



Rural women and solar energy: barriers, findings, and opportunities for companies in the sector

A study conducted in Colombia
and the Peruvian Amazon.

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ALIVE Ventures (ALIVE) is a leading impact investment fund manager in Latin America with more than USD 80 million in assets under management. Through its funds, ALIVE invests in innovative, scalable companies that combine financial returns with significant social and environmental impact, focusing on solutions that foster sustainable economic development, reduce inequality, and strengthen the climate resilience of low-income communities in Latin America. More information on its [website](#).

Pro Mujer is a social enterprise that has worked for more than 36 years to advance gender equality in Latin America. During the 2022-2026 period, Pro Mujer, through its gender knowledge lab (Gender Knowledge Lab), provided technical advisory and consulting services to institutions across Latin America — whether from the public, private, or third sector — to help them integrate a gender, diversity, and inclusion lens into their products, services, and operations and move toward more inclusive practices. More details are available on its [website](#).

Ingeniería Sin Fronteras Argentina is an interdisciplinary civil association that drives engineering projects for community development in urban and rural areas of Argentina. Since 2012 it has worked on the design and implementation of technological solutions related to access to water, energy, community infrastructure, and work and production, alongside communities, social organizations, universities, companies, and public agencies. It has completed more than 40 projects, mainly in Buenos Aires, Córdoba, and Santiago del Estero, such as rainwater harvesting and storage systems, vehicle bridges, expansions of kindergartens and community buildings, a community swimming pool, as well as the incubation of worker cooperatives linked to solar energy and construction. Its approach combines technical tools with participatory methodologies across the different stages of its projects, promoting collective processes that strengthen local capacities and contribute to sustainable human development from a human-rights and environmental-care perspective. More information on its [website](#).

In recent years, various studies across Latin America have shown that incorporating a gender approach into energy access and energy transition projects improves not only social equity but also the sustainability and effectiveness of the projects. When women actively participate in the diagnostic, design, installation, maintenance, and management processes of energy systems, projects tend to show higher levels of community ownership and greater sustainability of the solutions implemented.

This study was commissioned by ALIVE Ventures with the objective of better understanding how energy initiatives can help reduce gender inequalities in rural communities. It also sought to identify the opportunities generated by mainstreaming a gender approach among companies in the sector.

Analysis of the research conducted is based on semi-structured interviews with six executives from companies operating in the solar energy sector in Colombia and Peru, one representative from a civil society organization dedicated to installing solar solutions in the Peruvian Amazon, and seven specialists and representatives from various fields in both countries, including academics and technical experts involved in implementing public policy. The methodological design also included an anonymous survey answered by 180 rural women who use solar energy in Colombia and the Peruvian Amazon.

Findings from Company Interviews

Organizational culture and policies

- Although several companies have women in different positions, there is a lack of representation of women in decision-making roles and technical positions.
- Most companies lack internal policies that actively promote the inclusion of women in the roles mentioned above, and they likewise lack specialized gender units or specifically assigned roles.
- In general, a gender approach is seen as something still on the agenda rather than something already integrated into strategic planning.
- Institutional communication reproduces gender stereotypes, portraying women mainly as users and men mainly in technical or leadership roles.

Impact on women and user communities

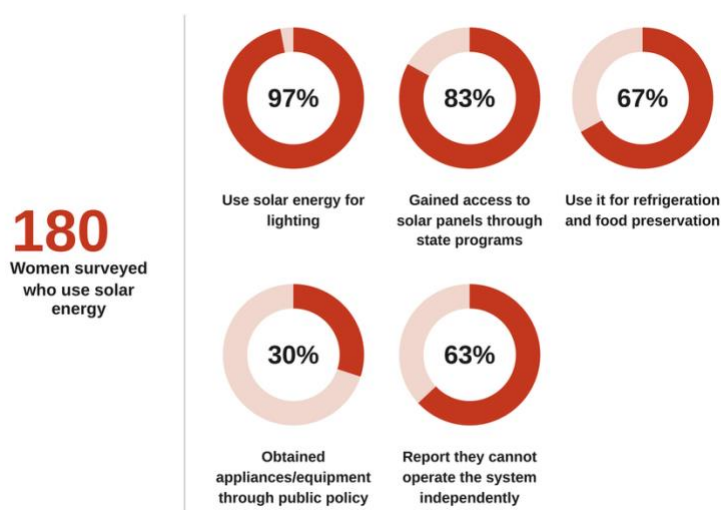
- By bringing solar energy solutions to unconnected territories or remote areas, companies energize the local economy.
- Connectivity and communication are spurred by energy access and are key to promoting greater economic autonomy for women in rural areas.

Business practices and strategies

- Women's participation in the rollout of standardized products and services is limited, generally to training sessions.
- Most companies do not measure the social impact of their activities or report on it.
- The sector's commercial strategies do not build communication around people and user communities, but mainly around technologies and equipment, leaving out the experiences and the potential benefits generated in everyday life.

Results from the surveys of rural women

- Women are the main users of solar energy at the household level, but they face barriers in using the systems and devices independently.
- Nearly all women use solar energy for lighting, while two out of three use it for refrigeration and food preservation. 57% use it to prepare food and 50% for cleaning — all which could be considered feminized tasks in the region.
- 83% of users report having gained access to photovoltaic solar panels through state programs. However, only 30% obtained the appliances and equipment powered by the generated solar energy through a public program; most acquired them through private purchase.
- Practically all users of their own photovoltaic solar systems use them daily and would recommend them, although 63% report that they cannot operate them independently.
- More than half of the users with their own solar panels say they received no training to operate them.



