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Energy Exclusion and Resilience of Amazon People

Report for discussion



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Presentation

The Brazilian Institute for Consumer Defense (*Instituto Brasileiro de Defesa do Consumidor* - Idec) and the Socio-environmental Institute (Instituto Socioambiental - ISA) are members of the Energy and Communities Network (*Rede Energia e Comunidades*), formed by a group of organizations that develop model clean energy projects with and for the sustainable development of traditional and Indigenous people.¹

These model projects contribute to isolated community access

to clean and sustainable energy, in the scope of the public policy aim to universalize access to modern energy services.

The Covid-19 pandemic has put in relief how the lack of electric energy access weakens the conditions of life mainly among the Indigenous populations. The service availability in the region represents not only a quality of life improvement alternative, but also the minimal conditions to improve community resilience in the matter of health.

This report proposes an initial discussion about the urgency and the challenges to provide

¹. For more information, please see the link: <https://www.energiaecomunidades.com.br/>.



the service. The text is divided into four parts. The introduction shows the region's main characteristics, the impacts of the pandemic on Indigenous populations and the measures adopted, by highlighting the public electrical energy services, to facilitate redesigning healthcare services and to provide improved resilience for these people. The next section broaches the electrical energy characterization of the isolated system and the challenges where attention is needed. The third section presents The Xingu Indigenous Territory (*Território Indígena do Xingu* - TIX) case, pointing out the mobilization

toward renewable energy access and the pandemic. Finally, based on the evidence presented, the proposed aspects that should be considered for implementation of universalization of electric energy access policies in the region in the years to come are shown.

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Executive Summary

The Covid-19 pandemic has put in relief the vulnerability of people who live in the remote regions of the Legal Amazon. The lack of access to essential services such as electric energy is associated with higher levels of deaths caused by the disease in the region, as compared to the rest of the country. This scenario shows the urgency to promote universal access to modern energy service in the region. After all, besides improving the quality of life, electrical energy can help in confronting the public health crisis and supporting community resilience.

Brazil undertook a great deal of meaningful effort in favor of electric universalization in past years. The Light for All Program (*Programa Luz para Todos* - LpT) brought benefit to a total of 16.5 million people between 2004 and mid 2019 according to Brazilian Central Power (*Centrais Elétricas Brasileiras S.A. - Eletrobras*) data. But the challenges for remote communities in the Legal Amazon only now have begun to be

addressed, with the creation of the More Light for the Amazon Program (*Programa Mais Luz para a Amazônia* - MLA). Estimates show that there are presently about one million people with no access to modern electric energy in the region.

It is important to highlight that a large part of the Amazon is not connected to the electrical transmission lines of the National Interconnected System (*Sistema Interligado Nacional* - SIN). Electricity in the municipalities and localities where it already exists is therefore rendered by means of isolated generation systems. Most of these municipalities use diesel-fuel generators. These systems have high generation costs, low efficiency and an expensive maintenance needs, besides involving complex fuel transportation logistics and emissions of greenhouse gases. On the other hand, the use of diesel fuel in the region is widespread. The supply chains are well structured and the commercialization of this fuel generates state income by means of tax collection.



Notwithstanding, projects developed by The Socio-environmental Institute in the Xingu Territory region show that decentralized, clean and low-impact energy sources, including photovoltaic energy, are the options with a greater feasibility to serve the people, due to the relative ease of technological appropriation by the communities, because most of their needs refer to intermittent usage and the model does not present difficulties to the families' daily activities. The results of experiments such as these reinforce the need to consider renewable energy sources in new policies for the region.

Considering these experiences and peculiarities, as well as the urgency to expand regional electrification, the Brazilian Institute for Consumer Defense and the Socio-environmental Institute have proposals for rapid and high quality implementation. Such proposals, in particular, are initial contributions, based on the discussions promoted by the Energy and Communities Network, as well as public debate on the subject.

The proposals include the accomplishment of mapping all communities in remote areas, with no access whatsoever to energy and the preparation of an updated national rural electrification plan. Such a plan should be based on the communities'

consultation protocols, to assure the services rendered match the community demands and take into consideration the existing socio-cultural diversity.

The universalization policy would also enable the access to energy services that are safe, sustainable and with low environmental impact, by guaranteeing enough energy to meet the household and the communities' productive needs. The establishment of a robust training and capacity building program can guarantee that the people who live in the area are trained to take responsibility for the systems operation and management. Furthermore, public policy should integrate the overall sustainable development of isolated communities, including such necessities as health, education, housing, basic sanitation, communication and food security.

The recommendation involves the need for a totally transparent timeline and established targets, including criteria for the energy utilities, with frequent monitoring and accountability, as well as conclusion dates so that the universalization of clean energy access in the Amazon region can be fully achieved.



1.

Introduction: Legal Amazon



The Brazilian Amazon region is territorially defined as the Legal Amazon, which corresponds to the Amazon Development Superintendent

(Superintendência de Desenvolvimento da Amazônia – Sudam) area of activity.² In its entirety, the region comprises 58.9% of the Brazilian territory (see Figure 1) (1).

