

EnDev Peru

ENERGISING DEVELOPMENT PROJECT

10 years

COOPERATING WITH ACCESS
TO ENERGY IN PERU

October 2018

Amaray

SPECIAL CLOSING EDITION

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A journey of many roads...

In that past 10 years, EnDev Peru has travelled many roads in the national territory, managing to reach isolated populations in difficult to access rural areas.

Couple of peasants in San Juan de Yanacolpa, Huancavelica

Looking for a better future...

Recognizing the needs of the population in vulnerable conditions, EnDev Peru has worked to improve their living conditions, looking for a better future for all.

Mother and baby in Yanamarca,
Cajamarca



Towards development with access to energy

Access to energy is a fundamental right for the development of Peruvian families, which has been EnDev Peru's main objective since arriving to the country.

Family in Cajabamba, Cajamarca



The cooperative work of EnDev Peru has facilitated the arrival of basic energy services in rural areas.

The Energising Development Project (EnDev) Peru, executed by the German cooperation for development, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, has been a strategic ally for the Peruvian Government since its inception in the task of achieving universal access to affordable, safe, sustainable and modern energy, an objective that is part of the 2030 Agenda and the Sustainable Development Goals.

Since 2007, EnDev Peru has provided an average of a half million households that live in rural areas to gain access to electricity and more than a million people access to modern energy services through the use of improved cookstoves. It has also actively promoted the productive use of energy and the use of clean energy in the energy matrix. To achieve this, EnDev Peru has worked in alliance with private companies and state entities such as the Ministry of Energy and Mines, specifically with the General Directorates of Rural Electrification and Energy Efficiency.

In this context, it is a pleasure for the Ministry of Energy and Mines to present the special edition of Amaray magazine, which shares and disseminates the results and lessons-learned from the cooperative experiences carried out in the country by the EnDev Peru Project during its 10 years of work.

The cooperation between EnDev Peru and the Ministry has been consistent with our objectives and guidelines. As a result, our joint actions contribute to achieving the goals established in the National Plan for Universal Access to Energy by 2022, which seeks to expand access to electricity by using the conventional system for expanding the grid and by employing solar photovoltaic systems; to disseminate technology and clean fuels, as well as to promote the productive use of electric power and energy efficiency projects.

We value the efforts of EnDev Peru in closing the energy access gap in a sustainable manner, due to its contribution to technical standards and the creation and validation of strategies, as well as the generation of methodological tools and the coordination of the various social actors. Likewise, we appreciate the transfer of its technical know-how, business models and management in the development of the Nationally Appropriate Mitigation Actions (NAMAs) of Universal Access to Sustainable Energy to reduce greenhouse gases emissions and halt the negative effects on the environment, which is deployed jointly by the Ministry of Energy and Mines and the Ministry of the Environment. All of these actions result in improving the quality of life of the population and furthering human development.

For all of the reasons mentioned above, the Ministry of Energy and Mines would like to recognize EnDev Peru for its hard work and permanent support on behalf of the most vulnerable populations in the country.

Raúl García Carpio
Vice-minister of Energy

“With Amaray we know that we can carry a memory that unites us all.”



EnDev Peru aimed to assist Peruvian families on their path to adequate energy access.

Dear readers,

After a decade of work, EnDev Peru is taking our final steps in this beautiful country. The race is over and although we know that there is still much to do, we feel we have done our part towards reaching such an indispensable goal: a Peru with universal access to basic energy services, in a sustainable and affordable way for everyone. We have opened the path, laid strong foundations and created possibilities in this important task, directed toward populations most in need, without forgetting about the importance of generating a positive impact on the environment.

Amaray magazine has accompanied us in a large part of this journey, displaying our work and that of our partners, as well as other initiatives that we believe are beneficial for the development of basic energy access in rural areas.

Through Amaray, we have not only shared relevant experiences and knowledge, the magazine has also been a portal for the stories and faces of the people we met along our way, the real actors of this story. With Amaray we know that we can carry a memory that unites us all.

We say goodbye with a special edition of the magazine, which apart from showing us the strengths of our work, focuses on highlighting our main strategy: the development of the market of BEAT (Basic Energy Access Technologies), which we believe is indispensable for the sustainability of this long struggle against energy poverty. At the same time, we also present articles from the Ministry of Energy and Mines related to energy access in the state policies section. Besides, there is a group of histories of cooperation, as well as an engaging photographic portfolio.

We share with you our memories, which are still alive, of what has been done, as well as experiences that we hope will be useful for those who will continue with this task. To document is to re-live, to convey, and to pass the mantle to new actors and to give continuity to our “company”.

We want to thank all those who have accompanied us, either on the roads of Peru or through these pages; and we hope that you always keep the task at hand, projecting a brighter, cleaner and warmer future for all.

Best regards,

Ana Isabel Moreno Morales
Director of the EnDev Peru Project

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An entrepreneur with an improved cookstove model promoted by EnDev Peru.

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Access to pico photovoltaic systems facilitates study at night.

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Amaray

Energy and development for rural areas

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Residents of Candarave, Tacna.

Portfolio
Off the path with EnDev Peru

State Policies





Rosendo Ramírez Taza
General Director of the General Directorate
of Energy Efficiency of the Ministry of Energy
and Mines

Contribution of EnDev Peru to Sustainable Development Goals

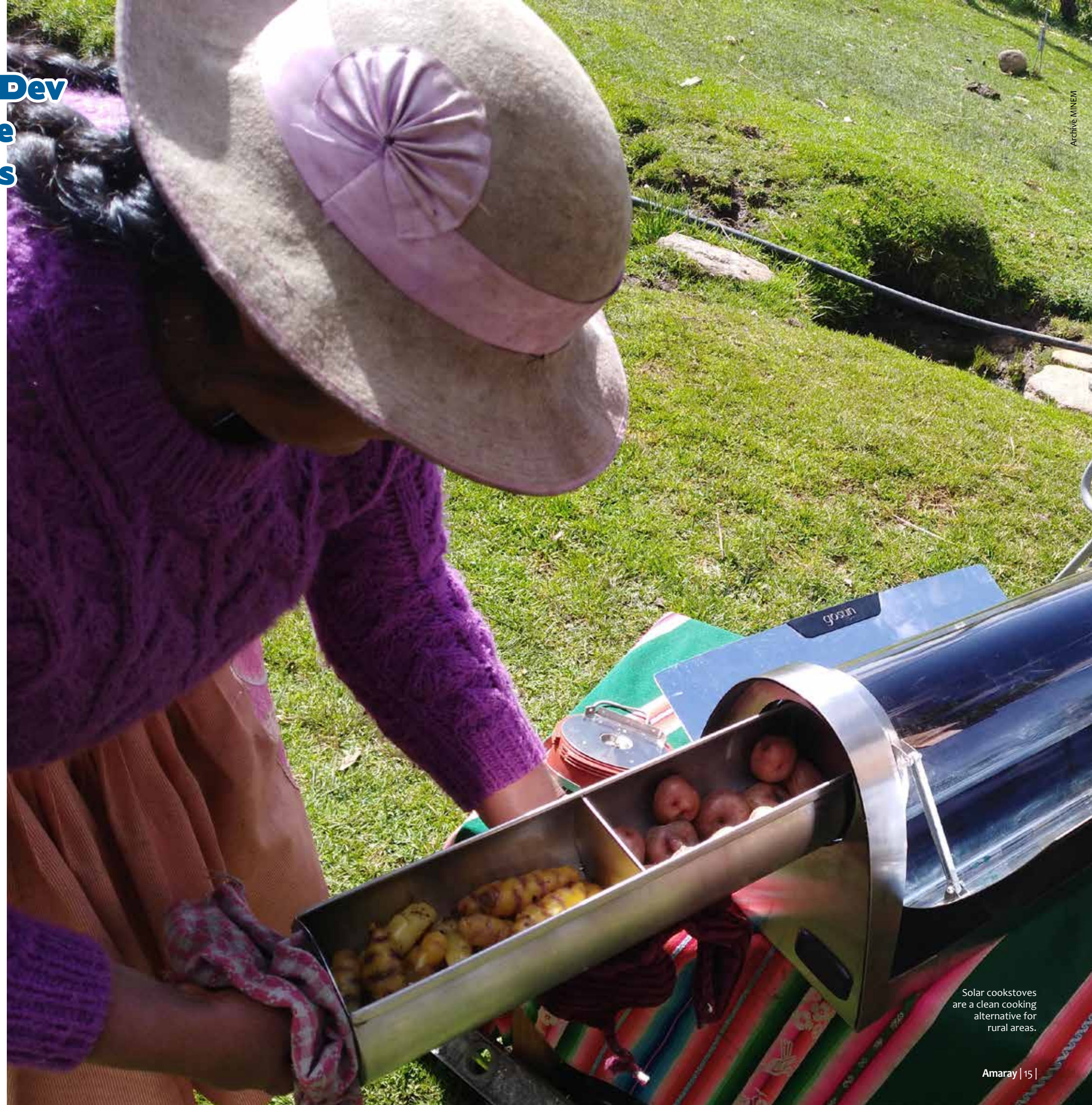
cookstoves models; capacity development for the actors involved; the strategies for the adoption of improved cookstoves; as well as the identification of mechanisms that ensure sustainability in the use and maintenance of these technologies. This programme, called the NINA Project and later the Cocina Peru Programme, managed to implement more than 100,000 improved cookstoves between 2010 and 2014, improving the quality of life of the most vulnerable populations in the country, due to the reduction of respiratory diseases in children.

Another important contribution by EnDev Peru was established in the context of climate change. In the framework of the Nationally Determined Contributions (NDCs) that were assumed by Peru to reduce Greenhouse Gases Emissions (GHGs), DGEE became the focal point of commitments taken by the energy sector. Consequently, DGEE promotes and encourages the compliance of these commitments, implementing Nationally Appropriate Mitigation Actions (NAMAs) in the areas of energy generation and its final use, which seek to reduce GHGs in related sectors. One of these NAMAs is the so-called Universal Access to Sustainable Energy in rural areas, which promotes the use of renewable energies for lighting and cooking. EnDev Peru provided its technical assistance for the design of this commitment, contributing in the development of the diagnosis, technological diversification, quantification of impacts and sustainability strategies.

It is important to highlight the role played by EnDev Peru in the energy sector, becoming a strong ally for MINEM in the development of actions that seek to provide access to clean, sustainable and quality energy services, with environmental responsibility, for populations located in rural and peri-urban areas of the country. In this manner, EnDev Peru contributed to sustainable development objectives in the different energy related components, working towards a better future for the generations of tomorrow.

The General Directorate of Energy Efficiency (DGEE) of the Ministry of Energy and Mines (MINEM), acknowledges the significant contribution of the Energising Development Project (EnDev) Peru, which has been accompanying DGEE since its creation as a regulatory entity for energy efficiency in the country. A contribution that has allowed various regulations to have a sustainability component, necessary in all public policies.

Since 2009, the Ministry has executed a change programme in the energy matrix, aimed at poor households in marginalized urban and rural areas of the country. In this context, two programmes were developed: the programme to substitute kerosene domestic consumption for liquefied petroleum gas (LPG); and the programme to replace traditional wood-burning cookstoves with improved wood-burning cookstoves. In the second programme, EnDev Peru contributed its technical knowledge and experience through an Interinstitutional Cooperation Agreement for the development of a strategy of the large-scale adoption of wood-burning improved cookstoves. The project contributed in the identification of improved



Solar cookstoves
are a clean cooking
alternative for
rural areas.



Hugo Sulca Sulca
General Director of Rural Electrification of
the Ministry of Energy and Mines

EnDev Peru's collaboration for rural electrification

By the end of 2017, it is estimated that the national electricity coverage is 91.6%, (using data from the INEI through ENAPRES surveys), and in rural areas, drops to 81.5% (MINEM data).

Given the slow progress in improving rural electrification in the country, DGER has been redoubling efforts to achieve universal access in terms of rural electricity coverage in accordance with the National Rural Electrification Plan.

To complement its work, DGER has had the firm support of the Energising Development Project (EnDev) Peru, an entity with which a constant process of technological validation was implemented, which included innovative alternatives for rural electrification. An example are the implementation of portable solar or pico photovoltaic systems, which since 2016 have had a specific standard, approved by the General Directorate of Electricity (DGE - MINEM).

As well, EnDev Peru supports the efforts of DGER by developing capacity around electrification projects that were carried out. Training and communication methodologies and strategies for rural electricity users were developed in indoor electrical connections, residential photovoltaic systems and productive uses of electricity. Since 2014, the knowledge accumulated by EnDev Peru has been transferred and implemented by DGER within the framework of budgetary programme 046 "Access and Use of Rural Electrification".

As a result of the reduced use of polluting devices and fuels (such as diesel lighters and candles for lighting), and through coordination with other actors and sectors, EnDev Peru provided DGER with all the necessary information to quantify and monitor the impact of rural electrification with solar energy within the framework of the Nationally Determined Contributions (NDC). As well, the relationships needed to generate the conditions for achieving universal access to energy with low carbon emissions were identified.

A topic to highlight is the "Energy Caravan", a socio-educational proposal designed by EnDev Peru and transferred to DGER with the objective of generating interest within the school population of the stewardship of energy resources and the development of good practices in the safe and efficient use of energy, with an emphasis in electricity.

The "Energy Caravan" reinforces the celebration of the arrival of electricity in a locality within the framework of the inauguration process of rural electrification projects carried out by DGER using the infrastructure of educational institutions. Through large-scale and colourful games, themes related to energy and its sources are developed, as well as the safe and efficient use of electricity and renewable energy. In this way children and adolescents are encouraged to act as promoters in their households today and as adults responsible for the sustainable use of energy in the future.

To conclude, we reiterate what was stated by our Minister of Energy and Mines: "With electricity we can develop ourselves, and improve our education, health and productive activities". Let us fight to achieve the longed-for universal access to electricity in Peru.

The lack of access to electricity for Peru's rural population is one of the causes of rural poverty. Combined with the shortage of other infrastructure services, lack of electricity restricts economic development and hinders improvements in living standards, and also limit the quality of medical care and the availability of educational opportunities.

Access to electricity represents one of the pillars in the fight against poverty, which as national policy has allowed successive governments make rural electrification one of its main priorities.

Regarding the subject of rural electrification, Peru has made progress, but still falls behind in electrical coverage. The most important thing to point out is that the value of electrification or electrification coefficient, at an Urban Level shows a disproportion with respect to the Rural Level. For this reason, the National Government led by the General Directorate of Rural Electrification of the Ministry of Energy and Mines (DGER - MINEM), in collaboration with regional governments (RG) and local governments (LG), has been making efforts to develop pending rural electrification projects.

Different applied technologies are used based on a selection of energy sources, which consider grid extension of the National Interconnected Power System and Isolated Systems as the first option, from which the Rural Electric Systems are developed.

However, the greatest difficulty in carrying out these grid extension projects is "population dispersion". A large geographic scope and the diverse and varied geography prevent electrical services from reaching all rural populations. In the case of rural electrification, this results in projects having a high unit cost per household and low economic profitability, which means that they are not attractive to private investment and require the active participation of the state.

Given this situation, in recent years, DGER has been implementing some projects with the use of photovoltaic systems, if it was technical-economically feasible.



A resident of rural Cajamarca grateful to have access to electricity in her home.

Special



EnDev Peru, 10 years of experience in cooperation

By Ana Isabel Moreno Morales
Director of the EnDev Peru Project

From an approach to the market development of basic energy access technologies, the EnDev Peru Project bids farewell by sharing lessons and experiences accumulated over 10 years in the country.

Bringing electricity and other basic energy services to rural households is a challenge in Peru.

Energy access in Peru

Access to energy for lighting, cooking and hot water is a need for almost 100 million people around the world¹. Within this context, currently, in Peru, 460,000 households do not have access to electricity and 1.7 million people lack an efficient appliance for cooking (INEI, 2016). Additionally, much of that population is located in remote communities or dispersed households, a factor that hinders the arrival of conventional systems for access to energy.

