

November 2015

# Amararary

Energy and development for rural areas



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## **Paris 2015 - COP21**

A year after COP20 in Lima, a new page opens to face climate change.

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# Benjamín Palmacera

Diver off of Santa Rosa Island, PARACAS, ICA

“When I began diving, back in the 80’s, there was a huge amount of scallops to be gotten by everyone. That was during the El Niño and its warm waters. Today, nobody knows if we are in an El Niño or La Niña. We have to adapt to what is given us. Some days, we get seaweed. Other days, we get ordinary clams or razor clams. Anyway, it has to do with Mother Nature, who gives us what she has available and who is making it increasingly more difficult for us to extract her resources”.



From the photo exhibition "The climate is changing, so is my life" (MINAM, SPDA, GIZ) / © Thomas J. Müller - El Taller.

# The Coast



# The highlands

From the photo exhibition "The climate is changing, so is my life" (MINAM, SPDA, CIZ) © Thomas J. Müller - El Taller.

## Flavia Tuco Cambilla

Farmers from the community of Patjata, CAPAZO, PUNO

"In 1983, the heat here was unbearable. Suddenly, around 1984, all the snow melted from Mount Llallahua. It seemed that the world was going to end. At night, it got incredibly cold, and during the day, the sun was burning hot. But no rain, none at all. Our livestock began to die, and the pastures around the wetlands dried out. Now, we store water for the dry times, like in August. What's going to happen? The weather is getting worse. It is getting hotter in the day time and colder at nights".



## Segundo Maldonado Perez and other park rangers

Members of the Maronal de Atumplaya Forest Management Committee , MOYOBAMBA, SAN MARTÍN

"In 2001, some of our neighbors wanted to 'clean' the maronal (forest) that had been in Atumplaya so they could increase the size of their fields. We thought the forest was good for nothing. Then, the mayor convinced us that it was better to begin developing it like a forest. We petitioned the INRENA to prepare a management plan, and now take a look! We have a great maronal, from which everyone took wood to build and we still have plenty to sell. It is lovely to walk into this forest, with its birds and its fresh, humid climate".

# The jungle





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Dear readers:

It is my pleasure to share with you a new edition of our magazine Amaray that within the framework of the COP 21 in Paris, presents initiatives that promote access to energy and their relation with climate change.

For the EnDev-GIZ Project, Amaray is the main tool to promote capacity expansion and knowledge management, considered as two main areas that generate significant changes, expected by different groups involved in the execution of projects and programmes.

Moreover, this publication is an example of EnDev-GIZ efforts to interact with various public and private actors in the cooperative and international cooperation sectors. We have managed to create a network of people interested in these subjects, who expose their improvements and conclusions to avoid duplication, favour synergies and achieve corporate identification on various sides of these subjects, which are of great importance for the economic, social, environmental and political development.

These contributions are not only important to Peru, but to all the international community. Experiences achieved on decreasing the negative effects of climate change and the use of new energy sources and their optimization are a contribution to the discussions that will take place in the Convention of Climate Change in Paris. Like this, many experts in the area, may we aware of the developments and proposals of different Peruvian institutions; this means that the magazine not only positions the subject, but the country and its expertise.

The reader will find a wide menu to choose from, depending on his/her necessities or interests. It offers different options, from statements on politics and strategies at national and regional levels; research results or experiences from different areas of energy: energy for cooking, photovoltaic energy, use of different types of energy in the productive sector; to studies and recommendations to demonstrate the impact of CO<sub>2</sub> mitigation with the development of energy service markets.

To finish, I want to express once again my gratitude to the authors of the different articles for the good achievement of this edition of AMARAY. I ask you, ladies and gentlemen to read the contents and send your constructive criticisms and comments. In this way, you will contribute to increase the flow of knowledge and deepen the interinstitutional dialogue, which are fundamental to the development of public policies and strategies of many projects. Only like this, we can counterattack effective and efficiently what we know as “energy poverty”.

My regards to you all,

**Ana Isabel Moreno Morales**  
 Director of the Energising Development Project EnDev-GIZ Peru

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From the photo exhibition "The climate is changing, so is my life" (MINAM, SPDA, GIZ) / © Thomas J. Müller – El Taller

Archive EnDev-GIZ



In December 2014, COP20 was held in Lima. At that time magazine Amaray issued a special edition covering a wide range of actors committed to mitigate the effects of climate change from the energy sector. A year later, we see a new page opening in Paris with COP21.

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Financiado por



Implementado por



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**Design and Layout:** Felipe Chempén.

**Printing:** Gráfica Bracamonte.

Amaray is a publication for social purposes published by the German Cooperation, implemented by GIZ, through the Energising Development Project EnDev-GIZ in Peru. For more information, write to [endev.peru@giz.de](mailto:endev.peru@giz.de)

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Energy and development for rural areas

November 2015, N° 9

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**Portfolio. Thomas Müller.**  
The climate is changing, so is my life.

From the photo exhibition "The climate is changing, so is my life" (MINAM, SPDA, GIZ) / © Thomas J. Müller – El Taller



# Peru facing climate change

In December 2014, Lima hosted COP20, the most important United Nations conference to reach international agreements that help to mitigate the effects of climate change. Almost a year later, on the threshold of COP21 in Paris, Mariano Castro Sánchez-Moreno current Vice-minister of Environmental Management mentions the contributions foreseen nationwide, which constitute a base for sustainable development and low carbon emissions.

By Mariano Castro Sánchez-Moreno, Vice-minister of Environmental Management - Ministry of the Environment.

Clean energy favours remote areas in the country.

Intended Nationally Determined Contributions (iNDCs) represent the commitment of the international community to reduce greenhouse gases emissions, in accordance with the United Nations Framework Convention on Climate Change (UNFCCC), not to surpass the two degrees Celsius above pre-industrial levels.

In Peru, five are the priority sectors for the design of national actions oriented to reducing greenhouse gases emissions: Energy, Transport, Agriculture, Solid Waste and LULUCF (land use, land-use change, forestry). These sectors were selected because, in accordance with the 2010 National Inventory, they produce more emissions, but have the largest potential for mitigation.

For such effect, since 2014 the Ministry of Environment, Peru's focal point before UNFCCC, has designed a process in which three levels of dialogue were included: "technical-scientific dialogue", made up of experts that design and calculate emissions, with technical parameters and costs of mitigation options, "technical-political dialogue", with representatives from the ministries involved in emission sources and mitigation options to review data and methodology, as well as to define the scope; and the "high-level political dialogue" for which a multisectoral commission made up of 12 vice ministers (Economy and Finances; Energy and Mines; Agriculture and Irrigation; Transport and Communications; Production; Construction, Housing and Sanitation, International Affairs; Education; Justice and Human Rights; Health; Culture and Environment) who are in charge of drafting a technical report containing the proposal of contributions in the country.

As well, a process of dialogue with the civil society was carried out, so that National Contributions are built in a transparent and participatory way. This process has already finished, and its scopes are an important base for the development of more sustainable national proposals with low CO<sub>2</sub> emissions.

In Peru, five are the priority sectors for the design of national actions oriented to reducing greenhouse gases emissions.

## Mariano Castro

Current Vice-minister of Environmental Management of the Ministry of Environment. Professor of the second specialization in environmental law at PUCP; he has worked managing the public and private sector.





# Access to energy as a step against climate change

Upon the necessity to take action to decrease contamination nationwide, Pedro Gamio, former Energy Vice-minister, puts an emphasis on the reform of transport and clean energy policies.

By **Pedro Gamio Aita**, Former Energy Vice-minister

Progressively, access to energy is a tangible reality in Peru.



