



How to bring electricity to Colombia's Pacific coast

Infrastructure for Development

IDB Infrastructure and Energy Sector

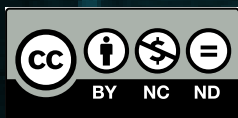
The purpose of these case studies is for INE to share its work in the region, the problems and challenges encountered, and the lessons learned. Alexandra Planas Marti, Juan Carlos Cárdenas Valero and Sebastian Solarte from the Energy Division are the sector experts for this case study. It was written by Alejandro Tarre, consultant, and Olga Morales, Infrastructure and Energy Sector.

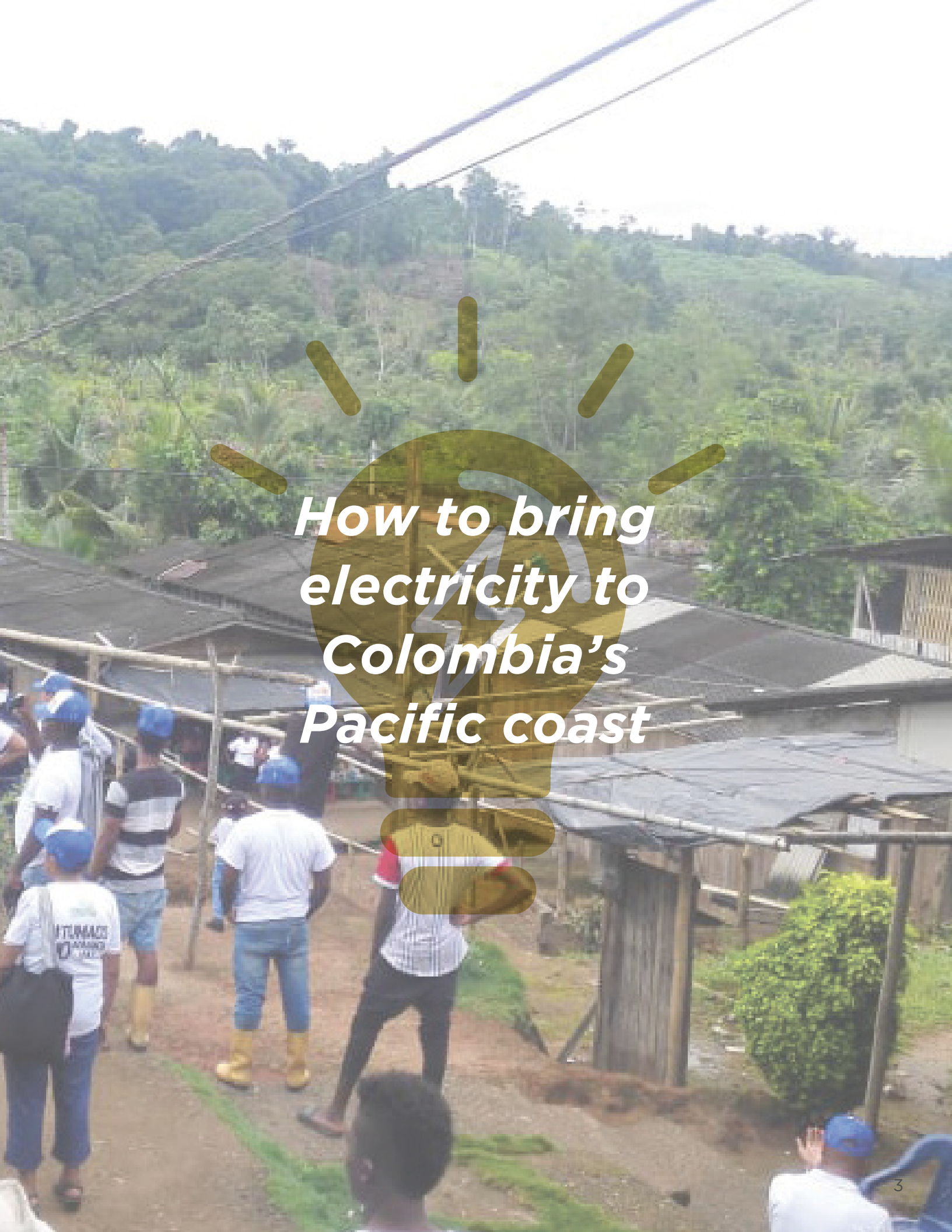
Infrastructure for Development is led by Olga Morales and was developed by Tomás Serebrisky and Ancor Suárez-Alemán.