In the 1990s and early 2000s, the Peruvian government started a series of structural reforms in the electricity sector. It went from a government monopoly control, vertically integrated, to a private operators' scheme. Then, in 2006, the General Law of Rural Electrification (Law 28749) was enacted, which through the National Rural Electrification Plan and Cross-subsidies Policies to Electricity Rates, resulted in residential photovoltaic systems being considered Rural Electrical Services.

These policies and laws improved the quality of service and raised urban and rural electrification rates. According to the National Institute of Statistics (INEI), by the end of 2016, Peru reached a national electrification rate of 94%, while rural electrification increased from 45% in 2007 to 79% in 2016. However, despite this progress, more than 1.5 million people in rural areas lack access to electricity.

In the case of energy for cooking, between 2008 and 2009 different political advocacy activities were carried out by representatives of local and regional governments, NGOs and international organizations, on the negative impacts of indoor pollution generated by open fires and traditional cookstoves.

In this context, the government in power approved Urgency Decree N° 069-2009 and its amendment, Urgency Decree N° 025-2011, authorizing local and regional governments to use up to 2.5% of canon resources (the share of income obtained by the national government from economic natural resource exploitation), sobrecanon and mining royalties in the construction of certified improved cookstoves. Until 2012, when the Urgency Decree was no longer in force, 250,000 improved cookstoves were built in the country. Moreover, during the following years the efforts of the State, private companies, NGOs and international cooperation continued, especially from the EnDev Peru Project, installing 300,000 additional certified improved cookstoves by the end of 2017.

Regarding the use of liquefied petroleum gas (LPG), Law 29852 was enacted in 2012, which promotes access to LPG in vulnerable rural and urban sectors, by delivering discount

coupons to purchase a gas tank of up to 10kg. Furthermore, if a family has access to LPG, but does not have a cookstove, the State donates one.

According to the 2016 Annual Report of the Social Inclusion Energy Fund (FISE)², in 2016 there were 1,519,578 beneficiaries of discount coupons. 12,201,298 discount coupons were issued and 9,943,173 were redeemed, reaching an exchange rate of 88.63%. In conclusion, there is evidence of a high exchange rate of coupons, a factor that indicates the sustainability of LPG use.

In 2013, the 2013–2022 Universal Energy Access Plan was approved through Ministerial Resolution N° 203-2013- MEM/DM, whose objective is to close the gap of energy access by implementing projects that provide partial and total subsidy to Programmes for the Development of New Supplies in the Border, as well as for the Improvement of Rural Energy Use, which includes improved cookstoves and biodigesters.

In the international context, the problem of energy access has been included in the agendas of multilateral organizations in recent years. Peru directs its policies on universal energy access and mitigation actions according to the commitments undertaken in these international agreements.

In the year 2000, the United Nations (UN) proposed the Millennium Development Goals (MDGs), although there was no exclusive objective related to energy access, this was a cross-cutting topic that contributed to the achievement of many MDGs.

However, in 2011, the Sustainable Energy for all (SE4ALL) initiative directly proposed actions for universal access to modern energy, such as raising the participation of renewable energy in the energy matrix and improving energy efficiency, highlighting the energization of low income households as a clear way to end energy poverty.

At present, the 2030 Agenda, approved by the General Assembly of the United Nations in September 2015, sets out 17 Goals for Sustainable Development and places the energy issue on the international agenda as a main axis for development. The seventh goal, "Affordable and Clean energy", seeks to ensure access to affordable, reliable and sustainable energy, improve energy efficiency and increase the use of renewable sources, ensuring universal access to modern energy services.

Similarly, regarding the Nationally Determined Contributions (NDCs), which represent the commitment of the international community to address the impacts of climate change and reduce greenhouse gas emissions, limiting the increase in the average temperature of the planet below 2°C, Peru has recorded two measures related to energy access: Electricity supply with renewable energy resources in off-grid areas (Eo2) and Clean cooking (Eo8).

In Peru, 460,000 households do not have access to electricity and 1.7 million lack an efficient device to cook their food.

¹ <https://sustainabledevelopment.un.org/sdg7>

² <http://e.issuu.com/embed.html#30957158/52759397>

The EnDev Peru Project strategy

The EnDev Peru Project, whose objective is to provide sustainable access to basic modern energy access technologies, mainly for rural populations, proposed to promote the access to basic energy access technologies (BEATs) through market mechanisms, where different resources are allocated through a monetary exchange (or not), defined by the supply and demand³. From this perspective, the final user buys a technology from retail distributors.

In this context, when the State does not provide public services, such as education and health, the vulnerable population uses private markets, depending on them to satisfy their needs, such as food, basic services and energy. For example, in the absence of electricity, people turn to the market of candles and lighters, inefficient technologies that do not cover their lighting needs adequately.

Misinformation on the economic potential of energy access markets, as well as the lack of knowledge of their technologies, mean that economic agents (suppliers) do not invest in developing or articulating a real market chain for this sector. In summary, this is a situation presented by emerging markets, in which the supply and demand should still be connected, so that population can have access to BEATs.

Given this situation, the EnDev Peru Project proposed to promote energy access through the development of BEATs retail markets, including improved cookstoves and ovens, photovoltaic systems (pico and residential), solar water heaters, and secure indoor electrical connections, through alliances with several public and private actors.

From the perspective of EnDev Peru, it is intended that the final user buys a technology from retail distributors.



The development of local retail markets, such as improved cookstoves, has been one of the contributions of EnDev Peru.

³ A synthesis of the Making Markets Work for the Poor (M4P) approach in https://www.eda.admin.ch/dam/deza/es/documents/publikationen/Diverses/172765-unesynthesedemarche_ES.pdf

STRATEGY AXIS

The project did not focus on improving energy access by promoting the delivery of technologies to a target group, but designed a strategy that provides a framework for energy access in a comprehensive way. Work was done based on the following three pillars: the institutional environment, supply and demand.

INSTITUTIONAL ENVIRONMENT

The institutional environment pillar was defined as the public domain, where policies, legal framework, regulations, product quality standards and public financing, which promote the conditions for BEATs access, are designed. This function was undertaken by central government and subnational governments. Academia was also included, which served to validate, research and develop technologies. Civil society participated as well, with actors such as the Collective of Basic Access to Energy (CABE), non-governmental organizations (NGOs) and international cooperation, which advocated politically for energy access.

SUPPLY

The supply pillar is comprised of existing companies with the capacity and desire to sell BEATs, in a specific period of time and location, in order to satisfy the needs of households.

DEMAND

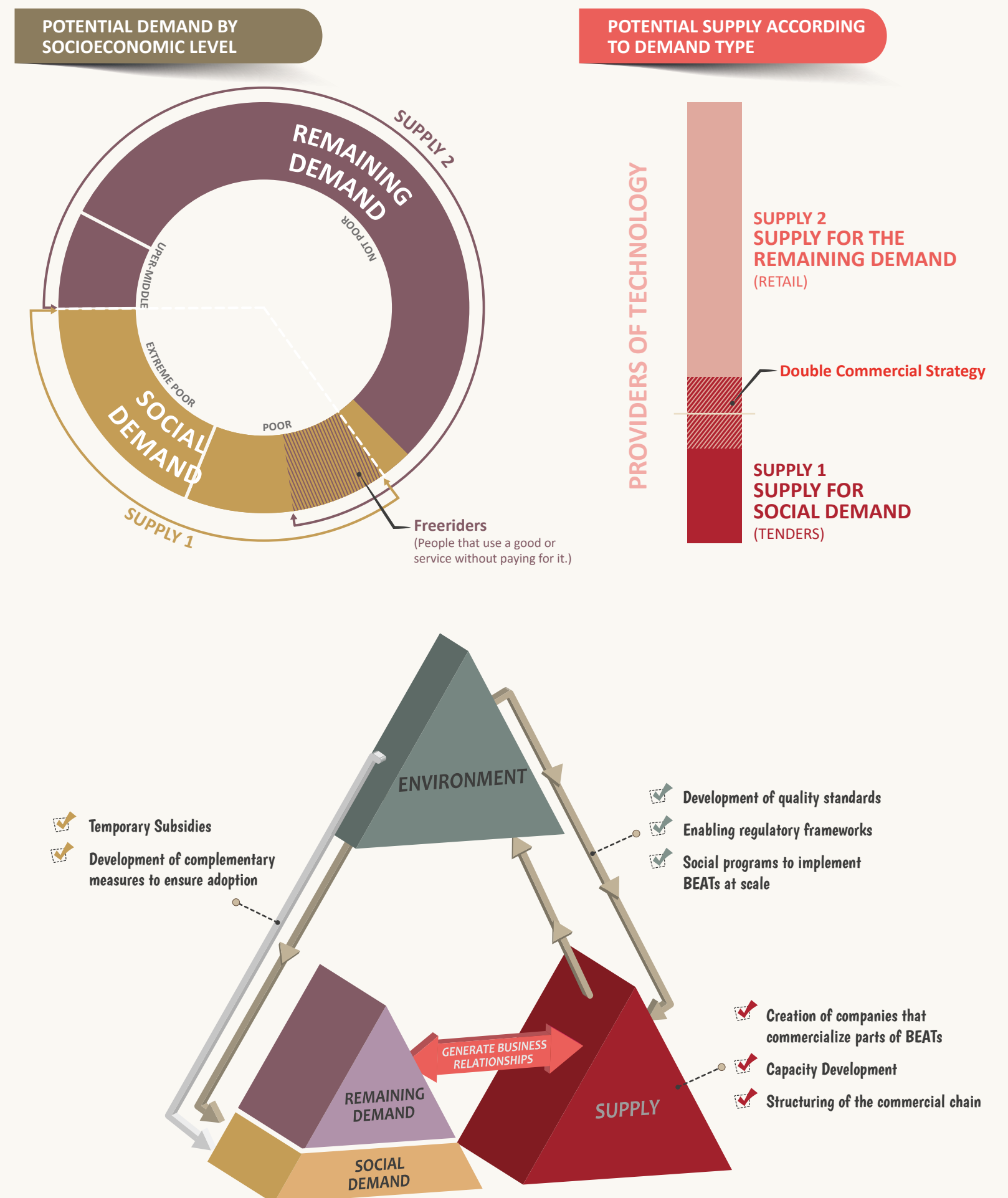
The demand pillar is made up of families that required BEATs to meet their needs. A distinction was made between the social demand (users of social programmes) and the remaining demand (rural population that does not qualify to be a beneficiary of a social programme). Thus, the social demand received BEATs under the modality of subsidy, while the remaining demand acquired them directly in the retail market (see graph).

In summary, the EnDev Peru strategy sought to promote and align itself with an institutional environment that supported the development and enhancement of the market through the creation of policies, norms, regulations and forms of financing for BEATs. Moreover, the supply was strengthened by providing information on validated and certified technologies, developing their business capacity, as well as assuming the risks and initial costs for introducing technologies through monetary incentives. This was managed by two funds, created by the project: Fund for Sustainable Access to Thermal Renewable Energies (FASERT) and Portable Wood-Burning Stoves Innovation and Development Fund (FIDECOP). In addition, advice on the consolidation of distribution structures and access to credit was provided. Additionally, the increase of BEATs informed demand was promoted, as well as access to financing mechanisms in order to acquire these technologies.

In short, the formation of these three pillars enabled the social demand to have access to BEATs, through projects and programmes implemented by public and private institutions. Likewise, this model allowed the the supply and the remaining demand to be boosted, thus contributing to the creation of a retail market (see graph).

Potential demand by socioeconomic level and potential supply according to the type of demand

Strategy of the EnDev Peru Project for the development of the BEAT market



KEY AND SUPPORT PROCESSES

The actions of the project were divided in two areas. The first area was called key processes and the second was support processes⁴.

KEY PROCESSES

Key processes are those actions that directly affected the attainment of the project's objective, such as: the development of enabling policies and regulatory frameworks, innovation and validation of technologies, identification of financing mechanisms, strengthening of the distribution chain and capacity building.

ENABLING POLICIES AND REGULATORY FRAMEWORK

Enabling policies act as generators of incentives and ease the participation of private companies in the production and importation of BEATs. At first, political advocacy was carried out with regional and local government representatives, NGOs and international organizations, on the negative impacts of indoor air pollution generated by open fires and traditional cookstoves, resulting in an Urgent Decree that permitted the use of public resources for the construction of improved cookstoves. Secondly, the incorporation of BEATs into budgetary programmes and public investment projects was pursued. Thus, these public financing mechanisms encouraged companies to develop specific markets for BEATs in rural and peri-urban areas.

At the same time, regulatory framework supported enabling policies, so that they were implemented adequately. For example, Supreme Decree N° 015-2009-Vivienda, which approved the Technical Standard for Improved Cookstoves, allowed the use of public resources authorized by the Decree to be used only in the construction of certified improved cookstoves, thus guaranteeing public investment in this sector.

INNOVATION, VALIDATION AND CERTIFICATION OF TECHNOLOGIES

In the technological innovation area, an improvement in the characteristics of technologies was sought, tailoring the technologies to the rural and peri-urban demand, as well as reducing their price without reducing quality. In this context, constant monitoring of technological innovations was carried out in the scope of global energy access, allowing new technological options to be identified for the BEATs market. Thus, many products were adapted to local conditions, validated both in the laboratory and in the field, and, if applicable, certified under national standards. Undoubtedly, these actions contributed to the consolidation of companies in the BEATs market.

FINANCING MECHANISMS AND MONETARY INCENTIVES

At the beginning, the project found that low income households and micro and small BEATs companies had limited access to credit due to lack of formalization of their

financial flows. Given this situation, EnDev Peru promoted the development and inclusion of financial products and services that permit families to acquire those technologies among regulated (and non-regulated) financial institutions.

Similarly, in the case of companies, access to credit was promoted to boost their development. Along this line, mechanisms to deliver monetary incentives were created, which cover the initial risks and costs of the introduction of technologies through the FASERT and FIDECOP funds, as well as through the intervention of a results-based financing model (RBF) implemented jointly with Caja Arequipa.

STRENGTHENING OF DISTRIBUTION CHAINS

A distribution chain is defined as the path followed by a technology from its manufacture to the final customer. In rural areas, specific distribution chains for BEATs were absent in the retail market, due the fact that they were unknown and weak, a factor that generated high transaction costs if they were intended to be developed by the same importers or manufacturers. They were also low quality.

Given this market reality, efforts were made to boost and strengthen BEATs distribution chains, connecting local entrepreneurs (wholesalers and retailers with existing businesses) with importers and manufacturers that were already in the local market. In addition, the strengthening of the technical and financial capacity of the actors was promoted.

CAPACITY BUILDING

EnDev Peru does not consider education as the accumulation of knowledge, but rather a process where society, organizations and people have managed to adapt to changes and social innovation⁵. So, when an organization incorporates new experience and knowledge in its structures, processes, rules and rituals, it is an organization that learns. Consequently, learning is connected to how one evolves toward the incorporation of new activities.

With this in mind, the strategy focused on capacity building for managers, technicians and leaders related to social programmes that implemented massive projects for BEATs, as well as for companies selling the technology. The expansion of institutional capacities was sought through the training and incorporation of new courses into the curriculum of public and private training institutions. These courses included the construction of improved cookstoves, the installation of photovoltaic systems and indoor electrical connections, and improving business management.

SUPPORT PROCESSES

Support processes are the actions that are not directly linked to the accomplishment of the project's objective, but provide support to key processes. Within EnDev Peru work, the support processes were monitoring, communication and knowledge management.

The project found that low income households had limited access to credit.

MONITORING

The monitoring system of EnDev Peru, based on results, contained a database of users served by the project and its partners, so that it was possible to make decisions based on solid information, with reliable and credible data on the access and use of different technologies, in addition to being focused on families in energy poverty. The information provided feedback to track the progress of the activities and correct mistakes in a timely manner.

COMMUNICATIONS AND KNOWLEDGE MANAGEMENT

Communications and knowledge management was carried out through publications and the creation of inter-institutional platforms. Videos were broadcast and research was published to provide evidence, as well as simple magazines to disseminate the knowledge base and experience produced by the BEATs project and determining factors for energy access. In general, the material was

aimed at academia, decision makers, public officials and people interested in the subject at the national and international level.

