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COMMUNITY NETWORKS AND THE INTERNET IN BRAZIL:

Experiences and challenges for digital inclusion

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Experiences and challenges for digital inclusion

Brazilian Internet Steering Committee – CGI.br
São Paulo 2022

Brazilian Network Information Center – NIC.br

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FOREWORD

For the past 17 years, the Regional Center for Studies on the Development of the Information Society (Cetic.br), a department of the Brazilian Network Information Center (NIC.br), has monitored the appropriation of digital technologies by Brazilian society. In the last few years, there has been a substantial increase in access to and use of these technologies, particularly the Internet, by the Brazilian population. In 2020, 83% of the population 10 years old or older were already Internet users, which represents an increase of 20 percentage points compared to the data collected in 2015[1]. This has also been reflected in a higher proportion of households connected, as well as in the expansion of activities carried out on the Internet, especially in terms of access to services provided online by enterprises, healthcare facilities, schools, and governments.

During the COVID-19 pandemic, the studies conducted by Cetic.br|NIC.br showed advances in the provision of online services in several areas, such as education and health care. However, the data also revealed that a more vulnerable part of society still faces barriers to full access to these technologies. While Internet access is practically universal among high-income and educated individuals, those who live in vulnerable situations and in rural areas face greater barriers to connectivity from their households.

In this context, it is fundamental to highlight the contribution of different stakeholders to digital inclusion. In addition to the efforts of Internet service providers (ISP), alternative models for expanding connectivity are also important, as pointed out by the International Telecommunication Union (ITU)[2] and the Alliance for Affordable Internet (A4AI)[3]. Multisectoral strategies, such as actions support-

1 Brazilian Internet Steering Committee. (2021). *Survey on the use of information and communication technologies in Brazilian households: ICT Households 2020 (COVID-19 edition – Adapted methodology)*. https://cetic.br/media/docs/publicacoes/2/20211124201233/tic_domicilios_2020_livro_eletronico.pdf

2 International Telecommunication Union & United Nations Educational, Scientific and Cultural Organization. (2021). *State of broadband report 2021*. https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-BROADBAND.23-2021-PDF-E.pdf

3 Alliance for Affordable Internet. (2021). *Affordability report 2021*. World Wide Web Foundation. https://webfoundation.org/research/2021-affordability-report/

ed by public and civil society organizations, are crucial to strengthen an ecosystem of appropriation and use of technologies by society as a whole.

One of the complementary models for expanding Internet connectivity is community networks. In addition to providing the necessary infrastructure for individuals to access the Internet, community networks can assist in the appropriation of ICT by offering services aimed at increasing digital skills, as well as community participation in collective decisions. This would allow technologies to be inserted in the daily lives of individuals, according to their needs. The adequacy of the actions of community networks in local contexts greatly extends the reach of the benefits associated with the digital environment.

The aim of this study is to offer an updated diagnosis of the role of community networks in Brazil, including the main challenges and opportunities for digital inclusion in the country. To this end, in addition to a literature review, interviews were conducted with various actors related to the field, including public managers, experts, community network managers, and representatives of civil society organizations and enterprises.

Based on the different views and discussions presented in this Sectoral Study on the role of community networks for digital inclusion, we hope to contribute to strengthening various strategies for the provision of Internet access in Brazil. In line with NIC.br's purpose of working toward the development of the Internet in the country, this study also intends to provide inputs for the formulation of public policies aimed at the development of community networks in the Brazilian context.

Enjoy your reading!
Demi Getschko
Brazilian Network Information Center – NIC.br

PRESENTATION

The global debate on access to the Internet by individuals who are more exposed to social vulnerability and those who live in remote regions is a pressing issue for advancing digital inclusion. In this field of study, there are two structural aspects. The first is Internet connectivity. About four billion people still do not have access to the Internet worldwide – including about one billion people who do not even have access to basic telephone services. The second structural aspect refers to the appropriation of the Internet by isolated and vulnerable groups. This involves the skills of understanding and discernment, which help people to live well. Without these skills, people living in rural areas or those who are economically disadvantaged may not get the benefits of Internet access. Rather than empowering and providing access to opportunities, Internet access and use may, in this case, be associated with broadening social inequalities and threatening local cultures.

The traditional public policy models for providing access to the Internet have not been able to fully accomplish universalization so far. Data from the ICT Households survey, conducted by the Brazilian Internet Steering Committee (CGI.br), has shown a significant difference in access between urban and rural areas, which suggests the prevalence of a model based on free enterprise as a solution to info-exclusion in the country. While more economically attractive regions are privileged in the provision of access, regions with low population density or a predominance of low-income populations remain unassisted.

The advance of digitalization around the world – driven by the confrontation with a global health crisis such as the COVID-19 pandemic – has revealed the centrality of information and communication technologies (ICT) in people's lives. Many essential services, especially those related to education and health care, started being delivered only online, further increasing the importance of the Internet to society. In many cases, they became essential digital services that must be ensured for the entire population.