Recommendations for companies in the sector

- **Implement a progressive roadmap:** develop an internal plan that incorporates gender guidelines, goals, indicators, and owners, ensuring periodic follow-up and the consolidation of actions over time.
- **Build capacity:** strengthen internal teams through training programs, workshops, and mentoring, drawing initially on external organizations if needed, to ensure a gender approach is adopted and sustained.
- **Design products and services:** apply the findings on users to optimize the use and operation of solar systems, including manuals, visual guides, and support materials that facilitate correct use.
- **Refine communication:** involve communications teams in field activities, testimonial gathering, documentation of experiences, and the generation of information on the changes produced in the lives of the users and beneficiary communities, to strengthen the company's commercial strategy.
- **Develop relevant, accessible commercial offerings for rural women:** treat rural women as a strategic and diverse segment, designing products, services, payment options, usage demonstrations, and after-sales support tailored to their needs and ability to pay.
- **Conduct trainings to reduce gender gaps:** implement programs adapted to the users' context, including visual teaching materials and participatory workshops, taking into account education level, languages, and local cultural representations.

- **Advocate within the sector:** document and share gender protocols and good practices in forums, sector networks, and business chambers, generating replicable standards and inspiring the adoption of inclusive practices across the industry.

03 · STUDY CONTEXT AND OBJECTIVE

Access to safe, affordable energy is a fundamental condition for wellbeing, production, education, health, and quality of life. However, inequalities in energy access, use, and management do not affect everyone in the same way. In rural settings, women tend to take on most of the tasks linked to caring for the home and for other people, such as cooking and fetching water, among other activities. As a result, limitations in access to energy services generate disproportionate, differentiated impacts on their time, their development opportunities, and their economic autonomy [1].

The availability of electricity improves access to information, connectivity, education, and health — including telemedicine — and increases safety in public spaces through lighting, an aspect that is particularly relevant for women. It also eases domestic and care work, opening access to other rights and development opportunities.

In rural areas, solar energy systems are mainly used for lighting, food refrigeration, charging mobile phones and other communication devices, as well as powering schools, health centers, and community services. They can also boost productive activities and local initiatives, creating new economic development opportunities for rural women.

Within the framework of a just energy transition, understood as the process of transforming energy systems to be more environmentally sustainable and more socially equitable, access to renewable energy in areas without a conventional electrical grid has a twofold positive impact: it improves communities' living conditions, and it does so through less polluting alternatives. In this process, understanding how gender inequalities shape the benefits associated with energy is a strategic factor for the design and implementation of solutions. Integrating this lens makes it possible to develop more relevant products, services, and intervention models, strengthen the sustainability of projects, and create new opportunities to expand the reach and impact of companies.

04 · SCOPE AND METHODOLOGY

This study aims to identify opportunities for companies that implement solar solutions in remote or unconnected rural communities, helping them to close gender gaps. To that end, it sought to understand how rural women use energy and the practices, approaches, and challenges faced by companies.

The analysis focused on Colombia and the Peruvian Amazon, in territories where decentralized solar solutions play a significant role in expanding energy access. While the results are not intended to be representative of all rural contexts in Latin America, the findings may be useful for interpreting dynamics present in other territories with similar characteristics.

The methodological strategy combined qualitative and quantitative tools together with an analysis of secondary sources. In the first stage, a documentary review was carried out covering regulations and public policy in each country, specialized studies on energy and gender, sector information, and available statistical data. This analysis made it possible to characterize the energy context, understand how the sector has evolved, and build a reference framework for interpreting the study's findings.

Fourteen semi-structured interviews were then conducted with key actors in the energy ecosystem. These included interviews with six executives from companies linked to the solar energy sector in Colombia and Peru; one representative from a civil society organization that implements solar solutions; and seven specialists and representatives from various fields in both countries, including academia, as well as technical professionals and members of institutions involved in designing or implementing public policy related to energy, rural development, and gender.

The companies interviewed are part of a diverse ecosystem that combines energy service delivery models, infrastructure development, and technology operation in the field. Their activities include providing decentralized energy solutions, photovoltaic microgrids, and hybrid solutions with storage, along with remote monitoring systems, smart metering, and flexible payment mechanisms adapted to these contexts. Financing models combine private investment, debt, subsidies, and public rural electrification instruments, in coordination with state programs and various territorial implementation schemes.

Alongside the interviews, a review of secondary sources on the participating companies was carried out, including their websites, institutional materials, and public communications. This exercise helped identify how they present their solutions, which attributes they prioritize in their value proposition, and how — or whether — they incorporate aspects related to women's experiences.