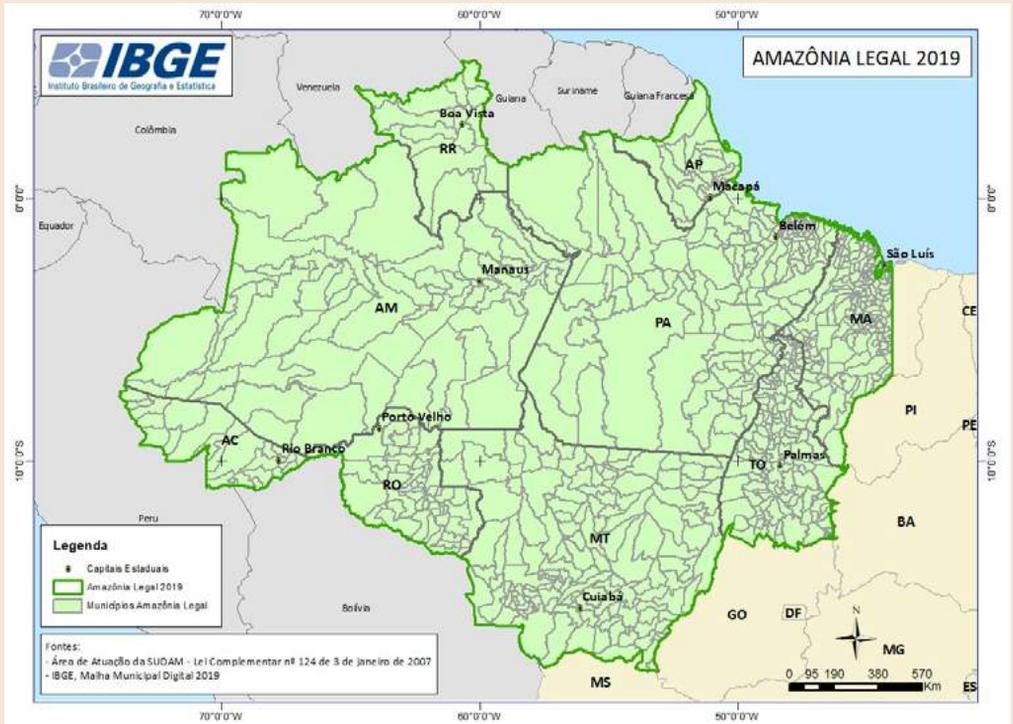


Figure 1. Legal Amazon characterization - Source: IBGE (2019)

². Sudam – the Amazon Development Superintendent’s area of activity is set forth in Art. 2 of Complementary Law no. 124, of January 3, 2007. Sudam’s purpose is to promote the economic integration of the region constituted by 52 municipalities of Rondônia, 22 do Acre, 62 of Amazonas, 15 of Roraima, 144 of Pará, 16 of Amapá, 139 of Tocantins, 141 of Mato Grosso and 181 of Maranhão, located West of Meridian 44 (of which 21 of them are partially integrated into the Legal Amazon). It has a surface area of 5.015.067,749 sq/km.



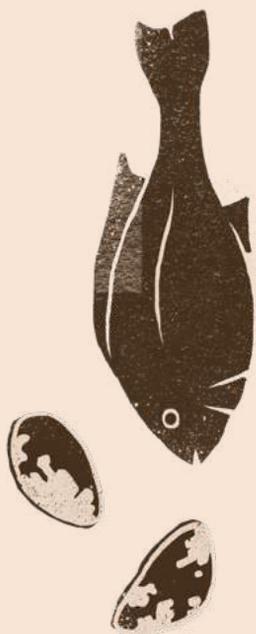
The Amazon shows a far-reaching socio-cultural diversity. Such a diversity is due to the intense migration of populations from other regions and, most importantly, due to the great diversity of Indigenous People and of other traditional populations. At the start of this decade, there were 411 Indigenous Lands (*Terras Indígenas* - TIs) in the Legal Amazon, and the area corresponds to 21.7% of its territory and has 173 people, representing a total population of approximately 250 thousand people (2).

Generally, the region shows low demographic density. The totality of its population corresponds to about 12% of the Brazilian population distributed in an area that, according to the illustration

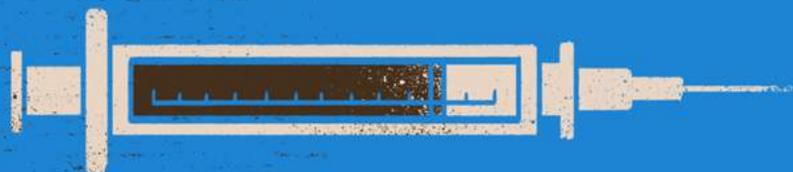
above, is equivalent to almost 60% of the national territory. The population's income and the Human Development Index (HDI) are lower than the rest of the country, according to Table 1 (3). According to data of Municipal Human Development Index (MHDI) of the United Nations Program for the Development (PNUD), among the ten municipalities with the lowest HDI, all of them are located in the Legal Amazon Region (4).

Indicator	Brazil	Legal Amazon
Area (sq.km)	8,510,295.91	5,110,862.50
Estimated population (millions)	210,147,125	6,694,432
Demographic Density (inhabitants/sq.km)	24.69	4.83
Human Development Index (HDI)	0.699	0.682
Monthly Household Income per capita (R\$/capita)	R\$ 1,439.00	R\$ 1,027.35

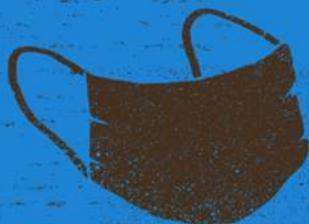
Table 1. Indicators of Brazil and the Legal Amazon - **Source:** IBGE (With no date)



The access to essential services is deficient. The states of the North Region have the lowest level of basic sanitation coverage in the country. It should be pointed out that the subject of infrastructure in the region has always be one of the most difficult challenges, either due to the access difficulties to certain localities or due to the focus of public policies that have given priority to the exploitation of the region's natural resources and have left as a secondary priority the development of a growth model that would consider the basic needs of the local population (5).



2. Covid-19 pandemic impacts in the region





The crisis resulting from the Covid-19 pandemic has put in evidence the vulnerability of the Legal Amazon people. The population living the farthest from the urban centers and, consequently, from hospital beds, are subjected to the greatest risks (6). The lack of clean and reliable electric energy, basic health services and sanitation also increase these peoples' vulnerability.

It should be observed that the isolation of a great part of the population could help in avoiding the infection. The problem is that this isolation is put in risk by increasing land clearing and illegal mining activities. According to a survey carried out before the pandemic, such activities were already perceived by the Indigenous People as a public health problem (7).

The pandemic is mainly impacting the North Region. A study shows that there is a higher prevalence of Sars-CoV 2, being more emphatic, in Indigenous and people of color.

The same study shows that the virus spreading has occurred by fluvial channels and has reached cities of the Northern part of the Amazon River such as Breves (Pará State), where the study has concluded that 25% of the population has had contact with the virus (8).

Analysis of Institute for Energy and Environment (*Instituto de Energia e Meio Ambiente - IEMA*), on the other hand, has identified a connection between the deaths for Covid-19 and the access to electric energy (Figure 2) (9). In those regions with a higher vulnerability - where there is a predominance of Indigenous People and African Brazilians, who live on the river banks and in ancient hiding places for slaves -, there is a higher level of deaths per inhabitant.