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IDENTIFYING THE PROBLEM

Colombia's Pacific coast is unique, both in its ethnic and cultural diversity and its incredible ecological, mineral, and forest wealth. Encompassing the departments of Cauca, Chocó, Nariño, and Valle del Cauca, its privileged geographical location on the Pacific Basin connects Colombia to China, Japan, and other major Asian markets.

Its residents, communities of Afro-descendants, indigenous peoples, and mestizos, make their living from fishing, mining, and selling timber. This diversity has given birth to a rich culture, evident in the region's music, dance, art, and cuisine.

The coast is also known for its biodiversity, with almost 2.5 million protected hectares. The Chocó Bioregion is among the top ten places on the planet in terms of biodiversity and rainfall. Its rivers contain 70% of the country's water. The area's tide pools, mangroves, and tropical jungles are crucial to protecting the coastline from erosion.

But this wealth and potential are only part of the equation.

Colombia's Pacific coast is home to almost 2 million people, 60% of whom cannot meet their basic needs. This is twice the average of other regions in Colombia. Not only is extreme poverty higher here than in the rest of the country, but it is higher than in other countries in the [Pacific Alliance](#) — [ten times higher than on the Chilean coast](#).

The region has a high illiteracy rate (almost 40%) and a high unemployment rate (almost half a million people). A 2015 assessment by the Colombian government highlights the socioeconomic gaps between the Pacific Coast and the rest of the country, the largest of which are [water supply \(44%\)](#), [sewer connections \(48.7%\)](#) and [electricity \(26.2%\)](#).

These gaps are partially due to low population density, weak institutions, and inadequate public services. But in some rural areas, there are other factors at play, including lack of access and problems with public safety and security. Many of these communities are among those most affected by illegal activities and armed conflict, both of which have led to



significant migration. Between 2008 and 2015, around 12,000 people—or about 5% of the population—left San Andrés de Tumaco in Nariño because of armed conflict.

One of the largest obstacles to reducing poverty and driving economic development on the Pacific coast is the availability of electricity. Nationally, the number of households with electricity is high (97%), but it is ten percentage points lower on the coast ([nearly 87%](#)). Of approximately 413,000 homes in the area, roughly [55,000 did not have electricity as of 2015](#).

These households must meet their energy needs with firewood or diesel generators. This raises the cost of living and poses a serious threat to the environment. In most cases, the service provided by the generators is intermittent, sometimes only four hours per day per village. Food can't be refrigerated, schools have limited access to computers and audiovisual equipment, and use of electrical appliances is restricted.

An estimated 81% of dwellings without power on the coast can be connected to the National Interconnected System. But the rest are in Non-interconnected Zones, which will require stand-alone solutions such as photovoltaic systems (solar) or hybrid systems (solar and diesel). These areas are considered “non-interconnected” because they are so isolated or sparsely populated that the cost of connecting them to the grid is much higher than installing a stand-alone solution, one reason why grid operators have not invested in the electrification of these areas.