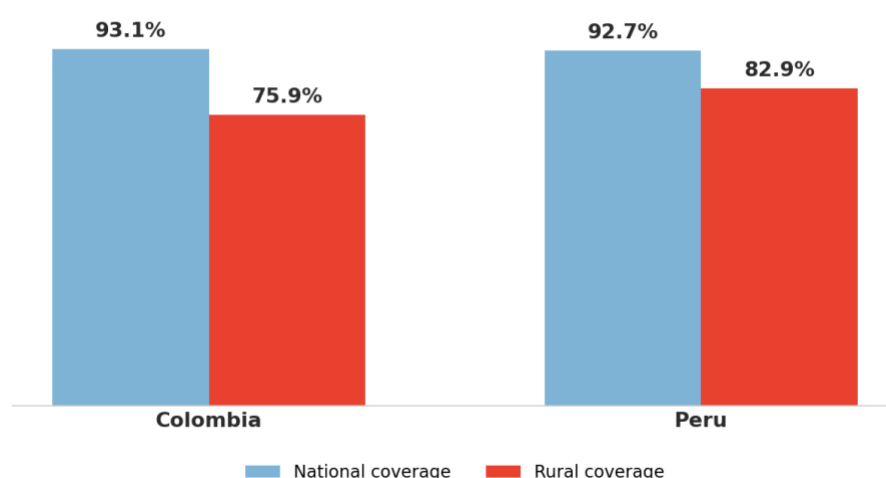
Finally, an anonymous survey aimed at rural women who use solar energy was designed and administered. The instrument asked about usage practices, decision-making, perceived benefits, access barriers, and perceptions of the technology. The survey was distributed across different localities in Colombia and the Peruvian Amazon, reaching a total of 180 rural women.

Combining these tools made it possible to compare the perspectives of users, companies, and other actors in the energy ecosystem, generating a more comprehensive understanding of the opportunities and challenges that exist for incorporating a gender approach in the sector.

05 · GENDER GAPS WITHIN THE SCOPE OF THE STUDY

In the region covered by the study, access to safe, affordable energy remains structurally unequal. Broadly speaking, primary energy matrices are strongly tied to fossil fuels, mainly natural gas and oil, driven by transport and industry. In terms of the electricity matrix, however, power generation retains a significant historical hydroelectric base and is seeing sustained growth in unconventional renewable energy, which is essential for the energy transition [5], [3].

At an aggregate level, the region shows high rates of electricity coverage. In Colombia, the Electricity Coverage Index (ICEE) reached 93.12% of households in 2024, while in Peru, public-grid coverage reached 92.7% of homes in 2024. However, these figures mask a deep territorial gap. While interconnected urban areas are close to universal access to the grid, rural areas lag significantly behind, at around 75.9% in Colombia and 82.9% in Peru [18], [17].



National vs. rural electricity coverage — Colombia and Peru [18], [17]

These territorial inequalities also have a gender dimension. Although coverage indicators are measured at the household level, access to energy does not generate the same benefits for everyone. In rural households, women tend to take on a larger share of domestic and care work, so shortfalls in access to modern energy services increase their workload, limit the time available for education, productive activities, or community participation, and restrict their opportunities for economic autonomy.

These gaps deepen dramatically in hard-to-reach areas — such as the Amazon rainforest, high-Andean zones, border areas, and other extensive territories not connected to national grids — where distances, complex geography, dispersion, and low population density make it difficult to extend conventional electrical grids [16], [14]. As a result, people living in these territories lack adequate access, endure intermittent service, or depend on inefficient, polluting sources such as firewood or liquid fuels to meet basic needs for lighting, cooking, or productive activities.

This situation affects women differently. In Peru, for example, 68.5% of rural households use firewood or other biomass for cooking [15], a task that falls mainly to women, who spend an average of 20 hours a week on it, limiting their time for education or paid employment. This dependence not only perpetuates inequality in the use of time, but also has serious impacts on their health [15]. These conditions recur across different rural contexts in Latin America, where energy poverty limits women's development opportunities.

To address this reality, regulatory frameworks within the scope of the study recognize rural electrification, expanded coverage, and the incorporation of renewable energy as high public priorities, whether by declaring them a matter of national necessity

or public utility, or through specific planning, financing, subsidy, and investment-promotion instruments. Within that framework, recent energy-transition and sector-development regulations promote the integration of renewable sources, efficient energy use, self-generation, and decentralized solutions, through instruments that vary by country, including, among others, tax benefits and tariff incentives in certain cases, to encourage investment. Nonetheless, the explicit incorporation of a gender approach into these policies and into electrification programs is still at different stages of development between the two countries [11], [14].

Added to these inequalities are barriers to participating in energy planning, decision-making, and implementation processes. Available evidence shows that the energy sector remains predominantly male-dominated, with low participation by women in technical and leadership roles [2], [6], a situation that limits the incorporation of their needs, experiences, and priorities into the design of electrification policies and projects.

In both countries, the institutional architecture for energy is led by sector ministries, supported by technical planning bodies, regulatory agencies, and authorities responsible for service oversight. At the rural level, there are directorates or institutes dedicated to promoting solutions for unconnected areas, which align national policies with the specific needs of dispersed populations.

Given the geographic, territorial, and population-density challenges already mentioned, along with the difficulty of providing a private service in remote areas because of the scale, service levels, and speed required, expanding the electrical grid necessarily involves different levels of government. State investment through public policy and subsidies is therefore combined with company participation in building the necessary infrastructure and, additionally, in distributing electricity.

Infrastructure is financed through state funds, transfers, royalties, and/or public-private trusts, while the affordability of tariffs and operations is made viable through compensation funds and subsidy schemes that cover the gap between the high cost of generating energy in dispersed areas and the social tariff that rural families can afford [5], [12], [9]. From a gender perspective, these mechanisms are especially relevant for reducing the economic barriers rural women face in accessing and sustaining modern energy solutions, particularly in lower-income or female-headed households.

