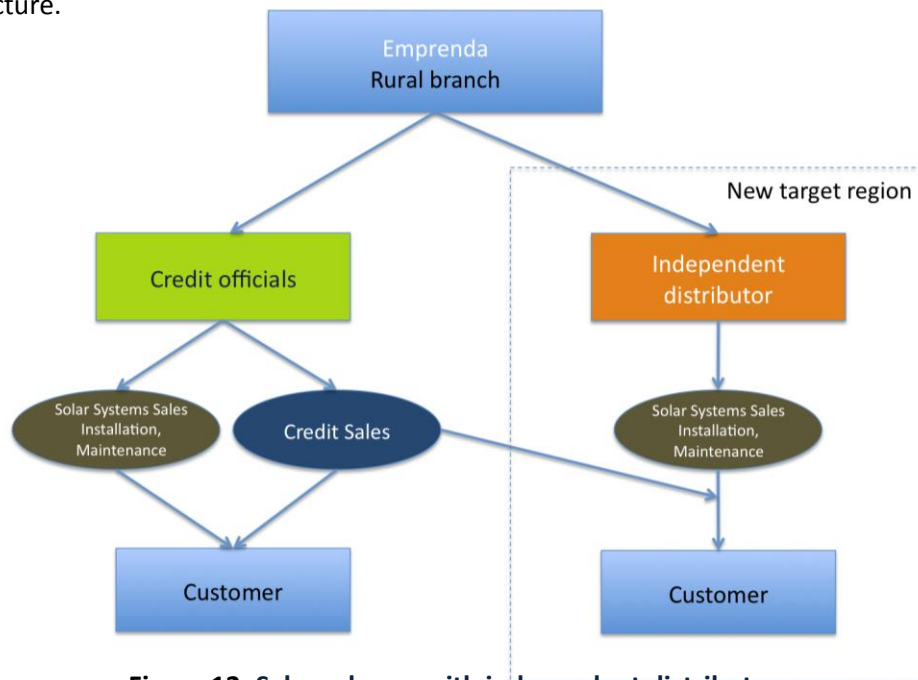


Figure 12: Sales scheme with independent distributors

INCLUDE INDEPENDENT AGENTS/DISTRIBUTORS

EMPRENDA's growth and expansion capacity depends on its ability to increase sales. EMPRENDA does this by diversifying its sales channels by not relying on its loan officers for all tasks, but by incorporating local people as independent micro-distributors. The incorporation of distributors requires training, but may increase the sales force without significantly increasing operating costs. The provision of credit may continue under the supervision of EMPRENDA staff, which could give a commission to dealers for sales, installation and services. Another option is for EMPRENDA to assign distributors a credit amount to lend to their customers; this option involves a different type of operation that EMPRENDA is not accustomed to and involves other risks, but could expand the customer base. The incorporation of local distributors involves creating micro-entrepreneurs.

INCLUSION OF NEW PRODUCTS

The fact that most of EMPRENDA customers already have solar systems reduces the market and makes it necessary to try to offer additional solutions. However, technical issues and guarantees must be thought out, since equipment and products are subject to extreme weather conditions. Some examples of additional products that could be marketed are: low-powered TVs; more efficient lamps, stoves, and radios (12V); machinery and equipment for productive activities; solar water pumps; water purification systems; and others.

One product that EMPRENDA could offer that has potential demand is water purification systems for use in a rural area housing. Most families address their water needs by collecting untreated river water or by storing rainwater in cisterns or tanks. Both the river water and rainwater do not have hygienic safeguards; therefore, the population has a high rate of gastrointestinal disease. According to an analysis of various products, an example of a product that could be most suitable for EMPRENDA’s market is the LifeStraw Family - Instant Microbiological Water Purifier.

LifeStraw is a point-of-use water treatment system to be used daily in low-resource settings. It filters up to 18,000 liters of water: enough to provide a family of five with microbiologically pure water for three years. The system ensures a high flow rate and a high volume of purified water. It complies with the *1987 Guide Standard and Protocol for Testing Microbiological Water Purifiers* of the US Environmental Protection Agency:

- Removes at least 99.9999 percent of bacteria (reduction >LOG 6)*
- Removes at least 99.99 percent of viruses (reduction >LOG 4)*
- Removes at least 99.9 percent of protozoa parasites (reduction >LOG 3)*

The system removes turbidity, does not require electricity, batteries or replacement parts, requires no running water or tap water, has an easy-to-clean pre-filter and purification cartridge, and all raw materials meet the standards of the US Food and Drug Administration or an equivalent authority. Below is a cost-benefit analysis of the product.

It is worth noting that the product needs strong marketing and penetration efforts for people to accept it and see its necessity, this cost would be included as part of the operating costs.

IN-KIND REMITTANCES

Another service EMPRENDA could offer is financing solar home systems for Bolivian and Peruvian immigrants living and working in Argentina. The solar systems would be purchased in Argentina, but delivered to the families of immigrants in their country of origin, i.e. Bolivia or Peru. This is in effect an in-kind remittance product.