Specifically, research was disseminated on the impact of pollution on the health and economy of a household, the lifespan of technologies, adoption, systematization of experiences, technology catalogues, methodological guides, educational materials, Amaray magazine, among others.

On the other hand, inter-institutional platforms, made up of public and private institutions, were promoted as spaces for advocacy, designing energy access policy, sharing knowledge, joining efforts and coordinating joint actions. The different platforms formed, both national and international, made it possible to build knowledge and generate responses to the difficulties faced by projects implemented by various institutions.

Research was disseminated on the impact of pollution on the health and the economy of a household.



The commercialization of portable improved cookers has allowed more people achieve access to these types of technologies.

⁴⁵ Cooperation management for practitioners. Designing social changes with capacity WORKS. GIZ GmbH



The coordination of stakeholders of has been a fundamental pillar in the advocacy process and the management of expertise.

Actors in the strategy Implementation

Although the direct political partner of EnDev Peru was the Ministry of Energy and Mines, the project had a large number of partners that participated in the development of its activities.

STATE INSTITUTIONS

Ministerio de Energía y Minas

Cooperation with the General Directorate of Rural Electrification was established to develop information, education and communication strategies, which allowed the rural population that has access to energy to understand the importance of using electricity safely and efficiently, in both in the case of power grid extension or with residential photovoltaic systems. Also, local electricians were identified and trained to carry out safe indoor electrical connections with certified materials. This improved the level of energy access for rural populations.

The General Directorate of Electricity, cooperated in the development of the standard “Technical Specifications and the Evaluation Proceeding of a Photovoltaic System and its components”, through Directorial Resolution N° 272-2016-MEM/DGE.

The Directorate of Energy Efficiency, cooperated in the Cocina Peru Programme, transferring models of improved cookstoves and methodology for their dissemination. Moreover, technical assistance was provided in the development of necessary studies to design the Nationally Appropriate Mitigation Action (NAMA) for universal energy access.

Ministry of Development and Social Inclusion

Support was provided to the National Programme of Direct Support to the Poorest - Juntos, the National School Feeding Programme - Qali Warma and the Social Development and Compensation Fund (FONCODES), transferring methodologies for large-scale adoption of certified improved cookstoves, building capacity in civil servants and social workers and incorporating new models for these types of cookstoves.

Ministry of Housing, Construction and Sanitation

Support was provided in the implementation of the laboratory of improved cookstoves at the headquarters of the National Training Service for the Construction Industry (SENCICO) and to the Directorate of Construction for the development and updating of the Technical Standard for improved cookstoves.

Ministry of Education

The pedagogical material Amigas y Amigos de la Energía was developed and validated with the objective of generating awareness about the use of energy in school children, as well as the necessary competences for responsible and sustainable development, based on the use of clean technologies. Learning projects were taught in the periods IV (3° and 4° grade) and V (5° and 6° grade).

Local and Regional Governments

Support was provided to four regional and 30 local governments, providing technical assistance in the design of BEAT projects, training for local technicians, as well as monitoring and impact studies. Particularly, with the regional government of San Martín the Energy Policy of the region was promoted.

CIVIL SOCIETY ORGANIZATIONS

Academic Institutions

Joint work was carried out with the Centre for Renewable Energies and Rational Use of Energy (CER) of the National University of Engineering (UNI) and with the Department of Renewable Energies of the National University of San Agustín (UNSA), where different BEATs were tested and validated, and research and development activities were conducted.

Microfinance Institutions

The incorporation of green credits into the portfolio of financial services was promoted between regulated and non-regulated microfinance institutions.

Non-governmental Organizations

Coordination was made with different NGOs, especially with Practical Action, which was in charge of executing the Portable Wood-Burning Stoves Innovation and Development Fund (FIDECOP), financed by the German cooperation for development, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. This fund sought to promote the mass production of efficient wood-burning portable cookstoves, according to the needs of the peri-urban and rural population, through incentives that promoted technological innovation in small and medium companies.

LOCAL COMPANIES

Basic Energy Access Technologies (BEAT) Companies

The EnDev Peru project directly promoted the coordination of entrepreneurs, suppliers, domestic manufacturers, wholesale distributors and microfinance institutions to continue the growth of the BEAT retail market.

INTERNATIONAL INSTITUTIONS

The Inter-American Institute for Cooperation in Agriculture

The execution of the Fund for Sustainable Access to Thermal Renewable Energies (FASERT) was organized by the Inter-American Institute for Cooperation on Agriculture (IICA) and financed by Energising Development (EnDev). The purpose of this fund was to co-finance projects that promote access to and the dissemination of Thermal Renewable Energy Technologies (TERT) in peri-urban and rural populations.

The Global Alliance for Clean Cookstoves

Collaborative agreements were established with the Global Alliance for Clean Cookstoves (GACC) to organise the First Latin American Seminar-Workshop on Clean Cookstoves and participate in international meetings focused on these technologies. Also, training workshops were held to empower women entrepreneurs and support was provided in the revision of the trainers manual.

The project involved a large number of partners who participated in the development of its activities.

In summary, the cooperation strategy of the project was based on the collaboration of various public institutions such as ministries, local and regional governments, providing assistance in the implementation of their large-scale programmes and projects of access to basic technologies directed at the social demand. This partnership permitted the promotion of both enabling policies and regulatory framework, which resulted in mass production and large-scale adoption of technologies, together with the beginning of the retail market.

In other words, the formation of the project's strategy and its key processes, along with social programmes and projects of the ministries, local and regional governments, and microfinance companies and institutions allowed the social demand to access BEATs, while the remaining demand was served by the market.

The result was that the social demand was able to access the BEATs, while the remaining demand was served by the market.



The project sought to promote pico photovoltaic products that are durable and easy to use and install.

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The strategy of the EnDev Peru Project in three steps

1

The EnDev Peru Project, directly engaging through its "institutional environment" strategic pillar, managed to influence the "regulatory framework" key process, cooperating with the Directorate of Electricity of the Ministry of Energy and Mines in order to define the technical specifications of third-generation photovoltaic systems.

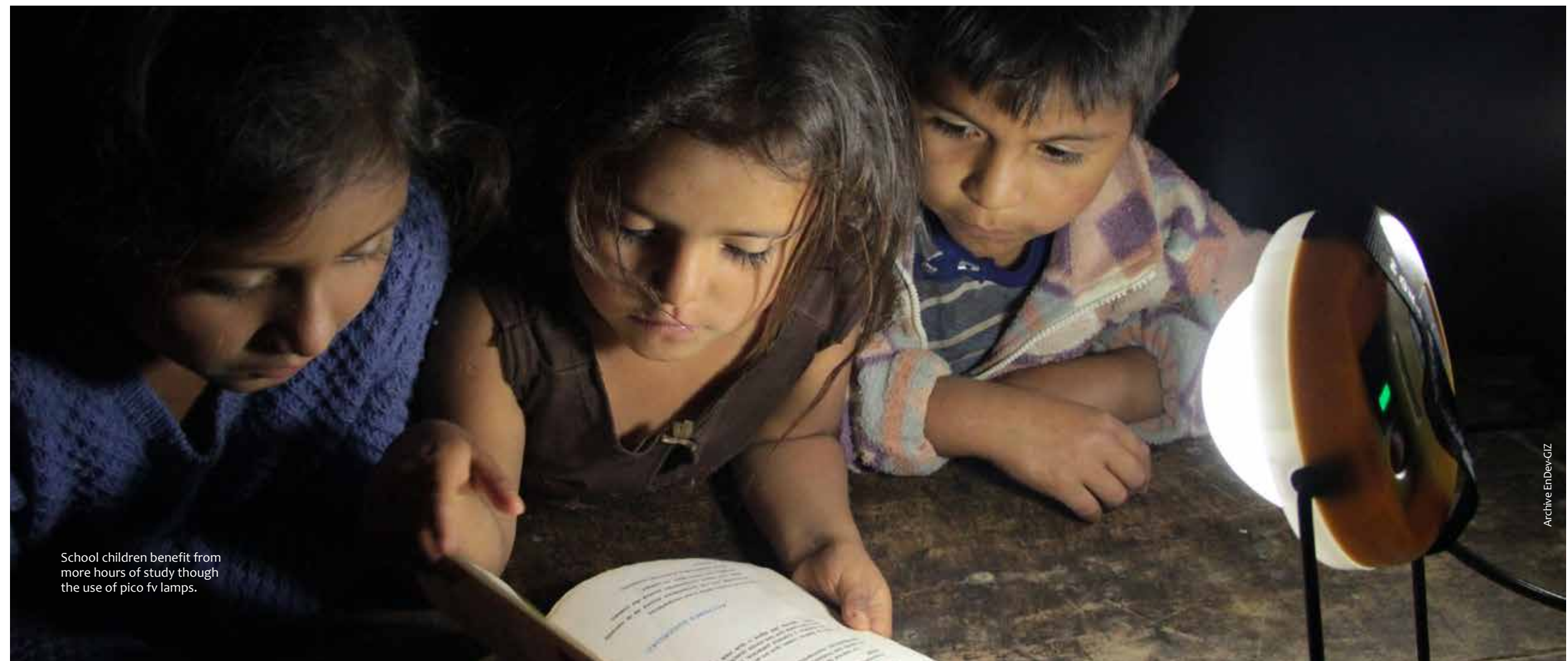
The result of this cooperation was the Directorial Resolution of the General Directorate of Electricity, which regulated the "Technical Specifications and the Evaluation Proceeding of a Photovoltaic System (SPFV) and its components" (RDN° 272-2016-MEM / DGE).

2

The Directorial Resolution was the result of a key process for product innovation and validation. The EnDev Peru Project, together with the academia, managed to validate different models of SPFV, which served as the basis for writing the resolution.

3

By strengthening distribution chains (key process) through the promotion of SPFV in local commercialization channels and with retailers, it was possible to take the product to the "last mile".



School children benefit from more hours of study through the use of pico fv lamps.

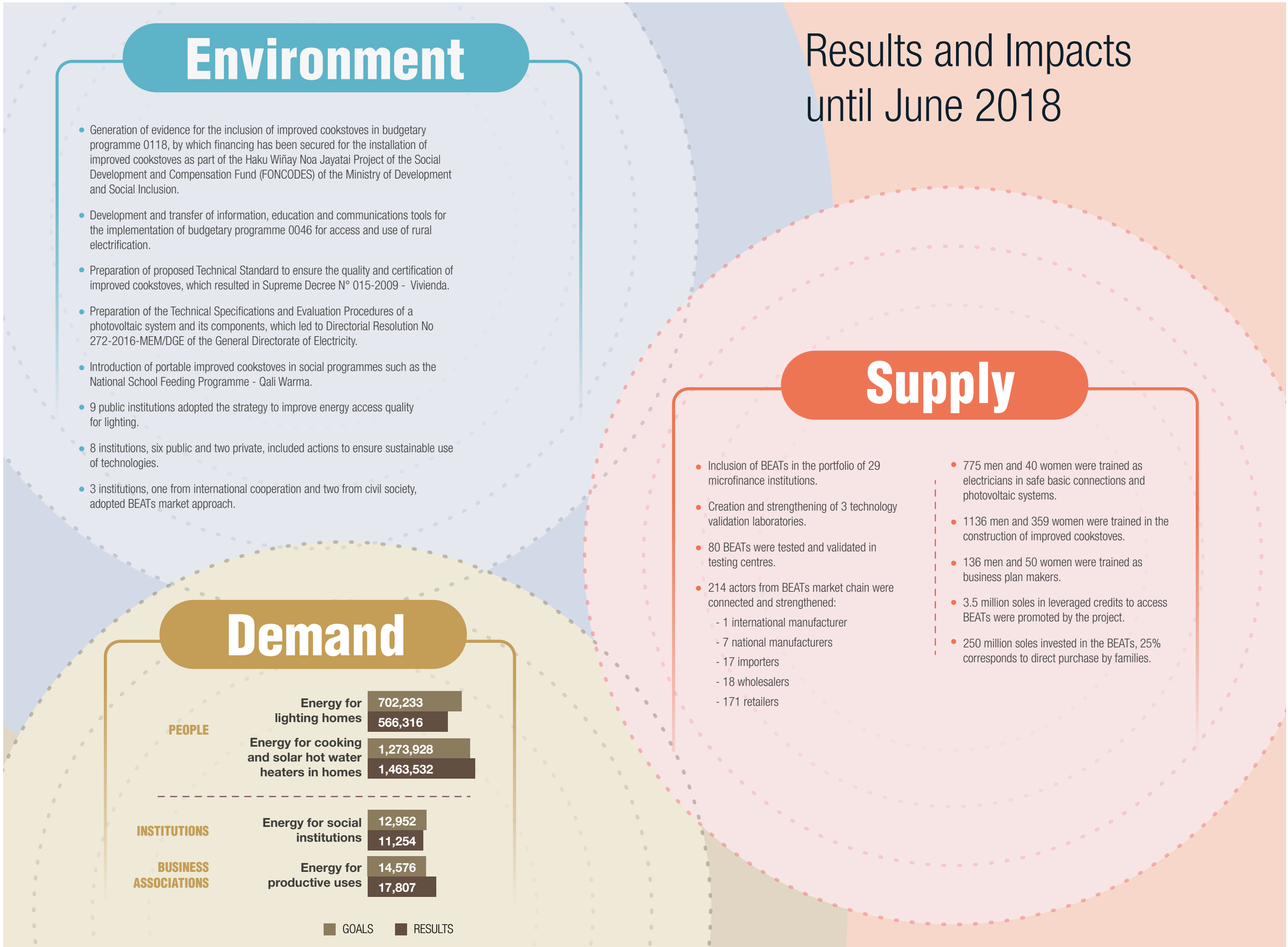
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Change effected

Change refers to an action that is sustainable over time and that is maintained due to the institutionalization of policies, programmes and projects in national strategies. In this sense, results obtained by projects should be sustained at institutional levels that can achieve consistency over time, eclipsing the transitory or short-term impacts.

Based on the above mentioned, the strategy developed by the EnDev Peru Project contributed to changes effected through the results presented below.

Of 250 million soles invested in the BEATs, 25% corresponds to direct purchase by families.



Lessons-learned

In Peru there were no public financing mechanisms (except the BT8 tariff, which subsidizes off grid photovoltaic systems) to acquire BEATs and meet the social demand. Thus, BEATs were considered goods for private use. Also, there was no regulatory framework defining minimum quality standards. Consequently, local and regional governments could not invest in basic energy access projects, or guarantee the quality of technologies.

To promote enabling policies, research was conducted on the negative impacts of indoor air pollution on health, households' income and the environment.

Political advocacy was carried out with the central government, and with local and regional representatives, NGOs and international organizations on the urgency of taking action to address the problem of indoor air pollution.

During this process, BEATs were defined as an energy service, as an instrument that provides thermal energy and lighting services with positive impacts and indirect benefits. As a result, projects and programmes stopped focusing only on access to technologies (that is, whether or not a good is delivered) and began to also focus on the results of the energy service.

All these processes contributed to bringing the issue of lack of energy access into the public agenda and consequently promoting enabling policies for public financing of BEATs to solve the identified problem. Likewise, to ensure public investment, minimum quality standards of technologies were set.

For example, to achieve large-scale adoption of improved cookstoves, it was necessary to promote an Urgency Decree. In this sense, the government published Urgency Decree N° 069-2009 and its amendment, Urgency Decree N° 025-2010, which authorized local and regional governments to use up to 2.5% of the canon, sobrecanon and mining royalties for the implementation of certified improved cookstoves, safe water supply and excreta management.

Moreover, Supreme Decree 015-2009 approved the Technical Standard for Improved Cookstoves and ensured their quality through certification. These processes allowed local and regional governments to meet the social demand that required certified improved cookstoves.

From this experience, many other enabling policies were generated, such as the incorporation of improved cookstoves into the budgetary programme 0118; the inclusion of promotion and training actions for electricians and users in budgetary programme 0046 for access to and use of rural electrification; and Directorial Resolution N° 272-2016-MEM/DGE of the General Directorate of Electricity, which regulated the Technical Specifications and the Evaluation Procedure of a Pico Photovoltaic System and its components.