06 · IMPACTS OF SOLAR ENERGY ON THE LIVES OF RURAL WOMEN

Within the global and regional expansion of renewable energy, solar photovoltaic power stands out as a strategic alternative given the technological progress and falling equipment costs achieved in recent years, as well as the solar potential available in these territories. Against this backdrop, national governments are promoting rural electrification programs and policies that highlight the importance of decentralized solutions, prominently including standalone photovoltaic systems, microgrids, and hybrid solutions for communities far from urban centers, with specific benefits for women.

The main purpose of these solutions is to replace inefficient, costly, and polluting energy sources. At the community level, they largely replace the intensive use of diesel generators, which involve complex and costly fuel logistics; and at the household level, they replace the historical reliance on candles, oil lamps, and fuel-powered refrigerators for uses such as lighting and refrigeration, as well as — although only partially, depending on the size and capacity of the system — the use of firewood for uses such as cooking, among others.

To adapt to the diverse geographic and demographic realities, from rural town centers to highly dispersed households in the jungle, these technological solutions can be organized into three categories:

Type of solution	Typical application	Main components	Characteristics
Individual photovoltaic systems (home kits)	Isolated or highly dispersed households, where extending an electrical grid is not viable.	One or more solar panels, a charge controller and/or inverter, and one or more batteries.	Provide electricity, generally for basic consumption, to an individual home. They traditionally used lead-acid batteries, with a growing trend toward lithium-ion batteries for their longer service life and lower maintenance requirements.
Solar or hybrid microgrids and minigrids	Villages or communities with relatively concentrated housing.	Photovoltaic solar generation, battery bank, and inverters. Can be integrated with diesel generation and/or small hydroelectric plants.	Allow multiple users to be supplied simultaneously through a local low-voltage grid and combine different generation sources to improve continuity and robustness of supply. Can cover basic consumption and, depending on capacity, other higher-demand uses as well.
Shared access points	Highly dispersed communities where a household grid is not viable and individual solutions do not yet exist for all users.	Centralized photovoltaic system installed in shared infrastructure, such as schools, health centers, or community halls.	Function as collective access hubs for basic electrical services, for example for communications and charging basic devices (e.g., for lighting).

The impact of these systems is reflected directly in consumption patterns and in the transformation of rural life, especially for women given their role in domestic life. At the household or primary level, depending on the size of the system, energy is mainly used for:

- ⚡ lighting mobile phones
- ⚡ charging mobile phones
- ⚡ using radios
- ⚡ using fans
- ⚡ connecting small appliances; for example, blenders and televisions;
- ⚡ connectivity; access to satellite internet or mobile networks.

These uses generate benefits for the whole population, although their impact tends to be especially significant for rural women. The main effects are shown below.

 Improves household conditions , by enabling lighting and the refrigeration of food and medicine, reducing the time spent on domestic tasks that tend to fall on women and improving family wellbeing.	 Extends the hours of light available for nighttime tasks , making it easier for women to combine educational or recreational activities during hours when care work eases up.
 Reduces information and communication gaps , supporting women's access to training, support networks, information about public programs, and economic opportunities.	 Enables access to electronic payment methods , contributing to greater economic autonomy and to the development of ventures and productive activities.
 Facilitates remote medical consultations , a task usually carried out mostly by women, especially in communities far from urban centers.	 Supports access to education and opportunities for training or remote work , expanding opportunities to generate income.
 Provides safety by lighting areas considered dangerous, particularly for women.	 Facilitates access to communication and reporting channels in cases of gender-based violence, by making it possible to charge mobile phones and stay connected.
 Improves access to climate information and early-warning systems , strengthening women's ability to anticipate risks, protect their livelihoods, and take part in community adaptation strategies.	 Supports productive activities , by enabling the use of tools and electrical equipment that let women diversify their production, add value to their products, reduce physical effort, and generate higher income.
 Strengthens access to community services and spaces , by powering schools, health centers, and other shared spaces, making it easier for women to access healthcare, training, connectivity, information, and support networks, in addition to improving conditions for care work.	

In short, access to solar energy in remote areas helps reduce the time spent on domestic and care work, improve access to essential services, strengthen economic autonomy, and expand opportunities for rural women's social and community participation.

The need to understand how companies in the sector incorporate a gender approach stems from the recognition that gaps can be reproduced and even deepened when they are not identified or addressed. Implementing solar systems in rural areas transforms traditional practices and uses. For women to take part in these processes and access their benefits on equal terms, projects need to build this lens into their interventions.

Profile and business models of the companies interviewed

The companies interviewed represent a range of business models within Colombia and Peru's renewable energy ecosystem, and their offerings include solar photovoltaic products and services for rural settings. While all of them seek to expand energy access in these territories, they differ in the type of solutions they offer, the scale of their operations, their financing mechanisms, and how they relate to user communities. These differences matter for the analysis, since they shape the opportunities and challenges involved in incorporating a gender approach into their work.