These immigrants can be an important target client group for EMPRENDA as these clients are an underserved and growing market. It is estimated that there are roughly one million Bolivian immigrants and 140,000 Peruvian immigrants living in Argentina. In 2009, these immigrants sent US\$ 244 million in remittances to their families in Bolivia, and US\$ 142 million to their families in Peru. Many immigrants’ families come from rural areas in their country of origin without access to electricity or water. The next table shows the market potential for remittances as mechanism to finance access to electricity.

Country	Population without access to electricity (millions of people)	Electrification rate	Remittances received in 2009 (million US\$)	Remittances from Argentina received in 2009 (million US\$)	Share of remittances in GDP (US\$)	Immigrants in Argentina
Bolivia	3.3	64.00%	1,061	244	6.12%	> 1.000.000
Peru	7.7	72.00%	2378	142	1.88%	>140.000

EMPRENDA can potentially use its knowledge and resources to access this market. Most of the immigrants live and work in urban areas, and EMPRENDA already has an important presence and service structure in certain cities in Argentina, which could be leveraged to realize this market.

EMPRENDA has already developed market knowledge, and its experience marketing clean energy products in rural areas can be extended to providing solutions for rural families in Bolivia and Peru.

The main objective of this effort is to sell energy solutions to immigrants working in Argentina. The products, instead of being used in Argentina where they are sold, would be paid for in Argentina, but would be made available to the immigrants' families in their countries of origin (Bolivia or Peru) via a partnership with a Bolivian or Peruvian partner company. The advantage of this is that the power purchasing capacity of an immigrant worker in Argentina is higher than that of a person living in a rural area in Bolivia or Peru where the salaries are lower and opportunities are scarcer. This model is premised on the fact that the immigrant is committed to send money back home to improve the quality of life for his or her family.

At the moment, EMPRENDA is focused on providing services to rural customers. However, ECAMI could expand its services to other types of clients, such as businesses in rural areas, foundations and cooperatives with activities in rural areas; it could also participate in government tenders for rural electrification projects and water services. EMPRENDA is very well positioned to provide financing, technical assistance, and after sales services, and this could be very interesting for local governments and public national programs, given that very few organizations in Argentina have the infrastructure and experience in all these areas. Expansion to these types of clients can provide EMPRENDA with additional income that can strengthen its operations in the rural market.

Under this system, EMPRENDA would sell and finance solar systems for Bolivian and Peruvian immigrants (and even immigrants from Paraguay) that are living and working in Argentina. The financial transactions would remain entirely in Argentina: EMPRENDA could offer financing so the immigrants would pay with Argentine pesos over a given period. The products available on the platform would be products already available in the receiving country (either imported or manufactured there) so there would be no need to send the product physically from Argentina to the country in question. The money would be sent in the form of a normal remittance (i.e. in cash) - it would just be tied to an energy product that is physically in Bolivia or Peru.

EMPRENDA could take advantage of the structure of ACP Group, with its affiliates BancoSol in Bolivia, and MiBanco or Vivencia in Peru to carry out the financing and distribution. It could also use this platform to provide remittance services. For both cases, the feasibility of obtaining a license must be analyzed for providing remittance services under Argentine regulations.

EMPRENDA could partner with local energy companies/distributors in Bolivia and Peru who would be responsible to deliver, install, provide maintenance for solar systems, and deal with the product related issues (technology manufacturers, shipping, import duties, stock, installation, after-sales service, warranties, etc.). EMPRENDA would need to negotiate with distributors on the quality and conditions of the products that would be sold via this platform. Note this model has been successfully piloted in Haiti.

Below is a cost-benefit analysis of this model.

Assuming 2,200 Bolivian clients a year, EMPRENDA could generate revenue of US\$ 250,500 by financing products that had a retail cost of US\$ 550 and funding 80 percent over six months (to reduce risk). In this scenario we will assume costs for a director in charge of the business, a sales person in each of the three branch offices, and a representative in Bolivia coordinating distributors (though depending on the final business model not all of these positions are necessary). In addition, investment would be needed to provide a mechanism to display products to the immigrants. Distributors could be prequalified companies that would sell products approved by EMPRENDA and could take a share of the profits. These companies would be responsible for product delivery, installation, and after-sales service.

The estimated investment for this model would be around US\$ 350,000 for adaptations, marketing, and time spent for the project coordinator to arrange all the necessary items.