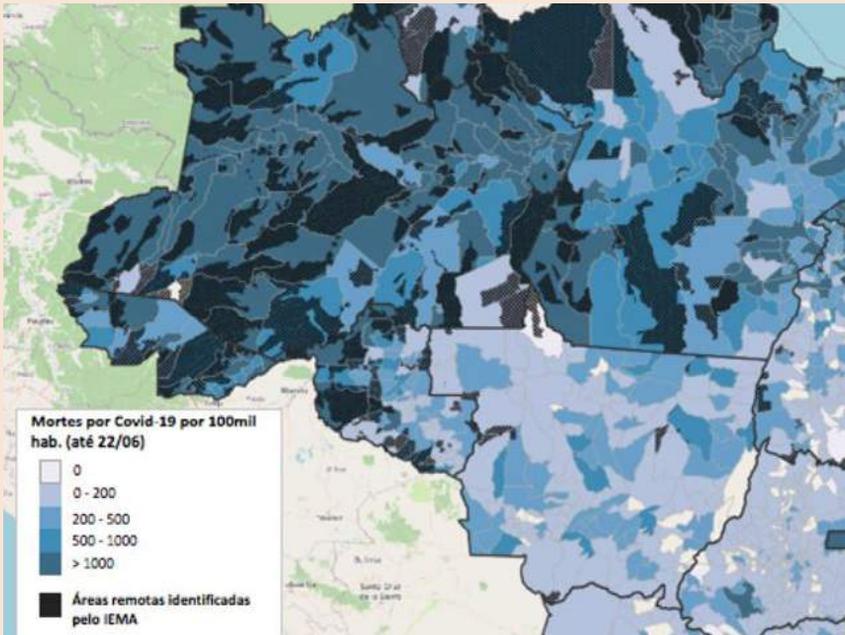


Figure 2. Map of deaths caused by Covid-19 - **Source:** IEMA (2020)

Figure 3 shows the number of deaths informed by the Special Secretariat for Indigenous Health (*Secretaria Especial de Saúde Indígena - Sesai*) and checked by the National Committee for Indigenous Life and Memory (*Comitê Nacional de Vida e Memória Indígena*) (10). It is pertinent to point out that in the context of a lack of mass testing, there is probably a disparity between the number of deaths made public and the real

quantity of deaths. Furthermore, according to data of the Indigenous People's Articulation in Brazil (*Articulação dos Povos Indígenas do Brasil - APIB*), due to the lack of transparency and the absence of information and details from the Sesai, it is not possible to check the duplication of cases between both databases.

The general panorama of Covid-19 among indigenous people is 52,494 confirmed cases, with 1,039 deaths (10)³.

³. Last updated on April 19, 2020.

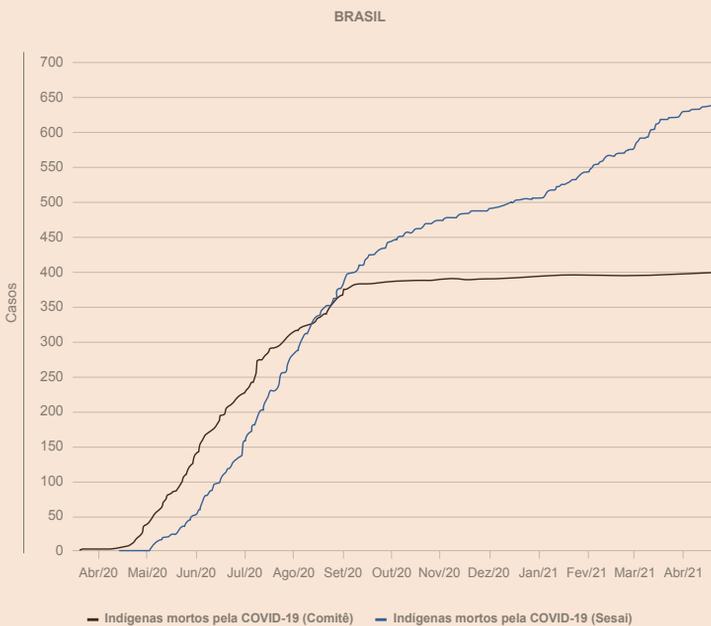


Figure 3. Indigenous population’s death estimate and check for Covid-19 -
Source: National Committee for Indigenous Life and Memory (2021)

Although this number of people is not limited to the Amazon, it is in this region that most of the country’s Indigenous population is concentrated (11). As an example, in the Xingu Indigenous Territory (*Território Indígena do Xingu – TIX*), which will be dealt with later, the first cases of contamination were identified in May 2020, totaling

996 cases and 19 deaths by February 2021 (12).

Considering the dimension of the pandemic within the Indigenous population and the difficulties of displacement to look for medical treatment, the first Indigenous Attention Units (*Unidades de Atenção Indígena – UAPIs*) have been created as a health strategy (13)⁴.

⁴. UAPIs have been created in strategical places in a number of Amazon areas such as Indigenous Lands of Xingu River, Negro River, Yanomami, Panará, Mekrangoti, Baú, Kaiapó, Capoto/Jarina, Juminá, Uaçá, Waiãpi, Tucumaque Park, Zoé, Kaxuyana/Tunayana, Trombetas-Mapuera, Nhamundá-Mapuera; and Extractive Reserve (Reserva extrativista – RESEX) of Anfrísio River, Iriri River, Xingu River.

The UAPIs are campaign infirmaries idealized by Expeditionaries of Health (*Expedicionários da Saúde*), a humanitarian medical organization, subordinated to the Indigenous Special Sanitary District (*Distrito Sanitário Especial Indígena* - DSEI) of Negro River, managing the Indigenous Health Attention Subsystem (*Subsistema de Atenção à Saúde Indígena* - SasiSUS).

These units are able to render services to low-complexity patients, with the use of a number of pieces of equipment to stabilize Covid-19 patients with respiratory problems (13). In these places, access to electricity is essential for patient care.

Other than that, initiatives have emerged to make it possible for indigenous populations to remain in their villages, such as campaigns to raise funds to purchase cleaning and hygiene materials, food and agricultural tools (14). It should be noted that electrification is also one of the factors that facilitate people to remain in social isolation.

Adding to these pandemic control actions, vaccination of Indigenous populations was initiated. At TIX, for example, almost half of the population has already received the first dose (12). In this context, the availability of electricity is essential to support actions aimed at the health area in facing Covid-19, mainly enabling the refrigeration and conservation of vaccines (12).

As will be discussed, access to electricity is indispensable for the success of such initiatives, as it strengthens peoples' resilience. This is because it favors their subsistence and creates conditions for communities to develop and have access to other essential public services.





