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Spanish Agency for International Development Cooperation

AECID'S COMMITMENT TO ENERGY ACCESS IN THE CONTEXT OF COMBATING CLIMATE CHANGE

Spanish Cooperation

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This guide aims to highlight AECID's the work in a field that has a wide-ranging impact in advancing the implementation of the 2030 Development Agenda through Sustainable Development Goal 7. To this end, and preferring specific examples to an exhaustive list, it includes some of the most representative projects and programmes in the area of renewable energy and energy efficiency financed by AECID since 2011, through different aid procedures, instruments and modalities.

The numbers next to each title of a project or programme refer to the goal with which each one is aligned:

1. Achieving universal access to quality energy sources.
2. Doubling sources of renewable energy.
3. Doubling improvements in energy efficiency.

1. CONTENTS

0. PROLOGUE

The Spanish Agency for International Development Cooperation (AECID) has a decades-long history of promoting access to renewable energy sources for vulnerable populations, in Latin America as well as in Africa and Asia. These efforts have focused on institutional strengthening and capacity development, as well as investment in infrastructure for isolated rural communities, where the problem of an absence of energy resources is a long-standing problem.

Although energy is an essential resource for development, some 1.1 billion people worldwide do not have access to electricity, whilst another 1 billion lack access to a stable electricity grid. This has a greater impact on the most vulnerable, and on their opportunities to live a decent life. Additionally, 2.6 billion people consume solid fuels, such as coal or biomass, on a daily basis for cooking and heating, which contributes to local deforestation and the increase in greenhouse gas emissions.

Access to sustainable, equitable, inclusive, and environmentally friendly energy resources is a crucial part of poverty eradication, and of achieving a smooth transition to low-carbon, energy-efficient development models.

At AECID, we are working to promote energy develop in our partner countries, providing the right setting for them to be able to transition towards regulatory reform and far-reaching policies able to meet the Sustainable Energy for All (SE4ALL) targets. This is possible using a set of instruments and modalities, such as financial cooperation, bilateral cooperation and South-South, triangular or regional cooperation, annual calls for projects from Non-Governmental Development Organization (NGDOs), and innovation actions promoted by private or academic institutions.

This guide intends to show how AECID is turning its commitments into actions. It presents the results achieved by our different projects and programmes, and by the instruments and financial resources put into play in recent years.

I hope that the information compiled here will serve to make AECID's work better known, enabling all of us to learn and to forge alliances that will help us to reach the goals of the Decade of Sustainable Energy for All.

Luis Tejada
Managing Director of the Spanish Agency for International Development Cooperation

1. INTRODUCTION: INTERNATIONAL CONTEXT

Energy services have a profound impact on productivity, health education, climate change, food and water security, and communication services. Lack of access to affordable, reliable renewable energy impedes social, economic, and environmental development, and constitutes a major obstacle to achieving the Sustainable Development Goals approved in 2015. However, 1.1 billion people lack access to modern energy sources, whilst 3 billion depend on "traditional biomass" and coal as their main energy sources.

The growing demand worldwide in the field of renewable-energy access and energy efficiency is linked to two factors: the first is growing energy demand, primarily from emerging markets; the second is the urgent need for mitigating climate change, caused to a large extent by an unsustainable development model based on combustible fossil fuels.

The combination of all these elements has led to an intense level of international activity, promoted by the United Nations, whose Secretary-General launched the initiative **Sustainable Energy for All (SE4ALL)** in 2011 as a multisectoral alliance uniting governments, the private sector and civil society, with three inter-related goals to be achieved by 2030: 1) Ensuring universal access to modern energy services; 2) Doubling the worldwide rate of improvement in energy efficiency; 3) Doubling the share of renewable energy in the global energy mix.

In 2012, the United Nations General Assembly (UNGA) passed a resolution declaring 2012 the *International Year of Sustainable Energy for All*, which made it possible for the Member States, after the talks at the Conference on Sustainable Development, the Rio +20 Summit (The Future We Want), to: 1) Recognize energy's role in development processes; 2) Stress the need to address access to modern and sustainable energy services for all; 3) Recognize that improvement in energy efficiency, an increase in the rate of renewables, and cleaner and more energy-efficient technologies are important for sustainable development.

In 2014, the UN resolution declaring 2014-2024 as the *Decade of Sustainable Energy for All* was launched with many different activities and commitments, and the appearance of technology hubs all over the world. That same year, UNGA proposed a set of Sustainable Development Goals (SDGs), with the seventh about energy: "Ensure access to affordable, reliable, sustainable and modern energy for all". It was based on compliance with five indicators, three of which are identical to the proposals for the SE4ALL initiative.

In 2015, intergovernmental negotiations regarding the SDGs continued, as well as the definition of indicators to measure progress. In that year, energy became the focal point of global efforts to galvanize a paradigm shift towards low-carbon energy systems, clean economies, sustainable development, and the eradication of poverty.

Finally, the recently approved **2030 Agenda** establishes **Sustainable Development Goal 7** on energy access:

- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all.
- 7.1. By 2030, ensure universal access to affordable, reliable and modern energy services.
- 7.2. By 2030, increase substantially the share of renewable energy in the global energy mix.
- 7.3. By 2030, double the global rate of improvement in energy efficiency.
- 7.a. By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
- 7.b. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.

The approval of this Agenda coincided with the **Paris Agreement on Climate Change**, to which 195 countries subscribed. This reflects the global consensus on the need to decarbonize the economy as a way to keep the increase in global temperatures below 2°C relative to preindustrial levels. This legally binding international treaty is complemented by commitments to mobilize unprecedented funds, programmes and initiatives for this area, starting from a target of $100 billion a year from 2020, a commitment to be revised upwards after 2025.

In Europe, many donors have taken positions, and the European Commission, aligning with SE4ALL, launched its own initiative in 2012, *Energising Development*, to address half of world energy poverty and provide access to quality energy to 500 million people by 2030 through technical support, innovative financial models, and mobilizing public and private funding.

2. AECID STRATEGIC AND PROGRAMMING DOCUMENTS, AND PRIORITY LINES OF ACTION

The **Master Plan for Spanish Cooperation 2013-2016** refers to the importance of renewable energy in three sections, regarding: inclusive and sustainable economic growth; the incorporation of the private sector, with proposals for specific pilot programmes; and, finally the necessary mainstreaming of environmental factors into every area, indicating that renewable energy sources are more environmentally friendly than fossil fuels.

The AECID, with its **Environmental Action Plan**, establishes as the agency's hallmark the promotion of a development paradigm based on sustainable, low-carbon economies with high indices of biodiversity, social justice and equality.

In the context of combating poverty, the promotion of renewable energy and energy efficiency is justified by its huge impact on development, as well as its contribution to climate change mitigation. Regarding the former, lack of access to energy is most acute in marginalized areas, among the most vulnerable people; regarding the latter, the primary source of energy for most rural populations is wood, which leads to deforestation and health problems, with women and girls being the most affected.

At the programme level, one noteworthy example since 2014 has been the **ARAUCLIMA Programme on the Environment and Climate Change in Latin America and the Caribbean**, which established a specialized Technical Office in Costa Rica, with such priorities as supporting climate change mitigation actions that preserve the environment, strengthen major organizations and institutions in the region, favour the crafting of a regional vision, and promote networking among public and private actors. Its scope includes work on to use renewable energy and energy efficiency as a means of promoting energy access for isolated populations, employment, and development.

AECID's efforts in its 23 priority countries defined in the Master Plan for Spanish Cooperation 2013-2016 revolve around the three SDG 7 targets and the SE4ALL initiative:

- ACHIEVING UNIVERSAL ACCESS TO QUALITY ENERGY SOURCES
- DOUBLING SOURCES OF RENEWABLE ENERGY
- DOUBLING IMPROVEMENTS IN ENERGY EFFICIENCY

The AECID's efforts to advance towards the goal of universal energy access are focusing on **poor, isolated rural communities**. The appendix includes the outcomes of a seminar held at AECID in 2012 with the participation of representatives from NGDOs, academia and the business community, where, on the basis of lessons learned in this area, criteria-which are still used by AECID-were established for prioritizing interventions. Among other experiences, we have the Project to Equip Integrated Smallholder Family Farms (PAP EFI) project for irrigating farmland with solar pumping systems in Senegal, and the Engineers Without Borders project in Ecuador for the electrification of indigenous communities using photovoltaic power. Resulting from Spain's commitment to Small Island Developing States, we have an example of support for the "Energy, Ecosystems and Sustainable Livelihoods Initiative" in Small Pacific Island States.

Regarding **support for diversifying the energy matrix through introducing renewables, as well as energy efficiency**, this guide includes some bilateral projects with institutions from Uruguay, Vietnam and Lebanon; other projects include supporting **Nationally Appropriate Mitigation Actions (NAMA)**, and now the **Nationally Determined Contributions (NDC)** under the UN Framework Convention on Climate Change, in such places as El Salvador (NAMA for energy efficiency in public buildings) and Costa Rica (NAMA for organic agricultural waste), both through the ARAUCLIMA Programme.

AECID seeks to further these objectives by prioritizing:

- **Institutional strengthening**, giving special attention to regional integration processes that are priorities for Spanish Cooperation: this is the case of the **Regional Centre for Renewable Energy and Energy Efficiency** of the Economic Community of West African States (ECOWAS) and the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) of the Caribbean Community (CARICOM).

- **Promoting partnerships and private sector involvement**, where a highlight is the opportunity presented by the AECID's annual call for Innovation for Development Actions. In the field of humanitarian action a pioneering project for energy access is being carried out at the refugee camp in Shire, Ethiopia. In addition, the guide features experiences with reimbursable capital investments in Latin America with the FONPRODE (AECID's Development Fund) and of Public-Private Partnerships for Development, such as the one carried out in Mexico with the Acciona Microenergía Foundation.

- **Technology transfer and capacity-building**, which is being promoted through the aforesaid calls for Innovation Actions through the Intercoonect@ programme, encompassing such strategic partners as CIEMAT (Spain's Research Centre for Energy, the Environment and Technology), and the UNEP's Regional Gateway for Technology Transfer and Climate Change Action in Latin America and the Caribbean (REGATTA), which provides technical support, with partners such as the Latin American Energy Organization (OLADE).

3. OFFICIAL DEVELOPMENT ASSISTANCE PAID OUT

At the international level, AECID is aligned with the goals of the UN's SE4ALL initiative, contributing to its objectives through different aid instruments and modalities, ranging from targeted programmes in multilateral and regional organizations to projects with NGDOs, universities and companies.

From a geographic standpoint, the lion's share of Official Development Assistance (ODA) paid out by AECID goes to Latin America, followed by Africa, due to Spain's support for ECOWAS/ECREEE.