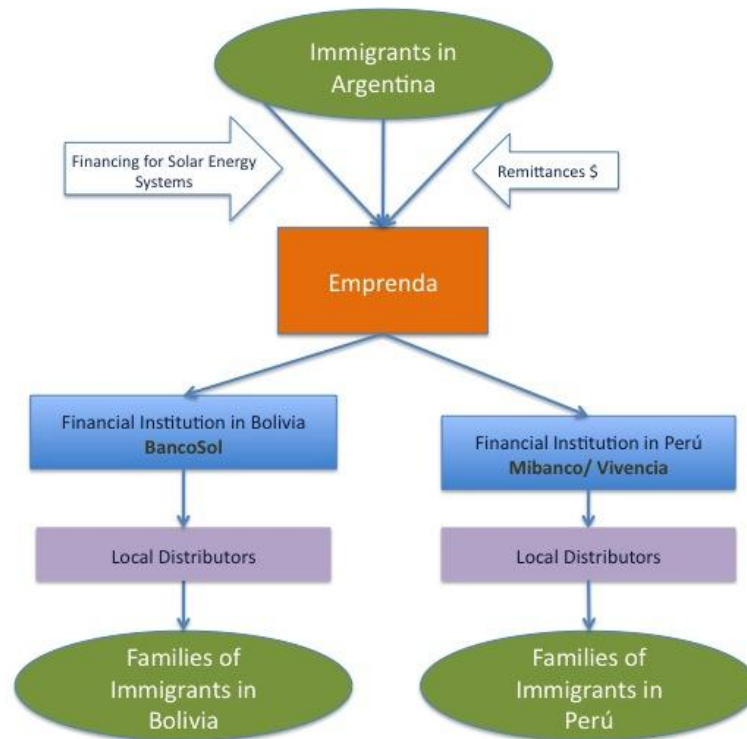


FIGURE 13: FINANCING SERVICE SCHEME FOR REMITTANCE SYSTEM

The number of products that can be sold is limited to the economic capabilities of customers. It is important to find mechanisms that can foster economic development and inclusion for the area's inhabitants. Partnerships with organizations specializing in self-employment programs, training for farming, carpentry, etc., can bring economic benefits to EMPRENDÁ's customers and an increase in the amount of microcredit that can be offered. The aim is to create a virtuous cycle that allows customers – and the institution – to grow.

Some months ago, the Argentine government imposed currency exchange restrictions, and restrictions on the amount remitted (up to US\$500 per month). These restrictions have complicated the remittance market and the ability of immigrants to send money home; however, depending on how the law has been drafted, this model may represent a means to circumvent the restriction as the model promotes access to products rather than cash. This idea is currently being explored by the Inter-American Development Bank.

5.3 ECAMI

One of the challenges ECAMI faces is that its target customers do not have the capacity to buy clean energy products. A large percentage of rural families do not have the capacity to fully pay for a clean energy system in advance. A credit system could change this. The availability of "End-User Finance", or "Small-scale Project Finance" or "Distributor Credit" mechanisms could increase the market share of ECAMI, and could enable rural households to acquire Solar Home Systems (SHS) by paying small sums of money over time, such as on a monthly basis. End-User Finance is the finance that

customers use to purchase energy products or services (normally in the form of microfinance or pay-as-you-go systems). Small-scale Project Finance refers to the financing provided to small off-grid or grid connected projects that ECAMI could develop (could be in the form of debt or equity funding), and Distributor Credit is financing provided to the distributors/agents that already buy products from ECAMI.

Research shows that successful energy vendors that have achieved high levels of market penetration selling household energy systems that have a very high portion of their sales purchased on credit. ECAMI has begun the process of developing its own internal credit mechanism and developing its credit assessment capacity so that it does not have to rely on microfinance organizations. The team advised ECAMI that it should develop credit products that are adapted to the different customer segments it serves. Currently ECAMI receives more than 75% of its income from projects that are developed for governments, NGOs and private companies, and the rest is allocated in similar proportions between individual customers, and distributors. The credit should be structured in a way that it can increase the sales of projects to governments, NGOs and the private sector, and at the same time it has to be able to increase the sales volume of “Individual” customers and “Distributors”. These forms of credit can encourage a client to make a purchase when the client cannot afford the complete initial investment cost, or prefers to pay for a renewable energy system via credit. It could be a competitive advantage for ECAMI to market its projects as having a credit component, and could significantly increase its share of the market.

ECAMI has been increasing its market share by opening branches in different locations in Nicaragua (and Honduras). This expansion strategy allows ECAMI to reach new clients and increase its sales volume. It is advisable for ECAMI to undertake a market assessment before opening new branches, in order to better identify the type of customers that each branch would be serving and the market potential. Companies are often reluctant to carry out market research as they feel they know their customers, but it should be stressed that it is a wise capital investment and could save millions of dollars in the long-term.

ECAMI has specialized in selling Solar Home Systems and other clean energy technologies. However, the team encouraged ECAMI to expand its current product range to include water purification systems, as this technology can be easily sold using the current structure and resources of ECAMI. The water purification systems have good market potential, as an important share of the families in Nicaragua drink untreated water from the river or from wells that cause gastrointestinal diseases. ECAMI, like EMPRENDA, might benefit from investing in the LifeStraw Family product.

BRANCH EXPANSION

ECAMI’s approach of creating new branches to enable it to be closer to customers could significantly increase sales. Opening branches in other countries could also help expand ECAMI’s business. In either case, the expansion must be based on a business expansion plan and a market study of appropriate locations and local needs. As discussed earlier, a large part of ECAMI’s revenue comes from project sales. Expanding into Honduras or other neighboring countries requires an analysis of the type of customer and the potential market that exists in each of the countries.