In view of this context, it is imperative to create approaches that allow populations excluded from Internet access to

solve their own connectivity challenges and structure their networks in a way that allows them to appropriate this space and enjoy the opportunities and benefits that the Internet can offer. Such approaches include alternatives to restrictive connectivity models based on massive data collection. It is possible to foster policies that support implementation models that listen to assisted populations and build projects together with communities. This is the core of community networks, whose objectives are: 1) expanding Internet access to places with little infrastructure and services to regions where exclusively commercial models are not sustainable; 2) ensuring nondiscriminatory treatment of traffic and data diversity in the first mile; 3) empowering individuals and communities, enabling them to play an active role as owners of the local Internet and communications infrastructure; and 4) promoting more equitable opportunities for the information society.

Community networks are mainly made up of traditional communities, rural groups, and *quilombola*[1] communities, and are initiatives capable of promoting digital inclusion in more remote or unassisted areas, in addition to playing an important role in advancing the appropriation of technology. By providing Internet access, community networks "are structured to be open, free and neutral"[2]. These values corroborate the *Principles for the Governance and Use of the Internet* by CGI.br, such as Internet universality, diversity, neutrality, and democratic and collaborative governance, which support actions and decisions for the use and development of the Internet in Brazil.

In view of the relevance of community networks, CGI.br initiated an important investigation in 2021, seeking to understand their modes of operation and effects on the territories, as well as to identify ways to promote their sustainability. The present survey is relevant not only for identifying the potential of community networks in Brazil, but also for con-

1 Brazil's *quilombola* communities date from the mid-1500s, when groups of Africans and Afro-descendants escaped slavery and banded together in close-knit communities to resist recapture. More information on the Inter-American Foundation website: https://www.iaf.gov/content/story/making-their-own-way-brazils-quilombola-communities

2 Internet Governance Forum. (2017). *Outcome Document on Community Connectivity* (p. 2). http://www.intgovforum.org/multilingual/index.php?q=filedepot_download/4189/174

tributing to the ongoing international debate about meaningful Internet access from the perspective of local realities. In addition, it is worth noting that this is an unprecedented study on community networks in Brazil, based on interviews with those responsible for their implementation at the local level.

This initiative is based on CGI.br's commitment to society by supporting projects aimed at the challenges to increasing Internet access, including the role of the Internet in the fight against the novel coronavirus and in the protection of citizens' rights. CGI.br, which has promoted the development of the Internet in Brazil over the past 25 years, also reiterates its mission for the generation and dissemination of cutting-edge knowledge, with a view to increasingly assist in the training, education, and certification of people. Thus, CGI.br expects to contribute to the strengthening of multisectorial and multidisciplinary Internet governance, which will be capable of dealing with the technical challenges of Internet use, as well as the economic, political, and cultural challenges that grow exponentially with the advance of the Internet in society. In this sense, we hope to encourage and promote the appropriation of technology by the population, especially young people and traditional populations. It is time to focus on the local to think globally.

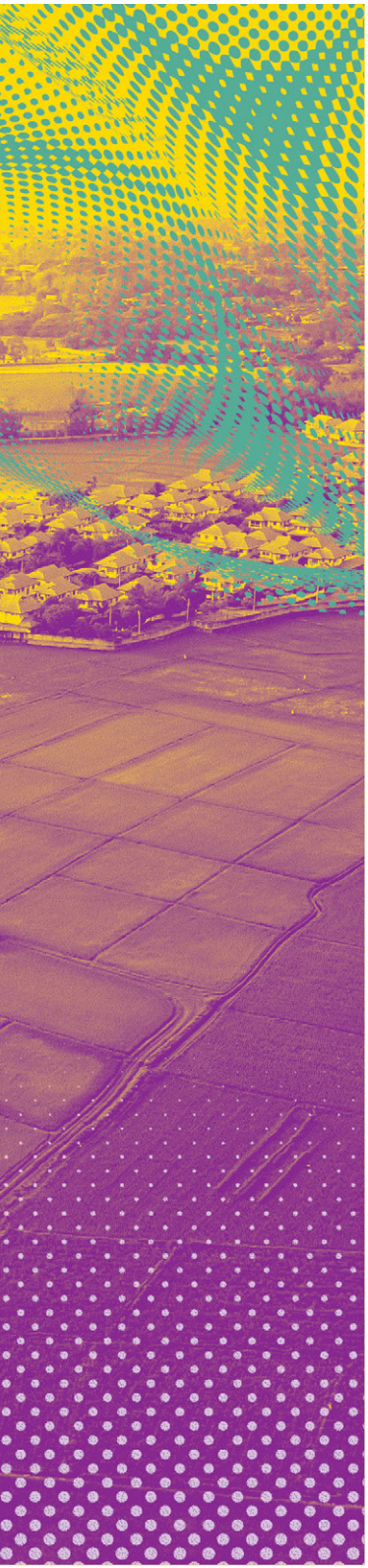
Laura Tresca
Percival Henriques
Brazilian Internet Steering Committee – CGI.br