3. **Energy** **aspects of the** **Legal Amazon**



Several surveys have shown the positive aspects of energy access for people who, previously, did not have this service. According to the United Nations Food and Agriculture Organization (FAO), access to energy generates important multiplying effects, such as food safety, malnutrition reduction, sustainable management of natural resources and generation of local work (15). Given the importance of access to energy, the United Nations established Sustainable Development Goal 7 (SDG 7) – Accessible and Clean Energy, to call upon countries to take action to ensure reliable, sustainable, modern and affordable access to energy for all (16).

The results of Light for All Program (*Programa Luz para Todos* – LpT) also show that electrification generates positive benefits in the quality of life by reducing poverty, facilitating the integration of public services, improving the water supply, basic sanitation and access to education, among other (17, 18).

As far as the populations who live

in isolated areas are concerned, the Institute for Energy and Environment has identified that the electric energy access in community regions among the TIX Indigenous people increased the community's sense of safety, due to the possibility of receiving basic health services and expanded education opportunity in night courses, among other aspects (19).

It should be pointed out that the optimum scenario is that this access be feasible by means of renewable energy, which is preferred by the people because it emits fewer greenhouse effect gases, is not dependent on fossil fuels and eliminates or significantly reduces sound pollution.

Despite the importance of electric energy as a public service, the reality is still much more complex, with social and economic privation, dispersion of the people's territory, difficulty of logistics for and energy distribution companies condition all impose additional challenges for rendering electrical services.⁵

⁵. Most distributing companies that operate in the North region have been recently privatized. Only the Amapá Electricity Company (*Companhia de Eletricidade do Amapá* – CEA) remains as a state-owned company.

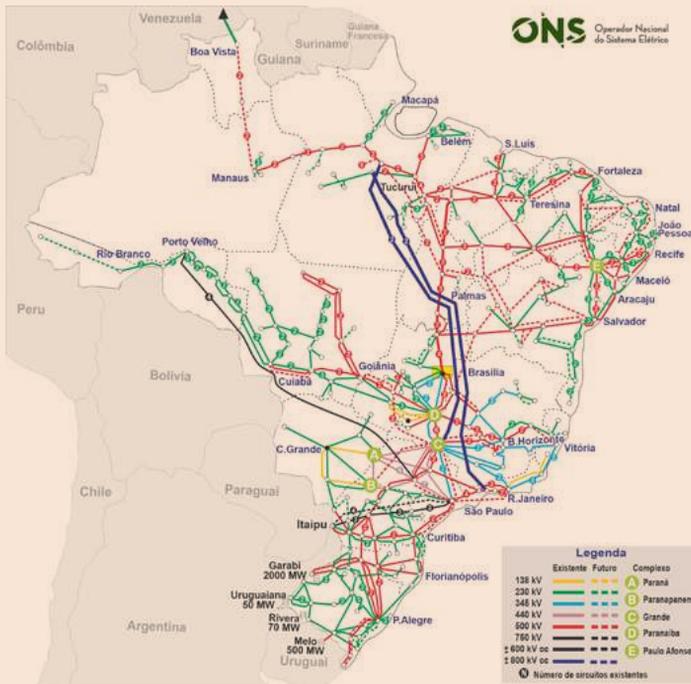


Figure 4. The National Interconnected System: Lines and Expansion Foreseen until 2024. - **Source:** ONS (With no date)

3.1 The Amazon Isolated Systems

An expressive part of Legal Amazon region is not serviced by The National Interconnected System (*Sistema Interligado Nacional – SIN*), i.e., the corresponding electrical transmission grid system and set of installations and equipment that enable electrical energy supply across transmission lines, as shown on Figure 4 (20). Besides the

already mentioned reasons, the lack of a scale that justifies the investment in new lines and the region’s environmental characteristics interfere with extending the network of transmission. Presently, the investments proposed for this region are to connect Boa Vista, the capital of the State of Roraima, to the National Interconnected System.

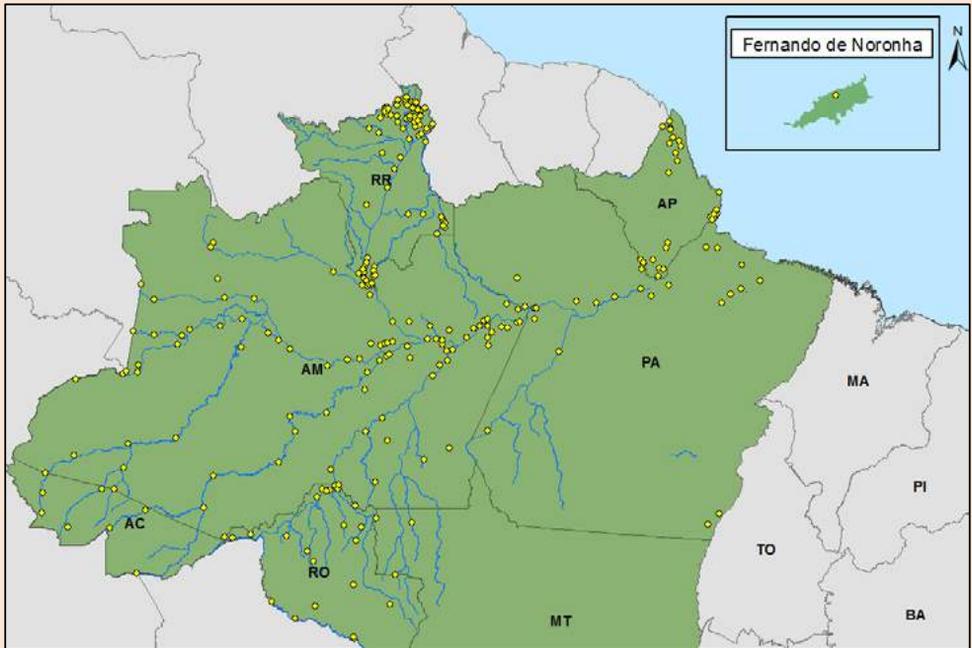


Figure 5. Location of Isolated Systems. - **Source:** EPE (2019)

According to the National Electric Systems Operator (*Operador Nacional do Sistema Elétrico* - ONS), any generation system which is not connected to SIN is qualified as an isolated system (21). Presently there are 235 isolated areas in Brazil and most of these systems are located in the Amazon region, mainly in the states of Rondônia, Acre, Amazonas, Roraima, Amapá and Pará (22), as shown on Figure 5 (23).