As regards ODA between 2008 and 2014 for renewable energy and energy efficiency (RE&EE) programmes and projects, it rose to more than 20.5 million euros, which break down as follows according to the Creditor Reporting System (CRS) codes of the OECD's Development Assistance Committee:

CÓDIGO CRS	TÍTULO
14050	Solid waste management/disposal
23010	Energy policy and administration management
23030	Power generation - renewable sources
23040	Electrical transmission/distribution
23065	Hydro-electric power plants
23066	Geothermal energy
23067	Solar energy
23068	Wind power
23069	Ocean power
23070	Biomass
23081	Energy education/training
23082	Energy research

4. FUNDING INSTRUMENTS AND EXPERIENCES

4.1 CALL FOR INNOVATION ACTIONS

As a result of the annual call for Innovation Actions–an instrument that AECID launched for the first time in 2013 with an annual budget of 3 million euros, and which has now been running for three straight years–NGDOs, universities and companies have been able to implement innovative projects in which energy solutions play a prominent role. These projects, whose innovative capacity makes them strategic, have enabled the development of solutions based on renewable energy and energy efficiency, local capacity-building and technology transfer, always working hand-in-hand with local organizations and public bodies in the target communities, enhancing their ownership of new technologies and their impact on development.

DEVELOPMENT OF MICROFRANCHING FOR ACCESS TO CLEAN ENERGY IN RURAL AREAS, BOLIVIA (1,2)

Context, beneficiary population and expected outcomes

The project was financed in 2015 through the annual Innovation Development call.

Lack of access to electricity in the area poses development problems stemming from lack of access to energy, e.g. pupils having difficulty studying or doing their homework without access to information and communication technologies; or the greater amount of time spent on housework, mostly by women.

The project focuses on rural areas in a country where 57.4% of rural homes lack electricity, 76% are categorized as poor, and 64% as extremely poor. The beneficiaries are 10,000 homes electrified according to three different levels: peak lamps, Domestic Photovoltaic Systems (DPS) for basic uses and DPS for productive uses. In addition, also deals at least 100 on level municipal, and maximum of two and Municipality.

Main activities

1. Creating a microfranchising network at the municipal level that sells DPS on credit, and manages their installations and maintenance.
2. Business and management training for the future managers of the microfranchises. Designing the sustainable business model: Modalities of funding, oversight, marketing and technical assistance. Operating manuals for microfranchises and market studies.
3. Technical training in installing and maintaining DPS.
4. DPS sales, funding and subsidies to rural communities by microfranchises.
5. To ensure the DPS' sustainability, a laboratory and national standards will be established for DPS quality control.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 817,000	€ 200,000	http://www.itd.upm.es/	Solar Energy Institute - Polytechnic University of Madrid ACCIONA Microenergía

COGENERATION OF ELECTRICAL AND THERMAL ENERGY FOR AGRIBUSINESSES THROUGH A HYBRID SOLAR-BIOMASS SYSTEM, CUBA (1,2,3)

Context, beneficiary population and expected outcomes

Financed in 2015 by AECID through an annual call for development innovation projects.

The region where the project is underway includes the eastern provinces of Santiago de Cuba and Guantánamo, with the town of Guamá, in Sierra Maestra, considered the pilot area. This zone suffers high environmental vulnerability–droughts, hurricanes and earthquakes–and its mountainous terrain impacts the lives of rural people and their access to quality energy sources.

The project seeks to optimise endogenous resources (biomass and solar radiation), analysing the feasibility of exploiting them at the local level in rural settings. Specifically, Dichrostachys cinerea (locally known as marabú) is being used: this shrub is a highly invasive species in Cuba, competing with local species and taking over the landscape, threatening agriculture.

By using D. cinerea as a raw material for biomass energy production, the idea is to contribute to controlling this invasive species, turning a socio-economic threat into a local strength.

Moreover, the project develops strategies to enhance energy efficiency in rural areas, cooperating with the technology transfers between the country's different regions.

The beneficiary population mainly includes self-employed farmers or farmworkers and their families in rural areas.

Main activities technology used

The technology used is a hybrid system combining biomass gasification and photovoltaic methods, with a capacity of 3.5 MW.

The management of this hybrid system will be designed based on the local situation of the pilot area, focusing on its particular characteristics regarding energy demand and social needs, highlighting environmental sustainability and its energy resources.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 356,000	€ 141,000	http://www.ciemat.es/	CIEMAT SODEPAZ

IMPLEMENTING IMPROVED MICRO-HYDRO GENERATION SYSTEMS IN REMOTE COMMUNITIES, HONDURAS (1,2)

Context, beneficiary population and expected outcomes

FFinanced in 2015 by AECID's annual Development Innovation tender, the project provides access to clean, quality energy to the remote rural community of San Miguelito, Quimistán, in the western Honduras department of Santa Bárbara, which has little possibility of being connected to the national network. The community is located in a mountainous area, near water sources with small-scale hydroelectric potential. The electrification of the area will help to alleviate such problems as lack of food quality and variety; provide access to training and education (e.g. radio and television programming); and improve communities' connectivity (e.g. making it possible to recharge mobile phones). The beneficiary population comprises 37 men, 45 women and 158 children.

Main activities and technology used

1. Optimization of the turbine (15 kW): construction, dimensions and control system of the turbine generator unit.
   - Analysis of turbines installed during the pilot phase.
   - Optimization of the turbine: a. Diameter of the impeller; b. No. of vanes; c. Geometry of the blades; d. Thickness of the turbine's impeller; e. Construction material.
   - Hydraulic bench testing.
   - Design and electric testing of the system and controllers.
   - Documenting outcomes and know-how transfer.
2. Drones for delineation. Laying power lines in mountainous areas.
   - Flight and GPS positioning technologies.
   - Vision algorithms and optimal delineation.
   - Recording results and transfer.
3. On-site works and system installation: fieldwork.
4. Capacity-building, organisation and the empowerment of the community: community organisation, Water and Energy Boards.

The technology used shall comprise: Pelton turbine. CAD/CAM for 3D modelling. Computational fluid dynamics (CFD). 3D printing. Quadcopters with HD cameras and GPS monitoring.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 275,000	€ 110,000	http://www.fundacionetea.org/	ETEA Foundation Loyola University

"DIGITAL ENTREPRENEURSHIP AND E-LEARNING": IMPROVING ACCESS TO ICT AND INCLUSIVE BUSINESS MODELS, (NICARAGUA) (1,2)

Context, beneficiary population and expected outcomes

The project was financed by AECID in 2015 through its annual Development Innovation tender. It was carried out in the Madriz region and in the North Caribbean Coast Autonomous Region, the latter a rainforest plain ranging from the north-central mountains to the Caribbean coast, with a high potential for hydrocarbon exploitation, mining and tourism, and rains leading to ground saturation and overflowing rivers.

Beneficiary communities are widely spread out, without access to electricity or mobile phone coverage. In indigenous communities, there are many cultural barriers to the implementation of new technologies and to energy access, making their technological isolation even worse, and they suffer serious pollution problems due to the use of kerosene lamps, diesel motors, and batteries.

The beneficiary population in this region–the poorest in the country, where 70.39% of the indigenous and Afro-descendant population lives–comprises 961 men, 1,221 women and 1,596 children.

Main activities and technology used

1. Installation and launch of 6 digital kiosks with photovoltaic generators and digital and ICT tools.
2. Installation of software packages for accessing information on education, health and child protection, taking into account the cultural characteristics of the Miskita people.
3. Programme to promote reading in children, adolescents and young adults through free educational software.
4. Development of an inclusive business model, with men and women community leaders.
5. Update of the Community Development Plan, with the participation of children, adolescents, and young adults.
6. Financial study to promote national scalability in the ICT services of digital kiosks.
7. Systematization of the process to make it replicable.
8. Organization of two events to nationally disseminate the project's impact.

The photovoltaic solar technology used. Each digital kiosk will have 3.6 kWp installed (in six communities). Total capacity installed: 21.6 kWp.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 319,236	€ 126,080	https://plan-international.es/	Plan Internacional Spain ELECNOR Foundation

LOW-COST PHOTOVOLTAIC SOLAR PANELS, HONDURAS (1,2)

Context, beneficiary population and expected outcomes

The municipality of San Juan de Flores comprises 20 scattered villages of less than 250 inhabitants each, of which only two have electricity, with the others lacking short- or medium-term possibilities of accessing this service.

Through the ILUMINA ("Illuminate") project in the municipality of Cantarranas, supported through a defunct Permanent Open Call, in 2011 and 2012 the Elecnor Foundation installed photovoltaic solar panels in four of the least-developed rural hamlets, for a beneficiary population of 120 homes (750 people) as well as at four social centres (schools, community centres, health centres) in plazas and parks.

Main activities and technology used

1. Installation of complete small-scale solar panels, enabling access to electric light and to electricity sufficient for small appliances.
2. Creation of four Energy Councils for community-based management of an operation and maintenance system, to guarantee the project's sustainability.

The systems installed could power lamps and energy-efficient household appliances; at the community centres, they were sufficient for computers and audiovisual systems.

Solar energy has enabled these communities to improve: their health, by lowering their need for firewood; their education, by creating better conditions at schools; the environment, by reducing the felling of trees; and social cohesion, by lighting community meeting places. The project has also led to a higher level of self-esteem.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 218,500	€ 100,500	http://www.fundacionelecnor.com/es/	ELECNOR Foundation

IMPROVING THERMAL CONDITIONS IN RURAL HOUSING WITH BIODIGESTERS, PERU (1,2)

Context, beneficiary population and expected outcomes

Financed in 2014 by AECID's annual Development Innovation tender, the project was carried out in the high Andean districts of Ocongate and Ccatcca, where 82.1% of the population is rural.

Given its innovative nature, the initial proposal is not being carried out on a massive scale; nevertheless, there is a steadily growing demand from the local population, due to the impact of the project out to date. The beneficiaries comprise 70 men, 70 women and 210 children.

The project generates renewable energy with animal waste. The use of tubular biodigestors is a technological innovation that, through a natural anaerobic digestion process, enables families to obtain three products: bio-oil, biosol (a natural liquid fertilizer free of biological contaminants) and biogas. Biogas can be used both for cooking and heating.

Main activities and technology used

1. Internships.
2. Production of capacity-building materials.
3. Capacity-building workshops.
4. Technical assistance.
5. Renovating rural housing, using a healthy housing approach.
6. Installation of prefabricated tubular biodigesters.
7. Installation of household stoves.
8. Organization of events to present the biodigester and its applications.
9. Drafting a public policy documents at the local and regional levels in the thematic area of the environment.
10. Systematization and publication of experiences with waste management, risk management, and climate change mitigation.