PROLOGUE

Community networks: Resuming collective appropriation of connectivity

Laura Tresca[1]

1 Mother, social scientist from the University of São Paulo (USP), and journalist. She holds a master's degree in communication from the Methodist University of São Paulo (Umesp). Laura has been working with Internet policies since 2007. In 2018, she participated in the International Visitor Leadership Program (IVLP), offered by the United States Department of State. A project she coordinated on community networks received the Regional Fund for Digital Innovation in Latin America and the Caribbean (Frida Awards), granted by the Internet Addresses Registry for Latin America and the Caribbean (Lacnic) in 2018. Laura is a counselor of the Brazilian Internet Steering Committee (CGI.br).



With the development of information and communication technologies (ICT), connectivity has become another element that influences economic and social growth, and digital exclusion has emerged as an additional factor of social inequality. Connectivity is beneficial not only for individuals, who can enjoy the information society as citizens, but also for society as a whole, which develops based on technology. Since then, the Internet community (civil society, academia, governments, and the private sector) has been concerned with how to promote digital inclusion: civil society, with its demands, construction of models, and implementation of projects; academia, with relevant activity in the development of research and studies on the theme and analysis of practices; governments, which stand out in the formulation and implementation of public policies; and the private sector, through the creation and implementation of connectivity solutions, aiming at the expansion of its business. It is a win-win scenario.

For over a decade, starting in the 2000s, the Brazilian government promoted public policies for the implementation of telecenters and collective spaces for Internet access, which became the main solution for connectivity in the outskirts of cities and, eventually, in rural areas. Considering the timeline of digital inclusion policies in Brazil presented by the Brazilian Federal Court of Accounts (TCU, 2015), in 2000, the federal government created the Programa Rede Jovem (Youth Network Program), focused on the implementation of telecenters. In 2002, the federal government created the Electronic Government Program – Citizen Assistance Service (GESAC) to offer Internet connections to telecenters, schools, and government organizations (TCU, 2015). In 2009, the Telecentros.br program was launched (TCU, 2015), the last major initiative aimed at fostering telecenters, which continued to exist for a long time and were relevant to Internet access, as indicated by data from the historical series of the ICT Households survey (Chart 1).

In telecenters, whether in wait lines or while using devices, users supported and helped each other with their knowledge about computer operation and how to obtain information,

or ways to communicate digitally. Many places also offered workshops, mediated by digital inclusion agents, called telecenter monitors. However, even when there were no courses or structured activities, the monitors were present to support whoever came to the centers. Thus, collective learning and technological appropriation processes took place.

This model of digital inclusion was criticized. While poor people had to stand in line for hours to use a computer for a few minutes and, sometimes, to access the Internet (when there was a connection) in the outskirts of cities, wealthier people purchased devices for shared family use or even individual use[2]. The model of digital inclusion through public access centers was not necessarily generating social inclusion. The rich could experience the full potential of new technologies, while the poor hardly had access to the same use experience. Rich people could make recreational use for as long as they wanted. Poor people had to stick to educational use or access to services. In addition to wait lines, it was difficult to keep the devices working, and there were fixed costs of maintenance, electricity, furniture, and water supply. The quality of access in public centers was very precarious – even though it fulfilled a key role for those who had no income.

I once interviewed the users of a telecenter in a very poor *quilombola* community in Vale do Ribeira, São Paulo. For the maintenance of the telecenter, the community association charged users BRL 1 per hour – which seemed reasonable, since, in addition to the maintenance of the devices, there were expenses with furniture and electricity, among others. Then, I asked a resident, "Do you or your family members go to the telecenter?" And she answered, "No. I have five kids. If I pay for one of them to go, I have to pay for all of them. It's BRL 5. And they want to go every day. So nobody goes."

Later[3], public access centers started to coexist with the dissemination of paid centers, such as LAN houses and cybercafés, as solutions for digital inclusion. These places had

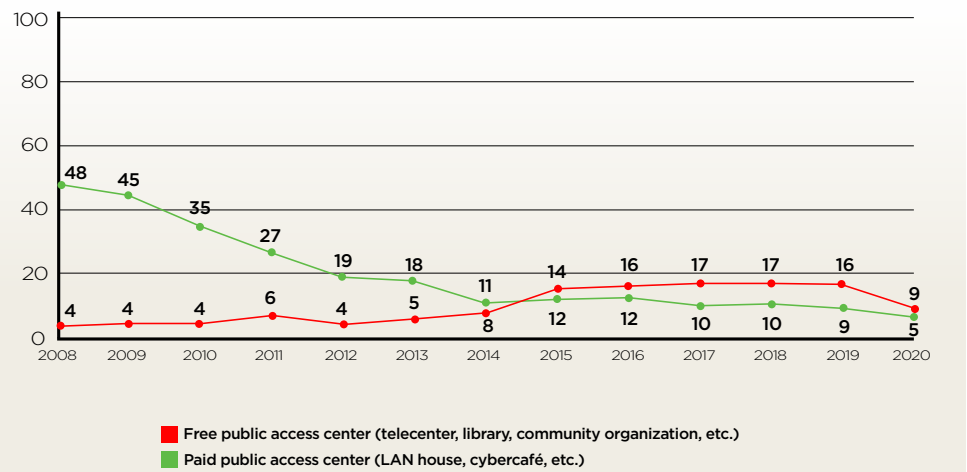
2 In 2005, according to the ICT Households survey, 16.6% of households located in urban areas had desktop computers. Of these, 88.7% belonged to socioeconomic class A (NIC.br, 2006-2021).