As a general rule, the isolated systems are located in the center of municipalities, whereas the remote regions of isolated systems involve small groups that are distant from the municipalities and are characterized by the absence of economy of scale or populational density (21).

Most isolated systems use diesel-powered generator systems for electrical energy generation.



Such systems have high generation costs, low efficiency and high maintenance necessities, besides having a complex fuel transportation logistics and emissions of greenhouse gases. On the other hand, the use of diesel in the region is widespread, the supply chains are well structured and this fuel

commercialization generates state income by means of tax collection, such as the Operations Referring to Goods Circulation and Services Rendering Tax (*Imposto sobre Operações relativas à Circulação de Mercadorias e Prestação de Serviços* - ICMS) (5).

3.2 The electricity access exclusion and the Amazon peoples' development challenges

The Amazon region is the last mile for universalization of electric energy access in the country. Many reasons for exclusion exist, beginning with the distributors' economic-financial conditions, the market characteristics, the necessary investments and the absence of an adequate policy, according to the regional energy supply specificities.

The universalization policies developed until today have given priority to the investments associated with the distribution networks expansion, by following a logic that says that the higher the number of units

supplied, the better the obtained monetary value, increasing the concessionaires basis for remuneration. In national terms, the importance of the Light for All program is undeniable. Promoted between 2004 and 2019, the program has been the most important one developed in the country, making 3.4 million electrical connections feasible and benefitting 16.5 million people, according to the Brazilian Central Power (*Centrais Elétricas Brasileiras S.A. - Eletrobras*) data, which is responsible for operationalizing the program (16).



But, after all these years of policies for energy access universalization, the Legal Amazon remote communities' challenge only recently has begun to be addressed. According to the Institute for Energy and Environment estimates, there are presently about 1 million people with no electric energy access in the region (9). Out of this total, approximately 500,000 people live in remote communities, the supply of which is dependent on off-grid generation systems, i.e., with no connection whatsoever to the distribution network. Despite the relatively lower access exclusion estimates as compared to the Light for All historical figures, the challenges will not be less difficult. The communities' access difficulties, the North Region Concessionaires' investment priorities, and the lack of a business model that attracts investors, have a trend to negatively impact the process.

Based on these challenges, Ministry of Mines and Energies (*Ministério de Minas e Energia* – MME) has created, as per Decree

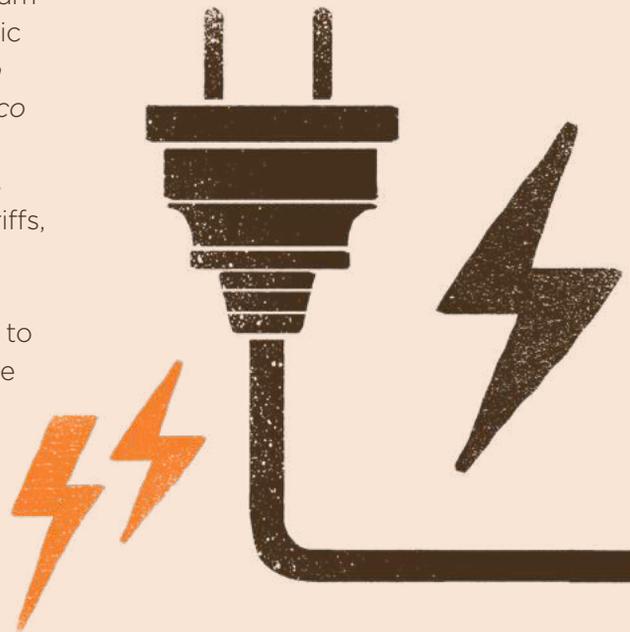
no. 10.221, of February 5, 2020, the More Light for the Amazon Program (*Programa Mais Luz para a Amazônia* – MLA). The MLA focus is to serve the remote populations in the Legal Amazon Region (24). This program, despite being very similar to Light for All, provides efforts to supply this region, based on renewable energy sources. The initial purpose of the program is to render services to 70,000 families by 2022 (25).

Some evidence shows that it is necessary to define strategies to accelerate and improve this process, by considering that the country is not providing a large part of its population their right to energy. In the current context, it is likely that the program will be postponed, as, according to MME information, it is expected that the Legal Amazon region will be completely universalized in 2030 and the program goes until 2022 (26).

The possible postponement of universalization is linked to two main factors. The first one is the way by which the universalization policy is organized, as the processes

validity is much more dependent on the rhythm determined by the distributors with permission by the National Agency of Electric Energy (*Agência Nacional de Energia Elétrica - Aneel*), than by the communities' needs. The second is related to the program costs, covered by the Energetic Development Account (*Conta de Desenvolvimento Energético - CDE*). As the tax budget is formed by several other items and exerts pressure on the tariffs, it is possible to have stimulus to limit the universalization program investments in order to reduce such tax impact. As the consuming units supply cost tends to be higher than the one of previous programs, the project's implementation will be extended for years, as mentioned by MME.⁶

Another worry is about the need to have adequate levels of energy supply so that the Amazon people can develop themselves, meeting the needs related to the productive, cultural, educational and health care activities.⁷



⁶. With this reality it is urgent to review the subsidies that impact the Energy Development Account, keeping up those that are necessary and have a high social return, such as the universalization policies.

⁷. According to the International Energy Agency (IEA) (27), in households, access to electricity should initially make some basic services feasible, such as lighting, cell phone recharging, radio, refrigerator, fan and television set; and ideally, there should be an increase in the availability of energy over time, until it reaches the levels of the regional average. Considering the use of standard equipment, access to these services corresponds to a monthly consumption of 104 kWh, and, in the case of the use of efficient devices, 35 kWh.

MLA advances in order to show this priority. However, it would be important that it should also be forecast in the program's regulations.⁸ This would provide more clarity for the distributors, the Brazilian Central Power and the Ministry of Mines and Energies. Important repressed demand for electricity should also be addressed.

Furthermore, it will be of fundamental importance that the distributed generation systems implementation processes consider the communities free, prior, informed consultation protocols and show a certain degree of flexibility for adaptations, according to specific needs of each community. Considering the multiplicity of people and their different demands, the electric energy uses can vary, according to the way the community is organized (28).