In conclusion, this policy and regulatory framework permitted public financing of BEATs and their large-scale adoption to cover the social demand, thus, ensuring public investment with certified and validated technologies. Additionally, many companies adapted to mass production or the importation of technologies according to regulations, to meet the requirements of the State and generate supply, so that the remaining demand can acquire these technologies through the market.

Working through public-private platforms facilitated the creation of strategies to achieve large-scale impact.



The lessons presented below promoted change and installed new procedures in various institutions in a sustainable manner, resulting in valuable knowledge for the implementation of similar projects.

1. Enabling policies and regulatory framework contributed to social demand having access BEATs and development of the market



In Peru, few standards had been developed related to the technical specifications and minimum standards of efficiency and safety for BEATs. Thus, low quality products were marketed, such as imported solar lamps without a warranty. Moreover, improved cookstoves were self-built, generating customer dissatisfaction for families whose expectations were not met.

In this context, support was given to the creation of a laboratory for the certification of improved cookstoves, overseen by the National Training Service for the Construction Industry (SENCICO), in which different cookstove models were validated. As well, new models were developed, for example, cookstoves that heat the environment and transitioning from fixed cookstoves to portable models.

Within this line, the EnDev Peru Project conducted technological monitoring to introduce new BEATs models, such as cookstoves without chimneys and single-burner cookstoves, cookstoves with gasifiers and assisted ventilation, solar water heaters with vacuum tubes and third-generation photovoltaic systems.

In the laboratories of the Centre for Renewable Energies (CER) of the National University of Engineering (UNI) models of fixed and portable improved cookstoves were validated, as well as pico pv systems. Similarly, solar water heaters were validated in the Department of Renewable Energies of the National University of San Agustín (UNSA).

Thus, by having validated and certified BEATs, that were better designed and more portable, the product's value proposal increased. In other words, these not only satisfied the needs of users, but also their subjective preferences and expectations. For example, having a pollution-free environment, prevented households from smelling like smoke and having clothes that were stained from soot.

All these factors allowed BEATs to be accepted by the demand, increasing sales. It is clear then, that innovation of BEATs technology promoted a market where users trusted in the certification, quality and durability of the product.

Additionally, the development of innovative marketing strategies, such as radio and television spots with the participation of local celebrities, broadcast in radio or TV programmes in the area, as well as participation in district and regional fairs, allowed technologies to approach the demand, informing of their benefits and positioning BEATs in the market.

2.

The innovation and validation of BEATs facilitated their adoption and contributed to more reliable markets.

3.

Financing mechanisms promote the development of BEATs market

Regarding financing, many families could not acquire BEATs because they had limited access to credit. Moreover, microfinance institutions (MFIs), such as Municipal Savings and Loans Associations and community banking, did not have specific credit portfolios for these technologies.

Given that situation, a model called the “two-hand model”⁶, was designed, which consisted of sharing responsibility between an MFI and a BEATs supplier company. Under this model, the MFI was responsible for issuing loans and providing associated services, such as identifying users, approving credit, collecting payments, selecting the most favourable technology according to the needs of the customer, choosing suppliers and evaluating the degree of customer satisfaction. For its part, the responsibility of the producer was to provide BEATs and all aspects associated with the supply chain, such as distribution, transport, installation and after-sales service.

This process involved validating technologies, strengthening suppliers, developing their technical capacities and, above all, improving their logistical capacity to serve areas that were more than 24 hours away from their work centres, seeking to improve the commercial chain. Meanwhile, as for MFIs, they had difficulties in managing the supply chain, and a lack of commitment on the part of credit analysts due to the low incentive received by credit granted for BEATs.

Due to the difficulties of this experience, a second model was used, which consisted of identifying new actors that could provide a credit scheme, such as community banking, savings and loans associations, and producer associations, institutions that in general, were closer to the demand and had more agile administrative mechanisms. For example, community banking is a small association of families that generates a system of contributions through savings, thus generating access to credit among its members. On the other hand, in the case of producer associations, financing was offered to members to purchase improved cookstoves or solar coffee dryers.

In perspective, both models are considered viable. The first model serves the peri-urban demand, and the second a more remote rural demand. In that context, financing mechanisms allowed more vulnerable households to access BEATs through a direct relationship with the supplier.

Especially in the case of the “two-hand model”, BEATs suppliers had to develop their technical and logistical capacities in order to be able to access new markets, which were far from their production centres, a factor that notably increased their final prices. Therefore, this model began to concentrate on the development of the peri-urban market.

In contrast, community banking, savings and loans associations, and producer associations managed to promote new markets in rural areas, identifying new suppliers and points of sales that were closer to their communities.

⁶ Realpe Carrillo, N. 2014 How to scale up green microfinance? A comparative study of energy lending in Peru. Submitted to Conference: Innovating in Energy Access for Remote Areas. Symposium UC Berkeley: Discovering Untapped Resources.

Microfinance has been a determining factor for access to technologies in isolated areas.



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Local youth were trained as installers, providing an alternative to generate income and offer services to families.



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Lack of qualified local technicians for BEATs resulted in families or people from the community installing technologies without following the right procedures. As well, they repaired products experimentally and did not perform the corresponding maintenance. As a result, technologies did not work correctly and had a shorter lifespan, factors that discouraged their sustainable use.

According to the conclusions of the reports “Evaluation of installed cookstoves by the NINA Project - Experiences and perceptions in Ayacucho and Huancavelica” and “Analysis of the situation of installed improved cookstoves in Moquegua, Tacna and Arequipa”, both conducted by Ipsos APOYO Opinión y Mercado and commissioned by the EnDev Peru Project, showed that households did not feel sufficiently informed about where to buy spare parts or who to turn to in order to solve the problems of cookstoves. In addition, it was confirmed that as the cookstoves deteriorate, a greater number of users would face repair problems.

In this context, technicians were trained in institutions such as SENCICO, which incorporated in its curriculum the training of qualified technicians in the installation of certified improved cookstoves and solar home systems, which then turned into short careers aimed at people with primary education.

Under this framework, those qualified technicians become part of the local supply for BEATs installation, maintenance and repair services, ensuring their operation and a payment of services assumed by families. In this sense, the local after-sales service market was developed, making the market more sustainable for improved cookstoves.

It should be noted that local technicians were not dedicated full-time to these activities, because in rural areas, jobs are seasonal and complementary. However, the community now has a group of qualified people that can solve technical problems that may arise and would be in charge of the installation of new technologies.

4.

Training of qualified local technicians ensured the sustainability of the market

5.

The creation of local distribution chains allowed BEATs to reach the last mile

Importing companies and manufactures of BEATs intervened in the entire distribution chain, seeking to reach the last mile. This resulted in an increase in their transaction costs, because households were remote and dispersed, making access almost impossible.

In light of that transaction costs were reduced through the coordination of BEATs importers and manufacturers with local wholesalers and retailers. This also made it possible to know in greater detail where informed demand interested in buying products was located, reducing the asymmetric information of the market. Moreover, it was possible to identify the different existing marketing channels (formal and informal) and incorporate BEATs in these channels. Finally, this also influenced the specialization of the functions of actors, that is, the importer was dedicated only to the importation of technologies and the manufacturer to producing them, without having to intervene in their distribution and sale, since these responsibilities were assumed correctly by wholesale and retail distributors.

Acquiring access to basic energy technologies through local vendors has allowed for the distribution of these products throughout Peru.



EnDev

Energising Development (EnDev) is an energy access program funded mainly by the governments of the Netherlands and Germany, whose objective is to provide access to energy for more than 20 million people around the world, with the German cooperation for development, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, being the executor in most cases.

EnDev operates in 29 countries, of which the majority are in Asia and Africa. In the case of Peru, EnDev has worked since 2007 seeking to construct public and private alliances that support the formation of markets that can benefit populations that lack adequate energy technologies and services.

www.endev.info

Portfolio





San Juan de Yanacolpa, Huancavelica.



San Juan del Abiseo, San Martín.



Ichoca, Huarochiri Province.



Touring San Martín.



Cochaya, La Libertad.

Off the path with EnDev Peru

Accompanying the work done by EnDev Peru throughout the country has not been an easy task. Many times, it meant going into remote places and facing difficult geographical conditions. However, universal access to energy as an essential right requires it. Therefore, we want to show the photographs of two of the photographers who have accompanied the project in different ways throughout the country. Leaving aside the technical aspect of the project, we present alternative images of those trips, where the human warmth and beauty of the country speaks for itself.

“Making this selection has been like going back to the paths that have taken me from forests to mountain ranges and to the coast. Thanks to this project I have come to know parts of Peru that I could have never reached. Now, what I know deep down, they make me love and admire it even more. I have seen how hard working we are as Peruvians, how much we want to educate ourselves, grow and improve the country that we have. If only I could tell the stories behind each picture ... “ Maria Pia Medicina

“After having lived several years abroad, I felt motivated to return to Peru and have the opportunity to get to know it better, reaching those excluded places, being able to interact with the locals, getting to know their daily life and collaborating to promote better access to energy. At times it was a challenge to try to sleep at 5000 meters or go several hours by river to reach these communities. However, having a camera with me at all times was always the main task, seeking to retrieve with images, the work with which we were engaged. “ Carlos Bertello



Mother and son in Cochaya, La Libertad.



San Juan del Abiseo, San Martín.



Couple that produces pisco in Moquegua.



Native Wayku Community, San Martín.



Resident in traditional attire from the Native Wayku Community, San Martín.



Young soccer players in San Juan del Abiseo, San Martín.



Boat on the Abiseo river, in San Martín.



Welcome to Cochaya, La Libertad.



Central Plaza of Cochaya, La Libertad.



Sandals at rest, Cochaya, La Libertad.



Jose Humberto Bernilla, EnDev Peru collaborator.



Woman in Cayasbamba, Ancash



Children jumping rope, Soritor, San Martín.



Resident of Ichoca, Province of Huarochiri.



Farmer in Candarave, Tacna.



Dwelling in the Huauya Village, Ancash.



EnDev Peru Collaborators on the way to San Juan del Abiseo, in San Martín.



Homes in San Juan del Abiseo, San Martín.



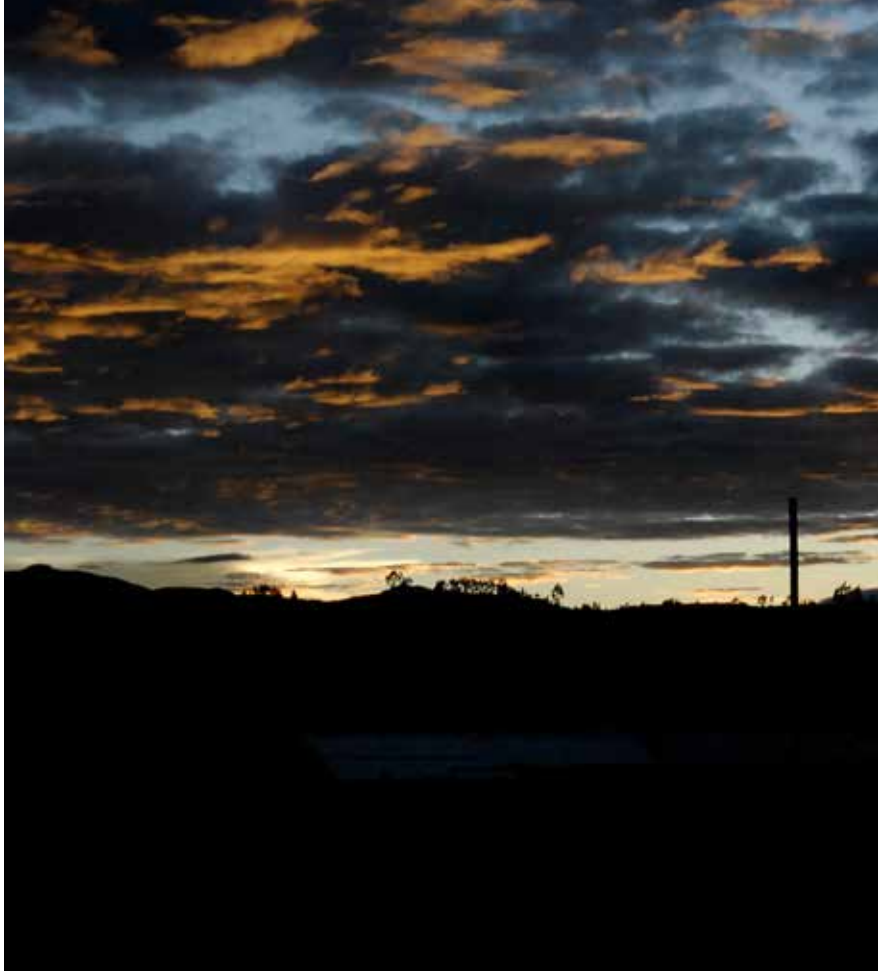
Couple from the Wayku Native Community, in San Martín.



Washerwoman in Huicungo, San Martín.



Family of Shanao District, San Martín.



Sunset in Cochaya, La Libertad.



Street in Ichocán, Cajamarca region.



Children in school in the Marisol Village, in San Martín.



Pisco producers in Moquegua.

Carlos Bertello is a consultant for EnDev Peru and an editor of Amaray magazine. He has worked with the project in recent years, highlighting the stories and faces of people who have achieved better energy access in rural areas through his photographs. **Maria Pia Medicina** is a Senior Analyst of Strategic Communications for Renewable Energy Projects for FASERT-IICA, implemented with funds from the EnDev project. In the last year she accompanied the project through FASERT-IICA, from which some of her photographs are also included in this portfolio.

Stories of Cooperation



Residents of remote villages in the San Martín region have gained access to solar technologies thanks to the work of EnDev Perú.



EnDev Peru worked with import companies and domestic manufacturers in order to multiply the distribution chains of BEATs, managing to take these products to the so-called “last mile” through the retail markets.

Distribution channels, a path to the last mile

By Angel Verástegui
Senior Advisor for the EnDev Peru Project

Distributing basic energy access technologies (BEATs) for rural markets is a challenge. Especially considering that access is difficult; transport is expensive; households are isolated, remote and without electricity; companies have little experience in these type of markets; and distribution channels are, generally, short. For this reason, it is essential to clearly define the distribution channels for technologies to be able to reach more families at affordable prices.

In this context, EnDev Peru worked with importing companies, national manufacturers, as well as wholesalers and retailers, to structure, develop, expand and multiply BEATs distribution chains, making it possible to take these products to the so-called “last mile” through retail markets. It is important to point out that the project did not give any type of subsidy to the demand, but provided incentives to the supply.

Cooperation focused on the implementation of five strategic actions:

1. Defining manufacturers and importers and the size of the distribution channel
2. Structuring distribution channels in rural markets
3. Networking among chain actors
4. Commercial promotion of technologies
5. Capacity building

In this line, the abovementioned five strategic actions are described below, with the aim of serving as lessons for organizations interested in rural markets.

1. DEFINING MANUFACTURERS AND IMPORTERS AND THE SIZE OF THE DISTRIBUTION CHANNEL

After identifying the importers and developing the national manufacturers of BEATs that complied with the minimum technical requirements in the country, initially a short-chain model was opted for. For this, points of sale were promoted to reach the final users. However, this generated high transaction costs and low profitability, since this type of channel is ideal only when the supply and demand are concentrated in accessible locations.

Then, based on the characteristics of the rural market and the distance faced by importers and national manufacturers to deliver their products, a long-channel model was chosen to reach the last mile. This distribution route integrated importers and manufacturers with regional wholesalers; and these, in turn, with local retailers, consolidating the distribution chain.

2. STRUCTURING DISTRIBUTION CHANNELS IN RURAL MARKETS

In rural areas there are various distribution channels, where a series of products circulate such and groceries, detergents,

batteries, soft drinks, etc. These products have their own dynamic and process to meet the supply and demand.