Considerations when opening a new branch are:

- Market potential by customer type (project, distributor, private client);
- Ability to pay by customer type and stability of income (i.e. if a client receives regular income, or only at certain times);
- Local competition: who is selling similar products or electrification programs in the area;
- Regulations; and

- Possible partnership organizations with a presence in the area (MFIs, NGOs, etc.).

The economic feasibility of opening new branches in Nicaragua is assessed through cost-benefit analysis and projected cash flows for five years per branch. According to information provided by ECAMI, the investment required to set up a new branch is up to US\$7,000 of inventory and another US\$7,000 for setup. The expense of running each new branch is estimated as the average costs and expenses of existing branches, taking into account the annual average inflation rate in Nicaragua. A 20 percent discount rate is included, which represents the average discount rate for commercial investments in Nicaragua.

ECAMI plans to expand its number of branches to a total of 17. It is important to note that this expansion plan calls for increased administrative capacity at the central office, increased advertising expenditures, and expanded resources to keep track of the sales and marketing of the branches.

Since most sales come from ECAMI projects, branches have to focus on attracting projects. This may become relevant to the maintenance of branches that serve mainly private clients and distributors.

PROMOTING PICO PV PRODUCTS AND WATER PURIFICATION

ECAMI has experience with Pico PV equipment and has noted that customers reject these products even if they cannot afford a more expensive system. The recommendation for ECAMI is to use these Pico PV systems as promotional items, enabling them to increase sales. In the process of searching for more robust equipment, ECAMI has identified Pico PV products that would work in the market, such as the Barefoot Power Pack 5.0, which consists of a small 5W solar panel with a battery and 4 LED lamps. However, the acceptance of these products in the target market is in question, and it is necessary to analyze product penetration.

The advantage of these systems is: they may be more accessible for people who cannot afford a solar system; they do not require a specialist for installation; they provide an economical solution to address electrical energy needs; and they double as a battery charger (e.g., for a cell phone). The main disadvantage of Pico products is that they compete against the 60W solar systems also sold by ECAMI, and may hurt ECAMI's market by lowering ECAMI's sales volume. Therefore, it is important to put together a field study of customers' responses towards these products.

As part of this analysis, a feasibility study was done on the expansion of non-energy related products into ECAMI's product line, which could have a positive impact on the target market in rural areas. It was concluded that the products that have the greatest potential in the Nicaraguan market are water purifiers, as there is a clear need. The proposed product is a Vietnamese water purifier called "LifeStraw Family," which has a purchase cost of US\$24, with a possible sales price of about US\$60. The product may be offered to NGOs and local councils as well as ECAMI branches for retail sale.

ECAMI has the resource capacity and the infrastructure to start commercializing these water purification systems. The water purification systems suggested are not complex technology, and do not require a specialized knowledge to sell it and provide after-sale support. Currently, a similar product does not exist in Nicaragua and thus, ECAMI would have a competitive advantage.

5.4 CARBON FINANCE

Rural renewable energy projects developed by the three organizations could have the potential to take advantage of carbon reduction mechanisms such as the Clean Development Mechanism (CDM) (regulated market) and voluntary carbon market, to generate new income. In the first case, developed countries with emission reduction commitments. The voluntary carbon market operates in parallel to the regulated market and is based on the voluntary interest of private organizations in

purchasing Voluntary Emission Reductions (VERs) in order to mitigate Greenhouse Gas (GHG) emissions.

A carbon finance analysis was conducted for each organization, taking into account the current clean energy projects that each organization has. The results of this analysis showed that EMPRENDA, IDEAAS and ECAMI are in a similar situation and are likely to find it difficult to obtain direct carbon finance at this time. The reasons for this, and the main strengths and weakness in the carbon finance context for the three organizations, are detailed below.

Strengths of the three organizations

From the perspective of carbon finance, the biggest strengths of the three organizations are:

- They are focused on renewable energy projects with social and environmental benefits, and they serve rural areas, a segment which is attractive for funding and financing organizations such as the KfW, the World Bank and other organizations, such as Myclimate.
- They have considerable knowledge of the rural context in their countries due to their field experiences, which is a key part in the success of these types of projects.
- They have important social capital due to the type of projects they have developed, and they have worked with several organizations that could be potential partners.

Weaknesses of the three organizations

From the perspective of Carbon Finance, the weaknesses of the three organizations are:

- The small size of the projects, and the fact that the projects generate low amounts of emission reductions and hence low carbon incomes, which are unlikely to compensate for the investment needed to obtain the carbon finance (studies, audits, etc.).
- The lack of knowledge about carbon reduction mechanisms and the level of organizational structure needed to carry out the new “carbon business”. Although some of the work related to the MDL-Voluntary cycle can be outsourced, it is important that the organizations have an administrative structure and systems that can ensure that the main goals of the project are achieved, and that the monitoring is being performed as stated in the proposed project.