Peru, as country highly vulnerable to climate change and current president of COP 20, shall improve its strategic planning and performing actions aimed at achieving total access to energy, like this, ensuring the provision in a competitive and diversified way. This would mean a relevant contribution to human development, together with the reduction of greenhouse gases emissions (GGE), thus reducing gaps and inequalities seen in the field and in the city. In that sense, it has to be shown how National Contributions proposed by the United Nations would be accomplished, as well as how emissions will be reduced, hand to hand with the strengthening of the capacity to fulfill these commitments, also giving better treatment to natural resources and biodiversity. The country shall show its utmost to progressively implement the necessary measures to achieve a reduction of 30% compared to the projected GGE by 2030, compared to the rhythm and the current trend of national emissions and strengthening policies to adapt climate change impacts.

The energy matrix in Peru is diversified, clean and affordable and has 54% of renewables sources and 46% of fossil fuels. However, a change in transportation, where the situation is critical, is desirable, as well as the need to be more efficient in the industry and the economy.

Currently, the government policy promotes energy social inclusion, which has helped to achieve 92% of energy coverage and raise the challenge to reach 99% in 2019. However, better renewable technologies shall be used and in greater quantity. In this context, the program energy access to 150,000 and 500,000 solar panels in rural areas is in progress. On the other hand, rules for microgrids and hybrid systems are lacking. Furthermore, a more aggressive policy of improved cookstoves in the rural field is needed, as well as the use of bioenergy and bioclimatic buildings, and the promotion of energy productive uses.

Peru wants to improve its vulnerability to climate change that is why the country shall work rigorously on public management, meritocracy, science and technology development, increasing the budget for education, and encouraging participation of organized populations.

Energy policy until 2025 will contribute to mitigate climate change effects, and for that, renewable energies will ensure universal access and reduce imports of oil and diesel, mainly used in transportation. That is, it seeks to make energy projects with low carbon emissions. For example, an opportunity is the exportation of electricity, based on the increased use of renewable energy potential, which will boost demand weather leverage complementarities and strengthen the country's infrastructure.

In this sense, it is about promoting private investment in the sector, through public-private partnerships, mainly in establishing an efficient infrastructure to ensure reliability and decentralize generation, through the new regulation on distributed generation, which is a great opportunity for the regions.

Also, there is the urgent challenge of efficient management of transport, through increased use of electricity, natural gas (CNG/ LNG) and hybrid vehicles in fleets of passenger transportation and cargo, as well as a new railway network, where it is most efficient. Furthermore, the system can accelerate scrapping of vehicles a significant volume of replacement, not only in taxis, but also for mass transportation units.

Another challenge is to advance in the replacement of cogeneration and replacement of boilers and electric engines with greater efficiency and advance the energy efficiency labelling of household appliances, lighting systems and electrical motors and boilers. Also promote the use of more efficient technologies, such as lighting, reduce operating costs, which will decrease the final consumer. In perspective, there is much to do.

There is the urgent challenge to manage transport efficiently, through increased use of electricity, natural gas and hybrid vehicles for passenger transportation.

## Pedro Gamio

Pedro Gamio former Vice-Minister of Energy; has contributed to the regulatory framework and execution of the National Plan for Rural Electrification, Renewable Energy Promotion Act and the Plan for the Mass Use of Natural Gas. At present, he is professor at PUCP and international advisor for institutions such as IDB and WWF in terms of energy and environment.





# The San Martin region reduces the effects of climate change

Hand in hand with the Energising Development Project ENDEV-GIZ Peru, the Regional Direction of Energy and Mines in the San Martin region has managed to provide clean energy alternatives to vulnerable populations.

By **Rafael Rengifo**, Regional Director of Energy and Mines of the San Martin Region; and **Fernando Aspajo**, Technical Advisor for the Energising Development Project EnDev GIZ-Peru.

Since 2009, the EnDev-GIZ Peru Project works together with the Regional Direction of Energy and Mines of the Regional Government of San Martin, to enable access to modern energy for populations living in remote and/or rural areas of the region.

San Martín was one of the regions with less access to energy. At present, 87% of its population have

energy coverage, registering an increase of 34% in the last 8 years (2006-2014). In accordance with San Martín's energy policy, there is much more to do in the energy sector, as for example, work towards energy generation and interconnection, using hydroelectric and photovoltaic technology, in the northern area of the region. As well, it is necessary to promote productive uses programmes related to electricity and energy efficiency.

An inhabitant of Santa Inés village explains the benefits of pico photovoltaic systems to a visitor from the German Cooperation Agency (GIZ).

The strategy applied in San Martin is based on three pillars for action: environment, supply and demand. The environment refers to the regulatory-political environment, which eases sustainable approach to energy access technologies generating optimal conditions to boost and maintain the market, articulating multisectoral actions. The supply ensures the production and sales of –efficient and affordable– technologies for energy access, offering maintenance and replacement of parts – after sales services. The demand is in charge of enabling access and adoption of those efficient and quality technologies.

Through these three pillars for action, energy alternatives have been considered to attend rural populations from the San Martin Region, enabling access to energy under different lines of intervention; this is through: Energy for lighting (electrical connections beyond the electricity meter, and photovoltaic systems, sustainable management models for isolated systems, hydrokinetic turbine); Energy for cooking (enabling the development of a sustainable market for improved cookstoves); and Energy for productive uses (supporting agricultural producers of different value chains to improve competitiveness). In order to support sustainability in these components, the EnDev-GIZ Peru project supports the development of local markets through the creation of commercial distribution networks for access to energy products and services.

From this strategy, interesting results were achieved: 29,500 technologies installed in households that benefit 150,000 people, corresponding to 41% of rural households in San Martin (10 provinces, 70 districts and 751 communities); as well, 469 technologies for

productive uses that benefit 374 agricultural producers (10 provinces, 40 districts and 259 communities). Similarly, local offer, which includes selling or building technologies for basic access to technologies, has been promoted. At present, San Martin has local trained installers to carry out indoors connections and build improved cookstoves; also the articulation of the solar systems value chain, which connects importers with regional distributors and promotes the development of local points of sales was reinforced; and five improved cookstoves companies were strengthened through the execution of their corresponding business plans and marketing strategies.

San Martin is the green region of Peru. Impacts generated by the abovementioned interventions, carried out by the Regional Government, specifically under the Regional Direction of Energy and Mines, in alliance with the EnDev-GIZ Peru Project, represent a clear contribution for reducing climate change effects:

- Curbing logging of 31,632 trees (represents the size of 63 football courts) and of 6,234 MT CO2 emissions due to improved cookstoves installation in the region.
- Decrease of diesel consumption used for lighting in 133,000 gal/year, which is equal to traveling around the world 333 times by car at 30/km/gal. The installation of 13.8 kWp through photovoltaic systems (responds to the demand of 150 rural households with conventional energy).

We are aware that these are small impacts and that there is much more to do in the energy sector. For that reason, we expect to continue working together to close even more the gap of universal access to energy in the San Martin Region.

The strategy applied in San Martin is based on three pillars for action: environment, supply and demand.



## EnDev-GIZ

The Energising Development Project (EnDev Peru) aims to facilitate sustainable access to basic energy services, especially in rural populations. In Peru since 2007, being executed by the German Cooperation, implemented by GIZ.

## DREM San Martin

The Regional Direction of Energy and Mines (DREM) of the San Martin Region is responsible for implementing and executing the sectoral environmental policy in the field of sustainable development of mining-energy activities, to improve the quality of life of the population, driving public and private investment. As well, it is responsible for the actions transferred by the Ministry of Energy and Mines at regional level.

[www.dremsm.gob.pe](http://www.dremsm.gob.pe)



# A debate on climate and energy

Taking into account the current global context, coming technological revolutions will fix their eyes on energy, water and climate. These topics were part of an international encounter carried out at the same time in 100 countries with a view to COP21, in Paris.

By Urphy Vásquez, Research Group Coordinator of INTE-PUCP; and by Augusto Castro, Director of INTE-PUCP.