In this context, EnDev Peru promoted the coordination of already identified local distribution channels, such as informal stores and grocery stores located in district capitals and villages, with BEATs wholesaler distributors. Moreover, local entrepreneurs were identified, which turned into retailers that offered different technologies and promoted their sales force. It is worth adding that the project did not promote the creation of new distribution channels and points of sales, since they are considered very expensive.

3. NETWORKING AMONG CHAIN ACTORS

One of the initial strategic actions was to define the functions of the actors in the distribution channels, so that they do not their activities did not overlap. In this sense, the importer and national manufacturer are focused only on the import or manufacture of BEATs, with wholesalers as their customers. On the other hand, wholesalers engaged in acquiring different technologies from importers and national manufacturers, with retailers and local stores as their customers. Finally, local retailers acquired technologies from wholesalers to meet the demand of the final user. In many cases retailers had a network of people under their charge who offered the technologies, therefore expanding the rural market.

The coordination between these four actors (importer, national manufacturer, wholesaler and retailer) in a distribution channel was based on networking, sharing common views and establishing minimum levels of operational coordination, which were based on relationships of trust and learning, thus avoiding excessive bureaucracy, accelerating the chain and increasing its efficiency.

4. COMMERCIAL PROMOTION OF TECHNOLOGIES

The benefits and value creation of BEATs were disseminated through radio podcasts and TV spots at the regional level and with national opinion leaders. Wholesalers and retailers participated in local and regional fairs, through collective participation and demonstrative modules to provide information. In this way, an increase amount of information on BEATs was provided to the demand.

5. CAPACITY BUILDING

The project developed different training workshops on various topics, such as business and sales management, corporate management, information on the operation of technologies, the development of business alliances, opening of new markets, technological diversification of BEATs, commercial cooperation between diverse agents of the same market, power of negotiation and joint promotion.

In summary, the coordination of these five strategic actions allowed developing distribution channels to reach the last mile. Sales were increased and regional wholesalers consolidated, diversifying the technology portfolio, integrating the distribution of BEATs with local retailers, especially local entrepreneurs, who incorporated new technologies and more people in their sales force.

EnDev Peru did not give any type of subsidy to the demand, but provided incentives to the supply.

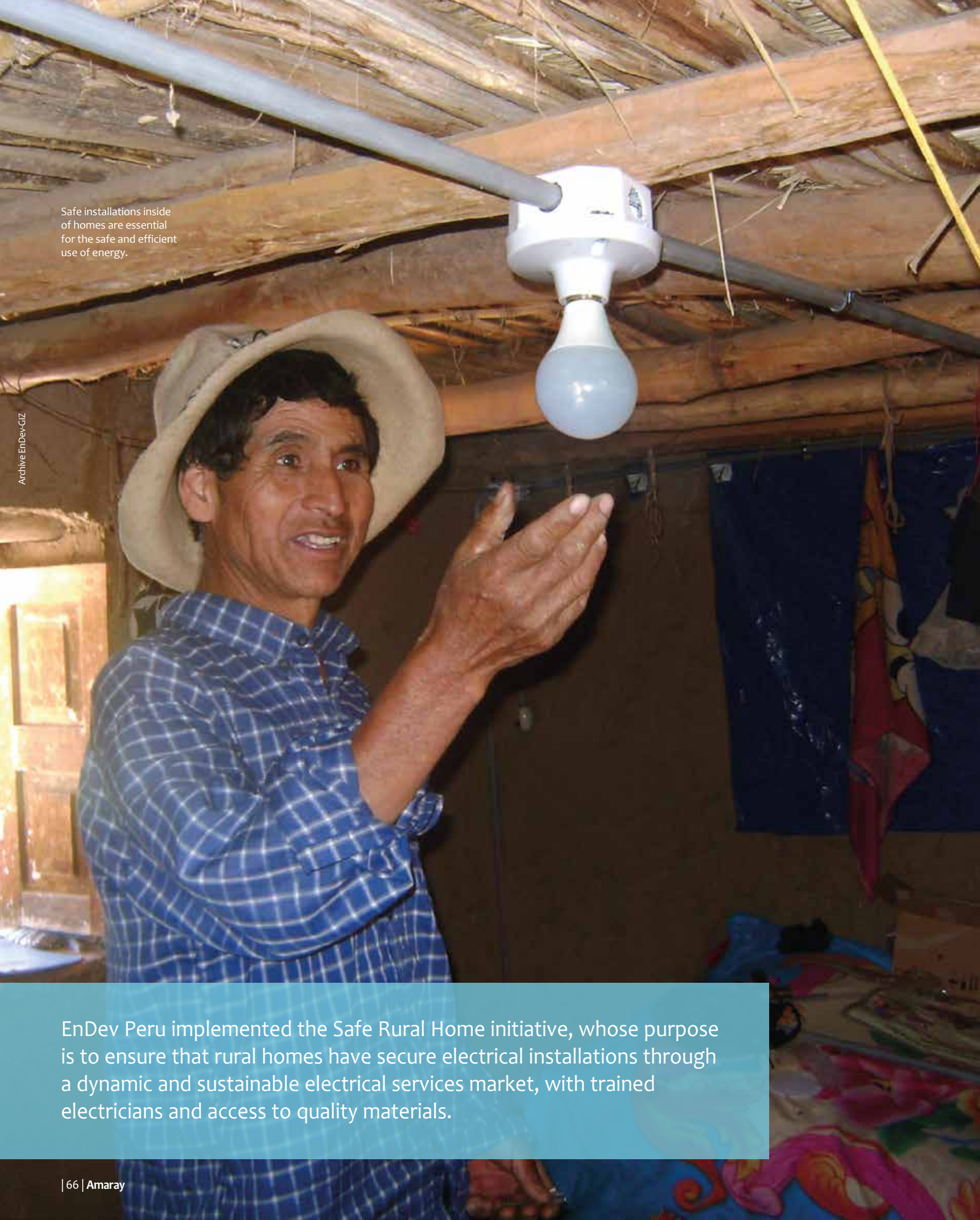
STRATEGIC ACTIONS	OUTCOMES
Defining manufacturers and importers and the size of the distribution channel	Manufacturers and importers of quality TAFE. Using the long channel.
Structuring distribution channels in rural markets	Coordination between local distribution channels, informal stores and grocery stores located in district capitals and villages. Coordinating with local entrepreneurs that become retailers and therefore promoting the sales force.
Networking among chain actors	Defining the roles of the importer, national manufacturer, wholesaler and retailer. Actors sharing common views and achieving minimum levels of operative coordination, based on relationships of trust. Minimal bureaucratic procedures allow acceleration of the chain and an increase in its efficiency.
Commercial promotion of technologies	Messages broadcast in local and regional radio and TV programmes, as well as participating in fairs, decreasing the asymmetry of information.
Capacity building	Developing business and sales management, corporate management, and market expansion allowed for increasing sales and multiplying channels. In addition, commercial cooperation among different agents of the same market, power of negotiation and joint promotion was encouraged.

Lessons-learned

- The short chain is not ideal for reaching final users of the last mile. In this sense, regional wholesalers are fundamental pieces in distribution channels, since they allow for the extension of the chain and coordination with retailers, an element that facilitates the circulation of the product in the rural market.
- The increase in the sales of wholesalers' benefits importers and manufacturers, increasing their scope beyond state tenders to include the development of rural markets.
- Using existing distribution channels enables the arrival of technologies up to the last mile. Placing technologies in stores located in district capitals or in villages, as well as identifying local entrepreneurs to play the role of retailers, brings technologies closer to users, accelerating the distribution channel.
- Strengthening circulation channels through a networking approach, ensures minimum coordination between the different actors in the chain and helps in the diversification of technologies at the wholesaler and retailer level. This is due to the fact that communication and collaboration is established between different technology providers to jointly address the rural market, assuming that commercial competition in these types of markets generates a lot of investment and low profitability.

The collaboration between commercial actors allowed the development of distribution channels to reach the last mile.





Safe installations inside of homes are essential for the safe and efficient use of energy.

EnDev Peru implemented the Safe Rural Home initiative, whose purpose is to ensure that rural homes have secure electrical installations through a dynamic and sustainable electrical services market, with trained electricians and access to quality materials.

Safe Rural Home, a path toward the development of local markets

By **Fernando Aspajo**
Senior Advisor of the EnDev Peru Project

In the last decade, Peru has made considerable efforts to expand the national interconnected electricity grid. According to the National Institute of Statistics and Informatics (INEI), the national electrification rate was 94% at the end of 2016, while the rural electrification rate went from 45% in 2007 to 79% in 2016. This increase was due to the execution of the National Rural Electrification Plan (NREP) of the General Directorate of Rural Electrification of the Ministry of Energy and Mines (DGER/MEM).

Beyond this progress, there is a challenge with the fact that the connection only reaches supply connections, and it is the responsibility of the user to carry out the electrical installation, from the load line of the meter to the interior of his house. Consequently, the majority of installations are carried out informally by people who do not have the necessary technical knowledge, using inappropriate materials, counterfeit products that result in poorly designed circuits.

This causes problems, like an increase in utility bills due to energy leakage to short-circuit fires. Moreover, there is a lack of information from users on the benefits of safe electrical installations and their positive impact on family economy and safety. In summary, this situation means that electrical installations in rural households do not comply with approved technical standards.

In this context, the EnDev Peru Project implemented, in cooperation with the Peruvian Centre for Copper Promotion (Procobre), the Safe Rural Home initiative, whose objective is for rural households to have safe electrical installations through a dynamic and sustainable market of electrical services, with trained electricians, access to materials that comply with approved technical regulations and a well-informed population.

In this framework, the following four strategic actions were implemented to address market failures:

1. Establishing a local supply
2. Strengthening an informed demand
3. Structuring of the electrical materials market chain
4. Adaptation of the local environment for large-scale installation.

1. ESTABLISHING A LOCAL SUPPLY

The lack of a qualified workforce was one of the barriers that impeded the implementation of safe electrical installations inside rural households in a proper manner. In this context,

the EnDev Peru Project cooperated with different regional technological institutes for the training of local electricians to provide installation, maintenance and repair services. In addition, courses on entrepreneurship were offered, so that new technicians could develop comprehensive offers and promote local businesses, not only to provide labour for the installation, but also incorporate appropriate electrical materials as well as other technologies into their supply.

2. STRENGTHENING AN INFORMED DEMAND

The majority of the rural population was not aware of the benefits of having safe electrical installations, made with quality materials. Thus, there was a lack of information, a factor that resulted in the electricity service market not being promoted in these areas.

In response, the EnDev Peru Project, in coordination with several electricity distribution companies, held informational workshops on good practices inefficient electricity use in three different spaces. The first was raising awareness of organizations at the regional level, to ensure their commitment and the promotion of a model for boosting the target market. The second was raising awareness and informing local governments and community leaders on the benefits of safe electrical installations, as well as the importance of the development of the installation services market. Finally, the third was focused on the local population to raise awareness about the benefits of having safe installations and good quality materials, making energy use efficient.

3. STRUCTURING THE ELECTRICAL MATERIALS MARKET CHAIN

The rural population did not have access to electrical materials that met the technical standards, because local businesses did not offer these products or their prices were not affordable. In that sense, the market chain consisted of national companies that offer these type of materials, such as INDECO, Bticino and Phillips, with regional wholesalers or local business agents with the financial capacity to acquire the products. In turn, these agents contacted trained electricians, who grouped themselves to purchase wholesale products at a reduced price. In this way, electricians were able to offer the service including the materials, based on the development of a commercial structure.

4. ADAPTATION OF THE LOCAL ENVIRONMENT FOR LARGE-SCALE INSTALLATION

The objective was to scale-up the number of safe electrical installations and decrease transaction costs. However, if electricians went from household to household, without prior coordination, installation costs would increase, a factor that would negatively affect families. So, for the adaptation of the local environment, coordinated actions were carried out with municipal authorities, community leaders, installers and the population in general to implement three processes: the registration and elaboration of a budget per household; the transfer and sale of materials per household according to the register of registrants; and the scaled installation days.

The implementation of these four strategic actions managed to boost the market in a sustainable manner and reduce their failures. A summary table of implemented actions and their respective results is presented, as follows.

The project cooperated with different regional technological institutes for the training of local electricians.

STRATEGIC ACTIONS	OUTCOMES
Establishing a local supply	<p>Cooperation with different regional technological institutes to train local electricians.</p> <p>Entrepreneurship training to promote local electrical service businesses and the sale of other technologies.</p>
Strengthening an informed demand	<p>Workshops to raise awareness and information on good practices in efficient and safe electricity use provided to regional organizations, local governments, community leaders and the local population. Electrical services and sales of other technologies.</p>
Structuring the electrical materials market chain	<p>Coordination between national companies that supply materials and wholesalers, and these, with electricians, for the sale of quality materials to families.</p>
Adaptation of the local environment for large-scale installation	<p>Coordination with municipalities, community leaders, electricians and the local population for the registration, transfer, sale of materials and massive installation days.</p>

Lessons-learned

- The creation of a local market for electrical services requires the intervention of different actors, such as local government, community leaders and companies to generate the necessary conditions to achieve a market for electrical installations at scale. If there is no participation and it is not possible to generate the conditions for large-scale adoption, it becomes very difficult to promote these types of markets.
- The partnership between national companies and wholesalers, commercial agents and local electricians ensures that the product reaches families. In this framework, the development of supply chains with materials that comply with standards is fundamental to promote local markets and commercial structures. If this does not happen, a market would be developed with poor quality products which would not adequately cover the needs of families.
- Safe basic indoor electrical installations increase the quality of energy access. Households that use them save energy, and there are less cases of power loss, avoiding electrical failures and wasted energy.

EnDev Peru cooperated with different regional technological institutes for the training of local electricians.



Enabling conditions for the large-scale adoption of improved cookstoves



Replacing the use of traditional stoves with improved stoves guarantees clean air inside rural homes.

EnDev Peru, in partnership with the JUNTOS Program, the Sembrando Program and PAHO / WHO, sought to create the necessary conditions for the large-scale adoption of improved stoves, meeting the social demand, which was being affected by the use of traditional stoves.

By **Victor Cordero**, Technical Advisor of the EnDev Peru Project and **Alicia Castro**, Senior Project Advisor of the same project

In 2009, after the publication of “Fuel for life: household energy and health” (WHO 2007), where indoor pollution was recognized as the “killer in the kitchen”⁷. Peruvian authorities, through the Technical Secretariat of the Inter-ministerial Commission for Social Affairs of the Presidency of the Council of Ministers (PCM/ST CIAS), considered it necessary to declare indoor pollution as a public health problem.

Within this framework, the EnDev Peru Project cooperated with the CIAS, which in alliance with the National Programme of Direct Support to the Poor (Juntos); the Work and Family Institute with its Sembrando Programme; and the Pan American Health Organization (PAHO/WHO), sought to generate the necessary conditions for the large-scale adoption of improved cookstoves (ICS), seeking to meet the social demand (users and beneficiaries of social programmes or projects) that had been affected by the use of open fires and traditional cookstoves.

Thus, the contribution of the Project focused on generating the appropriate conditions through the following strategic actions:

1. **Aligning with public and sectorial policies**, where the objectives of the projects or programmes, implementing ICS, were aligned with the national and sectorial policies in force in the country, so that the replacement of open fires and traditional cookstoves by ICS contributes to achieving the goals of these policies.
2. **The creation of regulations and standards to ensure the quality of improved cookstoves**, by promoting regulatory framework that govern the minimum standards for reducing indoor contaminants and energy efficiency and safety for ICS to ensure public investment and satisfy the demand.
3. **Political advocacy**, seeking out decision makers that make policies and allocate the budget to enact regulations for ICS financing. Political advocacy considered:
 - » The generation of evidence, by developing studies with scientific data that demonstrate the negative impacts of open fires and traditional cookstoves on health, the economy of poor households and the environment, in contrast with the positive impacts of using ICS, to demonstrate the benefits.
 - » The implementation of high-impact events, coordinating the efforts through a public-private platform with national and regional information and activities that raise awareness to attract the attention of policy makers and seeking the support of civil society, about the urgency of taking actions to address the problem, incorporating it into the public or sectorial agenda.
 - » The financing of improved cookstoves, by promoting the enactment of laws or standards and providing technical assistance to strengthen management tools that allow public resources to be used for the installation of these technologies. This implied establishing that ICS provide an energy service whose positive impacts and externalities contribute to the achievement of national policy objectives.