Therefore, considering the small-scale production of emission reductions, there are two alternatives for these organizations in the carbon finance context:

- Develop a Programme of Activities (PoA); or,
- Participate in a Nationally Appropriate Mitigation Action (NAMA).

A Programme of Activities (PoA) incorporates an unlimited number of projects (component of activities, CPAs) that use the same technology to be implemented in different regions (localities, cities or even countries) during a period of 28 years. These types of projects allow bundling of different organizations that perform similar activities in the same country or other countries, so as to distribute the costs of transactions. The main obstacle would be the organizational structure, which is crucial to ensure that the projects and the monitoring plan are implemented correctly.

A PoA could be registered either in the regulated carbon market (CDM) or in the voluntary carbon market (where a PoA is known as Grouped Project). Regarding the presentation and registration in the voluntary carbon market, there are different standards that could be considered. According to the latest “State of Voluntary Carbon Market” (2012 summary)⁴⁹ the Verified Carbon Standard (VCS) is the most important in terms of transacted credits (58% of the total voluntary market share). This standard considers the methodologies and guidelines from UNFCCC and has developed its own methodologies for some type of projects (mainly forestry). The registration cycle should be faster than the CDM registration cycle.

⁴⁹ State of Voluntary Carbon Market” (2012 summary)

It is important to consider that although the PoAs may result in lowering the costs of the CDM-Voluntary cycle, the investment the organizations must incur and the fact that the revenue streams occur after the project is implemented are still serious constraints.

There are financial organizations, such as *Kreditanstalt für Wiederaufbau* (KfW) and the World Bank, that manage carbon funds for private or public organizations (such as public authorities, microfinance institutions, NGOs, private companies, etc.) and that develop different type of projects and programs to reduce GHG emissions. These funds do not lend resources to projects, but develop contracts to purchase a part of the emissions reductions once verified⁵⁰ during a certain period of time. This can allow project participants to increase bankability of the projects by adding an additional revenue stream in hard currency, which reduces the risks of commercial lending or the need for a grant⁵¹.

In the voluntary market there are some organizations, like Myclimate⁵², that support the development of projects and programs with social and environmental benefits that reduce GHG emissions, in exchange for emission reductions certificates. Myclimate supports project development and funding through the following services:

- Generation of emission reductions according to the CDM and VCS;
- Creation and preparation of project documentation;
- Project funding through contractually guaranteed purchase of emission reductions.

Another carbon reduction mechanism available that is currently in a definition process is the NAMAs, which were included in the Action Plan of Bali (COP 14) and corresponds to actions proposed by developing countries to significantly reduce GHG emissions. The proposed actions are voluntary and administrated by the government, and can be proposed at a local, sectoral or at a national level, and directed to capacity building, emission reductions, technology transfer, etc. These actions should allow developing countries to adapt and receive support from developed countries to develop actions appropriate to the national reality. It is necessary to establish a monitoring process in order to report on and verify (MRV) the actions proposed.

To date, more than 40 developing countries have submitted proposals for mitigation measures to be included in the appendixes of the Copenhagen agreement. Both the implementation of the NAMAs and achievement of their goals stated are subjected to international public finance and the development of skills and technology.

There are three categories of NAMAs:

(A) Unilateral NAMAs: actions taken by developing countries to achieve lower emissions without external support or funding;

(B) Cooperative/Supportive NAMAs: actions in developing countries with funding or other support from developed countries, thus resulting in more drastic emission reductions; and

(C) NAMAs: actions which exceed credits based on Supportive NAMAs, producing offsets for sale in the global carbon market.

The organizations analyzed could be a part of a sectoral NAMA, which could be proposed to the relevant national government coordinating it and subject to international financing. The UNFCCC had published the NAMAs intention of each country on the following web link: http://unfccc.int/meetings/cop_15/copenhagen_accord/items/5265.php

⁵⁰ In some cases there can be an advanced payment, but that depends on how the contract is structured.

⁵¹ Information available at web page: <http://wbcarbonfinance.org/Router.cfm?Page=About&ItemID=24668>

⁵² Myclimate is a Swiss non-profit organization that operates worldwide.

Brazil. The Federated Republic of Brazil presented Brazil's GHG emission reduction goal and anticipated eleven actions that will lead to an expected reduction of 36.1 to 38.9% regarding the projected emissions of Brazil by 2020. The government has indicated the need for international support for their actions:

The domestic actions envisaged are voluntary in nature and consider:

- Reduction in Amazon deforestation (564 mm tonCO₂e in 2020)
- Reduction in Cerrado deforestation (104 mm tonCO₂e in 2020)
- Reforestation of grazing land (83 to 104 mm tonCO₂e in 2020)
- Integrated crop-livestock system (18 to 22 mm tonCO₂e in 2020)
- No-till farming (16 to 20 mm tonCO₂e in 2020)
- Biological N₂ fixation (16 to 20 mm tonCO₂e in 2020)
- Energy efficiency (12 to 15 mm tonCO₂e in 2020)
- Increase the use of biofuels (48 to 60 mm tonCO₂e in 2020)
- Increase in energy supply by hydroelectric power plants (79 to 99 mm tonCO₂e in 2020)
- Alternative energy sources (26 to 33 mm tonCO₂e in 2020)
- Iron and steel (8 to 10 mm tonCO₂e in 2020)

Peru. Peru presented the followed domestic actions and the government has indicated the need for international support for their actions:

- Reduction to "zero" net in terms of deforestation of natural forests.
- 33% percentage of renewable sources in total energy consumption.
- Implementation of waste management measures (targets are not yet quantified).