ADDRESSING THE PROBLEM

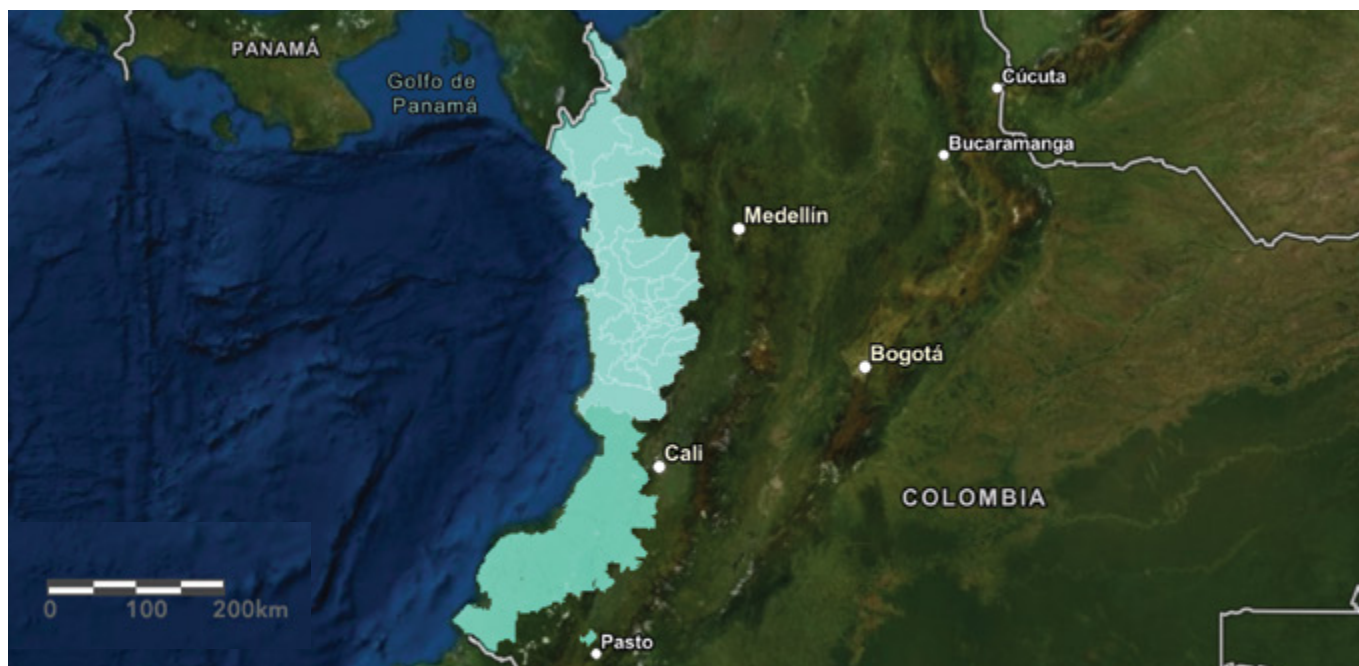
The “[Todos Somos PAZcífico](#)” Plan (TSP Plan), the purpose of which is to reduce poverty and close social and economic gaps in the Pacific coast region, is part of Colombia’s 2014-2018 National Development Plan, “Todos por un Nuevo País”.

The plan is an ambitious one. It covers a wide range of initiatives in several areas, including public services, urban development, environmental protection, education, employment, institutional capacity, and transparency. It includes bringing electricity to 50 municipalities on the Pacific coast.

At the request of the Colombian government, the Inter-American Development Bank

(IDB) approved a loan for Todos Somos PAZcífico in early 2017. The loan provides US\$91 million for a Sustainable Rural Electrification Subprogram (it also finances a water and sanitation subprogram not included in this case study.)

The Subprogram supports the construction and installation of electrical infrastructure in areas that can be connected to the National Interconnected System, expanded coverage in Non-interconnected Zones using solar and hybrid systems, and grid normalization in low-income areas—regulating illegal hookups by installing service connections and meters that enable users to be billed for service.



Currently there are nine projects in the departments of Nariño, Cauca, and Chocó that are either complete or in progress (see Box I). None of the projects involving stand-alone systems in Chocó and Valle del Cauca have been implemented yet, though a few

have already been approved. In total, the approved projects, including those that are complete or in progress, will benefit more than 17,000 users (here, the term “user” refers to a dwelling with an average of four or five residents).