The main intervention models identified are described in the following table:

Type of company	Value proposition	Revenue and financing model	Relationship with users and tariff structure
Medium-scale infrastructure developers	Design, construction, and operation of larger-scale assets (solar plants, hybrid microgrids, and storage systems) aimed at replacing or supplementing diesel or hydro generation in isolated electrical systems.	Investment in infrastructure, with returns based on long-term power purchase agreements with large customers or local distributors (occasionally within public rural electrification programs). They also operate under "Energy as a Service" (EaaS) schemes for commercial and industrial customers.	For the end user, this translates into a stable service, with tariffs regulated and made viable through compensation funds and state subsidies that cover the gap with the real cost of generation.
Small-system providers (home generation and storage)	Individual solutions for households, small businesses, and rural shops that, being located in dispersed populations, are beyond the reach of the electrical grid.	Small systems, often self-installable and provided under a loan-for-use arrangement, focused on basic-device use and "Pay-as-you-go" schemes with prepaid top-ups. Another model is "Energy as a Service," where the company retains ownership and maintenance of the equipment; given their capacity and features, these systems generally also allow the use of small appliances. Corporate financing combines venture capital, impact investment, and debt.	Direct collection from the end user through local networks or digital payment platforms, occasionally offering flexible monthly plans adapted to the variability of rural incomes.
Integrators of decentralized infrastructure and services	A mixed role that combines developing and building infrastructure (microgrids, public lighting, and energy for community spaces) with	A highly diversified structure that combines own capital, debt, strategic alliances, and, at times, crowdfunding schemes. Starting from government tenders, some	Monthly billing to end users for part of the costs, combined with contributions/subsidies provided by the State, to ensure long-term operational viability.

Type of company	Value proposition	Revenue and financing model	Relationship with users and tariff structure
	operating and managing electricity distribution at a regional or national level.	have also expanded toward large private customers.	
Specialists in appropriate technologies	Engineering and design of custom solutions, specifically suited to tropical climates, that can combine various services such as water and energy provision (for example: solar-powered well pumping, water treatment plants, and standalone systems).	A mixed commercial model with revenue from direct contracts with private companies with local operations, public tenders, and/or budgets channeled through partner organizations.	Work on the ground is usually carried out through Civil Society Organizations (CSOs). They manage their own logistics to ensure the installation and maintenance of schools, health centers, and small businesses in hard-to-reach areas.

The main findings from the interviews conducted are presented below. The analysis is structured around two axes: organizational culture and policies; and territorial impact, products, and commercial strategy.

Organizational culture and policies

UNDERREPRESENTATION OF WOMEN

Although several companies have women in different positions, there is a lack of representation in decision-making roles. The same is true of technical positions, where the absence of women is generally seen as a reflection of the broader underrepresentation of women in technical careers and trades.

GENDER EQUALITY POLICIES

The vast majority of companies lack internal policies that actively promote the inclusion of women in the roles mentioned above. Likewise, those that do have gender-equality policies or initiatives do not make them visible or communicate them.

SPECIALIZED UNITS

Most companies lack specialized gender units or roles specifically assigned to mainstream this lens, and when they do address it, they do so only in an incipient way.

VIEWS ON THE GENDER APPROACH

In general, companies see the topic as an outstanding item on the agenda, a task for the future. Incorporating this lens is not thought of as a process or as a component integrated into organizational strategy.

REPRODUCTION OF GENDER STEREOTYPES

In the images and audiovisual material distributed by companies, women tend to appear portrayed as users, while men mainly occupy technical and leadership roles, reproducing stereotypes that associate technology with masculinity.

Territorial impacts and impacts on women users

ENERGIZING THE LOCAL ECONOMY

It was found that when solar energy solutions reach unconnected territories or remote areas, companies energize the local economy.

ECONOMIC IMPACT ON WOMEN

Women tend to take part in installation work mainly by providing services such as food preparation or laundry, rather than in specialized technical tasks. In some cases, companies also bring them into permanent roles, such as collectors or community representatives. Some of the people interviewed also noted that they prefer to hire women for these roles because they consider them more trustworthy.

REDUCING GENDER GAPS THROUGH CONNECTIVITY

The arrival of connectivity and the communication that comes with energy access is one of the greatest opportunities for community development and for women's economic autonomy.

Business practices and opportunities for improvement

→ Women's participation in products and services

Companies tend to survey community needs; however, when offering standardized products and services, they do not implement participatory design processes. In some cases, they complement their rollout strategy by inviting women to take part in training sessions.

→ Impact measurement

Most companies do not measure the social impact of their activities or report on it.

→ Commercial strategy

Commercial strategies rely on communication centered mainly on technologies and equipment, with little visibility given to users' experiences and to the benefits energy solutions bring to their everyday lives.

Taken together, these findings show that incorporating a gender approach among companies in the sector remains at an early stage, both in internal management and in product design, project implementation, and commercial strategies. This not only limits women's participation in technical and decision-making roles, but can also keep companies from fully understanding their needs, experiences, and contributions as users of solar energy.

Deepening this understanding is an opportunity to develop more relevant solutions, strengthen the impact of projects, and expand the reach of business models.

In this sense, the following section presents the results of the survey of rural women, which make it possible to compare the findings identified among companies with the experiences, uses, and barriers reported directly by users.