3 The linearity presented in the text is an analytical construction. Certainly, with more or less emphasis in digital inclusion, these initiatives coexisted and persist until today.

similar characteristics to telecenters, but were small businesses. Perhaps they emerged as a business opportunity due to the deficit in quality of public or community services. The peak of this model occurred at the end of the 2000s. In 2008, almost half (48%) of the people who had access to the Internet did so via paid centers (Chart 1).

CHART 1 - PROPORTION OF INTERNET USERS BY INDIVIDUAL ACCESS LOCATION – 2008 TO 2020

Percentage of the total number of Internet users



SOURCE: BRAZILIAN NETWORK INFORMATION CENTER (NIC.br, 2008-2020).

To some extent, LAN houses and cybercafés have solved the issue of device maintenance by keeping many units in good working condition. They have also greatly improved users' browsing experience, with greater connection availability and higher speeds.

INDIVIDUAL CONNECTIVITY SOLUTIONS

Technological development has shifted toward individual connectivity solutions, perhaps inspired by the experience of exclusive use by wealthier individuals and facilitated by the decreasing cost of devices (computers, mobile phones, and tablets) over time. In 2019, according to the ICT Households

survey, only 9% of Internet users in Brazil accessed the Internet via LAN houses and cybercafés.

Collective spaces gradually lost their prominence as a solution for digital inclusion. We all began to have a relationship with connectivity as a service offered by broadband providers, rather than a right, and a service that was provided only in some locations in the country. Digital inclusion was linked to expanding Internet to communities.

Somehow, the popularization of the use of mobile phones has helped mitigate the demand for access to Internet connection devices, even though the experience of using the Internet on computers is often better than that of using it on mobile phones. By 2020, 58% of users accessed the Internet exclusively on mobile phones, as shown in Table 1.

TABLE 1 – PROPORTION OF INTERNET USERS BY DEVICE USED EXCLUSIVELY OR SIMULTANEOUSLY– 2014 TO 2020

Percentage of the total number of Internet users

	ONLY MOBILE PHONE	BOTH	ONLY COMPUTERS
2014	20	56	24
2015	35	54	11
2016	43	51	6
2017	49	47	4
2018	56	40	3
2019	58	41	1
2020	58	41	1

SOURCE: NIC.br (2014-2020).

However, there is little or no commercial interest in building Internet infrastructure in certain locations, because the cost is too high to assist a small number of users. In these scenarios, other ways to ensure Internet access are sought, such as solutions in which the government encourages the development of infrastructure by the private sector or operates directly in its construction. Financial incentives[4] and the creation of obligations are some examples of ways

4 The Superintendency for the Development of the Brazilian Northeast (Sudene), for example, offers income tax exemption to enterprises that develop goods or services aimed at digital inclusion, upon compliance with some conditions. More information available at https://www.gov.br/sudene/pt-br/assuntos/incentivos-fiscais/isencao-do-irpj-programa-de-inclusao-digital

to encourage the private sector. The Telecommunication Networks Structural Plan (Pert), created by the National Telecommunications Agency (Anatel) in 2019, is a reflection of this model. Chapter 7 of this Plan addresses the identification of possible sources of funding for developing projects aimed at the expansion of broadband access, and points out:

> 1) Revision of the fixed telephony service concession model – STFC: Amendment to the General Telecommunications Law to allow switching the current fixed telephony service concession model into an authorization model, generating a balance of resources that can be invested in broadband projects;
> 2) Conduct Adjustment Terms – TAC: Additional commitments should be aimed at addressing the gaps identified in this plan;
> 3) Sale or renewal of radio frequencies: Establishment of obligations aimed at the expansion of SMP [personal mobile services] in unserved areas identified in this plan;
> 4) Universal Service Fund – Fust: After the approval of Law No. 14.109/2020, it is possible to use these resources to expand broadband;
> 5) Balance resulting from the installation of backhaul transport networks: The balance resulting from the replacement of obligations established in the Plan of Targets for the Universalization of Public Switched Telephone Service – PGMU (multifacility service points, backhaul, and public payphones) was directed to the implementation of transport infrastructure (backhaul), according to Decree No. 106.10/2021 – PGMU V;
> 6) Obligations: The Agency can establish obligations to providers to act, instead of imposing fines. (Anatel, 2021, Chapter 7)