The project used tubular prefabricated geomembrane biodigesters, 6.7 m long and 1.27 m in diameter with a useful volume of 8.5 m3. It is a highly efficient low-cost alternative for producing biogas and biofertilizers (bio-oil and biosol). The biogas produced will be used as a source of energy for cooking and for heating family bedrooms.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 345,935	€ 138,148	http://tallerdesolidaridad.org/	Solidarity Workshop

RURAL ELECTRIFICATION WITH SUPPLY AND SERVICE CENTRES, PERU (1,2)

Context, beneficiary population and expected outcomes

Financed in 2014 by AECID's annual Development Innovation tender, the project was implemented in the Department of Cajamarca, the poorest in Peru and the one having the least electricity coverage, with an average altitude higher than 3,000 metres. The population lives in a rural area, with an average monthly income of US$50. The local economy is based on livestock, agriculture and mining. The project's beneficiary homes are found in isolated rural areas, which are difficult to access and geographically highly dispersed.

The beneficiary communities lack access to the electricity grid, and there are no short- or medium-term plans to provide this service.

ACCIONA Microenergía Peru–the local partner–had already provided basic access to electricity through operating and maintaining 3,900 Household Photovoltaic Systems (HPS) through its Luz en Casa (Light at Home) program, including the 900 HPS installed for the project. Their goal is to reach 10,000 HPS by 2020. Besides installing 900 HPS, the project's goal is to start

Foto: ACCIONA Microenergía

up at least 6 service and supply centres, using a microfranchising model under which users of the Luz en Casa programme would be able to buy high-quality, energy-efficient appliances compatible with the HPS (televisions, radios, tablets, lamps, DVD players, etc.) at affordable prices. The beneficiaries of this project for accessing renewable energy are 5,669 men, 5,652 women, and 4,678 children.

Main activities and technology used

1. Provision and installation of HPS, working with beneficiary communities.
2. Selection and training of entrepreneurs to launch the energy supply and service centres.
3. Testing HPS-compatible appliances to sell at the energy supply and service centres.
4. Development and implementation of the supply and service centres.

The technology used features HPS (total installed power for the project, 76.5 kWp), and the main supplies necessary for each installation are:

- 1 photovoltaic panel, 85Wp
- 1 stainless steel support panel
- 1 battery, GEL 100 Ah 12 V
- 1 Regulator, PWM 10/10 A
- 3 Lamps, 12 Vcc, LED 5W

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 525,833	€ 200,000	https://sites.google.com/a/accioname.org/acciona-microenergia-peru/programa-luz-en-casa-sfd/er-cess_luz-en-casa	ACCIONA Microenergía Foundation UPM ICAI Engineers for Development Foundation ACCIONA Microenergía Peru

SUSTAINABLE MANAGEMENT OF ORGANIC WASTE AND RENEWABLE ENERGY PRODUCTION FOR ENERGY SELF-SUFFICIENCY, PERU (1,2)

Context, beneficiary population and expected outcomes

Financed in 2015 by AECID's annual Development Innovation tender, the project aims to provide a solutions to environmental and energy problems involving managing organic waste and lack of access to quality energy in certain parts of the country. The project is being carried out in Peru, in the regions of Puno and Ica and in Callao province. Response to the project's outcomes will make it possible to expand this proposed solution to more communities.

The proposed innovation aims to convert organic waste into a useful resource, whilst also promoting the development a local energy industry based on organic waste and biofertilizers. Other industrial subsectors and groups should also benefit: manufacturers of tanks and boilers, cement builders, manufacturers and distributors of electrical or thermal generation equipment using biogas (motors or gas boilers), manufacturers and distributors of industrial spare parts, such as tubes, valves, and pumps.

The proposed technology offers advantages compared with others, in terms of energy saving, savings on waste management costs, and reduced environmental impact and carbon footprint.

Main activities and technology used

The main innovation proposed is a co-digestion strategy for waste that would otherwise be difficult to use (waste from fish markets, street peddlers, etc.) through creating mixtures able to optimize the process.

The project includes:

1. Optimization of mixtures of organic waste, and production of biogas.
2. Transferring AINIA's equipment, knowledge and experience.

The technology used will be biogas, with pilot projects of <1 kW.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 410,850	€ 164,100	http://www.ainia.es/	AINIA

4.2 ANNUAL CALL FOR PROJECTS FROM NGDOs

In the Annual Call for Projects from NGDOs, traditionally an instrument aimed at financing interventions targeting different thematic areas, in recent years, two projects have arisen that have a clear component related to renewable energy solutions. Given their versatility, these kinds of actions could fit in with a wide variety of sectors, such as education, health, economic growth, and the environment.

SOCIO-ECONOMIC, TECHNOLOGICAL AND ENVIRONMENTAL DEVELOPMENT IN THE MUNICIPALITY OF GUAMÁ, CUBA (1,2)

Context, beneficiary population and expected outcomes

Financed in 2013 by AECID's annual NGDO Development Projects tender, the programme was carried out in the municipality of Guamá, in Santiago de Cuba. The beneficiary population lives in the Sierra Maestra, without connection to the national electricity system: 14,506 men, 12,369 women and 8,421 children.

The project focuses on productive energy uses, also covering the water-energy-agriculture nexus.

Main activities and technology used

1. Setting up farms for producing local ecological crops, powered by photovoltaic electricity.
2. Photovoltaic electrification of isolated rural homes, installing photovoltaic pumps for human consumption of water.
3. River basin reforestation plan.
4. Commissioning a Multipurpose Centre for Science, Technology and Environmental Protection.
5. Workshops, training sessions, and international exchanges.

Photovoltaic solar technology was selected, with the following characteristics: 250W, 24V, 60-cell module for each housing unit, and polycrystalline 80W, 12V photovoltaic solar module for productive uses. For pumping, a Grundfos SQFlex 2.5-2 pump will be used.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 285,592	€ 285,592	http://www.sodepaz.org/	SODEPAZ

ELECTRIFICATION OF ISOLATED RURAL COMMUNITIES, PALESTINE (1,2)

Context, beneficiary population and expected outcomes

The project comprises two actions, funded by AECID through its annual NGDO project tenders in 2011 and 2013.

It was carried out in several communities north of the West Bank, in the communities of Ab-Dawwa, Khirbet Tana, and Khirbet Massaod, and in the area south of the West Bank in the community of Birin. The action centres on a Bedouin population in Area C, administratively and militarily controlled by the Israeli Army and which has no access to the national electricity grid.

For the communities of Ab-Dawwa and Massaod, the project provides the communities with solar micro-networks enabling rural electrification with renewable energy: solar pumping for productive activities and household access to electricity, improving the communities' lives.

In Khirbet Tana, the project installed Single Household Systems (SHS), also providing access to electricity.

For the Birin community, the intervention focused on rural economic development (livestock and the agriculture), with 3 solar micro-networks providing coverage to the entire community. The beneficiaries of this last community are 63 men, 69 women, and 216 children.

Main activities and technology used

1. Electrification of 63 homes (18 SHS systems), with the others covered by solar micro-networks.
2. Electrification of two schools.
3. Electrification of a Health Centre.
4. Public lighting.
5. Solar-powered water pumping system.
6. Electrical systems for textile production.
7. Electrical systems for food processing.

Photovoltaic solar technology used.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 805,019	€ 665,820	http://www.seba.es/es/cooperacio.html	SEBA

INSTITUTIONAL STRENGTHENING AND SOCIAL PROMOTION FOR IMPLEMENTING RENEWABLE ENERGY IN THE NORTH-CENTRAL AMAZON, ECUADOR (1,2)

Context, beneficiary population and expected outcomes

The project was carried out in the provinces of Orellana and Pastaza in the Ecuadorian Amazon, where 9,306 families lacked access to energy (INEC, 2010 census)–more than 80% of them belonging to six indigenous peoples living in the area. In this rural area, 75% of the population had access to energy in Orellana and 65% in Pastaza, with a significantly higher penetration rate for photovoltaic systems in the former. Throughout the area, other Human Development Index indicators are the lowest in the country.

The principal obstacles identified for electrification with renewable energy are lack of awareness and knowledge among the local people, and the lack of institutional capacity and of professionals willing to work in these areas.

These problems and the methodology to address them were identified and created by the NGDO ISF, which has been active in the area since 2005, as well as by the local partner, the Under-Secretariat of Renewable Energy and Energy Efficiency, from the National Directorate for Renewable Energy (DNER), under the aegis of the Ministry of Electricity and Renewable Energy.

Main activities and technology used

1. For Orellana province, local capacity-building was carried out through awareness-raising modules on renewable energy in a provincial technical college, for more 70 students. During the project period, presentations were organized in local and provincial fairs to raise awareness and promote the use of renewable energy among the general public. These activities were led by ISF-CAT, with the support of the Francisco de Orellana Decentralized Autonomous Municipal Government.
2. For Pastaza, the institutional capacity-building carried out by ISF-CAT and DNER at the public distributor Empresa Eléctrica Ambato S.A (EEASA) was continued, with the support of the Decentralized Autonomous Provincial Government of Pastaza, consolidating its Renewable Energy Area.
3. In Pastaza, data was collected on 309 families lacking energy access in 26 isolated communities (Kichwas, Achuar, and Záparas).
4. Moreover, 9 technical studies were drawn up for the electrification of entire communities using photovoltaic energy. 8 of these projects (156 families) already had a budget earmarked (US$ 752,646), along with the local partner (Ministry).
5. 2 photovoltaic facilities were installed, one in an educational centre in Achuar and the other in a day-care centre in a protected area,, both located in the eastern part of the province, one of the most isolated areas in Ecuador.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 134,325	€ 80,000	http://www.catalunya.isf.es	Ingeniería Sin Fronteras (Engineers Without Borders)

4.3 BILATERAL AND REGIONAL COOPERATION

Using the bilateral cooperation format, AECID has financed the projects and/or programmes of national and regional counterparts; the main beneficiaries are public institutions. Below are four examples of bilateral programmes financed partially or in full by the AECID, in three different regions: Latin America, Asia and Africa. All of these programmes relate to renewable power and energy efficiency and employ innovative working methods to promote development of communities and human development, whilst bearing in mind protection of the environment and mitigation of climate change.

This Guide also includes an example of cooperation in ECOWAS, where Spain's cooperation is strategically positioned in regional terms, including being the largest financial contributor to ECOWAS/ECREEE. Established in 2011, ECREEE has achieved an excellent international standing over the course of recent years, accumulating an extensive portfolio of regional work, fostering the inclusion in the national policies of 15 member states of renewable energy and energy efficiency, throughout the western region of the continent.