09 · SURVEY RESULTS AMONG RURAL WOMEN

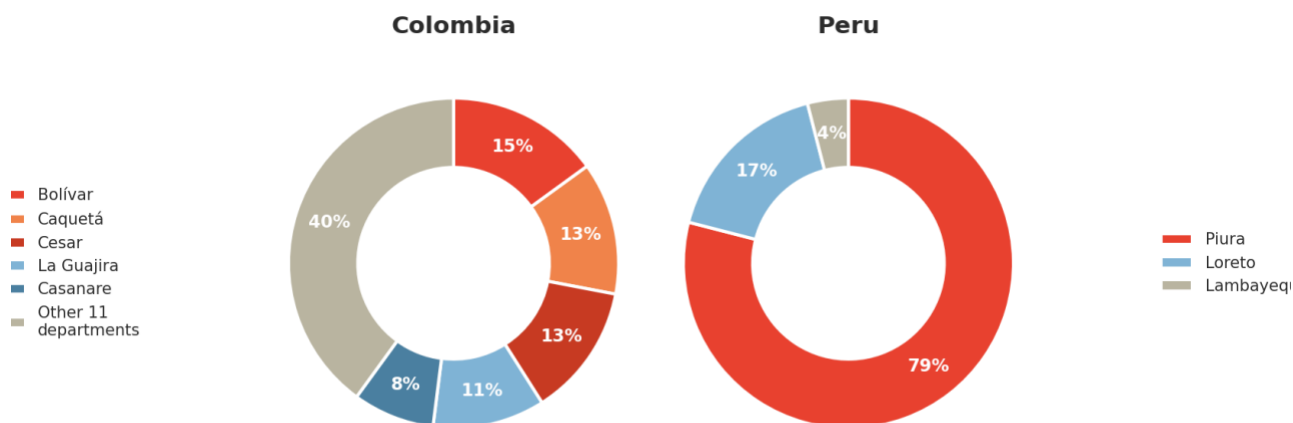
As part of this study, surveys were conducted with 180 women from rural communities with the aim of understanding their relationship with energy in general, and with solar energy in particular, identifying the opportunities it creates in their everyday lives, and learning about their perceptions of its use.

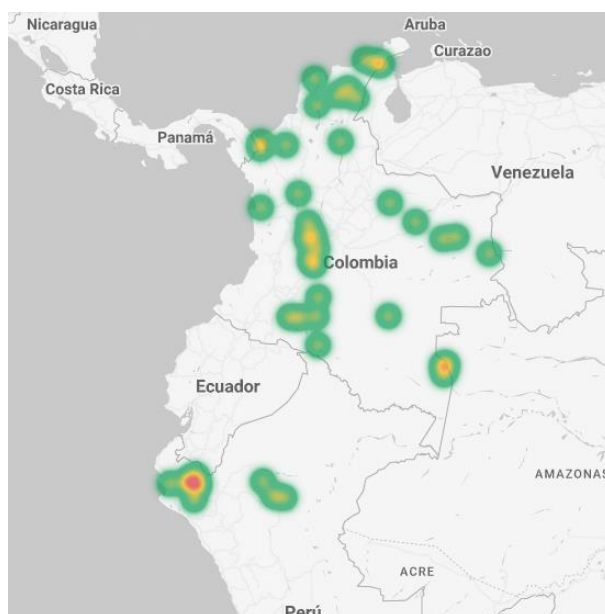
Most of the women surveyed (87% of the total) were from Colombia. Within this group, the geographic breakdown was as follows:

- Bolívar 15%
- Caquetá 13%
- Cesar 13%
- La Guajira 11%
- Casanare 8%
- Rest (11 departments – 40%)

The remaining 13% of women surveyed were from Peru, with the following breakdown by department:

- Piura 79%
- Loreto 17%
- Lambayeque 4%





Distribution of surveys among rural women who use solar energy

Profile of the women surveyed

Around 66% of respondents were between 20 and 50 years old, and 39% identified as belonging to an indigenous community. 60% described homemaking as their main occupation, and 60% lived with their children. In other words, the large majority are heavily engaged in domestic tasks, with their productive activities seen as secondary.

While around 26% did not finish primary school, 51% have completed secondary education, reflecting relatively high education levels for rural, hard-to-reach contexts. However, this higher education level does not necessarily translate into greater participation in paid activities, since a significant share report that their main occupation is care work.

Likewise, 53% of the women surveyed spend between one and three hours a day on tasks related to accessing and using energy, such as gathering firewood, buying bottled gas, cooking, or heating water. This shows that energy poverty involves not only limited access to energy services but also a significant time burden, which falls disproportionately on women and can deepen existing gender inequalities.