BOX I

SUSTAINABLE RURAL ELECTRIFICATION SUBPROGRAM: PROJECTS EITHER COMPLETED OR IN PROGRESS

Nariño:

- A transmission line between the departments of Nariño and Cauca that connects 2,253 users in Nariño and 2,093 users in Cauca (in progress, estimated completion date: January 15, 2021*).
- A transmission line in Río Gualajo that connects 191 users (completed).
- A transmission line in the Awa community to connect 282 users (in progress, estimated completion date: May 11, 2020*).

Cauca:

- Normalization (service connection and meter installation) for 3,500 users (in progress, estimated completion date: May 29, 2020).
- Distribution lines and normalization for 2,016 users in El Tambo (in progress, estimated completion date: April 28, 2020*); 466 users in Suárez (in progress, estimated completion date: May 15, 2020); 822 users in Morales (completed).

Chocó:

- Transmission lines in San Miguel Sipi to connect 858 users in Sipi and 10 communities (in progress, estimated completion date: April 9, 2020*).

***These projects may be delayed due to disruptions caused by the SARS-COV-2 virus (COVID-19).**

THE CHALLENGES OF IMPLEMENTATION

Bringing stakeholders together to kick off the project

Implementing an electrification project on the Pacific coast means aligning the interests of different stakeholders, particularly communities and project implementers.

Colombian law has a mechanism to ensure that this takes place. All ethnic groups have the right to a preliminary consultation to weigh in on projects or activities in their territories. The purpose is to protect their cultural, social, and economic integrity and protect their right to participate.

Project developers and representatives from the Ministry of the Interior are equally responsible for conducting the preliminary consultation. There are several steps in the process, which may last up to two years. The methodology, activities, timelines, and costs are laid out in the initial stage; agreements are signed during an administration phase; monitoring occurs in another stage.

As this is often a long process, communities have an alternative to the preliminary

consultation; they can bypass the formal consultation process by signing an agreement to authorize the project. But this option means that project objectives and targets must be aligned with beneficiary expectations, needs, and interests, which can be a challenge.

In Río Gualajo, the project was met with skepticism. After decades without reliable electricity (or other basic services), communities had learned not to get their hopes up when someone came along promising change. Thus, many people initially wanted a preliminary consultation. There was even more resistance in San Miguel Sipi. Due to a misunderstanding with local authorities, the project implementers thought that the residents knew about the project and had already approved it. However, the community was surprised when the operator arrived, and it blocked the project from getting underway.

How did the project team overcome this obstacle? By using a well-thought out strategy of communication and outreach. In both cases, the project teams had to work extensively with the communities to get them on board with the project.



This approach had several goals. First, to explain the project: clarify for the communities what the project team wanted to do, what their targets were, where the resources were coming from, and what they hoped to achieve. They also explained the project benefits. Contractors always need labor, housing, food, transport, and more. Ideally, the local residents themselves would provide these services. Beyond bringing electricity to these communities, the project would create jobs and income.

Community engagement also made room for questions and collaboration. Communities in Río Gualajo were involved in every stage of the project; not only did they feel like they were part of it, but they contributed to its success. Permanent communication channels were established between council representatives, the contractor, the controller, and the executing unit. Committees for women were created as well (see “The role of women”, Box IV).

The successful electrification of Río Gualajo demonstrated how important it is to reach out to communities and align the interests of all stakeholders. It is now a model for future projects under the Sustainable Rural Electrification Subprogram.

Getting operators to consider social and environmental issues

Under the terms of the IDB loan, grid operators who participate in these projects must create an Environmental and Social Management Plan. This document must include several elements, including plans for managing solid and liquid waste, training on efficient energy use and protection of flora and fauna, and detailed plans for forest compensation—planting trees to offset the ones that were cut during construction.

This plan must also address social issues such as workplace health and safety, how women will be included, and community engagement during the different phases of the project. The IDB must approve the document before the operator can start the project.

Getting the operators to incorporate social and environmental safeguards into their work was one of the first challenges for the Sustainable Rural Electrification Subprogram.