PHOTOVOLTAIC SOLAR PANELS IN RURAL COMMUNITIES, HONDURAS (1, 2)

Context, beneficiary population and expected outcomes

The project was conducted in the Valle and Choluteca departments in the south of Honduras, in remote, dispersed rural communities. The region, in the Central American Dry Corridor, is inhabited by the poorest communities, with the lowest Human Development Index ratings. Moreover, this area of the country experiences the greatest solar radiation over the course of a year. However, although it close to major thermal power stations and large solar farms that sell energy to the state power company Empresa Nacional de Energía Eléctrica, these communities do not have access to electrical energy with which to improve their living conditions.

With the aim of improving these people's quality of life through their local governments, associated through the Association of Southern Municipalities (NASMAR), from 2011 to 2013 a project was implemented entitled "Developing Renewable Energy and Combating Climate Change in Remote Areas of Southern Honduras". A total of 32 communities benefited from this, comprising 542 families.

A second phase of the project was supported through strengthened community management and administration of the solar panel systems.

Main activities and technology used

1. Installation of complete compact systems for family units of 75Wp, providing access to electrical lighting and a socket to connect small household equipment, thus changing the living conditions of those who benefited from the project.
2. Formation of Water and Energy Committees, for community-based management of operation and maintenance, to ensure that the system is sustainable.
3. Training of young people from the target communities in maintenance of the solar panel systems and in the technical specifications of the systems, to enable them to form micro-enterprises or become employees of solar panel companies.

AECID CONTRIBUTION	LINK	ENTITY
€ 687,225	http://www.aecid.hn	AECID

ENERGY EFFICIENCY, FEASIBILITY STUDY FOR PUBLIC LIGHTING TRANSITION, PANAMA (ARAUCLIMA PROGRAMME) (3)

Context, beneficiary population and expected outcomes

Street lighting, which is key to citizen's safety, to promoting commerce and to public life in cities, is increasingly expensive for public administrations and users. The transition to LED technology in public lighting offers reductions in energy consumption of more than 40%, not to mention lower CO2 emissions. Although the substantial initial investments are comfortably offset by savings in the medium term, they represent a considerable short-term barrier that prevents Latin American cities from launching programmes aimed at improving the energy efficiency of their public lighting.

This project, which received financing from AECID as part of the ARAUCLIMA Programme, aims to demonstrate the success of this process and to provide information and methods as regards technical and management matters.

Main activities and technology used

1. Feasibility study on the transition to LED technology for public lighting in Panama City, as a pilot scheme to serve as a reference for other cities in the country and in Central America in general. The study covers: the baseline; a report on the regulatory framework; a report on the management and billing systems for public lighting.
2. A technical proposal and a financial feasibility study, prepared in collaboration with the parties involved in the project. An evaluation of the different financing options, such as national funds, development bank funds, ESCO energy efficiency model, international financing mechanisms for measures to mitigate climate change, financing of manufacturers, as well as combined models.
3. Development of a logistics plan for the implementation of replacement of installed public lighting with LED technology in the selected cities. The plan will consider including automated control systems for each light or the conditions necessary to achieve this in a second phase, and will include an environmental sustainability plan for final disposal of the replaced products.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 72,000	€ 36,000	http://www.cooperacionespanola.es/es/tags-noticias/arauclima	AECID/UNEP


Spanish
Cooperation
ENVIRONMENT / ARAUCLIMA

NATIONALLY APPROPRIATE MITIGATION ACTION (NAMA) FOR ENERGY EFFICIENCY IN PUBLIC BUILDINGS, EL SALVADOR (ARAUCLIMA PROGRAMME) (3)

Context, beneficiary population and expected outcomes

In El Salvador there are 6,542 public buildings, with 7,559 electrical services. These buildings account for approximately 12% of the country's demand for energy, and it is estimated that potential savings of 23% could be made by changing technology and improving systems in areas such as lighting, motors and air conditioning systems. These savings could also potentially make a significant contribution to mitigating the adverse effects of climate change on the country.

The direct beneficiaries of the project are the Government of El Salvador and the National Energy Council, through formulation of NAMA concept note on Energy Efficiency in El Salvador's Public Buildings, expanding on the scope of the pilot schemes implemented as part of the "Energy Efficiency in El Salvador's Public Buildings" Project, at a national level and with the capacity to be implemented in all the country's public buildings.

These measures have the potential to generate annual savings of 27% in energy expenditure and a reduction of approximately 58,341 tCO2e a year, especially at hospitals and state schools.

This action was financed by AECID as part of the Arauclima Programme.

Main activities and technology used

1. Training and identification workshop. The aim is to produce a roadmap at the workshop, containing the key milestones of the support process to formulate the NAMA.
2. Securing Technical Support to facilitate the identification processes followed to formulate the NAMA, also including identifying the governance structure of the NAMA and to facilitate MRV (monitoring, reporting and verification).

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 96,358	€ 76,586	https://unfccc.int/files/focus/mitigation/application/vnd.openxmlformats-officedocument.presentationml.presentation/nama_el_salvadorsantiago_chile_final.pptx	Perspectives Ministry of the Environment

BIOMASS ENERGY NAMA: EXPLOITING ORGANIC AGRICULTURAL WASTE TO GENERATE ELECTRICITY, COSTA RICA (ARAUCLIMA PROGRAMME) (2)

Context, beneficiary population and expected outcomes

This project, which is financed as part of the Arauclima Programme, supports development of measures to mitigate and adapt to climate change in the energy and water resource sectors, as well as in industries such as agriculture, as per the National Climate Change Strategy's Action Plan. The plan's section on energy states that support will be given to "Nationally Appropriate Mitigation Actions in the energy sector, for the use of biomass with organic agricultural waste". The NAMA entitled Biomass Energy was designed through the Climate Change Directorate of the Ministry of the Environment and Energy, with the participation of Germany's development agency (GIZ).

The objective is to contribute to appropriate use of organic agricultural waste–especially those originating from pineapple and livestock farms–enabling increased use thereof in the country's energy network, thus also reducing consumption of electrical energy by different companies and emission of greenhouse gases, as well promoting good practices in agro-industry.

The project also contributes to resolving the environmental problems caused by pineapple waste, fertilizer use and runoff into rivers.

Main activities and technology used

1. Pilot project and equipped laboratory to validate practices to convert organic agricultural waste from pineapple crops into energy.
2. Pilot projects to validate practices to convert organic waste from pig and poultry farming into energy.
3. Business models that demonstrate profitability.
4. Concept note for the Biomass Energy NAMA.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 650,000	€ 650,000 (Part 2: € 404,600)	http://www.cooperacionespanola.es/es/tags-noticias/arauclima	Climate Change Directorate (Ministry of the Environment and Energy) GIZ

INSTITUTIONAL STRENGTHENING IN RENEWABLE ENERGY AND ENERGY EFFICIENCY, URUGUAY (2, 3)

Context, beneficiary population and expected outcomes

Pursuant to the agreements between the governments of Spain and Uruguay entered into as part of the 2011-2015 Partnership Framework, Spanish Cooperation supports the country in a number of areas related to improving the environment, including the energy sector. In this sphere, support is given to the government in its aim to diversify the national energy system, resulting in 50% of renewable energy in the primary supply network. Support has also been given for improvements to the energy efficiency of the transport sector, which consumes a third of the country's primary energy, most of which is imported.

Main activities and technology used

Spanish Cooperation's work in institutional strengthening addresses different phases of the energy strategy, from generation to use.

1. Diagnosis of the electrical system and design of energy policies that focus on managing demand, rational use of energy, use of different sources and the inclusion of renewable sources.

2. Design, implementation and evaluation of a pilot scheme to supply electrical energy to small rural communities, with no access to electricity grids and limited financial resources, generated using hybrid renewable sources (wind and solar).
3. Evaluation of the energy requirements of the country's different regions that form part of the National System of Protected Areas, and design of supply solutions with renewable energy.
4. Development and publication of technical standards and recommendations to improve energy efficiency in transport.
5. Preparation and publication of a proposal with outlines for the introduction of new technologies in the transport sector.
6. Development of technical recommendations for promoting public transport and changes in the mode of cargo transport.
7. Evaluation of the possibility of incorporating other smart networks.
8. Support for capacity-building for national technicians.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 341,117	€ 295,000	http://www.aecid.org.uy/?p=1540	National Energy Directorate

ECOWAS CENTRE FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY (ECREEE) (1, 2, 3)

Context, beneficiary population and expected outcomes

The 15 ECOWAS countries –Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo–have the worst levels of access to energy in the world. Hundreds of thousands of people in the region–and especially in rural environments–therefore do not have access to quality energy services (access to electricity, energy efficiency measures or other services), which is hindering their development.

Furthermore, continued use of fossil fuels, traditional widespread use of biomass and the great distances between communities, as well as low population density, are all in many cases barriers to reducing the dependency on imports of crude oil, installing traditional means of electricity supply and bolstering measures to mitigate climate change.

Spanish Cooperation's support for ECOWAS's renewable energy policy aims to improve people's access to quality sources of renewable energy, demonstrating the potential of renewable

energy and energy efficiency in the region. Spain is one of the ECREEE's key partners, with a direct contribution to its budget of 7 million euros (2011-2016).

Main activities and technology used

1. Support for drafting of policies and regulatory frameworks.
2. Support for the programme to establish electricity infrastructure in rural areas.
3. Support for the Action Plan to improve women's access to renewable energy.
4. Capacity-building and training.
5. Promotion of financing facility for projects, through open calls.

The technology that has been implemented includes photovoltaic solar, energy efficiency, solar heaters and dryers, mini-wind power, small hydro and hybrid systems, particularly involving micro-networks.

AECID CONTRIBUTION	LINK	ENTITY
€ 7,000,000	http://www.ecreee.org/	ECREEE

PROJECT TO EQUIP INTEGRATED SMALLHOLDER FAMILY FARMS, SENEGAL (1, 2)

Context, beneficiary population and expected outcomes

Compared with progress in the Sahel, as a result of harsh living conditions and a lack of productive material, Senegal's rural communities often encounter restrictions on production, food security risks and underuse of ecosystem resources in productive family work.

Since 2006, Spain has supported the Rural Development Strategy rolled out by the Senegalese government following the launch of the REVA Return to Agriculture Plan. Moreover, construction 10 of Rural Development Hubs was financed through AECID and a Development Aid Fund (FAD) loan, including the Kafesse farm.

The PAPEFI supports the National Agency for Agricultural Integration and Development in its promotion of a suitable and sufficient diet and opportunities for economic growth through development of irrigation systems based on the powering and irrigation of 110 family farms, using photovoltaic solar energy, in rural and vulnerable areas.