Considering the government's initiatives, we highlight the National Broadband Plan (PNBL), created by Decree No. 7.175/2010, which reactivated Telebrás with the assignments to:

> [...]
> b) provide support to public policies for broadband Internet connection to universities, research centers, schools, hospitals, citizen service centers, community telecenters and other points of public interest;
> c) provide infrastructure and support networks to telecommunications services provided by private enterprises, states, the Federal District, municipalities, and nonprofit organizations; and
> d) provide broadband Internet connection to end users, only and exclusively in locations where there is no adequate supply of such services. (Decree No. 7.175/2010, Article 4)

Although this is still the focus of the Brazilian government's efforts for digital inclusion, which mainly benefit enterprises in the sector[5], prices are still a barrier to access for end users. The problem remains and will not be solved by market solutions. According to the ICT Households 2020 survey, the reason most cited by household respondents for the lack of Internet at home was its high cost (68%), being this the main reason in 28% of households without Internet access.

In 2015, social network enterprises began to realize that connectivity was a barrier to the expansion of their businesses and started to offer alternatives. Within this context, Facebook, for example, announced its Internet.org project[6], which was widely criticized, even because of its pretentious name.

THE RISE OF COMMUNITY NETWORKS

Within this context, community networks emerge as a collective connectivity alternative. Unlike previous solutions, the proposal is not only to offer Internet access, but

5 In 2021, the Minister of Communications discussed a possible partnership with Elon Musk's Starlink connection enterprise to provide connectivity to isolated regions of the Amazon. However, the initial monthly fee for the service was US$100, which today corresponds to approximately half the minimum wage in Brazil. More information available in Santana, J. (November 16, 2021). Ministro se reúne com Elon Musk nos EUA e pede ajuda para levar internet à Amazônia. *G1*. https://g1.globo.com/tecnologia/noticia/2021/11/16/ministro-se-reune-com-elon-musk-nos-eua-e-pede-ajuda-para-levar-internet-a-amazonia.ghtml

6 More information available in Elgan, M. (2016). The surprising truth about Facebook's Internet.org. *Computerworld*. https://www.computerworld.com/article/3032646/the-surprising-truth-about-facebooks-internetorg.html

also to establish a different relationship with the network infrastructure. Instead of contracting a service, a connectivity infrastructure is collectively built to meet the needs of communities.

This is not just a theoretical or international model. Community networks are already being implemented in Brazil, and the present study identified 63 of them in the country.

Community networks are not essentially characterized by the technology they use to promote connectivity, but rather by their social processes for community appropriation of this infrastructure. The idea is that the network can not only meet the individual interests of a given community, but above all, support its economic and social development. Community networks dissociate from the concept of "Internet as a service to be contracted" toward the idea of connectivity as a right, an essential and collective right. The customer-consumer logic is replaced by a community logic of sharing knowledge and ways of living. The communicative possibility that community media present reinforces community life and values, because they are designed by the values of the community of that territory. The rules of the network set up, therefore, reflect the rules and culture of that social group. According to this study, 45% of the community networks interviewed stated that the beneficiaries participated in decisions about their operation and services (further information on the results of this research is presented in Chapter II).

This perspective on community networks was an organic construction, based on experiences developed over time. Marcelo Saldanha is one of the pioneers of community networks in Brazil. He worked tirelessly to raise awareness and involve stakeholders in the proposal. His work initially included the idea of free networks, evolving to the concept of community Internet providers and finally to community networks. He encouraged me to reflect and act on the issue, but I believe the idea of free networks, although quite libertarian, did not seem feasible in a context of a regulated spectrum such as the one we live in. We worked together on the publication *Como montar e regularizar um provedor comunitário* (How to set up and regulate a community provider) (Artigo

19 et al., 2017), for which Marcelo Blanco, Percival Henriques, and Nieremberg Ramos collaborated as formulators.

As a result of the publication, we set up a workshop on the topic for community organizations and had the opportunity to work together in several communities. The second workshop we offered was at Casa dos Meninos, located in the connected outskirts of São Paulo, which already had a local network in place, but was facing some technical difficulties. Besides the local actors, other interested parties who related to the idea of free networks were invited to develop the activity, which took us three days of immersion to prepare, sleeping at the organization's headquarters. This meeting resulted in several people interested in working on the theme, who formed their own organizations.

The experience at Casa dos Meninos was a milestone in the advancement of the idea of community networks in Brazil. I still remember Daiane Araujo dos Santos and Maria de Fátima Gomes Rodrigues presenting their Intranet project, conceived from a territorial logic, and asking, "Why are we going to connect people to the Internet? To create new Facebook users? What we want is to disseminate the students' production, the audiovisual products we create, the books we have to share." The project was incredible. Within a radius of 2 km, they had a public hospital, a cemetery, and a school. "Imagine: you've been waiting in line for eight hours to see a doctor, and you have no money to put credit on your cell phone. What do you do? You look for an open network. And you find a network of Casa dos Meninos full of local products. Eight hours of waiting? You are going to consume that content." This is how the idea of community providers was quickly replaced by the idea of community networks, which started to become popular among technicians and specialized media.