66%

are between 20 and 50 years old

39%

identify as part of an indigenous community

60%

homemaking as main occupation

60%

live with their children

26%

did not finish primary school

51%

have completed secondary education

53%

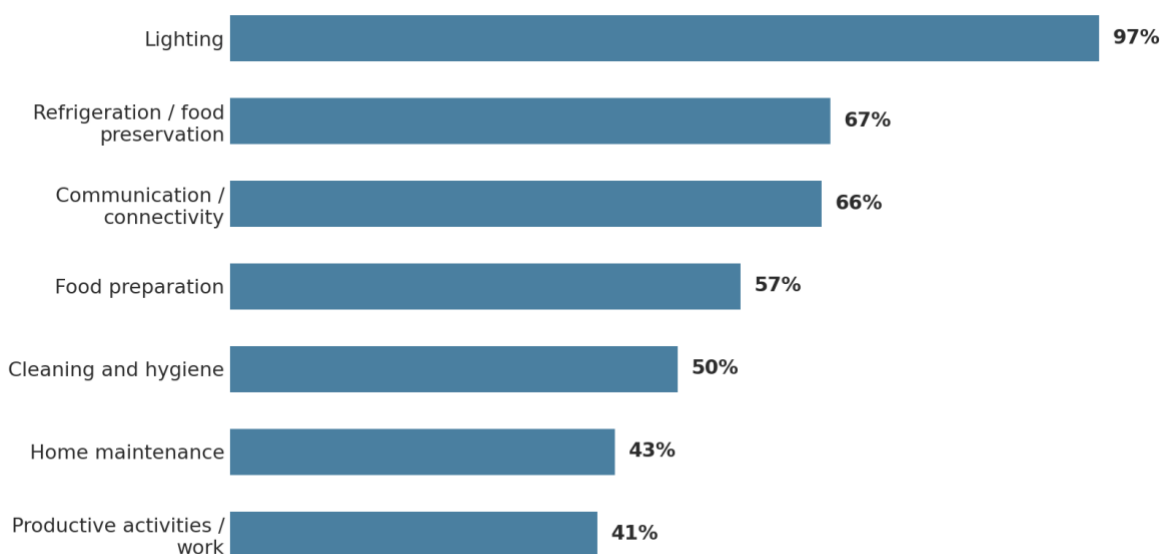
spend 1 to 3 hrs/day on energy-related tasks

On access to and use of solar systems

The findings suggest that women living in remote, unconnected rural areas tend to be the main users of solar energy solutions, since these solutions mainly meet needs linked to domestic and care work, which are mostly taken on by women.

Nearly all women use solar energy for lighting, while two out of three use it for refrigeration and food preservation. 57% use it to prepare food and 50% for cleaning — feminized tasks that, as the surveys show, tend to be carried out exclusively by women.

Among those who reported not having grid access, and who mainly use their own panels to access electricity, the energy obtained is used for the following purposes:



One notable finding is that 83% of users report having gained access to photovoltaic solar panels through state programs, consistent with the country-level data gathered. However, only 30% obtained the appliances and equipment they use with that energy through a public policy; most acquired them through private purchase.

83%

gained access to solar panels via state programs

30%

obtained appliances/equipment through public policy

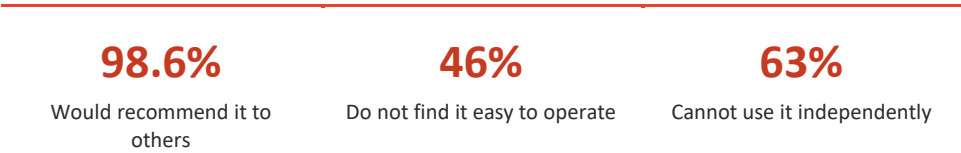
Perceptions of technology use

Practically all users of their own photovoltaic solar systems use them daily and would recommend them. This reflects the broad acceptance and adoption of the technology among the rural women surveyed.

Despite this broad acceptance, nearly half of the women who own solar panels say the technology is not easy to operate, and 63% report that they cannot operate it independently. This difficulty in operating the systems points to a degree of dependence on other people to effectively access energy, even when they have the devices.

It is worth noting that more than half of the women who own solar panels say they received no training to operate them. In this sense, gaps in access to technical training, together with women's perceptions of their own ability to take ownership of these

technological devices, constitute a barrier that is not being taken into account by those bringing solar systems to these territories.



10 · RECOMMENDATIONS FOR COMPANIES IN THE SECTOR

Based on the data gathered through the user surveys and the interviews with key informants, opportunities are identified for companies to incorporate a gender lens into their business models. Beyond helping to close gaps, this approach can strengthen the sustainability of projects, create new market opportunities, and contribute to the growth of the sector within a just energy transition.

Recommendations for organizational management

Implement a progressive roadmap

A gender approach tends to be addressed through isolated initiatives rather than as part of business strategy. A roadmap makes it possible to turn this commitment into priorities, responsibilities, and measurable results, linking it to people management, product design, operations, and community relations.

***Implementation:** Conduct an initial assessment to identify the main gender gaps in people management, operations, products, and community relations. Based on the results, prioritize actions for the next 12 months, assigning owners, budget, indicators, and timelines. Incorporate these goals into the OKRs or work plans of the relevant areas and review progress quarterly to adjust the roadmap.*

Build capacity

Develop practical knowledge so that teams can incorporate a gender lens into their everyday decisions and activities, without needing to create a specialized unit.

***Implementation:** Designate a point person within the team and initially train those who make decisions on people management, operations, products, and community engagement. Training can take the form of short workshops and case studies linked to the company's projects, complemented by simple tools such as checklists or guides that can be built into existing processes. When needed, the company can draw on external support to design these resources or to support their initial rollout.*

Strategic positioning

Align with public policies that prioritize a gender approach when opening tenders or evaluating suppliers for various initiatives. Strengthen the company's position in international funding calls and with impact accelerators aligned with global equality goals and targets.

***Implementation:** Monitor policies, tenders, and calls for proposals that include gender criteria, and factor this information into strategic planning. Assign a person with gender-lens training to be responsible for submitting proposals.*

Recommendations for product design and commercial strategy

Design gender-smart products and services

Gather users' experiences during the diagnostic phase and conduct gender-segmented analyses to identify gaps and opportunities. Factor findings into the product and service design stages.