The Citizen Debate on Climate and Energy organised by PUCP took place in Lima in June 2015.





Energy and climate are closely related and that may be seen in the meaning of Climate Change: there would be no climate change today were it not for the use of fossil-based energy sources, and at the same time, we could overcome the challenges of the climate phenomenon through a change in the energy matrix. Therefore, to talk about climate and energy is to talk about elements that are strongly linked and that permanently nurture each other.

Over the past four centuries, industrial revolutions have contributed to the development of techno-economic paradigms that have not considered environmental issues adequately. Without a doubt and considering the current world context, the next technological revolutions will focus on energy, water and climate. This will definitely demand the creation of low-carbon green economies.

There are already several international institutions promoting open consulting events on energy and climate change, aimed at democratizing this problem and searching for potential solutions from the citizens' perspective. Some of these institutions are, for example, the United Nations Framework Convention on Climate Change (UNFCCC-CMNUCC); the French Commission for Public Debate; the Danish Board of Technology Foundation; Missions Publique (France); the Ministry of Ecology, Sustainable Development and Energy of France; and the French Embassies around the world. France has responsibly assumed the organization of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) in Paris at the end of this year.

It was under this approach that the Citizen Debate on Climate and Energy, a global event, was proposed. Peru was chosen as one of the 100 countries in the world where the event would take place. Thus, four Peruvian institutions came together to organize it: the Institute for Natural Sciences, Territory and Renewable Energies (INTE-PUCP) and the "Climate

of Changes" programme, both of the Pontifical Catholic University of Peru; the Peruvian Society of Environmental Law (SPDA) and the Round Table for the Fight against Poverty (MCLCP).

Last June, almost 100 citizens from different parts of Peru met at the university campus in Lima to attend this global appointment. The opinion of citizens from all over the country, men and women of different ages, from different backgrounds and educational levels, environmental specialists or activists, was gathered at the meeting, with the purpose of learning what an ordinary citizen thinks about climate and energy. The results from the work done in the 82 participating countries will be presented to the decision-makers at the COP-21 meeting in Paris.

Considering all answers to the opinion polls done, it is paramount to our context that 87.8% of survey respondents consider that educational programmes on climate change aimed at the general public are a relevant instrument to reduce the level of greenhouse gases emissions; that 52.44% of respondents consider that subsidies for low-carbon energies –renewable energies- like wind, solar, biomass, hydraulic, tidal power and geothermal should be prioritized; that 41.46% of polled persons agreed that support for research and development of low-carbon technologies – such as more efficient batteries for vehicles- are effective tools to mitigate the effects of climate change; and that 52.44% agrees to definitely suspend the exploration of fossils fuel reserves.

It can be deduced from these results that there is a concern and a demand from the population for the diversification of the energy matrix and the use of renewable energies, with all its implications. All these very relevant issues were identified by ordinary Peruvian citizens. Thus, if the decisions agreed upon at the COP 21 this December show these perspectives, we can believe there is hope for all of us.

it was planned to conduct the Citizen Debate on Climate and Energy internationally and Peru was chosen as one of the 100 countries in the world where the event would take place.

## INTE-PUCP

The Institute for the Sciences of Nature, Territory and Renewable Energies of Pontifical Catholic University (INTE-PUCP) is dedicated to research, academic training and promotion on the following subjects: ecology, socio-environmental and territorial issues, biodiversity and renewable energies. INTE was created on 7 March, 2011 as part of the Vice-rectorate for Research of the PUCP. Its creation is based on the work of three academic units with a long history on environmental issues: The Institute of Environmental Studies (IDEA); the Centre for Applied Geography (CIGA) and the Rural Sector Support Group (GRUPO-PUCP).

[www.inte.pucp.edu.pe](http://www.inte.pucp.edu.pe)



### Instituto de Ciencias de la Naturaleza, Territorio y Energías Renovables (INTE-PUCP)

Promovemos la investigación y la formación académica en materia ecológica, socioambiental, de la biodiversidad, del territorio y de las energías renovables.

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- Estudio de análisis de ciclo de vida ambiental de productos o servicios
- Desarrollo de combustibles sólidos (pellets - briquetas)
- Desarrollo de estudios de impacto socio ambiental y diagnósticos situacionales



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# The climate is changing, so is my life

The photo exhibition “The climate is changing, so is my life” was inaugurated in 2008, in the framework of the V Summit EU-LAC hosted in Lima, under the organization of the Ministry of Environment (former Conam), the Peruvian Society for Environmental Law and the German Cooperation Agency, implemented by GIZ.

Since then, it has been presented in different contexts in Peru, and even abroad. The sample gathers 30 photos and the corresponding testimonials from Peruvian residents.

Photographer Thomas Mueller traveled around 13 regions from the coast, the highlands and the jungle in Peru, where he had the opportunity to talk to farmers, fishermen, artisans, community leaders, among many other people from 29 places. This trip prompted 8 years ago, and since then climate change was seen as a reality in Peru.

Today we continue facing the same problems and if we do not react, it can become one of the greatest threats to humanity and our Earth. This is not far, it is happening and we are feeling it in our own lives.

## Javier Macedo

Fisherman on the Madre de Dios and Tambopata Rivers, PUERTO MALDONADO, MADRE DE DIOS

“It is marvelous to see the amount and diversity of fish in our Amazon. Yet, they are being appallingly plundered throughout this land. In order to raise livestock, migrant farmers have come from the highlands and ‘cleaned’ millions of hectares of land and are burning the forest. They have destroyed the balance of nature. And to destroy this fragile balance is to destroy the very essence of our life. They are ruining the lungs of our land”.



From the photo exhibition “The climate is changing, so is my life” (MINAM, SPDA, GIZ) / © Thomas J. Müller – El Taller





**Félix Vicencio Maguiña**

Mountain guide from the Huaraz Province, PUNTA OLIMPICA PASS, ANCASH

“When we drill glaciers to take samples, we often reach rock. Our snow capped mountains are quickly dying, and little by little this is stripping away our joy. As a consequence, water levels in rivers are on the increase, but this has not stopped toads and frogs from disappearing from the valleys; now they are being replaced by bugs and flies that are loving the rise in temperatures, in the midst of a landscape where prosperity is one fond memor of the inhabitants”.



**Galo Miguel Sarmiento Sánchez**

Mayor of Andaray, ANDARAY, AREQUIPA

“Since 1950, the rain has gradually decreased. Since the 1970’s, the intake of the main canal began drying up, and we have had to build smaller canals to gather water from the glaciers that have been rapidly retreating. We have also improved our irrigation and water damming efficiency and introduced new crops that require less water. I am the mayor and have pledged to change some things around here, like the water users organization. Nevertheless, I also want my children to live here and build their futures”.



**Ángela López**

Member of the Association of Ecological Farmers of Aromatic and Medicinal Plants, CUMBRE, CAJAMARCA

“The medicinal herb pasuchaca has always abundantly flourished on these cold hills. But the sheep and we humans almost put an end to that. We sold too much in the cities because it is a good remedy for kidneys ailments. When we started to strip the hills of the plants, and the frosts at night killed off the immature ones, we then understood we were ruining everything. At the association meetings, we are developing management techniques; we take a small plant and leave the others as a seedbed. The thing is, if we sold off every last plant, then nothing would be left us but sadness”.





**Herculina Cruz**

Farmer from the San Antonio Farming Community, CARACOTO, PUNO

“The frosts come whenever, without warning. Before, we knew when they would come and had time to light the manure. Today, we have to keep watch during the nights so it does not sneak up on us and surprise us. The best grain, the strong and healthy ones, we store to use as seed. If, in the cold, they mature into strong grain, then great in deed will their offspring be. My neighbor has already started planting trees around her fields. She is using them to fight off the frosts, but won't the birds harvest the quinoa faster than we do?”