The support of civil society was sought to address the problem, incorporating it into the public agenda.

⁷ In 2000, it was revealed that cooking was a dangerous activity and that indoor air pollution, generated by burning solid fuels, was one of the top ten global health risks. The “killer in the kitchen” turned out to be the cause of 1.6 million deaths and 2.7% of the global burden of disease.

STRATEGIC ACTIONS	OUTCOMES	
	IN THE FRAMEWORK OF COOPERATION WITH THE CIAS	IN COOPERATION WITH OTHER ACTORS
1. Aligning with public and sectorial policies	ICS project aligned with policies for reducing poverty and chronic malnutrition.	ICS projects are aligned with policies related to energy efficiency, renewable energy and emission reductions, promoted by the Ministry of Energy and Mines.
2. Creation of regulations and standards to ensure quality	Enactment of Supreme Decree N° 015-2009-VIVIENDA, where the technical standards for ICS were approved. Approval of the Regulation for the evaluation and certification of an IC by the National Governing Board of SENCICO, in its meeting N° 988 (Agreement N°988.01) dated August 19, 2009.	Update of the ICS standards, which incorporated portable improved cookstoves, cookstoves without chimneys and institutional cookstoves. Establishment and operation of the Technical Committee for the Standardization of Clean Cookstoves INDECOPI/CTN127, from the elaboration of the technical standards (voluntary) to the evaluation of safety, emissions, energy efficiency, adoption measurements and the aspects regarding construction of ICS.
3. Political Advocacy	-----	-----
Generation of Evidence	Conducting studies on the impact of open fires and traditional cookstoves on health and the environment; and collection of international studies.	Studies on the operation of ICS in the field, tests on the durability of the parts, the adoption, and its proper use and maintenance.
High Impact Events	Organization of events with representatives of regional and local governments, NGOs and international organizations, on the impacts of pollution in the framework of the National Campaigns of One Million Improved Cookstoves. Organization of the World Clean Air Forum, with the participation of representatives from 41 countries.	Creation of the Latin American Network of Clean Cookstoves and the production of the First Latin American Seminar-Workshop on Clean Cookstoves with the participation of 11 countries in the region.
Legal Standards for ICS Financing	Enactment of Urgency Decree N° 069-2009 and its amendment Urgency Decree N° 025-2010, which authorized regional and local governments to use up to 2.5% of canon, sobrecanon resources and mining royalties for the implementation of certified improved cookstoves.	Incorporation of ICS to the 0118 budgetary programme "Access of rural households with subsistence economies to local markets" (PP 0118) of the Haku Wiñay/Noa Jayatai Project. Approval of ICS financing in the 2013–2022 Plan of Universal Access to Energy, approved by Ministerial Resolution N° 203-2013- MEM/DM and the Social Inclusion Energy Fund (FISE), Law 28853.

Lessons-learned

- It is essential to present evidence and carry out advocacy work with policymakers, as well as those who allocate budgets. This facilitates processes such as the enactment of policies and the development of financing mechanisms for large-scale adoption of ICS. Presently, a series of public financing mechanisms are still being promoted for the implementation of ICS through the 2013-2022 Universal Energy Access Plan, approved by Ministerial Resolution N° 203-2013- MEM/DM and the Social Inclusion Energy Fund (FISE), Law 28853.
- The approach to improved cookstoves projects or programmes should not be binary, that is, not only based on whether an IC was delivered or not, as if it were a good. It should focus on the energy service provided by the cookstove, its positive impacts and externalities, as well as the cost-benefits. In addition, it is essential to align with the objectives of national or sectorial policies.
- Large-scale adoption of certified ICS ensures public investment and user satisfaction. These technologies reduce indoor air pollution, since they are more efficient and safer in comparison with open fires or traditional cookstoves, and reduce the risk of chronic obstructive pulmonary diseases (COPD), lung cancer and cataracts, among others. Consequently, expenses in outpatient care in the health sector are avoided, generating savings for families.
- Budget allocation for the large-scale adoption of ICS promotes supply development in order to serve the rural population that does not qualify as a beneficiary of a social programme. In this sense, the supply (companies) recognizes the existence of a rural market and is motivated to attend it. To date, there are international and national manufacturers, importers, and wholesalers and retailers that are offering these technologies.



Achieving widespread adoption of improved cookstoves ensures safer and more efficient energy use for cooking.

Participation has been fundamental in capacity building.



EnDev Peru promoted capacity development for officials in charge of the Ministry of Development and Social Inclusion programs to elaborate strategies in the widespread adoption of improved stationary and portable cookstoves.

Capacity development for the distribution of improved cookstoves

By **Alicia Castro**, Senior Advisor of the EnDev Peru Project and **Víctor Cordero**, Technical Advisor of the same project

The EnDev Peru Project worked with the Ministry of Development and Social Inclusion (MIDIS) through the Social Development and Compensation Fund (FONCODES); as well as with the National School Feeding Programme - Qali Warma to develop capacity building strategies for stationary improved cookstoves (SICS⁸) and portable improved cookstoves (PICS⁹) large-scale adoption.

In the case of FONCODES, support was provided to the Haku Wiñay/Noa Jayatai Project, implemented by the Productive Project Management Unit (UGPP), whose objective was to generate market access for rural households living in poverty, as well as for beneficiaries of the Juntos Programme. In addition, support was provided to the Infrastructure Project Management Unit (UGPI), responsible for implementing 50,000 SICS for beneficiaries of the Juntos and Pension 65 Programmes, commissioned by the Ministry of Energy and Mines (MINEM). Also, Qali Warma received support in the installation of 11,448 PICS for schools in the preschool, primary and secondary levels located in Andean and Amazonian areas.

The contribution of the EnDev Peru Project centred on building the capacities of social programme officers, in each of the following components present in the large-scale adoption strategy:

1. **Diagnosis**, identifies the type of household, cooking practices, fuels used and accessibility to the areas of intervention.
2. **Defining a technology**, component that defines SICS and PICS models as a result of the diagnosis.
3. **Operational logistics**, prepares technical files and minimum requirements, and organizes the transport, storage and distribution of materials.
4. **Capacity strengthening**, where workers and community leaders are trained in the construction or installation of cookstoves, considering social development as well, in order to organize the community and families to adapt their environments, like households or social institutions. In addition, information is provided on the

negative effects of the use of traditional cookstoves, as well as on the proper use and maintenance (PUM) of new technologies.

5. **Supervision of the installation and verification of the PUM**, component that is developed in order to provide early alerts and implement preventive and corrective measures in the construction and installation of cookstoves, as well as verify the adequate use of the technology and reinforce knowledge of maintenance procedures.

IMPLEMENTED PROJECTS

The characteristics of the different social programmes are described below.

The UGPP Haku Wiñay/Noa Jayatai and UGPI projects built stationary improved cookstoves, since there was a lot of experience regarding the implementation of projects with this type of technology. Meanwhile, Qali Warma installed portable improved cookstoves, considering that educational institutions were highly dispersed and in areas of very difficult access. Also, it is worth noting that in Peru there was no previous experience with PICS which is why, in the case of Qali Warma, the technical validation and acceptance of these models by future users was introduced as an extra element.

Haku Wiñay/Noa Jayatai implemented the project with Yachachiq, a group of local leaders, whose function was to guide families in the construction of SICS and the PUM. UGPI installed SICS with local engineers responsible for ensuring the compliance of the number of cookstoves assigned; with construction supervisors in charge of verifying the works; and with foremen in charge of construction. In addition, there were social workers who sensitized families about adapting their households and provided information about the PUM.

In the case of the Qali Warma Programme, PICS were installed by technicians of companies that won the tender, who trained the officials of the regional units of the programme, as well as school food committee members.

Training was differentiated based on the programme. While for the Yachachiq, the training methodology was based on “learning by doing”, in the case of local engineers, construction supervisors, foremen and social workers, a group was trained to be “trainers of the trainers”, which was responsible for replicating the knowledge to the teams in each region. In addition, technicians of awarded companies (companies that were awarded the tender) were trained in installation criteria and in the PUM of PICS.

Likewise, all programmes, in order to ensure the quality of technologies, created technical files for SICS and PICS, which included the minimum technical specifications, emissions standards, energy safety and efficiency.

The contribution of the project was the transfer of knowledge and methodological tools in the capacity development process.

⁸ Improved cookstoves are made of mud, brick and ferrocement slabs or cast iron.

⁹ Portable improved cookstoves are made of a steel or stainless steel structure. Its acquisition process was through a public tender. Awarding companies were in charge of their installation and provide information on the good use and maintenance.

STRATEGIC ACTIONS	OUTCOMES		
	HAKU WIÑAY/NOA JAYATAI	UGPI	QALI WARMA
Diagnosis	Cooking practices by boiling in the Andes and roasting in Amazonian areas.		Educational institutions were dispersed, and food was boiled.
Defining a technology	Inkawasi Pichqa, Inkawasi 3 burners, Caralia and Selva models of improved cookstoves.		A pilot project was developed and PICS implemented.
Operational logistics	All materials complied with the minimum technical requirements and the transportation, storage and distribution of materials to households was defined.		
Capacity strengthening	<p>Yachachiq were trained as facilitators who oriented families in the construction and PUM of SICS.</p> <p>The training methodology "learning by doing" and using the "cascade model" approach.</p>	<p>Tools were strengthened and transferred to the managers for implementing the strategy.</p> <p>Local engineers, supervisors and foremen were trained in the construction of improved cookstoves.</p> <p>Social workers were trained in the organization of the community, the handling of materials and in the methodology of raising awareness and educating families to adapt their environments for the sustainable use of FICS. The training methodology "trainer of trainers".</p>	<p>Technicians of awarded companies were trained for the installation of PICS and PUM.</p>
Supervision of the installation and verification of the PUM	Use of face-to-face survey technique and non-probabilistic sampling for convenience. . The instrument was a structured and automatized questionnaire in the "EnDev Surveys" app.		

The proper use and maintenance of improved cookstoves is essential for their sustainability.

Lessons-learned

- The role of the social workers is fundamental in the process of large-scale adoption and the proper use and maintenance of the improved cookstoves. By previously sensitizing the families in the construction of the technologies, they generate the conditions for the widespread adoption to be carried out without setbacks. In addition, they provide information about the PUM with enough time for a proper explanation.
- Through the implementation of PICS, which require semi-industrial manufacturing, training times, logistics and installation processes are reduced. However, it is necessary to make an accurate diagnosis to ensure minimum required conditions in the cooking environments of homes or social institutions.



When a technology is identified, an evaluation and certification process is carried out to then drive its entry into the market.



EnDev Peru carried out a series of strategic actions in order to develop the rural market based on technologies that adequately meet quality standards. Some examples include the implementation of laboratories and the development of technical standards.

Validation and certification of technologies

By Victor Cordero

Technical Advisor of the EnDev Peru Project

In 2007, when the EnDev Peru Project started its actions, there were no technical standards for the certification or validation of improved cookstoves (ICS), or for pico photovoltaic systems (SPFV) in the country, there were only technical standards for solar water heaters (SWH). However, the vast majority of companies that offered this product did not provide information on their thermal performance, because they were not validated. To add to this situation, there was a lack of laboratories or it was evident that existing ones did not have the necessary equipment for ICS or SWHs certification. With the exception of the National University of Engineering (UNI) which had a laboratory for the validation of SPFV.

It is a well-accepted fact that social programmes and private companies offering certified or validated basic energy access technologies (BEATs) ensure public investment, boost the rural market and protect users from acquiring poor quality technologies, generating trust in those institutions and companies.

As a result, the EnDev Peru Project carried out a series of strategic actions in cooperation with the Department of Renewable Energies of the National University of San Agustín (UNSA); the National Training Service for the Construction Industry (SENCICO) of the Ministry of Housing, Construction and Sanitation; and the Centre for Renewable Energies and Rational Use of Energy (CER) of the National University of Engineering (UNI); for the certification and validation of BEATs, in order to develop the rural market based on technologies that comply with adequate quality standards.

In this framework, the strategic actions carried out by the project, together with its cooperating partners, were the following:

1. IMPLEMENTATION OF LABORATORIES

In 2008, the EnDev Peru Project cooperated with SENCICO to implement the first laboratory for the certification of improved cookstoves in the country, becoming the only one of its kind to be promoted directly by a Latin American state. This laboratory has equipment to measure and certify the reduction of ICS indoor polluting emissions, as well as energy efficiency level and safety, in comparison with open fire. In addition, the project helped with the elaboration of a proposal to have a Laboratory Emissions Monitoring System (LEMS) and a Portable Emissions Monitoring System (PEMS), which allowed for the collection of information on cooking device efficiency and emissions during operation.

Similarly, in 2007, support was given to the Professional School of Physics of the Centre for Renewable Energies and Energy Efficiency of UNSA, for the adaptation of a laboratory where different models of ICS, which are commercialized in the region of Arequipa, are tested, according to the requirements of NTP 399.400-2001.

2. DEVELOPMENT OF TECHNICAL STANDARDS

In 2009, the Peruvian Technical Standard of Improved Cookstoves was developed, approved by Supreme Decree N° 015-2009-Vivienda and the Regulations of Evaluation and Certification of the Improved Cookstoves. Subsequently, in

2018, the Technical Standard was updated, incorporating new portable improved cookstoves models, such as one-burner, institutional use, or dung fuel varieties.

In 2014, the Technical Committee of the Peruvian Standardization of Clean Cookstoves and Clean Cookstoves Solutions INDECOP/CTN127 was formed, as a mirror committee of the ISO Standard TC 285 Clean cookstoves and clean cooking solutions. In this line, EnDev Peru supported the process of developing (voluntary) Peruvian technical standards for the evaluation of ICS in safety, energy use, concentration of indoor pollution under controlled laboratory conditions, adoption rates and other construction aspects of ICS using biomass.

In 2016, support was given to the Ministry of Energy and Mines for the enactment of Directorial Resolution N° 272-2016-MEM/DGE, which regulated the “Technical Specifications and the Evaluation Proceeding of a Photovoltaic System (SPFV) and its components” based on the IEC standard of Lighting Global organization. Until then, in Peru there were only standards for systems greater than 50 Watt peak (Wp), leaving aside the models with lithium batteries or plug-and-play systems of high efficiency (lm/W) and complementary uses to charge mobile phones and radio; these being the so-called third generation systems (3G SPFV). Thus, the standard was a product of the validation experience completed by the CER-UNI.

3. CAPACITY BUILDING FOR LABORATORY STAFF

For the ICS laboratory to provide a service which is in accordance with the requirements of the technical standards, laboratory staff capabilities needed to be developed in the handling of contaminant emissions, energy efficiency and safety tests, with the support of international experts. In addition, visits were made to laboratories in other countries also participating in international events. With respect to the staff of the 3G SPFV and SWH laboratories, it was not necessary to carry out training sessions because as university lecturers they already possessed broad knowledge of their topics.

4. TECHNOLOGICAL MONITORING

The EnDev Peru Project identified new emerging technologies, developed by international companies for basic energy access, in order to diversify the technological supply and adapt to the needs of rural households at affordable prices. In this framework, new models of ICS and 3G SPFV were identified.

5. TECHNOLOGY VALIDATION

Once new technologies were identified, they entered a validation process. For example, in the case of ICS, the one-burner portable improved cookstoves without chimney model was validated, as well as TLUD and FINCA type gasifiers, one-burner portable cookstoves with a fan, which use thermal energy produced by biomass for their operation. Similarly, the CER-UNI validated a solar ICS, known as induction solar cookers and vacuum tube solar cookers.

In the case of one-burner portable improved cookstoves with a fan and vacuum tube solar cookers, both models have been evaluated in the field to measure the level of user acceptance. The idea is to receive recommendations and be able to make adjustments to adapt the technologies to the Peruvian reality.