In this context, the World Wildlife Fund (WWF) has surveyed the

results of different renewable energy initiatives in Amazon isolated communities where more than 8,900 people have been directly benefited. The end uses of energy can be examined in Table 2 (29). The energy demands find similarity in essential services, distributed in productive, social and residential services. In parallel to the Xingu case, that is detailed as follows, there are common demands for water supply, sanitation, communication, illumination and food conservation, among other services.

But cultural aspects and each peoples' organization have an influence in their relationship with the electric energy: larger settlements, for their population, and community central areas, for their strategic position, tend to have higher energy demands. These factors can result in specific needs, justifying differences in approaching each community's energy demand.

⁸. The Aneel Normative Resolution number 493 of 2012, that regulates the criteria for attendance by means of an Individual Electricity Generation System with Intermittent Source (*Sistema Individual de Geração de Energia Elétrica com Fonte Intermitente - SIGFI*) or Isolated Electricity Generation and Distribution Microsystem (*Microssistema Isolado de Geração e Distribuição de Energia Elétrica - MIGDI*), determines a 80 kWh/month per consumed unit limit.

Energetic services	Productive activities	Household activities	Public services
Water supply, irrigation and sanitation	Irrigation, cleaning and extraction, products processing	Human supply (drink, take a bath, dish washing, laundry, etc.)	Sanitation
Communication (TV, radio, telephone, computer and internet)	Access to news, coordination with suppliers and dealers, etc.	Entertainment, access to information etc.	Teaching activities
Food processing	Milling, grinding, peeling of natural agriculture products (manioc etc.)	Use of small home appliances (blender etc.)	----
Conservation of food and other products	Refrigeration and ice production to preserve commercialized products (fish etc.)	Refrigeration of food	Refrigeration of vaccines
Illumination	Illumination of corrals, poultry farms fields etc.	Home Illumination	Night courses and community establishments
Energy generation	Production of artifacts, use of electric fence etc.	Home Appliances (ventilator etc.)	Leisure, entertainment and several community's uses

Table 2. Energy uses by isolated communities in the Amazon -
Source: Adapted from WWF (2020)



4. The Xingu Indigenous Territory Case:

An Example of
Challenges to be Faced





Xingu River Basin represents an important diversity of Amazon social-environmental heritage (30). It is the second largest Indigenous Lands corridor in the national territory, with a total of 139,517 sq.km. When added to the conservation units in the basin, these lands form the largest continuous corridor of protected areas in Brazil, with approximately 27 million hectares, located in 40 municipalities of Pará and Mato Grosso states. In these lands, hundreds of families live along the riverbanks and 26 Indigenous Peoples, forming a population of more than 17,000 inhabitants.

The corridor is located on the Amazon agriculture frontier, a region that is under intense pressure from agriculture, mining and illegal activities connected to land grabbing, logging, and land clearing, according to Figure 6.

Most people who live in the corridor guarantee their subsistence from the forest with the production of items such as cashew nut, rubber, honey, tonka beans and vegetable oil.

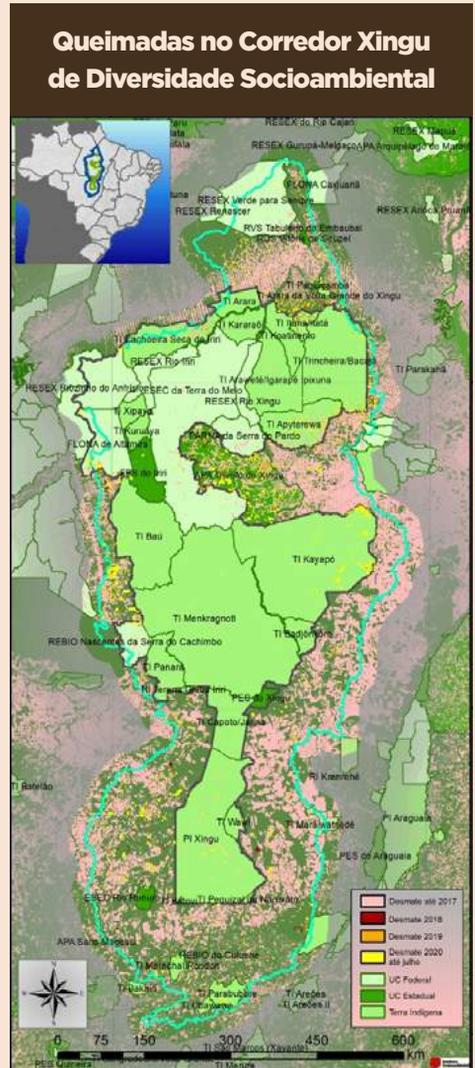


Figure 6. Indigenous Lands Corridor and Conservation Units in Xingu River Basin. - **Source:** ISA.

Some of these items have been produced for a long time, while other forest products are in development by community associations, which belong to Xingu+ Network (*Rede Xingu+*). Gradually, these associations are adhering to the Origins Brazil (*Origens Brasil*) initiative, the purpose of which is the commercialization of low forest impact production with fair trade criteria that adds value to the socio-environmental services that are provided by these people. The system enables above average incomes in the region, stimulating sustainable initiatives for income generation, preserving the forest peoples' cultures and strengthening local associations.

TIX is in the Southern part of the corridor, which is formed by the contiguous territories of the Xingu Indigenous Park and the Wawi, Batovi and Pequikal do Naruvotu Indigenous lands, distributed across 2,825,470 hectares of land, which shares the same administrative management structure. There are a total of 16 Indigenous ethnicities, located in more than 100 settlements, with an approximate population of 7,000 inhabitants.



This is a multi-ethnic territory, with several languages and cosmological systems and a distinctly organized internal policy. The settlements are located along the 1,500 km of rivers that cross the municipalities of Canarana, Paranatinga, São Félix do Araguaia, São José do Xingu, Gaúcha do Norte, Feliz Natal, Querência, União do Sul, Nova Ubiratã e Marcelândia, all of them in Mato Grosso state.

The TIX geographic limits with most of these municipalities represent a management challenge. The Indigenous people should be capable of planning and give priority to their demands, by organizing their political participation in each one of the cities, without losing sight of TIX personality as the main territorial unit. This is accomplished



based on the dialogue between the communities and their associations with a number of municipal administrative jurisdictions which, although they are accountable for a number of public policy actions linked to the Indigenous people, they usually are unaware of the Indigenist policies.