**José Saavedra**

Rubber tapper from the village of Tropezon, IBERIA, MADRE DE DIOS

“If you are a journalist, then please tell all of Peru that I am neither poor nor lazy. I harvest 2 kilos of dry rubber per day – do you realize how many condoms you can make from the amount of rubber I produce? Over to our right they are asphaltting the Inter-Oceanic Highway. To the left, trucks drive by every night. When it comes right down to it, I do not care about the trucks or the Brazilians who come by the highway here to buy our lands. I will not sell my forest. Besides, some engineers have told me that I can sell the air that the gringos need and that we have plenty of”.



**Samuel Francisco Adrianzén Ramírez**  
Agricultor, MORROPÓN, PIURA

“So it is like this now. The water looks the same as it did before, but it is not. Here, close to my lands, we drilled a well because the Chira Canal does not carry enough water for everyone anymore. The big problem is that each day there are more water users, and the canal is bringing less water. Piura is drying up. The water consumers board is discussing whether or not there will be enough water for us, but for that to happen, we have to stop planting rice and increase the technology used for irrigation. So, for the short planting season, we planted beans. Rice is a thing of the past in Morropon”.



# Access to pay-as-you-go solar lighting

PowerMundo is introducing an original pay-as-you-go technology to the Peruvian market that will allow the acquisition of solar lighting products intended for remote and rural populations. This is presented as an alternative for millions of Peruvians to finance clean lighting in their households.

By Monica Dykas, Project Coordinator of PowerMundo



Thanks to solar lamps, family get together to help children with their homework.



Over four million Peruvians do not have access to the electric grid. Thus, they use candles, battery-operated flashlights and diesel lanterns to light their homes, and they travel long distances to recharge mobile phones. Moreover, many people suffer from burns, respiratory diseases, pay high energy costs, and work under limited productivity, factors which perpetuate the poverty cycle.

At present, many clean energy products are available to meet these people's daily needs and conserve the environment. However, these technologies have not reached the millions of Peruvians for three primary reasons: first, product information does not reach rural communities, leaving people unaware of the solutions; second, distribution of these products must reach people living in very remote locations; and finally, lack of financing inhibits the acquisition of clean energy products.

PowerMundo, Peruvian company specialized in photovoltaic products, implements solutions to face the three challenges mentioned above by: providing marketing materials and sales training to local distributors, managing product distribution nationwide, and offering financing as inventory credits and Pay-As-You-Go (PAYG) products. As well the company has developed a distribution network made up of local businesses and traveling sales agents who can efficiently reach last-mile customers. Besides, it empowers its distributors and provides them with marketing and financing tools to develop successful businesses and help people save money, live healthier lives, and conserve the environment, resulting in a better quality of life.

To build upon existing rural distribution networks and efficiently reach remote clients, PowerMundo receives support from institutions, such as the Energising Development (EnDev) run by the German Cooperation Agency, implemented by GIZ, and the Peace Corps, to leverage their market strengths and networks. For example, the EnDev-GIZ Peru works in the identification and training of distributors, the creation of marketing materials, and after-sales service.

#### BENEFICIARIES

PowerMundo's beneficiaries include distributors who attain direct economic benefits and end-users who attain economic, health, and other human development benefits. Usually, distributors are micro and small businesses located in rural, peri-

urban, and urban areas. On the other hand, end-users are low-income rural and peri-urban families with no (or unreliable) access to the electrical grid.

The average per capita monthly income in rural areas of Peru is 377 Nuevos Soles (US\$125)<sup>1</sup>, or less than \$5 per day. According to PowerMundo field visits, an average family spends 50 soles (US\$16) per month on energy for lighting; thus, families spend a significant portion of their income to get this service. In this context, in rural areas of Peru there is a great demand for less expensive energy and lighting solutions that provide better lighting for children to study, enable families to charge mobile phones, and efficiently complete household tasks.

Based on this reality and upon recent sales growth and the company's strategic plan, PowerMundo estimates that it will reach over 1.5 million beneficiaries by 2020.

#### PAY-AS-YOU-GO PRODUCTS

With support from the Renewable Energy and Energy Efficiency Partnership (REEEP), the Inter-American Development Bank (IDB), and Startup Perú, PowerMundo is piloting the distribution of PAYG solar lamps that have the potential to revolutionize access to energy for rural communities. PAYG technology allows end-users to pay for solar energy products in weekly installments, thus eliminating the initial financial barrier to solar energy access in rural areas of Peru. Additionally, the PAYG system provides a guarantee for distributors; when the weekly credit runs out, the lamp turns off until more credit is purchased. Eventually, when the client has purchased enough credit to pay off the total cost of the product, the PAYG mechanism is deactivated so that the client owns his/her lamp and can begin saving money.

First, PowerMundo tested this method in rural communities of Peru by training and equipping distributors with PAYG lamps, smartphones, and a smartphone app. The results demonstrated that there is great demand for PAYG products, as distributors were willing and eager to learn how to use the new technology and clients repaid at a rate of 96%.

However, it was also discovered that both, demand and need for financing is greater for larger photovoltaic systems. Thus, PowerMundo

**PAYG technology allows end-users to pay for solar energy products in weekly installments.**



is currently introducing a larger and brighter, mobile phone charging PAYG system that can be paid off over 3-4 months, thereby putting it within reach of most rural families.

Finally, it is expected that PAYG products will enable PowerMundo to scale up by providing financing for end-users and establish repeat customers; as well as the PAYG technology is put into larger photovoltaic systems and other home appliances, customers can acquire additional products that meet both their energy needs.

#### SCALING UP IMPACT

PowerMundo has positively helped tens of thousands of people gain access to solar lighting products, leading to positive socioeconomic and environmental impacts. With the products sold to date, end-users will benefit from a total savings of over \$8 million and over 69.3 million hours of improved lighting for work and educational

purposes. Additionally, over 4 million liters of diesel fuel and an expected 15.9 million kg of CO<sub>2</sub> emissions have been replaced by clean solar energy.

Implementing a regenerative business model, where everyone benefits economically, PowerMundo and its distributors continue to grow as sales increase and as clients save money. PowerMundo has grown quickly in the past three years, though a main barrier to accelerating growth is lack of financing at all stages in the supply chain. Consequently, the company is actively seeking investors who can provide working capital for product inventory and distribution. With these investments, alongside the implementation of new PAYG products and the expansion into new regions of Peru and Latin America, PowerMundo expects to extend its market and increase its economic and social impact at an even faster pace.

*A micro-entrepreneur makes the most of light to have a more productive business.*

## PowerMundo

PowerMundo is a Peruvian social company that delivers life-enhancing solar energy solutions to off-grid communities to help people improve their lives and conserve nature. PowerMundo builds and manages a network to source, promote, distribute, and finance life-enhancing products to low-income, rural communities.

[www.powermundo.pe](http://www.powermundo.pe)

<sup>1</sup> National Institute of Statistics and Informatics (INEI). "National Series: real average per capita monthly rural income." Regional Information System for Decision-making."



# Carbon market development in Peru

A few weeks away from the COP21 negotiations in Paris, the carbon market is still an alternative to finance clean technologies projects. Under this approach, in Peru, Instituto Trabajo y Familia (Work and Family Institute) has successfully installed 120,000 improved cookstoves, from which 76,000 are already part of the carbon mechanism promoted by Microsol.

By **Ricardo Maraví**, Executive Director of Work and Family Institute; and by **Arthur Laurente**, Director of Microsol and **Guisselle Castillo**, Advisor for Microsol.