In 2010, there were few 3G SPFV models in the rural market, and their level of efficiency and quality were also unknown, as they had not been validated. In light of this, the EnDev Peru Project coordinated with the CER-UNI to carry out the validation required in its Photometry Laboratory in order to introduce new models into the market. This consisted of electrical and photometric evaluations of different LED type lamps, and selecting those that met the technical manufacturing characteristics.

The project identified new emerging technologies in order to diversify the supply.

STRATEGIC ACTIONS	OUTCOMES		
	ICS	SPFV	SWH
Implementation of laboratories for technology certification	ICS laboratory was implemented.	- - -	The UNSA laboratory was strengthened.
Development of technical standards	Strengthening the capabilities of technical staff	The Standard of Technical Specifications and the Procedure of Evaluation of a Photovoltaic System and its components were approved.	There are Peruvian Technical Standards.
Capacity building for laboratory staff	Coordination of actors and participation in the development of the ICS Technical Norm.	- - -	- - -
Technology monitoring	<p>The following was identified:</p> <p>One-burner portable ICS without chimney.</p> <p>ICS with TLUD and FINCA type gasifiers.</p> <p>One-burner portable ICS with a fan.</p> <p>Vacuum tube solar cooker.</p>	15 3G SPFV models were identified.	Additional technologies such as SWH with vacuum tubes "heat pipe" were identified.
Technology validation	All identified technologies were validated.	All identified technologies were validated.	Solar water heater vacuum tubes were validated.

Lessons-learned

- Having validated or certified models of ICS, SWH and 3G SPFV generates confidence in users to acquire the technologies, boosting the retail market. These products are confirmed as efficient, durable and comply with national and international standards, factors that ensure the investment made by the family when purchasing them.
- Technological monitoring is essential to incorporate new models in rural markets. Globally, BEATS development is increasingly innovative and at competitive prices. Validating technologies and incorporating them into the rural market allows for the diversification of the supply to satisfy the rural demand.
- Peruvian Technical Standards regulate BEATS, encouraging Peruvian manufacturers to improve their production and importers to offer quality products, leading to the circulation of products with permissible quality standards in the rural market.

Having validated models generates confidence for users in their purchase, boosting the retail market.

Solar water heaters have had a very positive reception from populations in rural and peri-urban areas.





FASERT-IICA

Entrepreneurs from different regions have begun offering technologies for basic energy access thanks to the promotion of incentives.

EnDev Peru created financing mechanisms to boost the market for basic energy access technologies by delivering to local enterprises, which generated benefits for rural markets.

The role of incentives in market development

By Victor Cordero, Technical Advisor of the EnDev Peru Project and Juan Carlos Quiroz, Senior Advisor of the same project

In peri-urban and rural areas, the creation of new markets or the development of existing ones in the field of basic energy access technologies (BEATs) implies boosting the market chain of products, as well as companies' value chain. This is a complicated task when there are faults in the market, households have budgetary restrictions, there is a lack of information and high transaction costs increase the prices of technologies. Given this, it is necessary to encourage and strengthen manufacturing and retailing companies (supply) interested in developing these markets through projects and funds that provide monetary incentives and subsidies, assuming the risks and initial costs for the introduction of technologies and their respective revitalization. Following this line, the EnDev Peru Project developed and financed the following two projects:

The project Getting to Universal Access in Thermal Energy Services in Peru, whose objective was to close the gap and reduce the barriers for sustainable access to thermal energies in peri-urban and rural areas of Peru, especially in energy for cooking and heating water.

The project was implemented through two components: Boosting the Solar Water Heaters (SWH) Market, implemented by the Arequipa Municipal Savings and Loans Association (CMACA); and the Portable Wood-Burning Cookstoves Innovation and Development Fund (FIDECOP), implemented by Practical Action.

The approach was based on the Results-based Financing (RBF), meaning that monetary incentives were given to manufacturing or retail companies after having verified their compliance with previously agreed results.

For example, in the case of SWH, CMACA granted incentives to retail companies based on previously established equipment sales and installation goals. Likewise, a second type of incentive was given to microfinance institutions (MFIs) when they allocated credits for the acquisition of SWH. Finally, an incentive was also given to companies for the proper operation of the equipment and good after-sales service after one year of installation.

In the case of FIDECOP, an Innovation and Development contest was held for companies dedicated to thermal technologies, which had to comply with a series of administrative and technical requirements, as well as the manufacture of a prototype of portable wood-burning

improved cookstove (PWICS) according to the standards proposed. If the requirements were met, the companies were considered winners and they were given a first incentive. Similarly, a following incentive was provided after the preparation of their business and marketing plans, as well as a report of a visit to a national or international company that manufactures PWICS. Finally, incentives were also granted for the certification of their PWICS by the SENCICO and for the manufacture and commercialization of these models.

The Fund for Sustainable Access to Thermal Renewable Energies (FASERT), had the objective of boosting the market value chain of thermal renewable energy technologies (TERT) in peri-urban and rural areas of Peru, implemented by the Inter-American Institute for Cooperation on Agriculture (IICA).

The fund had three components. The first one referred to the direct promotion of the TERT market, through a non-reimbursable competitive fund. The second promoted the innovation and quality of technologies. The third component, called Indirect Promotion of the Market of Efficient Thermal Renewable Energy Technologies, sought to position the market of these products as a viable alternative for the promotion of sustainable livelihoods.

Thus, the FASERT co-financed the projects presented by non-governmental organizations, associations, producer organizations, private companies, and academic or research institutions selected in the contest. It is worth mentioning that the second and third components were financed by direct allocation funds for complementary activities.

PHASES OF MARKET DEVELOPMENT

Within this framework, in order to compare between the projects and the function fulfilled by incentives, the Phases of Market Development are presented below in an adaptation of Rogers (1962) and World Bank (2003)¹⁰.

1. Pre-commercial, when a new product has been created and has not yet been introduced to the market.
2. Pioneer, when a new product is introduced in the market and is little known. As a result, it still does not create confidence in the demand, its production is low, the costs of introduction into the market are high and there is still no profitability.
3. Expansion, when the product is incorporated into the market, new competitors appear and the volume of sales increases, and consequently, profitability begins.

The phases 4. Maturity, 5. Saturation and 6. Degeneration have not been considered, because the incentives provide support only until the third phase, at which point the BEATs market should work without incentives.

Using the phases of the market development as a theoretical framework, we can see that the incentive boosted the SWH market and strengthened the expansion phase of retailing companies, offering the technology in new markets and strengthening the market chain.

Regarding FIDECOP, it allowed companies to begin in the pre-commercial phase and then move onto the pioneer phase. This, through the development of new products (such as the PWICS) strengthened the value chain of companies.

It is necessary to encourage and strengthen the companies interested in developing these markets.

¹⁰ Mimeo. Measuring Market Development. A Framework and Indicators for the Energising Development (EnDev) Programme. Authored by Ilka Neyla Buss (Consultant) and edited by Carmen Heinze (NL Agency), Gunnar Wegner (GIZ), Tim Raabe (GIZ), Özlem Taskin (GIZ). Version 07 July 2013.

In the case of the FASERT, the subsidy made it possible to strengthen the expansion of the local TERT market, which is on the path to regional expansion through the strengthening of the market chain. In this sense, moving from the pre-commercial phase to the pioneer phase, and then the expansion phase, can be considered the most difficult part of market development. Especially when a technology is introduced for the first time, because companies are not

willing to invest in technologies that have high transaction costs to introduce them into the market. In this sense, supporting the supply with subsidies or incentives became indispensable in these first three phases. In addition, it is essential to have the support of MFIs so that interested parties (demand) can acquire the technologies. For this reason, the projects also promoted providing credits for purchasing technologies.

MARKET MECHANISMS PROMOTED BY INCENTIVES	OUTCOMES		
	BOOSTING THE MARKET OF SWH	FIDECOP	FASERT
Phases of market development	The incentive has allowed the beginning of the expansion phase of SWH.	The incentive has allowed passing from the pre-commercial phase to the pioneer phase for the PWICS.	The incentive has allowed the beginning of the expansion phase of the TERT in the local market and the beginning of the regional expansion phase.
State of profitability of company	Profitability begins.	There is no profitability and production is low.	Profitability begins.

Lessons-learned

- In the design phase of the projects or funds aimed at the creation or boosting of markets, it is considered necessary to carry out an analysis of risks in field, which mitigates possible scenarios of non-compliance with the proposed goals.
- Manufacturing or retailing companies require monetary incentives and projects that assume the risks and initial costs to develop the BEATs markets. This is because companies become discouraged when they perceive a high investment risk in markets that are not established, where transaction costs are high and there is low demand and budget constraint.
- The development of new markets or the strengthening of existing markets in peri-urban and rural areas requires the support of microfinance institutions. Their support is necessary due to the budgetary restrictions households face in acquiring BEATs and to establish sustainable markets.
- RBF allows for the expansion of new markets through products that are already positioned in other markets. For example, this is the case of SWH, which are technologies already positioned in the southern region. In this sense, the incentive motivates manufacturers and suppliers to bet on new markets.

The incentive has allowed the beginning of the expansion phase in the local market and the expansion phase in the region.

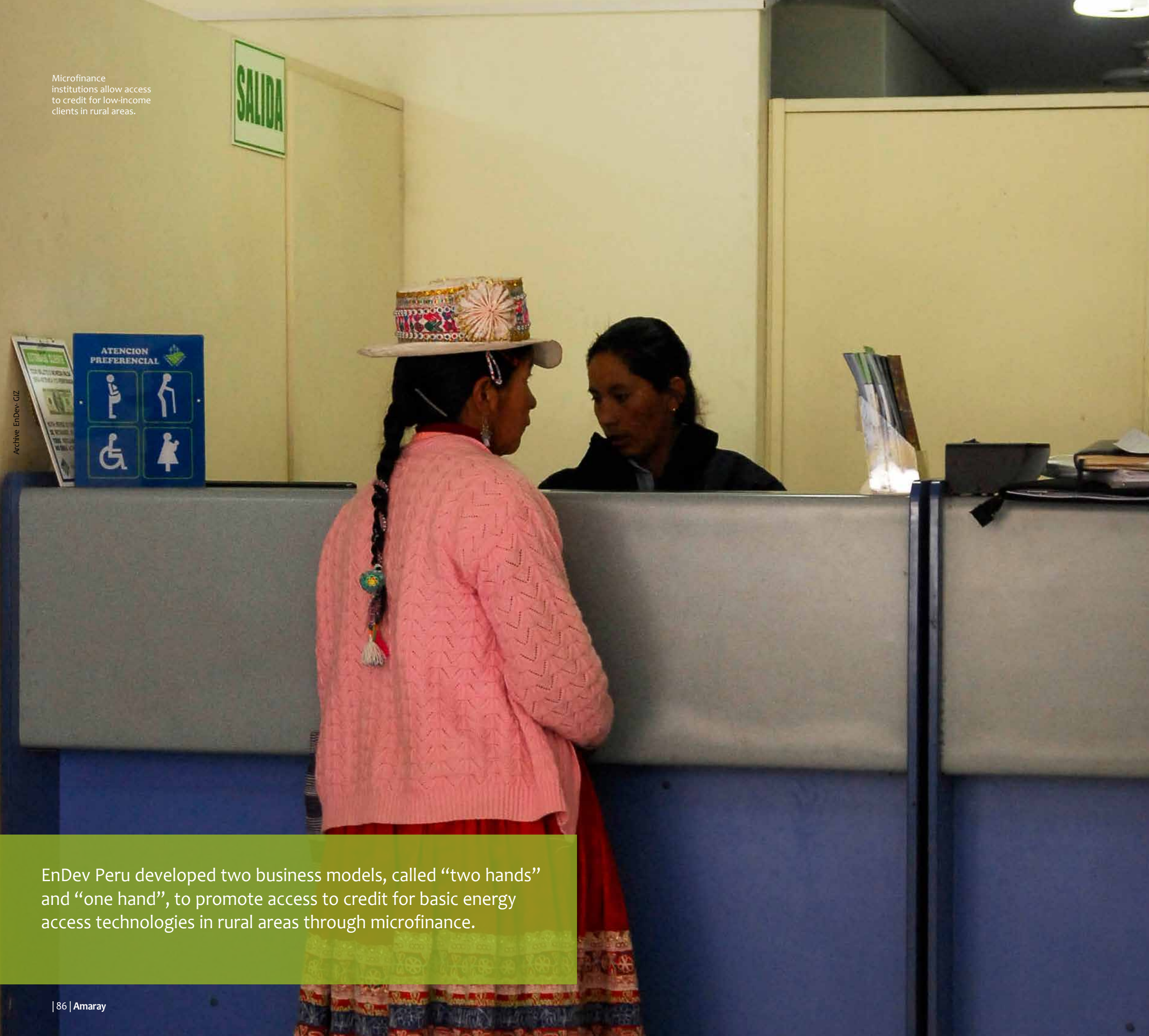
Regional fairs are very useful for emerging companies to demonstrate their technologies.



Microfinance institutions allow access to credit for low-income clients in rural areas.

SALIDA

Archive EnDev-GIZ



EnDev Peru developed two business models, called “two hands” and “one hand”, to promote access to credit for basic energy access technologies in rural areas through microfinance.

Financing mechanisms for access to basic energy technologies

By Juan Carlos Quiroz
Senior Advisor of the EnDev Peru Project

In Peru, the large majority of low income households located in rural and peri-urban areas have budgetary restrictions for acquiring basic energy access technologies (BEATs) in cash. In this context, the EnDev Peru Project cooperated with different microfinance institutions (MFIs) (regulated and non-regulated), such as credit unions, municipal savings and loans associations, community banking and producers associations that showed interest in developing profitable financing models for basic energy access in poor households. Along these lines, the project promoted two business models, called “two-hand” and “one-hand” models.

The two-hand model consists of a strategic partnership, formalized through the execution of an agreement, with a “win-win” vision, between MFIs and BEATs manufacturing companies. MFIs are in charge of issuing loans, identifying customers, approving credits, collecting payments, evaluating customers’ satisfaction and selecting technologies that will be offered through catalogues. On the other hand, manufacturers provide technology and factors associated with the supply chain, such as distribution, transport, installation, maintenance and after-sales service.

In this model, the customer is first recruited by the vendors of supplier companies and MFIs business advisors, and then requests a loan to acquire a BEAT, which is offered by the MFI. Consequently, the number of instalments to pay is determined according to the interest rate. In addition, the supplier is responsible for installing the technology and providing the after-sales service. The model was implemented through the framework of the Energy Inclusion Initiative with technical assistance from MicroEnergy International (MEI) and financing from Appui au Développement Autonome (ADA).

The one-hand model consists of a business agreement between BEAT suppliers and MFIs. To that effect, the supplier direct the customer, who is interested in acquiring a technology, at which MFI they should request a loan. After being evaluated and approved by the MFI, the customer receives credit for acquiring the technology. The installation is then made by the company. In this model, the MFI only provides credit, while the supplier assumes the sale, installation and after-sales service.