BOX 2

PROGRAM INFORMATION

Name: Sustainable Rural Electrification Subprogram*

Borrower: TSP Fund

Guarantor: Republic of Colombia

Amount: US\$91 million

Project start date: May 2017

Project Site: Colombia

Executing Agency: National Disaster Risk Management Unit, under the Office of the Presidency of the Republic

***The Sustainable Rural Electrification Subprogram is part of a larger program for the Colombian Pacific region that includes another subprogram (water and basic sanitation). The total loan amount is \$231,400,000.**

Part of the problem was that operators did not view these protections as their responsibility, simply because they had never paid attention to them before. Additionally, under Colombian law, rural electrification projects with low and medium voltage lines do not require environmental permits. Without this legal hurdle, operators had little incentive to prioritize these protections and adhere to international environmental and social standards.

Upholding environmental and social safeguards also requires additional time and effort. And it's hard to ask an operator to make a difficult change.

How did the team overcome this challenge? First, they made it clear to the operators that

they couldn't receive any of the loan money unless they implemented environmental and social protections. They also took a cue from the first challenge and engaged with the operators. The executing agency and the IDB held workshops to explain these protections and their significance, as well as train staff in how to create environmental and social management plans. They also assisted the operators in creating and monitoring those plans

Most importantly, they insisted that the operators hire or assign staff especially for these tasks. As it has with its other projects, the IDB not only helped the operators, but helped develop institutional capacity that will benefit the Sustainable Rural Electrification Subprogram and future projects.

Changing user attitudes

The normalization projects in Cauca (connecting and installing smart meters for prepaid billing) have been challenging because of how communities in these areas relate to public services.

In some towns, users pay for electricity, but do not want smart meters. This can be for a variety of reasons. For instance, many are afraid that if they install the meters, they will lose their energy subsidies from the government.

In other areas, users are connected to the grid illegally and see normalization as a threat because now they will have to pay for the electricity they use. They have never paid for the service before and are now being asked to accept a prepaid system—similar to prepaid mobile phones (see Box III).

Part of the problem is simply lack of information. The team worked to explain how the prepaid system works and assure communities that their energy subsidies would continue. But the other challenge is getting residents to understand that the quality and continuity of service depends on consumers paying for what they use. If some people pay for electricity and others steal it, service will be bad (and unfair) for everyone.

Several workshops and meetings were held to educate communities on these points. The team also talked about the advantages of normalization. When consumers pay for their energy use, service interruptions get fixed. If a transformer is damaged, the operator must replace it. No one is obligated to fix

service interruptions for a user who does not pay for their electricity. In the long term, the choice is to pay for service, or to not have service at all (or poor service).

This continues to be a struggle. Some users have agreed to install the meters, although there is still resistance to the prepaid model (the smart meters also allow for a postpaid option). So, the executing agency decided to launch a pilot project in Tambo to convince a small community to use the prepaid meters for a short period to demonstrate their benefits. If the pilot is successful, it can be an example to other communities when persuading them to adopt the new system.



Hard-to-reach project sites

Some of the areas where Sustainable Rural Electrification Subprogram projects are being implemented are not easy to access. The problem is not so bad in Cauca and Valle

del Cauca, but in Chocó and Nariño, there are places that can only be reached by boat.

Getting to Río Gualajo and San Miguel Sipi is complicated. A trip to Río Gualajo involves catching a ferry in San Andrés de



Tumaco, making a half-hour journey across the Pacific, crossing the Rosario river, and heading up the Gualajo river to the village of San Agustín. This can take between two and six hours depending on what transportation is available (ferries can go faster than more unsteady craft like canoes and smaller boats).

This makes it hard to transport materials and equipment, as well as project staff. How did the team overcome this challenge? By working together with the project beneficiaries. These communities have plenty of experience navigating the waters in their territories, and that knowledge has been indispensable for moving people and supplies efficiently.