Argentina. Argentina will focus on the following sectors (Argentina has not submitted reduction targets NAMAs into the UNFCCC web site):

- Energy efficiency
- Renewable energy
- Biofuels
- Forest management
- Solid waste

Nicaragua. Nicaragua will focus on the following sectors (Nicaragua has not submitted reduction targets NAMAs into the UNFCCC web site):

- Energy efficiency (residential, commerce and services).
- Improved performance of transport and load vehicles.
- Mitigation in forestry sector.

The four countries relevant to this study are considering energy efficiency and/or renewable energy sources in their actions, however, it is important to note that NAMA development depends on each government; therefore, direct contact needs to be made by an interested company in order to discuss and evaluate the feasibility of developing and implementation the projects as NAMAs.

6 LESSONS LEARNED

ENSURE ADEQUATE MARKET KNOWLEDGE

Any business model, strategy, or new product for rural areas requires a market assessment that allows the enterprise to understand the main characteristics of the potential market, the potential products, conditions of sale, challenges, etc., as well as define strategic planning. Some of the most important information that needs to be gathered includes:

- Client segmentation.
- Power purchasing capacity, reliability and regularity of income.
- Current energy expenses and needs, as well as existing resources to cover energy needs (batteries, wood, etc.).
- Financing options.
- Potential partnerships with NGOs, cooperatives, or other organization that can help the distribution of clean energy products.
- Government plans (energy, roads, water, etc.).

It is common for start-ups and SMEs to under-prioritize or under-fund market research when planning their strategies. This can contribute to false expectations about the potential market size, or even difficulty in truly understanding the target market. None of the organizations analyzed have undertaken deep market research to develop their business ideas; as a result, mistakes have been made based on assumptions and perceptions. The lack of information on clients and products has prevented them from developing more strategic and realistic action plans and business models. However, their entrepreneurial spirits, passions and willingness to change their strategies so as to reach their objectives has enabled them to continue growing and providing services to rural areas.

DEVELOP BUSINESS PLAN AND STRATEGIC PLANS

It is important to have a business plan and a long-term vision for the company, including a marketing strategy and financial projections. A five-year strategic plan can help businesses stay organized and meet the necessary goals to stay profitable. Strategic planning takes time and effort, and usually requires modifications, but when executed, a well-thought-out plan can increase sales, increase customer awareness and provide more certainty to the business. In the case of the three organizations analyzed, none of them provided a clear five-year strategic plan. The organizations' leaders have clear goals and objectives, but their strategies are not defined or documented. ECAMI, EMPRENDA and IDEAAS do not have mid- and long-term business plans; planning is done on an as-needed basis so it is difficult for them to do financial planning or to properly plan for growth or changes in the market.

DIVERSIFY THE CLIENT BASE – HAVE COMPLEMENTARY ACTIVITIES

A business model that services only poor families in rural areas can be self-sustaining if the business engages other revenue-generating activities, or targets other kinds of clients (e.g. medium or large sized enterprises), so as to secure additional sources of income. A medium/large sized enterprise/project or a different type of client can provide several benefits to the organization, such as:

- Providing a reliable source of income.
- Building a more robust "sale/service" platform.
- Acquiring technology at a more competitive price (because of the volume).
- Ensuring client diversification.

- Reducing the risks associated with market and political uncertainties.
- Sustaining and expanding the services for “poor families” in rural areas.

In order to diversify the client base, it is necessary to build additional capacity in the organization to serve these kinds of clients, but the capacity would strengthen the organization to serve families more efficiently. A good example of this is the client diversification achieved by both ECAMI and IDEAAS. ECAMI provides services to three different types of customer segments: a) projects for government entities, NGOs, and private companies; b) distributors that resell and install solar systems; and c) retail sales to end-users (normally poor families). In the case of IDEAAS, it provides services to two main customer segments: a) big companies that require cost-efficient and reliable energy solutions in rural areas without access to the grid; and b) poor families that live in rural, isolated communities, (in the Amazonas area) without access to the grid.

CONDUCT COST-BENEFIT ANALYSIS FOR CLIENTS

It is important to estimate and be able to describe the real economic benefit of the energy services for the final user. The client should be made aware of the economic benefit and the potential quality of life improvement of replacing old practices (candles, kerosene, coal, etc.) with clean energy devices. The clean energy solutions should have a payback period of less than five years; otherwise, it becomes very difficult to finance the device. In the case of the three organizations analyzed, none of them provide clear information to the client on the economic benefits (savings) that the clean energy devices can provide.