STRATEGIC ACTIONS FOR MODELS OPERATION

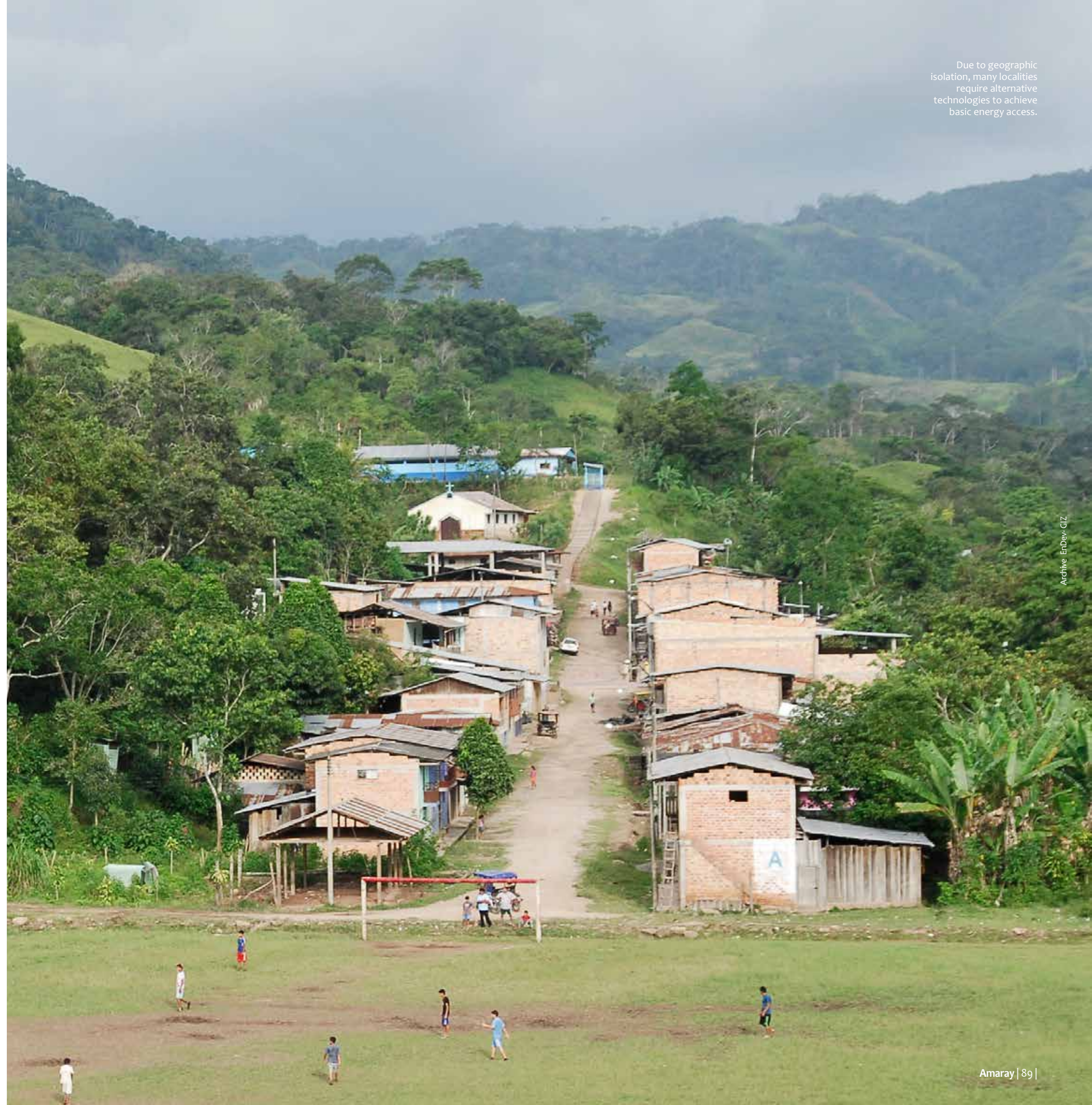
To implement the models explained above and promote access to credit for BEATs, four main actions were carried out: technology validation; identification and strengthening of suppliers; identification and strengthening of MFIs; and marketing strategy. In this context, the following table presents a description of the actions developed to achieve energy access through microfinance.

EnDev Peru cooperated with microfinance institutions to develop financing models for poor households.

STRATEGIC ACTIONS	OUTCOMES
<p>Technology validation</p>	<p>Validation of improved cookstoves and ovens, solar water heaters, solar dryers, through national and international standards.</p> <p>Decrease in the risk of late fees.</p> <p>Building trust between suppliers and MFIs.</p> <p>Building trust between customers and suppliers in supplying quality technologies.</p>
<p>Identification and strengthening of suppliers</p>	<p>BEATs supplier companies, identified according to the following minimum criteria: regional presence, formal company, experience with microfinance institutions, proper supply chains, and experience in BEATs and after-sales service.</p> <p>Strengthening of market distribution chains to reach remote rural areas, install the technology and provide after-sales service.</p> <p>Trained entrepreneurs who know the process and dynamics of credit access to refer clients to MFIs.</p>
<p>Identification and strengthening of MFIs</p>	<p>Identification of MFIs, such as community banking, municipal savings and loans associations, that are interested in promoting green credits for access to technologies; and producers associations, which offer credits to their partners to acquire BEATs.</p> <p>Trained credit analysts with knowledge in the operation, proper use and maintenance of BEATs, so that they have grounds for allocating credit.</p>
<p>Marketing strategies</p>	<p>Design of marketing strategies to disseminate BEATs value proposals and information on access to credit through TV spots and radio podcasts.</p> <p>Delivery of brochures, a cook book, and information on technology suppliers.</p>

Lessons-learned

- Actions such as technology validation, the identification and strengthening of market chains and the provision of an adequately after-sales service generate trust between MFIs and customers, ensuring a better return rate.
- In the “two-hand model”, BEATs credit portfolio is steadier and is maintained overtime, since it is a part of MFIs credit products. This is different from the “one-hand model”, where BEATs are not part of credit products. However, this model is more practical and less expensive to implement than the “two-hand” model. In that respect, choosing a model will depend on the MFI, that is, if it would like to incorporate “green financing” credit lines aimed at technologies that use renewable energies to protect and care for the environment.
- It is important to provide additional incentives to credit analysts to keep them motivated. This is because the amounts of BEATs credit placement are low compared with other credits. For this reason, analysts often prioritize other credits.



Due to geographic isolation, many localities require alternative technologies to achieve basic energy access.



EnDev Peru, in alliance with other institutions, promoted platforms and working groups to promote the knowledge transfer.

Sharing knowledge about the problems of basic energy access in rural areas and alternative solutions was one of the tasks of EnDev Peru. The project sought to bring the issue to the public agenda and disseminate information.

Knowledge management, a tool for awareness

By Alicia Castro
Senior Advisor of the EnDev Peru Project

The EnDev Peru Project, in alliance with public and private institutions, has generated a greater understanding of the problem of basic energy access in rural areas and the many alternatives for its solution. Sharing this information among the actors who work on this topic was one of the actions promoted by the Project within the framework of knowledge management, with two objectives: insert the reality of the lack of energy access into the public agenda (sharing lessons-learned and solutions) and disseminate knowledge.

In this context, the project developed three actions to achieve the abovementioned objectives: 1. Creation of inter-institutional platforms; 2. Production of documents; and 3. Identification of thematic repositories to disseminate the knowledge and experience developed.

1. CREATION OF INTER-INSTITUTIONAL PLATFORMS

A lack of basic energy access in rural areas, which causes negative effects on people and households, especially by using solid fuel for cooking and lighters for lighting, was a problem that was not a part of the public agenda. This, despite the fact that many non-governmental organizations (NGOs), academic institutions and international organizations had clear evidence on the issue.

Given this reality, the EnDev Peru Project, in alliance with other institutions, set out to promote different platforms and working groups, which carried out various actions. The main actions are presented below:

- » In 2009, an inter-institutional platform was created, comprising of 18 institutions, to support the “National Campaign for a Smoke-Free Peru”. This was the first experience of coordinating between different public and private institutions regarding the topic of access to clean cooking in rural households. Moreover, the platform was essential for the Peruvian government to promote an Urgent Decree authorizing the use of public resources for the construction and approval of the improved cookstoves technical standards.
- » In 2013, the Focus Group on Energy for Cooking was formed; to encourage the correlation between actions, knowledge management and political advocacy on sustainable energy access for cooking, through the implementation of improved cookstoves. This was achieved through a series of specialized encounters with the participation of public and private actors. In 2014, the “First Latin American Seminar-Workshop on

Clean Cookstoves: Promoting Large-scale Adoption and Sustainable Use”, sponsored by the Global Alliance of Clean Cookstoves (GACC) was organized, placing the topic on the national and international agenda.

- » In 2014, the formation of the Latin-American and the Caribbean Network for Clean Cookstoves was supported by the project, which is a platform for the exchange of experiences and information with focal points for each participating country. The Network has a website and a blog, where the exchange of regional experiences is continuously channelled and promoted. In addition, bi-annual in-person events are organized. All of this, in order to contribute to the technical discussion of access to clean energy for cooking at the regional level.

- » In 2016, the “Collective for Basic Energy Access” was created, with the objective of contributing to universal energy access in Peru, through proposals for a sustainable energy policy. The collective is made up of the Latin-American Platform of Sustainable Energy and Equity (PLESE), the Institute for the Sciences of Nature, Territory and Renewable Energies (INTE-PUCP), Practical Action and the Fund for Sustainable Access to Thermal Renewable Energies (FASERT), and implemented by the Inter-American Institute for Cooperation on Agriculture (IICA). As well, that same year, the Collective presented its first proposal before the Energy Commission of the Congress of the Republic and, in 2017, in the First Congress of Renewable Energies and Bioclimatic Architecture (CABER).

It can be noted that through sustainable work with other actors, such as the promotion of platforms and sharing of knowledge, it was possible to make the lack of energy access visible in the field of public policy.

2. PRODUCTION OF DOCUMENTS

The EnDev Peru Project, during its ten-year work in the country, produced a large quantity of documents on basic energy access. The contents are based on experience developed in the field and much research. Within this framework, the following were developed:

- » Guides and manuals for the installation and use of technologies, the training of social workers in healthy environments and a guide for teachers on the use of energy, among others.
- » Audio-visual materials on the market chain and radio podcast and TV spots in Spanish and Quechua on the benefits of technologies and their proper use.
- » Informational documents on systematization, evaluation and research and the Amaray magazine.

3. IDENTIFICATION OF THEMATIC REPOSITORIES

EnDev Peru identified thematic repositories, which made it possible to make available the information generated and enable the exchange and download of this information in real time, disseminating it easily. These are shown in the following table.

The project has generated a greater understanding of the problem of basic energy access and the alternatives for its solution.

STRATEGIC ACTIONS

OUTCOMES

Creation of inter-institutional platforms

Positioning the problem of lack of basic energy access in the public agenda
Increased awareness in policy-makers
Joint efforts for information and experience exchange at the regional and national levels.

www.cocinasmejoradasperu.org.pe

www.redcocinasoestufaslimpias.blogspot.com

Production of documents

Dissemination of the knowledge of EnDev Peru and its partners

www.cooperacionalemana.pe/Biblioteca

www.energypedia.info/wiki/Main_Page

www.foncodes.gob.pe/porta/index.php/component/content/article?id=232

Identification of thematic repositories

Dissemination of knowledge in energy networks

www.hubenergetico.com



In 2014, the first meeting of the Latin American Clean Cookstoves Network was held in the city of Lima.

Lessons-learned

- Inter-institutional platforms contributed to the problem of basic energy access becoming a visible topic on the public agenda. In this context, the generation of evidence and solutions to the problem promoted the investment in energy access actions by different national and subnational governments.
- Knowledge management improved the interventions of public and private institutions. Thus, exchanging experiences and sharing knowledge on basic energy access, not only at national level, but also at the regional one, allowed for the incorporation of new intervention methodologies and technologies.
- The institutional repository increased the visibility of the different approaches implemented in different countries. It is worth noting, that in the case of rural market development for basic energy access, a series of experiences is provided, so that they may be replicated nationwide, thereby facilitating other interventions.

Inter-institutional platforms contributed to the problem of basic energy access becoming a visible topic on the public agenda.



The Collective for Basic Energy Access presented its proposal before the Energy Commission of the Congress of Peru, in 2016.



The monitoring system of EnDev Peru allowed for the tracking of the use of technologies in rural households.

The EnDev Peru monitoring system

By **Ileana Monti**, Senior Advisor of the EnDev Peru Project and **Diego Bustamante**, Technical Advisor of the same project

The EnDev Peru monitoring system, called SiMon, provides basic information to direct, manage and make decisions for the proper progress of the Project. In addition, it has a results-based monitoring (RBM) approach, meaning that activities are oriented not only to the description of the events but, to the observation of the changes that have been generated. In this sense, RBM observes the entire sequence of the results chain, from the inputs, activities, products, results, and impacts, in order to make corrections or implement preventive measures depending on the situation.

SiMon also provides information for the additionality of the project, in other words, whether the results achieved can be attributed to the EnDev Peru Project. In this way, the project focuses on people or households that do not have access to basic technologies and can only access them with the intervention of the project, in cooperation with other actors. In addition, the useful life of the technology and the capacity to be acquired by users once that period is terminated are taken into account. In other words, the sustainability of the project is considered.

SiMon presents four components: the monitoring of eligibility criteria; the monitoring of information for management; quality monitoring; and the monitoring of impacts and sustainability, which are presented below.

1. THE MONITORING OF ELIGIBILITY CRITERIA

The monitoring used to identify the project's beneficiaries or target groups, that is, populations living in energy poverty conditions. To do so, an energy poverty matrix tool was developed with information from the 2007 Census and the National Survey of Strategic Programmes (ENAPRES), carried out in 2012 by the National Institute of Statistics and Informatics (INEI). Based on this information, the variables of households with or without access to the public grid and those cooking with biomass were considered, focusing on geographic areas with less grid coverage, up to the district level. With this, the matrix estimated the extent to which the goal of increasing energy access to households has been achieved by geographic area.

2. THE MONITORING OF INFORMATION FOR MANAGEMENT

This allows the progress of activities and products generated by the EnDev Peru Project to be monitored. The tool used is the matrix of operational planning of activities, where progress is weighted.

The useful life of the technology and its ability to be acquired by the users are taken into account.

Through a results-based approach, EnDev Peru's monitoring system provides information to help manage and make decisions for the progress of the project. In addition, the sustainability of the intervention is taken into account.

Another tool used is the online platform called SimEnDev, which keeps track of the projects implemented with strategic partners. It also includes the registry of beneficiaries, which is a database of people who acquire an energy service and permits traceability, meaning that beneficiaries are identified. Likewise, it contains follow-up on the use, maintenance, and replacement of technologies, as well as information on sellers and sales made by type of technology and geographic area. This information allows reports to be prepared on the project's progress.

3. QUALITY MONITORING

This aspect aims to ensure the quality of the energy access provided. The quality assurance system (QAS) is the tool used, which consists of the random and periodic evaluation through a “checklist” to verify the following aspects: if the user has the technology, if he is using and maintaining it, if he received information on how to maintain and use the technology, if the technology is well installed and meets the minimum standards, if the user is satisfied and if he is willing to continue using it. These evaluations were conducted by the EnDev Peru team, partners and external

consultants. Thus, this information allowed preventive or corrective measures taken if necessary.

4. IMPACTS AND SUSTAINABILITY MONITORING

The objective was to obtain data on the benefits generated by the use of energy services and the conditions which had been developed for sustainability. To do this, the database of indicators and the sustainability matrix were used as tools, which were developed from the results chain and indicators provided by the project. Direct indicators are the products and results obtained from sustainable access, demand, supply, and a favourable environment in order to ease access. The effects on the health, economic, environmental, education and gender are considered within the level of indirect indicators.

These tools provided information on the results and impacts, and contributed to reflection on the objectives as well as to develop implementation strategies. In this sense, access to energy was not only limited to the delivery of a technology, but became a proper process in which concrete results are expected.

It has been essential to have direct information to reflect on the results and impacts of the project.

COMPONENTS OF THE MONITORING SYSTEM	TOOLS
Monitoring of eligibility criteria	Energy poverty matrix
Monitoring of information for management	Matrix of the operational planning of activities (SimEnDev)
Quality monitoring	Quality assurance system (QAS)
Impacts and sustainability monitoring	Database of indicators Sustainability matrix

Lessons-learned

- The results-based monitoring system (RBM) allowed the processes of energy access to be focused on. Thus, it has been possible for project partners not to focus on the delivery of the technology, but on the results of energy access, structuring the model on results-based management, which is being implemented by different public organizations in the country.
- Quality monitoring allowed the costs of repair or replacement of inadequately installed technologies to be reduced. Thus, the quality assurance system (QAS) was verified as a tool that ensures that technologies are well installed and meet users' needs.



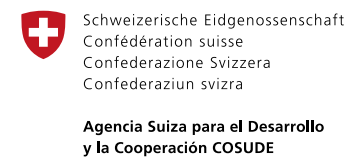
Family of the Native
Wayku Community in
the San Martín region.



Improving
the welfare
of Peruvian
families has
been the
goal of the
EnDev Peru
Project.



Financed by:



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