In Río Gualajo, transformers, posts, and cables for the transmission systems had to be transported by boat. The tides there are unpredictable; sometimes they are so low that navigation is difficult. But the residents have a lot of experience with these tides: they know the tide schedule and the different routes they can take to get where they need to go.

Land routes aren't any easier. The community built pulleys to move posts, transformers, and other heavy equipment from tree to tree in places where the thick vegetation was impassable.

BOX 3

PREPAID SYSTEM

In a postpaid system, a home is connected to the electrical grid, and the grid operator records how much electricity the home uses. Then, based on that information, the operator sends a monthly bill to the user.

A prepaid system turns this on its head. The customer pays for the electricity they plan to use before they use it. How? They buy a card worth a certain number of kilowatt hours. Each home has an electronic meter where the card is inserted. When the balance is low, the meter alerts the customer so that they can reload their card before the system automatically cuts the power. If the power is cut, the user simply needs to reload the card and reinsert it into the meter, with no additional cost for restoring service.

This system offers advantages for the customer and the grid operator. Customers have more control over their electricity use and how much they pay. Using the meter's hourly use rate, customers can determine which appliances use the most electricity.

For companies, there are three advantages. First, because customers must pay for their electricity before they use it, there are no more missed payments. Second, it allows the company to save money on processing, issuing, and sending out bills, which allows them to lower their rates. Third, customers finance the company's operations before it incurs its costs, rather than the company financing its operations and hoping that customers subsequently pay for the service.

Safety and security

Nearly all the projects in the Sustainable Rural Electrification Subprogram face security challenges. Drug traffickers and illegal armed groups have a strong presence in the four departments that are part of the program. It is not unusual to see coca crops near installation sites for transmission or distribution lines, or service connections or meters.

These groups are a threat to the project in several ways. First, they view any outsiders who come into their territory with suspicion because they don't know whether they work for security forces and are there to spy or gather information. Second, they sometimes try to extort contractors to allow them work in their territory, which brings construction to a halt. Third, conflicts between different groups can put project implementers at risk.

Projects in Río Gualajo and San Miguel Sipi were suspended more than once due to problems with illegal groups, causing delays and cost overruns. Illegal groups in Cauca have conspired to block meters from being installed in some towns and villages. The reason? These groups steal electricity for their illicit activities, and they would rather preserve the status quo. Conflicts between these groups have made it hard to get into Balboa and Argelia, two towns in Cauca. As

a result, the estimated number of beneficiaries for that normalization project has been lowered.

Just as with access, overcoming the security problems was only possible because of the relationships the project teams developed with the communities. Local residents are in the best position to make these groups understand that the contractors and operators are just there to implement their projects. They also know the best ways to lower the risk of conflict with these groups. They can provide valuable information about where contractors can work and where they can't, the safest routes, the least dangerous times of day, etc.

Because of the workshops and activities, the communities not only familiarized themselves with the project, but involved themselves in its execution to the point that they felt ownership over the program. This sense of ownership led them to defend the project and find solutions to the problems caused by the illegal groups.

OUTCOMES

So far, two projects from the Sustainable Rural Electrification Subprogram have been completed in their entirety. The first is the distribution line in Morales, Cauca, which will provide electricity to 822 users, 18 schools, and 7 health centers.





The second is the Río Gualajo transmission line. 192 users—approximately 1,000 people—in these communities already had reliable, quality electricity. But it was limited to just a few hours a day. Now the entire populace has uninterrupted service. Since electrification, several former residents who had fled the area due to safety concerns have returned.

What impact will these projects have? Although it's still early (especially for the recently completed project in Morales, see Box I), some benefits are already emerging; others are easy to predict.

The new electrical service means students can use computers and have internet access in schools. Formerly unsafe areas are now well lit, and students have more hours available to study. In communities with electricity, fewer children drop out of school. An IDB study in Brazil found that dropout rates fell 27% in rural Brazilian schools that were electrified between 2013 and 2016.