Implementation: Apply the information gathered on users to optimize how solar systems are used, including manuals, visual instructions, and operating guides adapted to the local culture.

Communicate with purpose

Communicate the positive local impacts that come with installing solar solutions in remote areas, such as energizing the local economy and creating jobs for women, in both the short and long term.

Implementation: Involve communications teams in field activities such as installation, training, and project follow-up; systematically gather testimonials, experiences, and use cases; and generate information on the changes produced in the everyday lives of the people and communities benefited.

Develop a relevant, accessible commercial offering for rural women

Treat rural women as a key segment within the company's market strategy, with a gender and intercultural lens.

Implementation: Conduct brief consultations with women in the communities to identify needs, ability to pay, and barriers to use, recognizing that they are not a homogeneous segment. Using this information, pilot a product or service offering in one or two localities that combines practical demonstrations, payment options adapted to variable incomes, and accessible after-sales support. Measure adoption, sustained use, and user satisfaction before expanding the strategy to other territories.

Include training to reduce gender gaps

Given that women are the main users of solar energy at the household level, along with the barriers women report in using these technologies independently and their perceptions of how difficult they are to operate, training becomes a necessary condition for genuine ownership of these devices.

Implementation: Implement training programs that teach users to independently operate and maintain solar systems and associated devices. This training should include teaching materials and pedagogical approaches adapted to literacy levels, education, languages, and local cultural representations.

Drive change across the sector

Companies with formalized gender policies and protocols, together with significant territorial reach, have the potential to act as references and drive change across the sector.

Implementation: Document gender protocols and good practices and share them in sector networks and business chambers, through success stories and guidance materials. This helps establish replicable standards and influence business chambers, contributing to a more inclusive industry.

11 · FINAL CONCLUSIONS

The solar energy solutions implemented in rural communities in Colombia and the Peruvian Amazon show a positive impact both on communities' access to rights and on the everyday lives of women. While women are the main users of these technologies, the gaps identified — such as women's limited participation in decision-making, the lack of technical training, and women's dependence on others to operate the systems — show that the sustainability and transformative potential of these interventions can be strengthened by mainstreaming a gender perspective.

Analysis of the private sector and of company practices reveals opportunities to improve the fit, adoption, and effectiveness of solar solutions by incorporating a gender approach at different stages of projects. This includes factoring in gender inequalities from the diagnostic and design stages, promoting women's participation, and developing training materials adapted to their needs. Likewise, measuring and communicating the impact of these actions and integrating a gender approach into business strategy can help establish good practices and set new standards for the sector. In this sense, mainstreaming this perspective is an opportunity to strengthen the sustainability and impact of business models, expand demand for solar solutions, and position companies as leaders of a more inclusive energy transition.

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Photovoltaic system: Technology that directly converts sunlight into electricity using solar panels and other components. For the purposes of this study, it is used both in homes and in community microgrids.

Microgrid / minigrid: A local electrical system that supplies a limited group of users from a nearby generation source (solar, hydroelectric, diesel, or a combination of these). It can operate autonomously or connected to the main grid, in the latter case as a complement.

Decentralized / distributed energy: Energy generation close to the point of consumption, without depending exclusively on large interconnected electrical grids.

Gender approach: An analytical lens that makes it possible to identify how inequalities between women and men affect the access to, use, management of, and benefits from resources — in this case, solar energy.

Value chain: The set of activities needed to produce, distribute, install, maintain, and support energy solutions, from design through after-sales service.

Non-interconnected zones: Typically rural territories that are not connected to the national electrical grid, where electrification depends on local or standalone solutions. These areas have complex geography and highly dispersed populations, so addressing them requires a combination of state investment, subsidies, and decentralized technological solutions.

Energy poverty: A situation in which a household or community lacks sufficient, reliable, safe, affordable, and adequate access to modern energy services to meet basic needs and sustain wellbeing, health, and livelihoods.

After-sales service: The set of services provided after installing an energy system, including maintenance, technical support, and operational follow-up.

System sustainability: The ability of energy systems to remain operational and functional over time, taking into account technical, financial, social, and community-ownership factors.

Productive uses of energy: Energy applications that generate income or support economic activities in households, such as water pumping, food refrigeration, or equipping workshops and family businesses.

Energy autonomy: the degree to which a household or community can meet its energy needs using its own or local resources, with less dependence on external supply.

Just energy transition: the process of transforming energy systems toward sources and uses with lower climate and environmental impact, while ensuring social and territorial equity, effective participation, livelihood protection, and inclusive, affordable access to energy.

Energy communities: collective forms of organization in which people, communities, or local entities take part in generating, managing, using, storing, or governing energy, seeking shared economic, social, or environmental benefits.

Unconventional renewable energy: renewable sources other than conventional technologies, such as solar, wind, and biomass energy, among others. These are currently seeing sustained growth and are essential for the energy transition and the gradual replacement of fossil fuels.

Individual photovoltaic solar systems / home kits: Small-scale technological solutions, typically made up of one or more solar panels, a charge controller, an inverter in some cases, and a battery bank, designed to meet the basic needs of isolated, highly dispersed homes.

Shared access points: an electricity installation, located in community infrastructure, that provides shared energy services (in schools, health centers, or community halls), giving basic access to electricity for highly dispersed populations.

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