The Conference of the Parties (COP20), held in Lima in 2014, allowed understanding more about climate change. There, in the Rural Energy Pavilion, three improved cookstoves were exhibited; one of them presented by Sembrando (ITyF) and Qori Q'oncha (Microsol) Programmes, which displayed the technology and the

geographic scope, as well as the carbon market scheme to finance sustainability and expand its coverage. In addition, the government, represented by the National Training Institute for the Construction Industry (SENCICO), explained the advances gained in models certification, and the Ministry of Energy and Mines (MEM)

The Institute Work and Family and Microsol showed their joint efforts in Voices for Climate, an event held during COP20 in Lima.

presented the commitments refereeing to improved cookstoves and LPG cookstoves.

In the world, 600 million families (3,000 million people) cook their food using wood, coal or dung, from which 40 million are in Latin America and 2.6 million in Peru. These people, especially women and children, are affected by smoke inhalation, which is equivalent to smoking two packs of cigarettes a day. Within this panorama, improved cookstoves are an alternative for energy efficiency (they use less fuel than the traditional ones) because they expel smoke outside households, are safe, have an impact on people's quality of life and are effective in the fight against climate change.

For more than a decade there have been multiple initiatives in Peru. In that sense, in 2009 a public-private platform was created to expand articulately the use of improved cookstoves. In this context, transitory faculties were given to regional and local governments to finance improved cookstoves projects, and regulations and protocols to evaluate and certify improved cookstoves prototypes were elaborated by SENCICO, which has already certified 39 models of improved cookstoves.

Since then, 325,000 improved cookstoves have been installed, from which 32.7% (106,000) generate carbon credits through Microsol's Qori Q'oncha Programme, a unique initiative in Peru that allows valuing and certifying the reduction of greenhouse gases. Since the program began in 2008, 884,429 tCO<sub>2</sub>e emissions have been avoided, under a work scheme in which participating institutions implement rigorous monitoring processes that are later assessed and subjected to international audits to ensure the existence, efficiency and continuity of improved cookstoves.

The government, through the MEM, has installed 84,738 improved cookstoves and delivered 491,817 LPG cookstoves up to 2014. A monitoring carried out by The United Nations Office for Project Services (UNOPS) indicates that 53% of people, who receive LPG cookstoves, stress the advantage of cooking faster, but 92% continue using traditional cookstoves. Similarly, IPSOS Peru, a market research firm, carried out a survey and found out that 97% of the people who received an improved cookstove perceived an improvement in health, and 89% in their quality of life, showing that these technologies are complementary and have a positive impact on users' lives.

In this context, the Work and Family Institute (ITyF) has installed 120,000 improved cookstoves, from which 76,000 are already considered as part of the carbon mechanism and the others are in the inclusion process, generating until now 84% (742,514) of the certified CO<sub>2</sub>e reductions of Qori

Q'oncha Programme. Thus, carbon credits have allowed ITyF to finance a monitoring system, replace worn parts and increase beneficiaries. This shows that carbon credits are a financing mechanism that works and helps, first, with projects' sustainability and second with the expansion of its coverage.

In this way, based on information provided by Qori Q'oncha Programme, supported by methodologies validated by Gold Standard, today we can affirm, based on evidence, that improved cookstoves save 1.9 t/year/family (less deforestation and contribution to the conservation of soil and water resources), reduce 2.5 tCO<sub>2</sub>e/year/family of greenhouse gases, saving 111 soles/month/family in families who buy wood, and 6h 20'/month/family in families who collect wood. Besides that, 99% of users perceive less smoke inside their household and cleaner environments.

## CHALLENGES

1. As carbon market demonstrated to be a financing mechanism, we have to seek that all other installed improved cookstoves integrate carbon mechanisms as well.
2. Integrate effectively interventions and progress made by all institutions involved to date under a single coordinated initiative to close the gap in access to clean cooking technologies.
3. Use innovative financing sources, which would integrate public and private financing in a segmented market scheme that considers both, subsidies and clean cooking market technologies, in first instance for spare parts and maintenance services.
4. Maximize the impact and ensure sustainability of clean cooking technologies.
5. Encourage designs to ensure durability.

## POTENTIAL ANSWER

The Nationally Appropriate Mitigation Actions (NAMA), which are initiatives in governments development priorities, are presented as an integrating element that can articulate public policies, through the creation of a public-private management platform to ensure the development of local market, public-private financing, drafting of legal norms and standards, and the establishment of a monitoring and technology maintenance system, allowing access to maintenance and improved cookstoves parts replacement.

Worldwide NAMA perfectly relates to the Intended National Determined Contributions (INDCs), which constitute the commitment to be assumed by each country facing COP21 negotiations to be held this year in Paris, where it is expected to reach an agreement in which all countries are committed under the principle of "common but differentiated responsibilities" to reduce GGEs and to avoid warming above 2 °C.

99% of users perceive less smoke inside their household.







A woman makes her food in an improved cookstove provided by ITyF, in Huanuaco, Peru.

## The Work and Family Institute (ITyF)

“Sembrando”, the ITyF programme, is one of the Latin American actors with the highest number of implemented improved cookstoves, which are part of an integral project that builds capacities in families on health, hygiene and nutrition; trains community promoters; works articulately with local authorities; implements the same model of improved cookstoves and focuses on the poorest who are sensitized on the benefits of improved cookstoves and their contribution to the environment.

## Microsol

Microsol has developed Qori Q'oncha and Utsil Naj Programmes, implemented in Peru and Central America respectively, to channel climate finance to initiatives with high social impact such as improved cookstoves and water filters projects. The joint work with about 20 partners in 5 countries has benefited more than 120,000 families in Latin America. Moreover, in Peru, the Qori Q'oncha Programme allows its partners to follow up the status of their projects and access to economic resources from the voluntary carbon market.



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# Boosting the clean cookstoves market

The implementation of improved cookstoves has improved the quality of life of rural families, although the worsening of their parts affect negatively wood saving and reduction of contaminating emissions. Thus, projects foreseen by FASERT seek to promote local markets performance that ensures sustainable adoption of cookstoves.

By Carlos Cervantes, National Technical Coordinator of FASERT.



Improved cookstoves promotion in a local fair.

At present, two million families in Peru still depend on traditional biomass to cook their food and heat their households. It is estimated that 15% of these families own an improved cookstove, due to the initiatives and joint effort of public institutions, social programs, civil society and international cooperation.

While the implementation of improved cookstoves has meant a significant improvement in the quality of life of families, contributing as well with the mitigation of climate change, their benefits will only remain in time if these technologies are adopted by the population in a sustainable way; this is to say, if families use them and develop actions related to their maintenance.

However, improved cookstoves installation projects have not traditionally considered the introduction of actions related to the development of commercial structures that contribute to the maintenance of cookstoves and their adoption. In this sense, it is quite common that there is no offer of local providers or repair services in geographical zones where projects have intervened.

This is particularly critical in the case of improved cookstoves with an age of more than four years, since the worsening of their main components affect negatively their performance, compromising wood savings and reductions of expected emissions. If local services development is not considered in the scope of disseminated technologies, it is estimated that access to efficient energy will be lost in at least 130 million families by 2018.

## CLEAN COOKSTOVES MARKET

The Fund for Sustainable Access to Thermal Energy (FASERT), implemented by the Inter-American Institute for Agricultural Cooperation (IICA) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), arises from the need of having alternative approaches that allow poor rural families to have sustainable access to modern energy services.

The programme's approach considers that to achieve sustainability of the interventions promoted, it is necessary to boost the market value chain around the technology, meaning that, it is not only focused on boosting the use of validated and certified technologies, but on strengthening technical and financing capacities of technology suppliers, traders, financial institutions and end-users. In that regard, it finally seeks intervention models that promote projects to generate market conditions.



A villager shows her ceramic portable improved cookstove for dung and wood.

Within the access to energy line, FASERT is currently funding six projects seeking to boost the domestic market for clean cookstoves in eight regions of the country that will allow 11,000 families to have access and to avoid annual emissions of at least 27,000MT of carbon dioxide. On the supply side, projects have strengthened 19 SMEs for the production, distribution, installation and after-installation services of clean improved cookstoves.