There are positive signs of development in Río Gualajo. Electrification has given rise to new job opportunities and small businesses, such as beauty salons, ice cream shops, and sawmills. Employees from the Department of Social Prosperity, the state entity in charge of

promoting economic enterprise, visited the area to see how they could help communities grow their small businesses.

Río Gualajo is also a role model in other respects. The project used 58% local labor. Community members performed all kinds of jobs, such as transporting people and supplies, providing housing and food to project staff, technical and supervisory work, and more.

As part of the forest compensation plan, the project team planted 1,500 trees. The community decided that one third of the trees should be cacao so that they can be used for commercial purposes. Now that they are no longer using diesel generators for electricity, communities will emit an estimated 740 fewer tons of CO₂.

Other projects are nearly complete. One of the largest is a distribution line in Tambo. Once finished, it will serve over 2,000 users, 17 schools, and 7 health centers. The normalization project in Cauca, which covers 3,500 users, is also coming to an end, as is the transmission line project in San Miguel Sipí, which will serve 40 towns in Chocó and 858 users. There are still more than a dozen projects awaiting approval, either in the design stage or undergoing feasibility studies.

Important lessons

Work “with” and not “for” the communities

There is no better partner than the communities themselves. This is one of the most important lessons of the Sustainable Rural Electrification Subprogram. Or as members of the project team say, the work should be done “with” communities and not “for” them.

There are several advantages to this approach. First, the communities know the area and their needs better than anyone, so they can provide valuable insights into how these projects

should be designed and implemented, as well as help adapt the solutions to their problems.

Second, building a relationship with communities has a practical advantage for project implementers. When communities understand the details of a project, they participate in its execution and get involved in decision making, which reduces the risk of conflict.

Third, when implementers work with communities, they can better understand how the communities work: how they make decisions, who makes them, and how long





it takes. Indigenous and Afro-descendant communities on the Pacific coast have distinct organizational structures. The former has a town council and a governor that make important decisions jointly. The latter works through community councils that have an executive committee and a legal representative. Knowing who oversees decisions and how they are approved is important for executing projects quickly.

Building a relationship with communities also reduces the chance of unintentionally

causing harm. During workshops in Nariño, Cauca, and Chocó, implementers learned about the medicinal and cultural value that certain plants have for these communities. Without these conversations, those plants might have been cut down during the installation of distribution and transmission lines.

Getting communities involved requires a big commitment of time and resources. But it can lead to shorter timelines and better results in the long term.

Changing attitudes requires continuous effort

A common obstacle for several Sustainable Rural Electrification Subprogram projects has been how hard it is to change attitudes—among users and operators.

For users, the challenge was changing how they related to public services and encouraging a culture of energy conservation. For operators, it was shifting how they viewed environmental and social issues.

These changes take more than just a single workshop at the beginning of the project. They take continuous commitment and support, even after the project is over. Changing minds is not a task that can simply be crossed off a to do list; it must be worked on every day. Progress is slow and gradual, and success is usually partial. Once the communities in Río Gualajo were electrified, the project team held seminars on efficient energy use. But many users still began using too much electricity as soon as they had access to the new service. It was clear that one meeting—or even a few meetings—was not enough to build habits and create a culture of energy conservation. Learning should be constant; it should take place

before, during, and after a project, not just at the beginning.

This is also true of the service connections and smart meters. So far communities have had trouble adapting to the prepaid system. But, knowing how hard it is to change attitudes, the team has continued to communicate the advantages of the new system.

The same lessons can be applied to the operators. As projects have moved forward, operators have begun to understand the many benefits of prioritizing environmental and social safeguards. Operators are learning that there are advantages to enforcing these protections apart from the intrinsic value of protecting the environment and prioritizing social issues such as workplace safety. For example, encouraging responsible energy consumption is aligned with the goal of making a profit.

But getting operators to reassess how they see these protections also requires continuous effort throughout the life of the program.