The challenges referring to energy access accentuate the conditions of vulnerability of a great deal of the TIX population. Historically the territory's electrical energy demand is supplied by diesel generators installed by the Special Secretariat for Indigenous Health, the National Indian Foundation (*Fundação Nacional do Índio* – FUNAI) and the Socio-environmental Institute (*Instituto Socioambiental* – ISA), whose administration is in charge of the communities. Many of those generator systems operate intermittently, either because of restrictions to fuel access restriction or due to equipment failure after a long period of usage.⁹

The energy insecurity is connected to the increasing demand for commodities to meet the collective needs and to difficulties and the high costs of obtaining diesel fuel. Adding to that, the Special Secretariat for Indigenous Health fuel supply is inconsistent, and the dispute among the settlements, as the diesel shares are supposed to go to the community central areas, which are places with a higher demand, as they concentrate the health, logistics, education, ethnic associations service centers and the productive activities management.

In this scenario, since 2009, ISA has been striving to find alternatives to increase the TIX communities electric power supply. Besides supplying part of the essential demand, the purposes are to increase the local technical knowledge and to contribute to the formulation of appropriate public policies for the Indigenous people who are excluded from the formal electrical energy supply systems.

⁹. In many communities the diesel supply is not enough to maintain a regular supply with a defined number of hours during the day, and there are serious problems with these systems maintenance.

The initiatives to supply electric energy to TIX, such as the Xingu Solar Project, described as follows, are examples of some of the several realities and challenges to be confronted in the Amazon. These initiatives deserve to be pointed out as they include energy potential studies, pilot-projects for community energy access, analysis of service providing scenarios, internal governance assemblies, territorial

management planning, free, prior, informed consultation protocols, associations, forest products, local technicians formation in energy and studies of the energy access impact analysis. Therefore, they can help in the actions proposed to increase the energy infrastructure to meet the communities' needs. This should be done with dialogue, adequate technologies to each and every reality and stimulus for local management and innovation.

4.1 Xingu Solar Project

The Xingu Solar Project was implemented by ISA in the Xingu Indigenous Land between December 2015 and September 2019, having as partner the Xingu Indigenous Land Association (*Associação Terra Indígena do Xingu - ATIX*) and the Institute of Energy and Environment (*Instituto de Energia e Meio Ambiente - IEE*) of University of São Paulo (*Universidade de São Paulo - USP*).¹⁰ Its objective was to plan and implement a reference model for generating solar energy in isolated communities, based

on potential sites and supported by structured community management arrangements.

Specifically, the project had three components:

1. Install off-grid solar energy systems in community facilities;
2. Train a minimum of 100 local indigenous electricians; and
3. Build and promote local replicable facilities and management systems for clean electricity outside the generation grid.

¹⁰. Xingu Solar was developed with the support of the Mott Foundation, which, within its Energy Access portfolio, aims to provide financial support for the development of clean energy projects.

Basic demands	Additional demands
<ul style="list-style-type: none"> • Water supply • Radio communication • Dental treatment rooms • Refrigeration to conserve vaccines, serum and medication • Medical devices • Portable devices charging • Flashlights charging • Illumination of public use buildings such as schools and health units • Health equipment operation (mainly oxygen inhalers) • Home illumination • Communication and telephone • Food conservation • TV sets, satellite receptor and sound equipment • Tools that facilitate home construction • Tools that facilitate artifacts confection • Manioc grating 	<ul style="list-style-type: none"> • Internet communication • Audio visual production centers • Vehicle maintenance equipment • Production units • Printers • Computers • Spaces for meeting and events

Table 3. Demands for Energy in the Villages



To comply with these provisions, solar energy and mini networks were installed, with buried electric transmission lines. The project provided electricity at TIX to supply 4 schools and 52 attached classrooms; 37 health facilities; internet at 14 locations; 12 community offices; 7 houses for honey production and 4 houses for seed processing. In addition, indigenous technicians were trained in the installation and management of solar systems.

Therefore, more broadly, the initiative contributes to the formulation of public policies that meet the demand for electricity from isolated communities considering the cultural specificities of these peoples.

ISA has 25 years of accumulated experience in permanent

work and dialogue with the local Indigenous communities, which has enabled it to identify energy demand in village and community center areas, as shown in Table 3. Whereas the basic energy demands are common in the villages, regardless the number of inhabitants, additional demands are generally requested in community centers and more populated villages.

Among the alternatives to help in the electric energy supply to meet these demands, the most feasible option was photovoltaic energy because of the relative ease of appropriating this technology by members of the communities, as most needs refer to non-stop usage and because solar maintenance does not place difficulties to the families' daily activities. On the other hand, it has limitations and restrictions in terms of supplying great quantities of energy. Larger investment is needed to buy solar systems to operate larger pieces of equipment and storage systems needed to store

energy. Important technological advances have been made in solar batteries in recent years. Though costs have reduced, relatively high investments are still required.

The general perception among the TIX residents who have received the solar systems is a positive one (31). Considering that they have been installed on community buildings, the best benefits that are observed by the residents and by participants of other projects in Xingu, are in the health area. According to Evelin Plácido, who is a nurse in the Xingu Project of São Paulo Federal University (*Universidade Federal de São Paulo - Unifesp*), “the electric energy enables access to drinking water, dental service and materials sterilization. Furthermore, it enables the immunization within the territory, and the communication and telemedicine access” (32). With the electric energy and the technological incorporation of access, Indigenous health care is improved (33).

As per the Indigenous Peoples’ perception, the health services are very important to maintain their way of life: “without health one does not have culture, isn’t it? If you have health you have how to practice your culture, dance, hunt, fish, each are connected to the other (sic)”, says Kamatxi Ikpeng, an Indigenous motion-picture producer of Pavuru pole (32).

Another aspect described on the subject of health, is the greater safety in electric energy availability as compared to diesel-powered generator systems, to guarantee the adequate serum conservation against snake bites and vaccines, according to Marité Txicao, Indigenous Health Agent: “today we suffer many snake bites, for example. Then, there at the community center, we can’t conserve the snake bite serum due to the energy problem,





because the generator is turned off over a period of time. This serum must be refrigerated all the time, but the generator can't remain on for 24 hours. Talking about solar energy, on the other hand, it will be enough and will be the positive point so that we can have the snake bites serum, and mainly vaccines, conserved in each first aid station that we have in the community center areas" (32).¹¹

The Indigenous people also point out that solar panels cause less environmental impact as compared to diesel generator systems. Among the reasons, they mention the lack of noise, the reduction in greenhouse effect gas emissions and the freedom from dependence on

fossil fuel to generate energy (31). The concerns among groups that have received electric power generation systems and those who have not are very similar. They are about the non-community based electric energy usage – mainly by the young people – the for more technical training for systems maintenance, the lack of spare parts and the insufficient electric energy power for the equipment in villages.