As well, and considering the need to provide sustainability to installation initiatives of improved cookstoves developed in previous years by different sectors in the country, the fund has foreseen the funding of pilot projects that contribute to re-establish and/or maintain access to energy for cooking in 20,000 families approximately.

Projects foreseen not only will develop actions related to the maintenance of clean cookstoves, but will as well generate the conditions for the operation of after-sales local markets that ensure sustainable adoption of technologies. In that vein, we are currently working with the Energizing Development Project (EnDev) of the German Aid agency implemented by GIZ, in an action line that includes the repair for the commissioning of 1,200 improved cookstoves in the Arequipa region and the implementation of an incentive plan aimed at local entrepreneurs, so that they have all technical and business skills to meet the demand of user families.

The fund has foreseen the funding of pilot projects that contribute to reestablish and/or maintain access to energy for cooking in 20,000 families approximately.



A portable improved cookstove under efficiency tests in the laboratory of UNI, in Lima.



### PARADIGM SHIFT

Improved cookstoves have been implemented in the country since the 80s, but only fixed cookstoves are the ones largely adopted. So, we saw the need to incorporate a market approach for disseminating this technology in a sustainable way, but fixed cookstoves have certain characteristics that make really difficult to develop commercial structures: high price, expensive for rural families; high logistics costs; and lack of standardization and quality control when assembled, because they are not a final product that is ready to be used by families.

In this sense, it is necessary to complement the approaches and dissemination strategies for improved cookstoves with new existing models. As consequence, modern portable improved cookstoves incorporate a new group of elements that may allow their implementation at commercial levels in the country, due to their low cost and easy transportation. Furthermore, their standardized design and industrial production guarantee the compliance of efficiency parameters and, to finish, portable improved cookstoves are finished products that do not need to be installed for their immediate use.

In short, a paradigm shift in the model of intervention is needed, in relation to energy access initiatives for cooking that have been developed in the country, which has only spread the model of fixed clean cookstoves, without taking into account technological advances and the need to diversify supply, providing families with options that fit their energy needs. On the other hand, it is important to promote interventions that ultimately seek the development of commercial structures that allow the use and maintenance of technology in time. Only like this, sustainable access and effective contribution of clean cookstoves to mitigate the effects of climate change will be assured.



El Fondo de Acceso Sostenible a Energías Renovables Térmicas (FASERT) busca dinamizar la cadena de valor del mercado de tecnologías de energía renovable térmica y actualmente financia 8 proyectos que buscan mejorar la calidad de vida de las poblaciones de zonas rurales y periurbanas del Perú.

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## FASERT

The Fund for Sustainable Access to Renewable Thermal Energy (FASERT) was set up in 2013 through an agreement between Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), an agency of the German Government and Instituto Interamericano de Cooperación para la Agricultura (IICA), as a mechanism to stimulate the value chain in the market for renewable thermal energy technologies in Peru.

The fund aims to improve the living standards of people living in rural areas and the urban periphery in Peru, motivating economic growth through the development of modern renewable thermal energy solutions.

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# Technologies for rural progress

Biodigesters, greenhouses, sugarcane bagasse dosing devices and mini hydroelectric power plants are some of the initiatives proposed by the EEP programme for productive and efficient energy use, without using contaminating materials. The question is: how can these energy technologies and services reach more people in remote areas?

By **Oliver Marcelo Bret**, Regional Technical Coordinator for the Energy and Environment Partnership Programme with the Andean Region (EEP).

A mini hydroelectric power plant located in Cotacajes, Bolivia, is operated by a local operator.



Undoubtedly energy is vital for human development. Therefore, lack of access to affordable, reliable and modern energy, particularly in areas drifted from urban centres, is a matter of concern. In this context, the use of natural resources through low-carbon technologies could be not only an appropriate alternative to improve quality of life, but also a sustainable option. This is indeed a great opportunity for the Andean region.

Lighting, cooking and room heating, as well as access to better health and education services, are some of the needs of people who live in remote areas in the Andean region. In this sense, energy should be regarded as a right—as important as any other right—in order to reduce the inequalities that threaten social and economic development in the long term.

#### MORE INCOME WITH CLEAN ENERGY

In this context, for someone who lives in a situation of vulnerability, access to modern energy services may be an opportunity to improve or expand his/her productive processes. The implementation of renewable energy technologies for the sustainable

use of natural resources can contribute to create jobs and increase people's income.

For example, a family that raise livestock near the house could use waste as raw material to feed a biodigester – a hermetically sealed container that produces biogas: a natural fuel that is used for cooking and heating, thereby reducing the dependence on wood or dung, promoting instead the use of cleaner and more efficient energy. Additionally, a biodigester produces biol – a natural fertiliser that improves agricultural production. If we add the use of the sun in greenhouses, the result is not only an improvement in food security for producers and their families, but also getting more income from selling products in local markets.

“With this biodigester we are going to avoid the destruction of forests. It will provide us with biofertiliser, biogas and energy. The biofertiliser is a liquid that we use at the farm. Dry fertiliser is useful for the farm and biogas avoids the use of wood,” says Luis Enrique Toconás, an inhabitant of the Munchique Los Tigres indigenous reserve in the

A member of the Chocolecos Association in Bolivia, using a machine that works with renewable energy for drying cacao.

territory of the indigenous Nasa people in Colombia, which is the beneficiary of the project ‘Promoting energy and food autonomy of the indigenous Nasa people’ implemented by the EEP programme.

As the number of livestock increases there are more possibilities to take advantage of the resource because the biogas produced may serve other purposes such as heating newborn animals, improving animal health, milk pasteurisation, and others. Additionally, biogas and biol produced could be shared with other families who are trying to improve their agricultural production and their living conditions.

As regards to a more efficient use of biomass, a panela producer who implements a bagasse dosing system (bagasse is a sugarcane byproduct) will avoid the burning of firewood and rubber, thereby protecting the environment and the health of his workers. The bagasse dosing device allows producers to avoid the use of contaminating materials, save fuel, produce the same amount of panela in less time and at less cost, and reduce the working hours. If physics says that energy is neither created nor destroyed, reality shows that it will turn into profits with direct benefits for producer families.

“We were not environmentally friendly. Before the introduction of these innovations, we used rubber and burnt oil as fuels for our productive activities. It has been a major change. Another change has to do with profitability; the cost of producing a panela load is now 115,000 Colombian pesos (US\$40) per day,” says Andrés Méndez, a panela producer from Finca Los Lagos in Colombia, who is one of the beneficiaries of the project ‘Improving panela furnaces by implementing a bagasse dosing system’ implemented by the EEP programme.

#### MORE THAN ELECTRICITY

The installation of a mini hydroelectric power plant in a small rural village brings multiple opportunities for the population – from the creation of small local businesses to the transformation of products for the selling in external markets. These are opportunities for the creation of new enterprises.

“There are many benefits: we will sell our products in markets and fairs, we will produce honey, and we will implement workshops such as the carpentry and motorbike workshop we have implemented. This will allow us to improve in many ways,” says Renata Solís Fernández, vice-president of the mini hydroelectric power plant of Cotacajes in Bolivia, a region that benefits from the implementation of the project ‘Hydropower: micro and pico hydroelectric power plants and productive alternatives’ implemented by the EEP programme.

Many initiatives such as the benefits of using energy for productive purposes in sectors such as the lumber industry, the textile industry, metallurgy, farming and fishing can bring many benefits and facilitate processes such as water pumping, milling, drying, cooling, transformation and commercialisation. Energy also brings many benefits in sectors such as trade, tourism and entertainment, and for the provision of services such as lighting, bioclimatic architecture, communications, and others. We can conclude then that without energy it is almost impossible to improve productive processes and create aggregate value.