Those who will benefit from the project are women and young people who reside in rural areas, with diplomas from farming colleges, current farmers and emigrants, through a project promoting a return to agriculture. All of these people will have access to assistance and materials to boost their agricultural work, generate jobs and increase food security. The project is being implemented in the districts of Ziguinchor, Sédhiou and Kolda and promotes creation of long-term employment in the agricultural industry, strengthens rural populations'

connection to the land and makes a positive contribution to peacebuilding in the region. This action promotes rural employment through smallholder family farms that are both productive and profitable, through sustainable use of water for irrigation and propulsion thereof using photovoltaic solar energy, while combatting climate change and demonstrating the connection between water and energy.

Main activities and technology used

1. Improved food security and contribution to the fight against malnutrition, by increasing the availability of animal protein.
2. Diversification of crop, fish and livestock farming at 110 family livestock farms.
3. Creation of agricultural jobs for young people and women, increasing income and combatting poverty.

The technology used will be direct photovoltaic solar pumping.

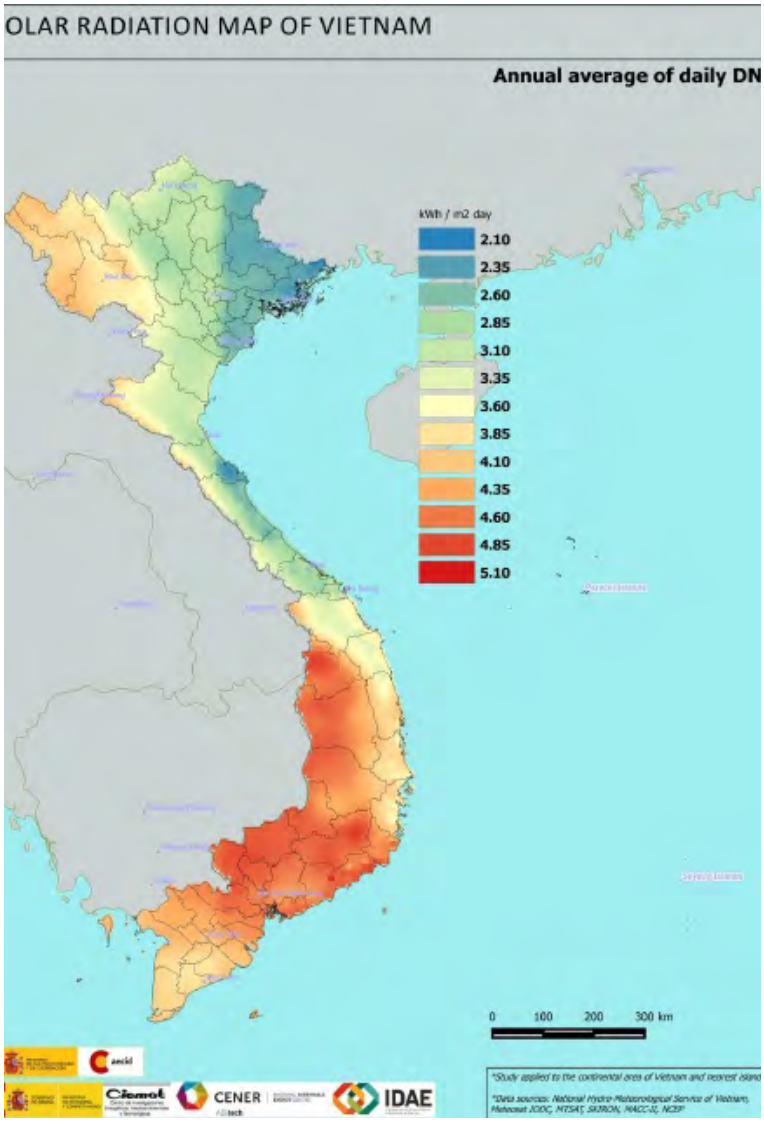
TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 1,520,000	€ 1,000,000	http://aecid-senegal.sn/es/?wpfb_dl=386	The National Agency for Agricultural Integration and Development

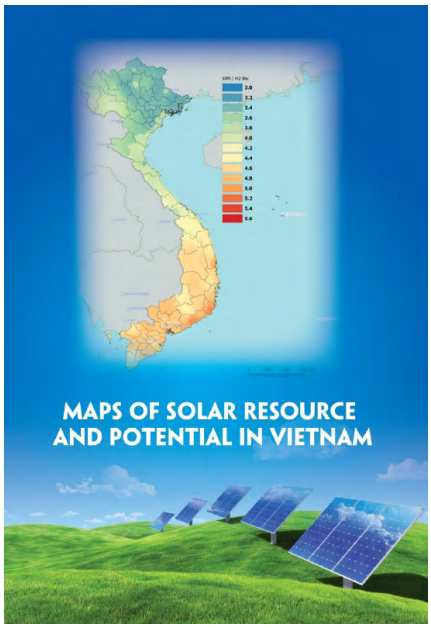
PROMOTING DEVELOPMENT OF RENEWABLE ENERGY BASED ON SPAIN'S EXPERIENCE, VIETNAM (1, 2, 3)

Context, beneficiary population and expected outcomes

Vietnam's primary sources of energy are coal, oil, hydroelectric and other renewable energy sources. A significant percentage of the population live in rural areas. Decentralized renewable energy technology could therefore play a role in electricity supply. In order to promote renewable energy, the government of Vietnam approved a Master Plan for development of renewable energy for the period through to 2015, with an outlook covering the period up to 2025.

This project was implemented in two locations: The Ministry of Industry and Trade in Hanoi (urban setting) and the Con Dao Archipelago, comprising 16 islands 200 km from the Vietnamese coast (isolated rural setting).





Main activities and technology used

1. On Con Dao, the prior supply of electricity originated from an isolated diesel-based micro-network, meeting requirements of up to 1.6 MW. The fuel was imported and transported to the island, thus causing pollution, despite the island's significant potential in terms of renewable energy sources. Therefore, on Con Dao capacity-building and knowledge transfer initiatives were undertaken, to promote development of its photovoltaic potential. A photovoltaic solar plant has been built at the An Hoi Diesel Power Plant, with a nominal power of 30 kW and a 36 kWp photovoltaic generator. It comprises 144 photovoltaic modules of 250 Wp each. The modules are connected to two 15 kW inverters. The photovoltaic facilities are monitored by sensors and a data recorder. Performance is tracked through the data recorder.
2. In Hanoi, the installation is connected to the building's internal network and generates electricity through photovoltaic solar panels, for use by the building itself.
3. The projected included preparation of a Solar Resource Map, by the Spanish consortium comprising CIEMAT, the National Renewable Energy Centre (CENER) and the Institute for Diversification and Saving of Energy (IDAE). The consortium produced maps of Global Horizontal Irradiance (GHI) and Direct Normal Irradiance (DNI) in the country, as well as maps of solar energy potential, based on trough-based solar power plants and photovoltaic plants comprising fixed modules connected to the network. The results of this project are related to the World Bank ESMAP Program, which promotes renewable energy resource maps in countries such as Vietnam.

AECID CONTRIBUTION	LINK	ENTITY
€ 242,000	http://www.aecid.es/ES/Paginas/D%C3%B3nde%20Cooperamos/Asia/Vietnam.aspx	CIEMAT, CENER, IDAE Vietnamese Ministry of Industry and Trade

4.4 COOPERATION FUND FOR WATER AND SANITATION

This Spanish Cooperation instrument, which was created in 2007, began operating in 2009 and aims to secure access to drinking water and sanitation for the most disadvantaged populations in Latin America and the Caribbean. To this end, it supports the institutions and organizations of the target countries with the design and implementation of comprehensive public policy to protect the sustainability of water resources. In this context, the Fund is aware of the intrinsic link between water and energy and therefore of the need for water and energy policies to be developed with a comprehensive approach. A number of the Fund's experiences analyse the ties between water and energy in water planning programmes, including consideration of energy efficiency in the design of water and sanitation systems. On occasion such experiences have included renewable energy as the best option for ensuring the sustainability of the financed systems.

Fund programmes that specifically incorporate planning as a key element analyse both supply and demand for water resources. As regards demand, the different uses include generation of power, human consumption and other uses that are fundamental to human development, all through rational exploitation of the resource. In terms of energy efficiency, the energy costs of the pumping and the mechanical parts of the water and sanitation systems represent, in many cases, the most significant portion of the tariffs paid by users. Economic viability is therefore key to the sustainability of these systems: operating and maintenance costs must be affordable for users. Within Fund programmes, proposed solutions for this are translated into: (i) preparation of optimised designs for the systems, considering potential savings in energy costs (through hydraulic designs and optimization of pumps); (ii) consideration of implementation in phases, starting with system design, including analysis of streamlining of investment costs and energy costs, thus adapting relative demand to gradual population growth; (iii) determination of energy-efficient equipment and performance of energy audits to identify improvements in this area; (iv) focus on system maintenance to prevent cost overruns linked to energy; (v) promotion of use of renewable energy and elements of systems that contribute to energy generation.

CASE STUDIES ON THE WATER-ENERGY-FOOD NEXUS IN LATIN AMERICA (1, 2)

Context, beneficiary population and expected outcomes

The importance of the interconnection between water and energy was the reason behind a specific programme, implemented by the Inter-American Development Bank (IDB) using funds from the EU's Latin America Investment Facility (LAIF), and managed by AECID, which included the variable of food. The objective is to contribute to sustainable management and development of the water, energy and food industries by building on the capacity for analysis and by undertaking more documented case studies on integrated resource planning in investments, identification and evaluations of offsetting factors and synergies between water resource management, energy generation and food production, when a comprehensive approach is taken to planning.

Key activities:

1. Preparation of available information, including analysis and review of available data, in accordance with requirements, to implement the Water-Energy-Food nexus method.
2. Development of an analytical tool for the Water-Energy-Food nexus, which is adapted to the reality in the Latin American and Caribbean regions, based on the existing Integrated Evaluation Models and the Hydro-BID system. The tool cover four major spheres (water, energy, food, and ecosystems) and includes economic modules (trade-off, optimization, financial result) and an environmental impact assessment.
3. Case study for application of the tool. The tool will use information and data from the Hydro-BID system on water resources (sources and amounts), demand, usage and efficiency, for three case studies (Peru, Colombia, and Brazil).
4. Dissemination of the knowledge acquired and promotion of dialogue on policies through publications on the case studies.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
$ 1,000,000 US	EU Funds 100% AECID managed	http://www.iadb.org/es/proyectos/project-information-page,1303.html?id=RG-T2660	AECID Inter-American Development Bank (IDB) Latin America Investment Facility (LAIF)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RURAL WATER AND SANITATION PROGRAMME, HONDURAS

Context, beneficiary population and expected outcomes

This programme has been executed by the IDB, but was financed by Spanish Cooperation through the Cooperation Fund for Water and Sanitation in Latin America and the Caribbean (FCAS). The beneficiaries are seven impoverished communities in the Dry Corridor on the Pacific coast. The communities are priority municipalities in the country within the Regional Alliance Plan for Prosperity in the Northern Triangle (El Salvador, Guatemala and Honduras) to establish development conditions that enable the area's population to remain settled and reduce emigration. To achieve this, the Programme aims to improve and increase access to drinking water and sanitation services, with economic, financial, environmental, social and institutional quality and sustainability.