STANDARDIZE PROCESSES

Organizations that are dedicated to rural electrification should implement systems and procedures that allow them to be more efficient and competitive. They can achieve economic stability through implementing procedures that reduce operational and transactional costs in their business processes (sales, installation, financing, and the maintenance of the clean energy systems).

In the case of microfinance mechanisms (leasing or credit), an effective appraisal, billing and collections system is essential, but may represent an additional challenge when servicing customers in rural areas. The billing and collections system must include a strategy for rapid action in case of payment default or late payment; ignoring or being indulgent with delinquent customers can create a non-payment culture in the community. Borrowers must be contacted promptly to uncover the nature of the problem and provide appropriate actions and support. In the event of default, rapid action should be taken to repossess the equipment. After-sales service is important, as there is a connection between the customers' willingness-to-pay and continued successful functioning of the SSRE equipment. If the system is not functioning, the borrower is much less likely to pay.

HAVE A LOCAL PRESENCE

It is important for organizations to be located in close physical proximity to the clients. This is especially true for retail sales, where the organization can build the trust of potential customers. Such presence can be built through physical location in the area, for instance, having a local branch office. Other methods include finding local partners (micro-franchising), setting up temporary selling points (stands) at public events (e.g. local fairs), marketing (radio and TV spots, posters, flyers) or organizing workshops or raffles to attract clients to the various selling points.

ECAMI and EMPRENDIA have implemented measures to be close to their clients. ECAMI has different branches spread across Nicaragua and has invested in marketing and product advertisements (Radio, TV, printed material) to gain client and market penetration. EMPRENDIA has two branches in rural areas and a network of representatives that allow it to be close to its clients.

SELECT SUITABLE TECHNOLOGY

The clean energy technology that will be offered to rural clients must be robust enough to operate reliably in harsh environments. New products are available every month, but unfortunately, not all of them are suitable for rural environments. It is important to evaluate and test every product "on the ground" before offering it to potential clients, so as not to spoil the market and hamper future penetration by other clean energy products. It is important to review the warranty/guarantee policies provided by the technology providers and analyze the procedures and cost implications of the guarantees, as well as the availability of after sales service for the clients. The quality and performance of the products have a tremendous impact on market penetration. EMPRENDA and ECAMI have established procedures to test the products "on the ground", as they had previously faced several problems with certain products and technologies.

BUY AND SELL IN VOLUME

High sales indicate that stock is being bought and sold rapidly, and this has a direct impact on the final price of the products. An organization cannot achieve competitiveness and efficiency if the volume of bought and sold items is small, and it is very difficult to financially sustain the operation of an organization that it is focused only on rural electrification with small sales volumes, unless the organization receives considerable subsidies. It is important to note that increases in sales also necessitate inventory management efforts. The company needs to be able to understand quickly which items are selling well in order to plan future purchases, and stockpiles that never move from the shelves do little good for the company. Batteries that are stored for long periods will eventually lose their ability to hold a charge, so a proper balance of the products in stock is of the utmost importance. A good example of buying and selling in bulk, and good stock management is evidenced by the final competitive price that ECAMI is able to offer to its clients.

When the target market is poor families in rural areas, volume becomes a more critical issue. Since each operation generates a small amount of revenue, a large volume of sales is required to cover the operational costs incurred. This is a big challenge when the target population is dispersed over a vast and remote area with limited means of transportation and communication.

UNDERSTAND CONSUMER PURCHASING BEHAVIOR

A successful business model incorporates the needs, expectations and customs of its potential clients, and provides them with acceptable clean energy products. Local customs and customer perceptions can present a major barrier when bringing a new product to market, even if its use brings a major benefit to the client. An example of this is "solar cooking" technology; even when this technology is shown to be reliable, to save users a considerable amount of money, as well as to provide many social and environmental benefits, its use requires a drastic change in the users' cooking behavior, which is not always readily accepted.

Factors that influence consumer behavior include: cultural (beliefs, norms), social (family and reference groups), environmental and situational factors (time of the day, temperature, etc), among others. Below are examples of how such non-financial factors can influence product sales:

- a) In the case of EMPRENDA, the company noted that the decision of a family to buy a solar home system is often influenced by the desire to copy their neighbors; for example they noted that when a system was installed for a client, this client and his or her system created an indirect influence on their neighborhoods and increased the desire of neighbors to acquire a similar energy system.
- b) ECAMI has had difficulties introducing more efficient cooking stoves. Clients are reluctant to exchange their traditional open fire stoves for smaller, portable, and more efficient cooking

stoves, even when the latter can deliver the same service using half as much wood as they would normally use (with the cost savings implicit in this).