The demonstration effect

Construction on the transmission line to Awa in Nariño did not start until



after the project in Río Gualajo was already complete. Both projects had to overcome the challenge of aligning various stakeholder interests. However, it was easier in Awa because the team had a new tool: they could point to the success of the Río Gualajo project and the lessons learned there.

Awa leaders visited the villages of Río Gualajo to see the completed lines and speak with members of the community. Río Gualajo was held up as an example during meetings and workshops to highlight the importance of shared responsibility and reiterate that success was dependent

on different groups working together. This encouraged Awa leaders to sign the agreement and inspired the community to participate.

Many communities on the Pacific coast have lacked basic services like electricity for a very long time. As a result, residents view initiatives to fix these problems with a degree of skepticism. A successful project is a powerful tool that can spark interest and win credibility for other projects.



THE CHALLENGES OF SUSTAINABILITY

Grid operators need to understand that continuous dialogue and collaboration post-project is key for service delivery, especially when communities are in relatively isolated, hard-to-reach areas. The operator needs to know if there is a problem with the internal wiring, or if a tree falls and damages a power line. Some of these issues can be managed using technology that monitors problems with the grid. But others require ongoing contact with communities.

Another significant challenge is maintaining a service that will collapse if users don't pay for it—in a low-income region.

Conservation and efficient energy use can help, but higher incomes and increased development are another part of the solution.

Small businesses have begun to pop up in

Río Gualajo, where all residents are now connected to the grid. These communities have asked the executing agency to help with these initiatives, which is significant. Even though it goes beyond the scope of the Sustainable Rural Electrification Subprogram, the team is looking for ways to help these small business owners under the umbrella of other programs.

There are several benefits to supporting economic activity in these areas. For example, the Government of Colombia has championed crop substitution programs, which help families who previously made a living growing illicit crops transition to legal activities. Although electrification isn't part of these substitution programs, it creates opportunities for alternative income streams and eases the transition for communities.

The purpose of the Sustainable Rural Electrification Subprogram is to reduce poverty and narrow the socioeconomic gap. But whether this happens will depend on the sustainability of the electrification projects.

BOX 4

THE ROLE OF WOMEN

According to the 2017 Global Gender Gap Report, Colombia ranks 36th in women's inequality— below Nicaragua, Bolivia, Barbados, the Bahamas, Cuba, and Argentina. On the Pacific coast, this disparity is apparent. Many communities are led by men, and women's participation is limited to housework.

The Sustainable Rural Electrification Subprogram attempted to combat this inequality. One of the project goals was to employ local men and women, both as labor and to provide transport, lodging, food, and other services.

In Río Gualajo this was a success. At the start of the project, meetings and workshops just for women were organized in each village. As a result, women were hired for certain jobs, particularly preparing food and providing lodging.

It also led to the creation of a “Committee of Women Caring for the Community”. Once the project was complete, this committee took on important tasks such as organizing bill payments. The committee created a system in which one person travels to Tumaco each month to pay the bills for all users. Women also helped with technical inspections to make sure that the service connections to homes were safe and operational. Little by little, women are getting involved in electrical service delivery.

Two examples are worth highlighting: during the installation of service connections and meters, a woman worked as an electrician for an electrification project based in Cauca for the first time. There was a similar case in Awa. For the first time in Nariño's history, a woman worked as an assistant on a development project.

Stand-alone solutions

Several stand-alone projects have already been approved, including photovoltaic systems in six municipalities in Nariño and hybrid systems in Chocó and Nariño. These are not included in the sections on challenges and lessons learned because they have not yet started the implementation phase.

That said, stand-alone solutions have their own sustainability challenges.

These systems are a service, and someone must provide that service and collect

money for it. They are quite sophisticated, meaning that operators need a certain level of technical capacity. Ideally, these services would be provided by capable, established operators like the ones that built the transmission and distribution lines in Chocó and Nariño. However, the only operators with a presence in these communities are small businesses without much technical capacity. So, in addition to installing these systems, project implementers must build the capacity of these local operators. The sustainability of the photovoltaic and hybrid systems depends on their ability as service providers.