Main activities and technology used

As this southern region of the country suffers from the longest dry periods and also has the highest level of solar irradiation in the country, the use of photovoltaic solar technology has been included for pumping groundwater, as the only viable alternative. The inclusion of a self-generated solar power component reduces the operating costs of the projects by between 70% and 81%. This saving improves households' finances and significantly benefits these communities, which are very economically vulnerable.

The inclusion in the design and subsequent construction of solar systems for projects centred on water pumping and self-generation of power from solar sources slightly increased the contract's budget, although this was offset by the self-generated energy. The investment in construction of the self-generation facilities will be recovered in six years, with an internal rate of return of 15%. Installation of these systems enables a reduction in electricity purchases, as well as a cut in greenhouse gas emissions of 2,500 tonnes CO2 over the life of the solar system, thus generating an environmental advantage.

In addition to the equipment, the proposed solution also included capacity-building for the community, as represented by the Water Boards, in operation and maintenance.

As regards the guarantees of the quality of the work, a period was opened during which the supplier could provide technical support to the communities as required.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
US$. 27,500,000	91%	http://www.fondodelagua.aecid.es/es/fcas/donde-trabaja/proyectos/HND-007-M.html	AECID

IMPROVING COVERAGE AND MANAGEMENT OF DRINKING WATER AND SANITATION SERVICES, GUATEMALA (1, 2)

Context, beneficiary population and expected outcomes

The objective of this bilateral programme between Spain and Guatemala, financed and executed by FCAS, is to reduce poverty and improve quality of life by increasing access to drinking water and sanitation services. The beneficiaries will be four hundred families from four rural indigenous K'iche' communities that are members of the Tzolojya Association (Mancomunidad): Cruzve, Xesampual, Chirijcruz and Chimachá. The Association comprises three municipalities in the Sololá Department of Guatemala: San José Chacayá, Santa Lucía Utatlán and Sololá, in the north basin of Lake Atitlán.

Main activities and technology used

To generate energy for the pumps in the system that provides drinking water to the communities, 186 solar panels have been installed, measuring two square metres each. This reduces the pumps' current consumption by 50% and benefits the 400 families who receive water from the system. The panels, which have a useful life of 25 years generate at least 280 Wh, feeding this electricity into the existing electrical systems in the communities and selling it, subsequently offsetting the water pump expenses.

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 8,094,138	80%	http://manctzolojya.org.gt/	Mancomunidad Tzolojya FCAS-AECID

4.5 PUBLIC-PRIVATE PARTNERSHIPS

Development Public-Private Partnerships (DPPPs) are a key instrument for AECID and reflect the priority in Spanish Cooperation's Master Plan of including different Spanish private-sector partners alongside public stakeholders (including AECID), adding value to renewable energy and energy efficiency programmes.

The energy sector has proved to be one of the most fruitful for DPPP that are co-financed by AECID, in terms of their impact. The initiatives undertaken in conjunction with internationally important private partners are particularly noteworthy, such as the DPPP formed in 2012 with the Acciona Microenergía Foundation and Spanish Cooperation's first experience with a refugee camp through a DPPP.

LUZ EN CASA (LIGHT AT HOME) PROJECT, OAXACA, MEXICO (1, 2)

Context, beneficiary population and expected outcomes

This DPPP is a reflection of Spanish Cooperation's Master Plan strategy to promote multi-stakeholder partnerships. In this case, the private party is ACCIONA Microenergía México, a Mexican social enterprise created by Fundación ACCIONA Microenergía in 2012, in partnership with AECID, AMEXCID and the Government of the State of Oaxaca.

The project aims to provide isolated rural populations in the State of Oaxaca with access to energy. Of the state's municipalities, 90% are in poverty or extreme poverty, and are marginalised. The region is the most ethnically diverse in Mexico, with 16 indigenous peoples.

The dispersion of the population complicates infrastructure development and makes services more expensive. In 2012, 808 of Oaxaca's municipalities with fewer than 100 inhabitants were not included in the Federal Electricity Commission's plans to establish conventional electrical connection; other solutions were therefore required to supply these populations with electricity.

Foto: ACCIONA Microenergía

Photo: ACCIONA Microenergía

The beneficiary population for the project comprises 10,441 men, 11,382 women and 7,466 children.

Main activities and technology used

1. Presentation of the project to municipal authorities.
2. Identification, awareness-raising, registration and capacity-building for users and Photovoltaic Electrification Committees (CEFs).
3. Creation of CEFs.
4. Purchase and supply of third-generation home photovoltaic systems (3GHPS).

Photovoltaic technology has been used, with 25 Wp per installation. The total installed capacity is 183.05 kW (including the 7,322 3GHPS that will be operational at the end of the programme, which is divided into three projects: LCO13, LCO14 and LCO15).

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 225,270	€ 57,000	https://sites.google.com/a/accioname.org/acciona-microenergia-mexico/	Fundación ACCIONA Microenergía AECID The Government of the State of Oaxaca

ENERGY ACCESS AT REFUGEE CAMPS IN SHIRE, ETHIOPIA (I)

Background and beneficiary population

The project is being implemented in the Shire refugee camps in Ethiopia, where UNHCR is managing four camps for people originating from Eritrea. Until 2011, these refugee camps had no access to electricity. At present, just two of the camps, Mai-Aini and Adi-Harush, are connected to the national grid; however, for services to be delivered properly, this connection must be adapted to the demanding circumstances of the setting, and to increasing and changing demand for energy.

Requirements and technical and organizational solutions to address this shortfall shall be analysed and proposed through a Public-Private Partnership formed by three companies– Iberdrola, Philips Ibérica and Fundación ACCIONA Microenergía–AECID and the Polytechnic University of Madrid, through the latter's Innovation and Technology for Development Centre.

The beneficiary population mainly comprises displaced people from Eritrea. The number of refugees in Shire is approximately 34,320, of whom 80% are men who have fled from military service, aged 19-35 and mostly unmarried.

Main activities and technology used

In the first phase the following outputs were achieved: audit of the distribution network for the Shire refugee camps; a guide for optimal management of the electricity distribution networks; a toolbox for training in maintenance and reparation of the electricity network; a report on logistical and operational matters on the ground. Other activities to be performed include:

1. Correcting anomalies in the network (relating to transformers, protection, earth connections and other connections).
2. Increasing the energy capacity at Adi-Harush (purchase of new transformer, installation of new LV lines to cover the increase in capacity).
3. Providing training in maintaining and refitting of the refugee camp's electrical facilities, and optimal management thereof.
4. Improving lighting and installing public lighting connected to the electricity network (50 LED lights at Adi-Harush).
5. Researching and designing biodigesters for households, and drafting feasibility studies for such installations.
6. Coordinating and promoting the Partnership (support and monitoring of implementation).

TOTAL BUDGET	AECID CONTRIBUTION	LINK	ENTITY
€ 413,000	€ 180,000	http://www.itd.upm.es/download/appah/02_Project_Proposal_Energy_Partnership_Executive_Summary.pdf	The Polytechnic University of Madrid PHILIPS Ibérica ACCIONA Microenergía Foundation IBERDROLA AECID

4.6 MULTILATERAL COOPERATION

For many years AECID has worked in close cooperation with a number of multilateral development organizations, in line with the goals contained in the development agendas and commitments assumed with the United Nations, such as the UNDP, the United Nations Environment Programme (UN Environment), the UN Industrial Development Organization (UNIDO), and the International Union for Conservation of Nature (IUCN). The environment and climate change form a traditional branch of work in this regard, through which AECID support other global efforts to facilitate access to renewable energy, energy efficiency and reductions in CO2 emissions.

UNDP PROGRAMME ON CLIMATE CHANGE FOR LATIN AMERICA AND THE CARIBBEAN (1, 2, 3)

Background

This UNDP programme, which is financed by Spain, started operating in 2009 with the aim of supporting countries in the region in their efforts to incorporate climate change into their national, regional and sector policies, and to identify the funds required to implement such initiatives. A budget of 7.2 million euros has been allocated to combat climate change, not all of which has been allocated to energy-related matters. Work has been carried out with eight countries in the region to develop the different tools agreed within the United Nations Framework Convention on Climate Change: these include Clean Development Mechanisms (CDM) and NAMA, and, since the 2015 Paris Summit, Intended Nationally Determined Contributions (INDC).

Main activities and technology used

AECID CONTRIBUTION	LINK	ENTITY
€ 7,200,000	http:// latinamerica.undp.org	UNDP

COUNTRY	CLEAN DEVELOPMENT MECHANISMS (CDMS)	NAMA
Chile		• Thermal enclosure
Cuba	• Baseline and evaluation of technologies to reduce emissions in refineries and thermoelectric plants in Cienfuegos	• Pork industry biogas
El Salvador	• Feasibility of an efficient residential lighting programme • Support for the annual operative plan to replace rural stoves with turbo kitchens • Manual for assessing profitability of energy efficiency in Salvadoran industry • Guide for developers of energy efficiency projects	• Turbo kitchens • Energy efficiency in the public sector
Honduras	• Design of MOCAL hydroelectric project in Tomalá	
Paraguay		• Reducing use of non-renewable biogas
Perú	• Feasibility of a model for mass use of improved wood stoves • Study on contribution of improved stoves to the MDGs • Identifying NAMA opportunities in the energy sector	• Creating incentives for investment in on-the-grid renewable plants • Using renewables in isolated systems
Dominican Republic	• Baseline for using biomass in stoves in rural areas	• Pork industry biogas
Uruguay	• Carbon footprint study of major agro-export chains: Rice, meat, and milk	• Promoting renewal energy generation

REGIONAL GATEWAY FOR TECHNOLOGY TRANSFER AND CLIMATE CHANTE ACTION IN LATIN AMERICA AND THE CARIBBEAN (REGATTA), UN ENVIRONMENT (1, 2, 3)

Context, beneficiary population and expected outcomes

The REGATTA Project, which is managed through UN Environment, fulfils the mandate established by the United Nations Framework Convention on Climate Change, promoting transfers of technology relating to the mitigation of climate change in Latin America and the Caribbean, and adaptation thereto; all of this has been done in collaboration with key institutions and stakeholders from the region.