As most of these communities' are organized based on the providing services to the collective interest, the questions about the electric energy availability, its uses and the systems operation are discussed in groups in order to develop more adequate solutions to their way of life, i.e., Xingu solutions are much more efficient for solving problems, according to Paulo Junqueira, joint coordinator of the Xingu Project at ISA (32).

¹¹. There are structures at the community center areas to store the snake bite serum, but due to health protocols that require the presence of a doctor at the place, the serum is not available yet.

The State and Municipal Energy Development Program (*Programa de Desenvolvimento Energético dos Estados e Municípios - Prodeem*), one of the first initiatives of the federal government to enable the installation of energy systems in isolated communities, provided for the training of community personnel to carry out preventive and corrective maintenance of the facilities (34). However, due to the lack of monitoring and evaluation, the systems were deactivated (35). In the Light for All Program, the dynamics were different: the distributor was responsible for the installation and maintenance of the power generation systems.

Faced with these two experiences, initiatives such as the Xingu Solar Project demonstrate the importance of technical training, community involvement and technological appropriation as ways to ensure the sustainability of the action. In the context of the MLA, which reinforces the need for decentralized actions, the management of energy generation systems by the community itself can also strengthen peoples' autonomy and expand the sense of belonging.

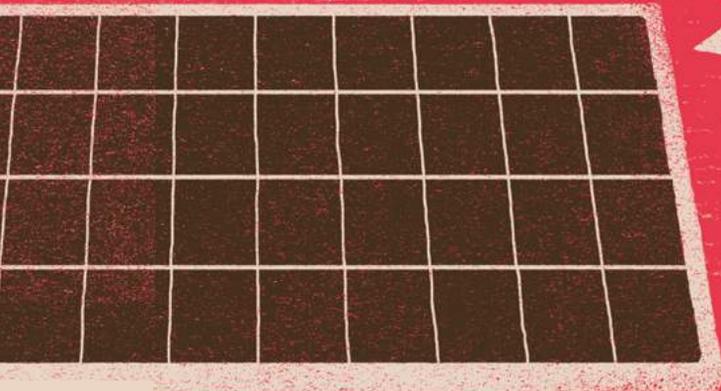
Therefore, replicating this experience under the More Light for the Amazon can reduce the costs of installation, operation and maintenance - reducing the pressure on the Energy Development Account -, and enable the generation of jobs at the local level. Thus, a portion of the beneficiaries would be responsible consumers and maintainers of the systems.

Box 1. Lessons learned and the role of communities in the management of generation systems in remote regions



5.

Idec and ISA recommendations



As described before, this document consists of an Idec and ISA contribution for the discussions of Energy and Communities Network and the society in general about the electric energy access universalization policies in the Legal Amazon.

The Covid-19 pandemic made evident the vulnerable situation of the people who live in remote regions due to the lack of access to essential services. As demonstrated, access to electric energy improves the quality of life, can help in confronting the public health crisis and strengthens community resilience.

According to the MME, the universalization of electric energy access in the country is forecast to occur in six to ten years. Depending on how it is organized, the process term is much more dependent on the rhythm and timing established by the distributors with authorization by the National Agency of Electric Energy, than by the communities' needs.



In this context, we must evaluate strategies that could accelerate this process because the timing forecasted means an important part of the population in the country will remain pushed aside from receiving their rights to modern electrical energy and its benefits for a long time. This evaluation should determine a common agenda based on the articulation among different actors – civil society, MME, electric utility concessions and the regulatory agency – in collaboration with the Indigenous People and community leaders.

The starting point is the production of a complete community mapping of remote areas with no energy access to prepare an updated national rural electrification plan. Such a plan should be designed based on



communities' survey protocols, to assure the full meeting of families' and each people's productive demands, considering the existing sociocultural diversity. Therefore, it will be possible to support sustainable development based on stimulating productive value chains that are connected to the low-impact forest economy, the conservation of the environment and protection of the territory.

Furthermore, it is necessary to have integration with other government policies and programs, as the communities' sustainable development is also dependent on actions in the areas of health, education, housing, basic sanitation and food security. This can contribute to improving the quality of life quality and maintaining their culture.

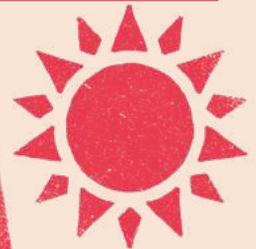
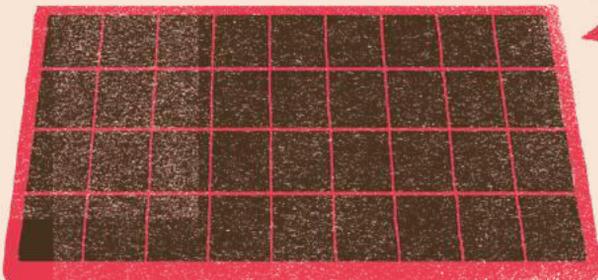
Also, besides the implementation of solar distributed generation systems in remote regions to expand the service, the universalization policy should forecast a robust training and



capacity building program for the systems' overall sustainability and operation and management. The successful mapping initiatives demonstrates that local operation and maintenance by the communities or their associations contribute to these peoples' autonomy and long-term sustainability.

Finally, considering these recommendations and the points that have been studied throughout this document, both organizations recommend the the following points for consideration in policies to implement and accelerate universalization of clean energy access in the years to come:

- To give priority to installations that permit access to basic health services and potable water.
- To use technologies that facilitate project planning, implementation, and operation.
- To help different actors' articulation to accelerate the electric energy access and overcome energy exclusion in the Legal Amazon.
- To enable the communities' access to safe, sustainable, and low environmental impact energy services, with the energy supply in sufficient levels to guarantee that residential and productive needs are met.
- To strive for alternatives that facilitate the systems implementation.
- To verify if the energy generation systems management can be accomplished by the community.
- To ensure transparency of the timeline and criteria to define the distributors' established objectives, with frequent monitoring and rendering of accounts.
- To determine a date for conclusion of universalization of clean energy access in the Amazon region.



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