#### THE ROAD AHEAD

So, how can quality energy services reach more people and be integrated in productive processes? The initiatives developed at international level and in the Andean region show that there are reliable technologies for sustainable energy generation. The gap results mainly from the lack of access to information and funding.

The Member States of the United Nations have set a new development agenda for 2015-2030 with new Sustainable Development Goals. This agenda contemplates ensuring universal access to energy services as a major goal. The challenge is to find mechanisms to achieve this goal. Promoting the rural market of affordable, reliable and modern energy services is key to ensuring energy access at household level and for productive purposes in rural areas of the Andean region.

Many initiatives such as the benefits of using energy for productive purposes and efficiently.



## EEP

In the frame of a partnership between the Inter-American Institute for Cooperation on Agriculture (IICA) and the Ministry for Foreign Affairs of Finland, the Energy and Environment Partnership Programme with the Andean Region (EEP) works in the field of renewable energies and energy efficiency, especially in rural and peri-urban areas, promoting the development of the energy service market and the access to energy for the integrated improvement of the rural habitat and the application of energy in productive activities.

[www.AEAAndina.net](http://www.AEAAndina.net)



# Promoting access to biodigesters

Biodigesters make way to cutting-edge technology to generate clean fuel. Here, a biodigester next to people from La Esperanza small village in Cajamarca.

In Peru, livestock areas lack proper treatment of organic waste from animal manure. Thus, environmental impact is reflected on air pollution from methane emissions, pollution of aquifers from coliforms and soil degradation. Additionally, wood is still the main fuel used, which generates deforestation and higher incidence of diseases caused by smoke inhalation.

Promote access to the market of low-cost domestic biodigesters to rural families serving as small agriculture and livestock producers.

There are systems that enable proper management and use of organic waste, such as biodigesters systems, which allow the entrance of dung mixed with water into a system of geomembranes to obtain biogas for cooking, and biofertilizers (biol) to increase productivity in the field, optimizing in this way the economy of rural families, reducing impacts on health and environmental pollution.

However, the biodigesters market is still small in Peru. Therefore, the Netherlands Development Organisation (SNV), through its global knowledge in biodigesters technology, is working to inform and promote access to the market of low-cost domestic biodigesters to rural families serving as small agriculture and livestock producers.

Within this framework, SNV, in collaboration with the Humanist Institute for Cooperation with Developing Countries (HIVOS) through the "Biodigesters National Plan (BNP) project: Access to energy in isolated communities from local production of biogas in Cajamarca", proposes the use of biodigesters as an accessible solution for renewable thermal energy technologies and the production of biofertilizers in rural communities. Moreover, this project is funded by the Fund for Sustainable Access to Thermal Energy (FASERT) established by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GTZ) of the German Federal Government and the Inter-American Institute for Cooperation on Agriculture (IICA).

## MODEL AND FUNDING

The Cajamarca region - main dairy farming region in the country- has been selected by SNV to promote access to the market of low-cost domestic biodigesters to rural families serving as small agriculture and livestock producers, specifically in the provinces of Cajamarca and Chota.

In order to spread technology awareness and match the demand of a tangible product, there are four demonstrative biodigesters. Additionally, promotional workshops to more than 400 families, as well as training workshops to private organizations and local authorities were developed to spread knowledge on biodigesters

The Netherlands Development Organisation (SNV), through its knowledge on biodigesters technology, seeks to promote access to the market of this clean alternative for the production of biol and biogas in rural areas in Peru. The project has already started in Cajamarca and is focused on families that serve as agriculture and livestock producers.

By Manuel Espinoza, Project Manager of SNV.



implementation. Also, in September 2015 the product was launched and the first sales were made, which validate the interest of the population in the product.

BNP also works with the supply, offering training to companies and local workers for the installation, quality control and maintenance of biodigesters, so that knowledge is transferred correctly and technology is adopted. Miriam Moreno, Manager of Bioproyectos, an installation company, says that "the plan offers multiple benefits: environmental, economic, social and health for cattle breeders in the region, as well as business opportunities to companies like ours, that are in the agriculture and livestock activity, and therefore there are more local jobs."

In addition, to increase easy acquisition, work is done jointly to access funding through financing institutions that consider differences in the

economic, social and cultural profile of potential beneficiaries, as for example the livestock credit line of Agrobanco. Jorge Paredes, Commercial Manager, indicates that his organization seeks to support projects that improve quality of life of people and protect the environment. Thus, the objective is that local residents may access clean technologies through the facility provided for funding.

Moreover, SNV monitors installation works, training activities for users who acquire biodigesters and promotes technical assistance for the correct operation and maintenance of the technology.

Finally, it is worth mentioning that due to BNP, renewable energies have more participation in meeting energy needs, contributing to sustainable development due to social and economic benefits, like reduction of property, gender equality and mitigation of adverse effects of climate change.

**Renewable energies have more participation in meeting energy needs.**

## Beneficiaries testimonials

**Hilda Briones Díaz**, from La Encañada: "The main benefit of the project is biogas. Since I use it, the consumption of wood has decreased, and I save time for taking care of my children and do the housework; before I had to collect firewood for cooking. I also use biol to fertilize the grass for nurturing my animals and I have noticed that pasture fertilized with biol grows better and produces more."

**Agustín Cadenillas Vásquez**, from Chalamarca: "The biodigester has improved my life, my health and my finances. Since I use biogas, I've reduced money spent on firewood; now I do not have to waste time carrying wood and my wife cooks better, without smoke. My plants look better and have grown since I use biol as fertilizer."

## SNV

The Netherlands Development Organisation is an international non-governmental cooperation organization committed to a society that is free to shape its own development. Its main objective is to "support local organisations to strengthen their development towards an effective action to reduce poverty and good governance". For this purpose, it points its activities to two key areas of impacts: "production, sustainable and equal income and jobs", and "effective, efficient and increased access to basic services distribution."

[www.snvworld.org](http://www.snvworld.org)

A beneficiary collects biol, a biofertilizer used to fertilise her plants, produced by a demonstrative biodigester located in her land, in the small village of Polloc in Cajamarca.

# PLAN NACIONAL DE BIODIGESTORES

ETAPA I CAJAMARCA

- ¿ESTÁS CANSADO DE RECOLECTAR LEÑA Y QUIERES TENER GAS COMPLETAMENTE GRATIS PARA COCINAR TUS ALIMENTOS?
- ¿QUIERES AUMENTAR LA PRODUCCIÓN DE TUS CULTIVOS?
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# Regional Centres for Clean Development

The Clean Development Mechanism is a tool developed from the United Nations Framework Convention on Climate Change that allows for the trading of carbon dioxide emissions between developed and developing countries. So far, there are more than 8,000 registered CDM activities, operating in more than 100 developing countries.

By **Karla Solís**, UNFCCC Programme Officer for the Regional Collaboration Centre in Latin America, currently assigned in Bogota, Colombia; and **María Laura Viñuela**, UNFCCC Programme Officer in Bonn, Germany.

People from India benefiting from the use of energy produced by the OSRAM CFL distribution CDM Project.

The International Energy Agency establishes that more than 1.3 billion people lack access to electricity world-wide; about 2.7 billion have no clean energy services for cooking (World Energy Outlook, 2014), and the World Health Organisation states that nearly 1.1 billion people do not have access to clean water (Health Through Safe Drinking Water, 2014). Access to these basic services is vital to humans' needs, such as health and education. For example; 4.3 million people die each year from illnesses (pneumonia, strokes, ischaemic heart disease and others) primarily attributable to the indoor air pollution caused by the inefficient use of solid fuels (House Air Pollution, WHO, 2014).