Main activities and technology used

1. Development and management of an online knowledge platform to promote exchanges of information between experts and to build an inventory of mitigation and technology transfer initiatives in the region, including tools, methods, case studies, best practices and lessons learned.
2. Collaboration with regional technology and knowledge centres, thus providing support for countries in the region, through specialized advisory services and management and oversight of "Communities of Practice".

Other examples include the Communities of Practice on NAMA and on Photovoltaic Solar Energy. Furthermore, in collaboration with the En.lighten initiative implemented by UN Environment with GEF funds, REGATTA has supported Central America in the formulation of the Efficient Lighting Strategy in Central America, signed in Panama in 2013 by the Ministers of Energy of Central America.

AECID CONTRIBUTION	LINK	ENTITY
€ 1,050,000	http://cambioclimatico-regatta.org/index.php/es/	UN Environment


UN
environment
REGATTA
Regional Gateway for Technology Transfer and Climate
Change Action in Latin America and the Caribbean

COUNTRY ENERGY EFFICIENCY AND RENEWABLE ENERGY DEMONSTRATION FOR THE RECOVERY OF LEBANON (UNDP) (2, 3)

Context, beneficiary population and expected outcomes

In October 2007, the UNDP, in collaboration with Lebanon's Ministry of Water and Energy, Ministry of Finance and Development and Reconstruction Council, began implementing the CEDRO Project, financed by the Lebanon Recovery Fund through a subsidy from the Spanish Government of 25 million euros. This amount was divided among three different projects: "Flood Risks Management and Water Harvesting for Livelihood Recovery in Baalbeck-Hermel"; hydro-agricultural development in the Marjeyoun district; and for CEDRO, a project aimed at improving energy efficiency by providing training in renewable energy and its implementation throughout the territory.

The CEDRO Project supported the government with 9.73 million euros from 2007 to 2013, with the objective of renewable energy representing 12% of its energy matrix by 2020 and of improving energy efficiency, fostering the country's recovery, reform and reconstruction efforts.

Main activities and technology used

The project worked at three levels:

1. Implementing end-use energy efficiency and projects to test renewable energy for public sector buildings and facilities.
2. Establishing a favourable environment for conversion of other public buildings and facilities into energy efficient installations.
3. Developing a national strategy and action plan for sustainable energy.

To achieve this, the following was carried out:

1. Installation of renewable energy systems in more than 100 public sites across the country: photovoltaic, micro wind turbines, commercial-scale solar hot water systems, geothermal heat pumps, solar public lighting and pico hydro power.
2. Resource evaluations and studies, primarily: the National Wind Atlas of Lebanon, the National Bioenergy Strategy, Evaluation of concentrated solar power, non-river hydro and the National Geothermal Resource Assessment.

AECID CONTRIBUTION	LINK	ENTITY
€ 9,730,000	http://www.cedro-undp.org/	UNDP

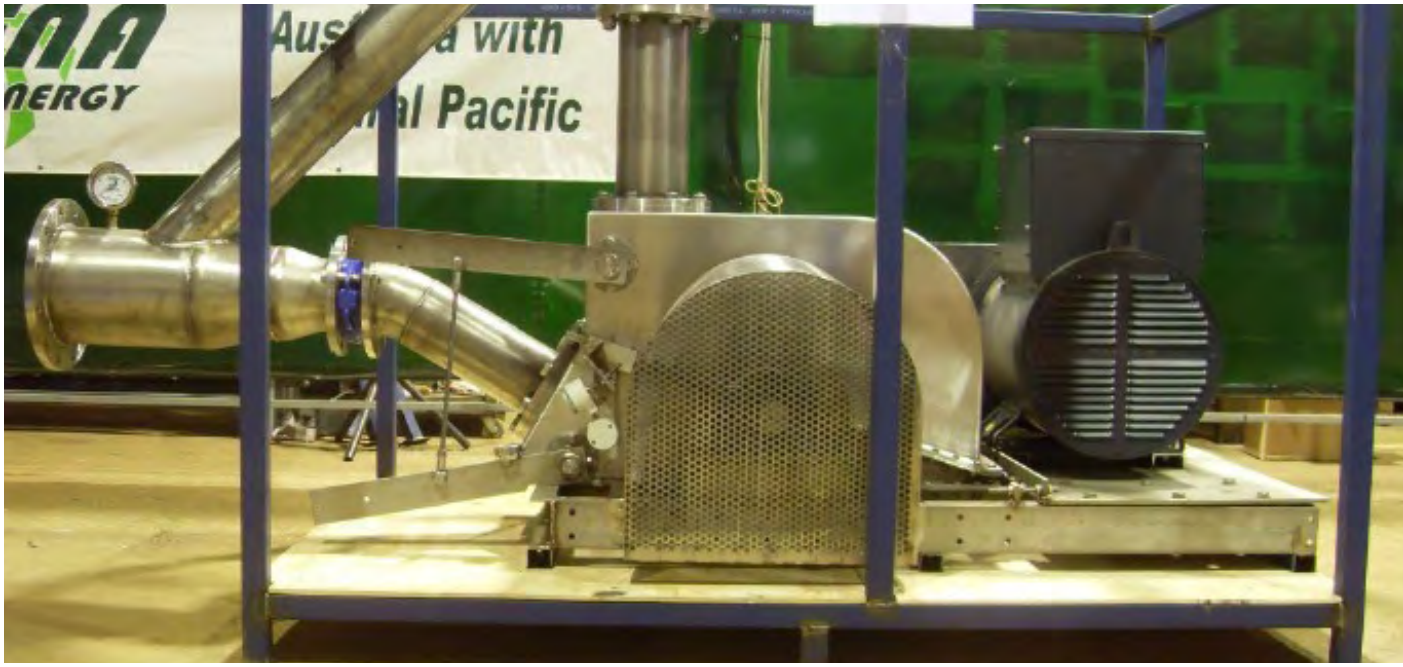
SMALL ISLAND DEVELOPING STAGES ENERGY, ECOSYSTEMS AND SUSTAINABLE LIVELIHOODS INITIATIVE (EESLI) PROGRAMME, PHASE II, OCEANIA (IUCN) (1,2)

Context, beneficiary population and expected outcomes

As part of Spain's support for Small Island Developing States, since 2015 and through the International Union for Conservation of Nature (IUCN), AECID and its European partners have co-financed Phase II of the Energy, Ecosystems and Sustainable Livelihoods Initiative (EESLI) to implement the Framework for Action on Energy Security in the Pacific, which was approved in 2010.

To date, Spain's support has been provided in Tonga, the Federated States of Micronesia, and Vanuatu, whose populations are highly dependent on imports of fossil fuels and extremely vulnerable to the effects of climate change and the gradual deterioration of their ecosystems, primarily leading to poverty among their rural communities.

EESLI contributes to improved access for the local population to clean, quality energy as an alternative to fossil fuels. This objective is accompanied by criteria and assessment of sustainability and environmental impact, through exchanges of knowledge and institutional strengthening between the different national governments and regional authorities.



Main activities and technology used

1. Development of regulatory processes and national policies to roll out training and financing mechanisms and tools to manage renewable energy projects.
2. Reduction of CO2 emissions through selected pilot renewable energy or energy efficiency projects, designed by each participant country, promoting its ownership.
3. Inclusion of methodologies and development of tools to guarantee a relationship between biodiversity and ecosystems in actions that entail installation of micro-hydro or generation of biofuel.
4. Promotion of criteria to correctly select pilot projects, to improving the living conditions of vulnerable populations by increasing access to quality energy resources and services, in addition to technical training courses.
5. Actions aimed at encouraging transformation of demand to clean energy instead of using technology based on traditional fuels.

The forms of technology used are photovoltaic solar, mini-wind, pico solar lamps, mini-hydro, biofuel and technology that improves energy efficiency in domestic and public settings.

AECID CONTRIBUTION	LINK	ENTITY
€ 1,000,000	http://www.iucn.org/	IUCN

4.7 REIMBURSABLE FINANCIAL COOPERATION

Reimbursable financial cooperation, channelled through the Development Promotion Fund (FONPRODE), is a unique format used by the Spanish Cooperation system. Its primary objective is to eradicate poverty, reduce social inequalities and gaps between people and communities, and promote gender equality, the defence of human rights and the human and sustainable development of impoverished countries.

Non-reimbursable cooperation operations are primarily contributions to multilateral organizations and international financial institutions for development, United Nations System initiatives and programmes or bilateral contributions. A significant portion of reimbursable operations have been invested in the microfinance sector, also including loans or holdings in investment funds in areas such as food security, renewable energy, agriculture and development of micro, small, and medium enterprises (MSME). In addition, the FONPRODE can undertake reimbursable operations, comprising either debt or capital. This guide includes two examples of financial support for venture capital funds that invest in renewable energy and energy efficiency.

LATIN RENEWABLES INFRASTRUCTURE FUND, L.P. – BRAZIL, CENTRAL AMERICA, COLOMBIA, MEXICO AND PERU (1, 2, 3)

Context, beneficiary population and expected outcomes

The sphere of action of the Latin Renewables Infrastructure Fund (LRIF) encompasses Mexico, Peru, Colombia, Brazil and Central American countries. The purpose is to foster the renewable energy industry, with the aim of boosting job creation and inclusive, equitable and sustainable economic growth, thus extending social and economic rights to excluded sectors of the population, and above all to the indigenous population. The intention is to reduce poverty in the region by transferring technology and promoting knowledge, boosting SMEs and local entrepreneurs in countries in the region by incorporating low-carbon, energy efficient technology and renewable, decentralized energy sources in difficult-to-reach rural areas. Through all of these measures, the aim is also to contribute to reducing the impact of climate change.

Main activities

The Fund is designed for investment in Latin America and the Caribbean, with a particular focus on priority countries for Spanish Cooperation.

In terms of sectors, investments are made in renewable energy projects (hydro, wind, biomass, geothermal and solar) and in energy efficiency projects (Energy Service Companies, ESCOs) that offer services to reduce costs and increase efficiency through maintenance contracts.

Investments are made in both operational (brownfield) and incipient (greenfield) projects or companies, whilst avoiding investment in technology that has not been proven to be commercially viable.

TOTAL BUDGET	AECID CONTRIBUTION	LINK
$ 56,000,000 US	12,500,000 US$	http://www.aecid.es/Centro-Documentacion/Documentos/documentos%20adjuntos/14%20%20LRIF.pdf

MGM SUSTAINABLE ENERGY FUND, L.P. – CENTRAL AMERICA, COLOMBIA AND MEXICO (1,2,3)

Context, beneficiary population and expected outcomes

The commercial, industrial, municipal and residential sectors in Latin America and the Caribbean use generally outdated, technically obsolete and inefficient equipment. The steady replacement of this equipment is an opportunity to increase energy efficiency in the region, with a corresponding effect on environmental sustainability, by reducing emissions of greenhouse gases.