- c) ECAMI offers different types of solar panels. Some clients prefer to buy a larger-size Solar PV panel rather than a smaller-size PV panel with the same generation capacity (more efficient), and they prefer to buy solar panels with blue cells (polycrystalline) rather than a more efficient uniform-color (monocrystalline) because of the perception that "bigger is better" and cells with brighter colors (blue) are "better"; to overcome this issue, ECAMI provides information to clients in each of its branches about the value-add of each product.
- d) EMPRENDA and ECAMI have faced difficulties in selling Pico PVs devices, even when these devices can address energy needs at a cheaper price than a complete solar home system. Clients who cannot afford to buy a solar home system are reluctant to buy a Pico PV (cheaper and portable) device because they perceive these devices to be "toys" and would prefer to wait until they can save enough money to buy a solar home system; to overcome this EMPRENDA and ECAMI try to select products that have strong materials, a robust structure, and a long-term warranty.

USE LOCAL COMPONENTS

The use of local components can have a positive impact on the final price of the systems and can increase product sales. For example, IDEAAS uses local car batteries for its systems, a critical and generally expensive component for solar home systems. The battery supplier provides a cheaper price on the replacement battery (at the end of the lifetime of the first battery and when exchanged) and provides immediate guaranteed support for any battery failure. Furthermore, IDEAAS has developed its own energy charge controllers, which manage battery charging and prolong the life of the batteries. These solutions have allowed IDEAAS to provide less costly and more efficient solutions to its clients.

BUILD AWARENESS AND CAPACITY OF END-USERS

It is important that potential clients of clean energy systems understand the functionality, benefits and limitations of the technology, and receive detailed technical training. Potential clients should be informed of the economic benefits, health effects, social and environmental impacts, and improvements to quality of life associated with clean energy systems. This helps to position the clean energy products in a favorable light and enhances the market penetration. These efforts do not need to be expensive. A good example of raising awareness is the brochures and posters that ECAMI has developed. This material is distributed to clients and potential clients, and is designed with graphic explanations, and in different languages (Spanish and indigenous dialects).

Some organizations use inexpensive SMS campaigns and social media sites like Facebook to promote products and notify customers about fairs and events, including those held at local schools and churches, where products will be displayed. These events provide good opportunities to educate customers about the economic, health and social benefits of the products. Another option is to partner with a university, an NGO, or a cooperative to develop educational materials, or organize discussion meetings or events that can help to raise awareness among target clients.

BUILD STAFF CAPACITY

Where local residents are hired as part of an organization's staff, they need to be trained in the selling, installation and maintenance of the systems, including follow-up training over the long-term. This can help to reduce the operational costs of the organization and can spur the selling process, as local staff understand the market and can identify local needs and build trust with potential clients. EMPRENDA and ECAMI have implemented procedures to hire and train local residents and incorporate them as part of their staff to service their clients.

CONSIDER THE RANGE OF END-USER FINANCING MECHANISMS

In addressing end-user financing constraints, it is important to consider the range of mechanisms that might work in the local context, such as microfinance, microleasing, remittances, pay-as-you-go systems, mobile-money and traditional financing mechanisms. The analysis of the appropriate mechanism for the local context should take into account the power purchasing capacity of potential clients, and if possible, provide a financial instrument or a model that allows poor consumers to pay in small increments over time. EMPRENDA offers three modalities of payment: 1) full cash payment; 2) short-term financing (up to three months); and 3) long-term financing (up to 18 months). Most of its clients buy solar home systems with short-term financing. ECAMI is in the process of piloting a pay-as-you-go system. In the case of IDEAAS, it has implemented a "microleasing scheme" that allows the client to make use of the system without making a big up-front investment, and with a free battery replacement program.

ENSURE APPROPRIATE ENTERPRISE LEVEL FINANCING

Organizations that want to serve rural areas should ensure that they are looking for the right type of financing for the stage of development of their organization. For example, start-up companies usually need grants and soft loans, while more established companies need working-capital to expand growth. However, even more established companies sometimes need grant funding or soft loans if they are piloting a new business model or if they are conducting market assessments on the viability of new products or processes. In the case of ECAMI it is using a soft loan from the IDB to finance the pilot of its pay-as-you-go system.

ESTABLISH RELATIONSHIPS WITH A RANGE OF FUNDERS AND INVESTORS

It is important for SMEs to have a diversified set of investors and donors so that they have different types of funding from a range of sources. This keeps them independent and less vulnerable to the whims of a specific donor or investor. It also enables them to leverage those relationships to create new funding alliances as often investors will co-invest with one another. EMPRENDA is taking advantage of its alliance with the ACP Group and has access to different investors and funds.

ESTABLISH ALLIANCES WITH GOVERNMENT, NGOs, AND OTHER ORGANIZATIONS

An alliance/partnership with a key actor can be the difference between a successful business and a failing one. An alliance can provide solutions or complement the activity of a partner, it can involve working together to strengthen business processes (e.g. to share selling or installation activities), or to extend presence in certain areas (using a partner network). Collaboration between a public body and a private company can also be an effective way to address rural climate change barriers.

The government (at the local, state or national level) should be seen as a partner, and efforts should be made to align services with its plans. Normally, the government has the mandate to provide the population with basic services, such as electricity and water, but often it does not have the expertise or resources to provide adequate solutions. The energy enterprise can facilitate solutions and attempt to positively influence the government, rather than ignore or compete with government plans, resulting in a negative impact on its own operations and viability.