The idea of community providers also put an end to the idea that connectivity was linked to Internet access. Casa dos Meninos promoted connectivity, but without Internet connection. And the networks that choose to remain as local networks are not conflicting with the Internet, because, after all, the Internet is a network of networks. At any given moment, they can connect to the World Wide Web (WWW).

Self-management, the absence of profit, technological appropriation, and a community nature are recurrent characteristics of community networks. Self-management means that the decisions about the infrastructure will be made by the community itself, based on the formulation of its own rules. The absence of profit does not mean that there will be no financial activities, but that any budget surplus will be invested in the network or association. Technological appropriation implies knowing how the Internet works, and acquiring some degree of knowledge that allows autonomous technical decisions to be made.

The core of community networks is not the technology implemented or the equipment used, but rather the community processes around the network and the local challenges it aims to address. Merely sharing Wi-Fi does not necessarily foster a community process. People in a luxurious condominium who self-manage their network infrastructure are overcoming an Internet service problem, but they are not building their own network as an exercise of a right or a form of resistance, as in the case of Casa dos Meninos.

AGENDA FOR THE DEVELOPMENT OF PUBLIC POLICIES FOR COMMUNITY NETWORKS

The challenges for community networks to become a massive connectivity alternative and gain scalability involve several bottlenecks: lack of support and incentives, funding, adequate regulation, and technological challenges.

One way to encourage this digital inclusion model is to create incubators that offer a variety of courses in management, community organization, networks, and equipment maintenance, and are not only limited to training activities, but also to the follow-up and support of the initiatives. The present study shows that 70% of the community networks interviewed maintain partnerships with other organizations. Similar ideas are already applied in different areas of the solidarity economy, especially in the formation of cooperatives. The creation of incubators of community networks can be implemented with public universities, through continuing education courses focused on the relationship between technology and society, for instance.

Another possibility is to adapt public funds in the telecommunications area to include support for community network projects, since they require small amounts of funding for the initial installation. The managers of these public funds must recognize that, for many enterprises working in large areas, there is no interest in serving locations with a population density below a certain threshold, so community networks fill a gap left by commercial access providers.

An interesting alternative to overcome the scalability challenge would be combining the community network model with the already-consolidated model of community radios. The idea is that groups that already operate and sustain community radio stations will be able to operate community networks if they are provided with proper training, thus combining two models of community communication.

Regarding regulatory challenges, Anatel approved Resolution No. 680/2017, which waived the need to obtain a multimedia communication service (SCM) license for broadband providers that have up to 5,000 users and that exclusively use restricted radiation radiocommunication equipment and/or confined media (Anatel, 2017). The Agency has already signaled that the operating license for private limited services (SLP) would be the most appropriate for community networks[7]. However, this regulation was not designed for this purpose and presents important limitations regarding the frequency in which the equipment can be used. This study indicates that 10% of the networks interviewed have already experienced some judicial issues, difficulties with legalization, fines, and/or lawsuits, and only 25% are formalized as legal entities.

It is also necessary to create legal conditions for community networks to share Internet links without major contractual impediments imposed by commercial providers. To this end, the government must establish legal standards for Internet provision that allow nonprofit sharing of connections in areas where there are community projects aimed at digital inclusion.

7 More information available at https://www.gov.br/anatel/pt-br/regulado/universalizacao/redes-comunitarias

Regarding technological challenges, the availability of an easily accessible map of the dedicated link providers would be highly important. Another difficulty is the equipment used. Enterprises are increasingly creating barriers to the exchange of their firmware, making it difficult to adapt the equipment to community networks. To overcome this challenge, there is the possibility of raising the awareness of hardware manufacturers, and even encouraging the development of equipment for community purposes. Another challenge refers to the maintenance of networks by community members themselves, which can be solved through a network of community technicians that understand not only about networks, but also the community processes that involve their construction. Only 37.5% of the community networks interviewed in this survey had received training to improve their operation in the last 12 months.

The development of community networks in Brazil will make it possible to think about the relations that can be established with the Internet exchange points (IXP) and OpenCDN[8]. IXP and OpenCDN are managed by NIC.br and, according to local possibilities and contexts, it is possible to establish IXP and OpenCDN connections for community networks through special contracts, aiming at digital inclusion.

It is worth pointing out that, for community networks to resume the collective appropriation of connectivity, it is essential that they do not reproduce the experience of telecenters, in the sense of trying to fill the lack of a service. The experience of use and connectivity of a community network is absolutely different from that of a commercial service. We can make an analogy with producing food for your own consumption. You can buy tomato sauce in a supermarket, but you can also plant tomato seeds, take care of the plants, water them, pick the tomatoes, and make your own sauce. Some people do this because they like it (long live the makers!), others out of necessity. The results may be similar, but they are totally different experiences.