The MGM Sustainable Energy Fund is being implemented in Mexico, Central America and Colombia, contributing to the development of local businesses and decent work by creating new energy efficiency markets locally, and as a result of its investment strategy based on partnerships with local SMEs.

The Fund is also expected to contribute to sustainable development of local communities and social and ecological benefits linked to efficient use of resources, such as reductions in pollutants (nitrogen oxides, sulphur dioxide and volatile organic compounds) and dissemination of technology and practices that are environmentally friendly.

Main activities and technology used

Energy efficiency projects are carried out, which aim to produce returns from the savings in energy and maintenance expenses they generate. These projects are expected to represent 75% of the Fund's investments. In addition, renewable energy projects are being carried out, using micro-hydro, overhauling some hydroelectric plants, as well as wind and solar power.

TOTAL BUDGET	AECID CONTRIBUTION	LINK
$ 63,000,000 US	US$ 12,000,000	http://mgminnovacap.com/investments.php

5. APPENDIX

SEMINARS ON RURAL ELECTRIFICATION IN ISOLATED AREAS: SOCIOECONOMIC, INSTITUTIONAL, AND TECHNOLOGICAL ASPECTS

SOCIOECONOMIC ASPECTS OF THE INTERVENTIONS

The session, held at AECID on 23 January 2012, brought together more than 40 professionals from the field, representing civil society organizations, universities, companies, and the public administration. Although they obviously had different approaches and interests, the event was also a clear opportunity to promote collaboration and complementarity, showing that it was crucial to promote information exchange. Below are the conclusions of the session:

- The socioeconomic aspects of rural electrification interventions in isolated zones are **key to their sustainability**.

- Different kinds of installations (street lighting, household or community installations) can be built: the decision to opt for one or the other should be determined mainly by the **beneficiaries' needs**, along with other factors such as **dispersion of the population** and **social organization**, which can also influence the process.

- Although all of these **installations** improve conditions for the beneficiary populations, **community installations** seem to have the advantage, due to their **greater installed capacity**, of being able to promote **improved production capacity**–this factor can have a positive impact on the population's ability to pay, and consequently, on the systems' financial sustainability.

- Whatever the kind of installation being promoted, whenever possible it is advisable for its **management** to be carried out in **a centralized** manner, since this option offers considerable advantages in terms of economy of scale to lower operating and maintenance costs.

- There are **several modalities for managing the installations**, for example:

  – companies chosen through a competitive tender
  – non-profit-making social companies
  – community management based on social consumer cooperatives
  – community management based on non-profit-making cooperative associations

- Whatever the chosen **management model**, it is crucial that its creation be planned **from the start of the intervention**, promoting **the beneficiaries' participation**.

- This participation can be promoted at different times over the course of the intervention; for example, through collaboration in the workforce during the construction phase, in the **operation and maintenance** of the installations, and in the **management or co-management of the systems**.

- To achieve full participation, it is crucial to carry out **training and awareness-raising among the beneficiaries**, both the end users and those who could be tasked with operation and maintenance.

- It is important to put special emphasis on **promoting equal participation** of men and women in the intervention.

- The **positive impact** of the rural electrification interventions in isolated areas are **many and varied** (e.g. improved access to health and education services, water pumping).

- An especially beneficial impact can be **increased income**, whether directly, through the creation of local energy services companies for operating and maintaining the systems, or indirectly, through the creation of productive activities that use electricity. This increased income can also have a positive impact on the population's **ability to pay**, and consequently on the systems' **economic sustainability**.

- It is important for the **beneficiaries to contribute** to the operation and maintenance of the installations, as well as to the replacement of equipment when necessary.

- Even so, there is usually a **gap between the costs of building, operating, and maintaining the installations, and what the beneficiaries are able to contribute**.

- Therefore, there must be a **system of grants and subsidies** so that the installations can be built and maintained. These subsidies can affect:

  – The **initial investment**, e.g. the donation of equipment by an external stakeholder or by the beneficiary government.
  – **Tariffs**, e.g. by setting a lower, subsidized price or by setting up a cross subsidization system for an installation's users.

- Another possibility is to promote a **micro-credit** system for rural electrification interventions in isolated areas, to favour the participation of the most vulnerable.

- In any case, it is essential to seek a **balance between the level of service offered by the installations and what the beneficiaries can afford**.

- It is interesting to explore more deeply the **development of business models** able to mobilize capital and the participation of the **private sector.**

- **Major differences** have been found between the experiences presented in terms of the **monetary quantification of the operating and**

maintenance costs of the systems: this is considered an important aspect to examine.

- There seems to be an interesting intervention field in those areas where rural electrification interventions were promoted using diesel generators that have not been adequately operated and maintained, and therefore are not working: at a relatively low cost, these installations can be converted into hybrid systems with strengthened management structures.

- It is is also important to **scale up** these kinds of interventions, going from small- to large-scale projects.

- Moreover, it is crucial for these installations to be of the **highest quality**.

INSTITUTIONAL AND TECHNOLOGICAL ASPECTS OF RURAL ELECTRIFICATION INTERVENTIONS IN ISOLATED AREAS

More than 30 professionals from the sector participated in the working session held at AECID on 17 February 2012, representing civil society organizations, universities, companies and the public administration. The conclusions included the following:

Institutional matters:

- All interventions must be **within the institutional framework** of the country and of the region where the action is being taken.

- This can be particularly difficult in situations **where there is an institutional void**, which is precisely what often occurs in isolated rural areas that are extremely vulnerable.

- In such contexts, it is important to view the electrification initiative not on its own, but as **part of a wider rural development framework**.

- Certain situations may exist where it is the country's institutional framework itself that is generating isolation of specific communities, including isolation that is not merely physical.

- Some important institutional matters are: **the legal and institutional framework**; identification of the **competent authorities and political leaders** to establish appropriate dialogue; **regimes of land ownership; sustainability: ability to pay, tariffs.**

- In addition to working at the community and local government levels, it would be of interest to accompany actions with initiatives to **enhance the**

capabilities of local energy authorities, bolster regulatory frameworks, policies and planning, and strengthen regulations and technical rules.

- **Civil society** also has an important role, to **lobby in Spain** and the European Union to influence development policy, an activity that is particularly important in this International Year of Sustainable Energy for All.

Technological matters:

- From a technological standpoint, there are two key factors: the **reliability and scale of the systems**.

- Other factors that must be taken into account include: weight; **transportation** (relevant for deliveries or transfers); **maintenance** (frequency of check-ups, for instance); versatility (possibility of dismantlement, for example); the **durability** of the system; **resistance**. In the latter two cases, weather conditions are key, as they can affect these two factors, be it through strong gusts of wind or corrosion.

- In terms of the **reliability of a photovoltaic system**, the critical elements are usually the **batteries**, which habitually maintain their initial capacity for less than two years and have a useful life of five and a half years. It is also essential that batteries are not handled by beneficiary populations. Other critical factors include **charge regulators**, the characteristics of the **solar panels** themselves, the actual capacity of which may be lower than their rate capacity, and hotspots.

- As regards **lighting equipment, energy-saving bulbs** offer numerous advantages over the incandescent alternative, such as the possibility of using a lower-rated generator. However, at present there is the limitation of the number of times they may be turned on and off. In this area, it would be advisable to closely track progress with LED technology.

- It is essential that a **high level of quality is guaranteed in the installations** that are built. To this end, it is important to perform **quality controls** on the installed equipment, and that the **control methods are appropriate** to the setting. Preliminary controls are advisable.

- There are numerous **quality standards** in this field, although not all technologies are 100% covered. Quality standards for wind power, and above all biomass, appear to require further development as regards electrification of isolated rural areas.

- It is crucial that the quality of the installations is maintained throughout the useful life of projects: this is why **operation and maintenance are important**.

- **Operating and maintenance expenses must also include the cost of replacing equipment and managing waste**. Theoretically, equipment should be returned to the supplier or manufacturer, but the necessary structure for this to happen does not normally exist in areas where actions are implemented; the informal market could be considered as a potential solution.

- To ensure that operation and maintenance are performed correctly, and to reduce the associated expenses, it seems fundamental that **economies of scale** be achieved by grouping various facilities that are sufficiently close to each other, and that specialized companies are used. In this regard, the possibility of public-private partnerships must be explored in further detail.

- Substantial differences have been identified between experiences in terms of monetary amounts of operating and maintenance expenses for systems; this is an important matter which should be examined.

- When deciding upon the **scale of a system**, the **needs of the users** must be taken into account, as they may differ from those the donors perceive them to have.

- On occasion, installed systems are **vandalized:** to prevent such problems, it is fundamental that work is done to promote **ownership** by the beneficiary population.

- At a technological level, there are many alternative means of generating electricity (photovoltaic, small wind turbine, small hydro, hybrid, etc.) and of distributing it (individual and collective systems, mini-grids, etc.). Whichever solution is chosen, it is essential that the **information on which the design is based is accurate and reliable**.

6. ACRONYMS

- **3GHPS** – third-generation home photovoltaic systems
- **AECID** – Spanish Agency for International Development Cooperation
- **CARICOM** – Caribbean Community
- **CCREEE** – Caribbean Centre for Renewable Energy and Energy Efficiency
- **CDM** – Clean Development Mechanisms
- **CEF** – Photovoltaic Electrification Committees
- **CENER** – National Renewable Energy Centre
- **CIEMAT** – Research Centre for Energy, the Environment and Technology
- **CRS** – Creditor Reporting System
- **DNI** – Direct Normal Irradiance
- **DPPP** – Development Public-Private Partnership
- **DPS** – Domestic Photovoltaic Systems
- **ECOWAS** – Economic Community of West African States
- **ECREEE** –Regional Centre for Renewable Energy and Energy Efficiency
- **EESLI** – Energy, Ecosystems and Sustainable Livelihoods Initiative
- **GHI** – Global Horizontal Irradiance
- **IDAE** – Institute for Diversification and Saving of Energy
- **IDB** – Inter-American Development Bank
- **FCAS** – Cooperation Fund for Water and Sanitation in Latin America and the Caribbean
- **LAIF** – Latin America Investment Facility
- **kWp** – peak kilowatts
- **NAMA** – Nationally Appropriate Mitigation Action
- **NGDO** – Non-Governmental Development Organization
- **OECD** – Organisation for Economic Co-operation and Development
- **ODA** – Official Development Assistance
- **PAPEFI** – Project to Equip Integrated Smallholder Family Farms
- **RE&EE** – renewable energy and energy efficiency
- **SDGs** – Sustainable Development Goals
- **SE4ALL** – Sustainable Energy for All
- **UNDP** – United Nations Develop Program
- **UNGA** – United Nations General Assembly

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