Various international organizations, such as the United Nations, the World Bank, and the World Health Organisation, are supporting country programmes to tackle the lack of primary services focusing on access to electricity, improved cookstoves, and water and sanitation services. One of these organisations is the United Nations Framework Convention on Climate Change (UNFCCC), which promotes clean technologies via the Clean Development Mechanism (CDM), which has been in operation since 2006. The CDM is a tool that allows for the trading of carbon dioxide emissions between developed and developing countries, based on reductions made on developing countries, as a result of implementing cleaner technologies. So far, there are more than 8,000 registered CDM activities, operating in more than 100 developing countries. Peru hosts more than 60 of these activities.

The vast experience and knowledge amassed under the CDM as a worldwide market mechanism, have demonstrated that it is an important political and economic tool that could enable countries to achieve their emission reduction ambitions, as proposed under the Intended National Determined Contributions (INDCs). INDCs are country (or parties) reports that define climate related actions and ambitions that countries are planning to implement and achieve. INDCs establish the foundations for countries to initiate, or intensify domestic actions towards achieving the ultimate objective of the Climate Convention, which is: to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (article 2 of the UNFCCC). The analysis of INDCs will be discussed during the Conference of the Parties (COP21) in Paris, in December of this year; based on the outcome, parties will determine the future for the post 2020 global Climate Agreement, which may include market mechanisms, such as the CDM.

In this context, the aim of this article is to analyse the contribution that has been made by the CDM to increase access to basic services within developing countries. This study focuses on the social and

environmental impacts; specifically, on the number of people who have benefited and the amount of emissions reduced due to the implementation of cleaner technologies to fulfil these basic human needs.

## DESIGN AND METHODS

Under the CDM, clean technology activities can be registered as either single projects, or as a group of projects which constitute a programme. A group of projects is referred to as Programme of Activities (PoAs). So far, there are 287 registered PoAs and 7,670 registered projects. The data presented in this study was compiled from publically available registered CDM programmes. All PoAs have been analysed, emphasizing those that applied clean technologies for four basic services: i) access to electricity, ii) efficient devices (for hot water, lights, etc.), iii) efficient cookstoves for cooking and, iv) clean drinking water. Moreover, these PoAs have been registered since 2009 until September 2015.

## RESULTS

From the 287 PoAs registered, 121 PoAs provide basic services. Out of these, 58 are implemented in Asia, 54 in Africa, and 9 in Latin America and the Caribbean (LAC) in El Salvador, Guatemala, Haiti, Honduras, Mexico, and Nicaragua. Out of the nine, seven belong to clean cookstoves and two to energy efficiency.

CDM is a tool that allows for the trading of carbon dioxide emissions between developed and developing countries.



In Rwanda, a boy has access to clean drinking water due to efficient filters, provided by the Rural Project of Water Treatment Systems



With the implementation of these 121 PoAs, around 110 million people are expected to receive benefits between the years 2009 to 2036. These activities have the potential to reduce about 9 million tonnes of carbon dioxide (tCO<sub>2</sub>) per year. Energy efficiency and clean energy for cooking have so far demonstrated the greatest potential, with 41 and 59 PoAs, respectively; which will benefit between 53 and 41 million people.

These figures on the number of people benefited are based on the CDM methodologies for small-scale or "Approved Methodologies for Small-Scale" (AMS), which are shown in bold in the table herein attached. For example, for access to electricity, data was taken from AMS-I.L., which establishes average electricity consumption for off-grid communities at 250kWh/year/household and provides a default emission factor of 1 tCO<sub>2</sub>/MWh. Therefore, for a consumption of 0.25 MWh/year/household the quantity of emissions would be 0.25tCO<sub>2</sub>/year/household.

**CONCLUSION**

Access to primary services in the developing world is key to improving the basic living

conditions of billions of people. This analysis shows that through CDM, at least 120 million people gain benefits, while about 9 million tCO<sub>2</sub> are being reduced each year. PoAs enabling access to electricity and improved cookstoves have demonstrated the greatest potential in terms of the number of people positively impacted and in terms of emission reductions.

The impact of these types of activities also bring co-benefits, which directly improve other aspects in addition to those of health and climate change mitigation, such as social (women's time in collecting fuel for cooking and lighting), economic (savings on fuel usage, creating jobs and livelihoods to e.g. manufacture cooking stoves) and environmental aspects (reducing pressure on remaining forest reserves and reducing soil erosion).

Key challenges to the implementation of small-scale energy projects continue to be: access to funding, replication of efforts (due to the fact that these activities serve mainly households) and changes on habitual practices (cultural stigma from users).

With the implementation of these 121 PoAs, around 110 million people are expected to receive benefits between the years 2009 to 2036.

	ACCESS TO ELECTRICITY	ENERGY EFFICIENCY	CLEAN COOKSTOVES	CLEAN WATER
<b>Programme of Activities</b>	12	41	59	9
<b>Reductions in ktCO<sub>2</sub>/year</b>	876.5	2,025	5,589	281.9
<b>Million of people benefited</b>	17.5	53.3	41.1	8.8
<b>Technologies</b>	Solar, wind, biogas	Compact flourescent lights	Rocket, Mirt, Carbon Zero efficient, EcoRecho, Improved cookstoves, Ethanol/biogas.	<b>Filters:</b> gravity membrane, ceramic <b>Disinfection devices:</b> solar UV, photo-catalytic, pasteurisation  Activated carbon

**CMNUCC**

The Regional Collaboration Centres (RCCs), such as RCC Bogota in Colombia, promote clean technologies by providing technical support to regional stakeholders. RCCs are designed to support stakeholders seeking to access clean projects and in so doing to increase their potential for carbon markets. They arise from the United Nations Framework Convention on Climate Change (UNFCCC) that promotes clean technologies through the Clean Development Mechanism (CDM). Thus, RCCs expertise focuses on carbon accounting, climate change policies and clean technologies. For further information contact: [ksolis-garcia@unfccc.int](mailto:ksolis-garcia@unfccc.int).

<https://cdm.unfccc.int/stakeholder/rcc/index.html>

120,000 cocinas mejoradas instaladas en Perú



↗ **Polución Intradomiliaria**  
Reducción de 98%

↗ **Calidad de vida**  
Mejora en 94%

↗ **Salud**  
Mejora en enfermedades respiratorias, gastrointestinales y de la vista

↘ **Desnutrición**  
Reducción en parasitosis y mejora en nutrición

↘ **Deforestación**  
1.5 toneladas de ahorro en madera por familia

↘ **Emisiones de CO<sub>2</sub>** 2.5 toneladas de ahorro anual por familia



**Una forma sostenible de construir cocinas mejoradas mediante los Bonos de Carbono**

- SEMBRANDO construye cocinas mejoradas y vende el ahorro en emisiones de carbono en el Mercado de Carbono voluntario por un periodo de 14 años:

A la fecha se han generado 742.000 Bonos de Carbono certificados por GOLD STANDARD

- SEMBRANDO aplica a los Fondos Verdes o Fondos de Carbono

En 2016, 30,000 cocinas mejoradas generaran un estimado de 1'049,000 bonos de carbono en 14 años



## 120,000 improved cookstoves installed in Peru

↗ **Indoor Air Pollution**  
Reduced by 98%

↗ **Livelihood**  
Improved by 94%

↗ **Health**  
Improvement in respiratory, gastrointestinal and eye diseases



↘ **Malnutrition**  
Reduction in worm diseases and improvement in nutrition

↘ **Deforestation**  
1.5 tons savings in wood per family

↘ **CO<sub>2</sub> emissions**  
2.5 tons of annual savings per family



## A sustainable way to build improved cookstoves worldwide through Carbon Credits

- SEMBRANDO builds improved cookstoves and sells savings in carbon emissions in the voluntary Carbon Market for a 14 year period:

To date, we have generated 742,000 carbon credits certified by GOLD STANDARD

- SEMBRANDO applies to Carbon Funds or Green Funds

In 2016, 30,000 improved cookstoves will generate an estimate of 1'049,000 carbon credits