8 More information on OpenCDN is available at https://opencdn.nic.br/

OPPORTUNITY FOR A FEMINIST CONSTRUCTION OF INTERNET INFRASTRUCTURE

Community networks are related to the idea of rights, resistance, community resilience, and, ultimately, digital rights decolonization. Therefore, they present a world of possibilities for establishing other social relationships with technologies.

In this sense, they can provide an opportunity for a feminist construction of the Internet infrastructure; that is, a technological infrastructure developed, not based on market logic, but rather on principles of inclusion, on valuing local knowledge, and striving not to reproduce the inequalities, exclusions, and violence that exist in our society. It is well known that technologies are not neutral and that they tend to reproduce the social structures in which we live, and the Internet is no different. However, considering a feminist Internet project, women must be motivated for this construction. According to the present research, only 37.5% of the managers of the community networks interviewed were women.

In the experience reported at Casa dos Meninos, one of the technical modules of the workshop was offered by a feminist volunteer. It was great. When I started to organize other workshops with the communities, I contacted her so that she could be the technical consultant for the project. She told me, "I don't feel prepared, with my level of knowledge, to support communities to build their networks. A man who knows less than I do would probably have enough self-esteem to take on the challenge. I don't." Even though we offered her support to develop her knowledge, she did not agree. At the time, we chose to support another woman who already had technical knowledge in radio and hired a technician to support her in developing her skills with community networks. She is currently a reference on the subject in Brazil. So, in order for community networks not to simply reproduce the dominant model, many different types of incentives are needed for the construction and development of these networks.

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METHODOLOGICAL NOTES

This chapter summarizes the methodological procedures adopted in the study *Community networks and the Internet in Brazil: Experiences and challenges for digital inclusion*. The study was carried out in two consecutive stages, combining qualitative and quantitative methods.

The next pages describe the general objectives of the study, the methods and techniques applied in each stage of its development, and the reasons for choosing the methodology employed.

OBJECTIVES

The agenda on community networks with Internet access emerged as a proposal to mitigate situations of digital exclusion in territories where traditional public policies to promote Internet access have had little effect. These include places with poor infrastructure and a low supply of services, and regions where exclusively commercial models are not sustainable, such as more remote rural areas, peripheral communities, and small or traditional groups distant from large centers.

In addition, community networks stand out as experiences that have the potential to ensure nondiscriminatory processing of traffic and data diversity in the first mile and empower individuals and communities, allowing them to play an active role in the governance of the local Internet and communication infrastructure. Community network projects have been pointed out, more recently, as models that could provide connectivity to places excluded from Internet access and implement more inclusive and fairer access alternatives.

According to the Declaration on Community Connectivity:

> Community networks are a subset of crowdsourced networks, structured to be open, free, and neutral. Such networks rely on the active participation of local communities in the design, development, deployment and management of the shared infrastructure as a common resource, owned by the community and operated in a democratic fashion. Community networks can be operationalised, wholly or partly, through local stake-

holders, NGOs, private sector entities and/or public administrations. (Internet Governance Forum, 2017)[1]

Considering this context, the aim of the present study was to map the community networks currently existing in Brazil, as well as their stages of development, and to identify the barriers and opportunities in the Brazilian context for the promotion of this type of model. The specific objectives of this study included:

i. investigating the current status of debates on community networks with Internet access;
ii. mapping the concrete experiences of community networks in Brazil; and
iii. understanding different aspects of the identified experiences, such as conditions for implementation, current status of operations, and service capacity.

In order to meet these objectives, the study was designed in two stages. The first (qualitative) stage relied on in-depth interviews, and the second (quantitative) stage was grounded in the application of structured questionnaires.

This two-stage configuration was chosen because of the need to identify the experiences of community networks that exist in Brazil and to understand the characteristics of these experiences. Identifying them depended initially on refining the concepts about what community networks are, as well as diversifying sources of information about these experiences, in order to make the search for the existing community networks effective and their characterization feasible. The study was structured in an exploratory stage, of qualitative nature, which preceded the quantitative research stage, for characterizing the experiences of the mapped networks. A description of the stages and a summary of the results obtained in the field are presented below.

QUALITATIVE STAGE

The qualitative stage of the study consisted of an exploratory effort to comprehend community networks in Brazil, identifying the current understanding of the topic

1 Internet Governance Forum. (2017). *Outcome Document on Community Connectivity.* https://www.intgovforum.org/en/filedepot_download/4189/174

and its relevance to the public debate, as well as the main challenges and opportunities for implementing community networks in the country. In addition, it sought to map the experiences of these community networks in order to build the base of respondents for the quantitative stage.

Initially, a literature review was conducted, which included documents, studies, publications, and news on the theme, so the concepts that nourished the subsequent methodological decisions of the study could be defined and refined. The survey also provided input for the development of the data collection instruments to be used in the subsequent stages of the study. In addition, cases of existing community networks in Brazil that appeared in the documentation were listed, resulting in a general listing of community networks that was developed throughout the qualitative stage to support the quantitative stage of the study, as previously mentioned.

Finally, in-depth interviews were conducted with strategic actors, seeking to map their perceptions about the object in question. This part of the study was essential for the identification of existing community networks in the country, since the networks mentioned by the interviewees also made up the general listing that supported the quantitative stage.

FIELD DATA COLLECTION

In order to meet the objectives of the qualitative stage, in-depth interviews were conducted with actors who work on the subject in different segments: governments, markets, and civil society. Key actors with experience in studying and working in this area in Brazil were selected, ensuring a composition that would favor diversity, with distinct institutional roles (formulation, management, and implementation), different backgrounds/areas of knowledge, and from various regions of the country.

The qualitative research stage was conducted in two stages. In the first, nine representatives from various sectors were identified as key actors by the team of the Brazilian Network Information Center (NIC.br), linked to the Brazilian Internet Steering Committee (CGI.br), in discussions with the team of the Brazilian Center for Analysis and Planning (Cebrap), and based on the literature review and documentation previously collected. At the end of this first stage, the interviewees were

asked to indicate the names of other key actors they considered relevant to this debate to be included in the universe of participants in the qualitative stage. The most frequently mentioned names were included in the listing for the second stage. Thus, we sought to ensure the inclusion of key actors with legitimacy and recognition in the study universe of interest.

Data were collected between March 21, 2021 and July 26, 2021. The interviews were conducted by video conference and lasted an average of 80 minutes. The in-depth interviews were carried out relying in a semi-structured script that was previously tested for validation. Considering the two collection stages, 19 in-depth interviews were conducted with key actors, as follows:

- 3 representatives of the federal government (National Telecommunications Agency [Anatel] and Brazilian Ministry of Communications);
- 2 representatives of the private sector (enterprises and business associations – small Internet services providers [ISP]);
- 14 representatives of civil society, research organizations, and advocacy organizations that work in this field;
- 2 representatives of communities that have implemented community networks.

The following topics were addressed during the interviews:

i. the agenda of community networks in the trajectories of the interviewees;
ii. their understanding of community networks, including concepts and elements of characterization;
iii. decisive factors and difficulties for enabling the development and sustainability of a community network;
iv. particularities of the Brazilian context for expanding the agenda in the public debate (barriers and opportunities);
v. perceptions about community network cases, factors considered decisive for their development, and possible implementation problems.

At the end of the interviews, interviewees were asked to collaborate by providing names and contact information regarding community network experiences they knew. This was essential for the consolidation of the listing of community

networks that made up the universe for further investigation in the quantitative stage. It is worth noting that interviewees were essential in the mobilization and access to community networks, since, in many cases, they mediated contacts and facilitated the researchers' approach to these networks.

QUANTITATIVE STAGE

The quantitative stage of the study sought to characterize the experiences of existing community networks in Brazil and understand the territories in which they are located and operate. It also sought to map the characteristics of the networks' implementation processes, current operations, and perspectives for maintaining their activities. The questionnaire aimed to measure the presence of infrastructure, resources, management, and technological and legal aspects, as well as to gather information about user profiles, activities performed, types of services offered, privacy, and security.

For this purpose, interviews were conducted based on the application of a structured questionnaire with all the networks identified in the previous stage. The procedures and results of the field collection in this stage are described below.

FIELD DATA COLLECTION

Once the qualitative stage of the study was completed, the community networks mentioned by the interviewees and identified in the active search (via documentation, publications, and publicly available materials) were organized in a database, with processing and collection of contact information. This was the initial register used in the study. A total of 63 community networks was indicated and listed, excluding mentions of organizations or community groups that were not constituted as community networks[2]. All the networks identified, and for which contact information was obtained, were contacted for carrying out the structured interviews.

Considering the wide territorial dispersion of these networks, and that the managers of the networks in question

2 Among the excluded cases are a local tourism cooperative, which the respondent considered a network because they used walkie-talkies to communicate with guides, and a women's group, which promoted meetings for discussions and conversations that had no relation to access to or use of technologies.

were defined as the main respondents for the study[3], conducting the interviews in person was considered too costly, given the distances involved and the constant need to postpone interviews to match the interviewees' schedules. Therefore, interviews were planned to be conducted by telephone by Cebrap researchers, based on previous scheduling with the managers of the identified community networks. Managers who were not available to participate in the phone interviews (even though this occurred with only one respondent among those interviewed) were also given the option of filling out the interview in an online format.

The structured questionnaire was designed in electronic format and the average duration for its completion was 50 minutes. Of all 63 networks mapped in the qualitative stage of the study, contact information of 54 networks was obtained, which enabled the researchers to contact the potential interviewees in these networks in the quantitative stage. At the end of the field work period, 40 interviews had been conducted between November 25, 2021 and March 10, 2022.

As an additional effort to investigate existing community networks that were possibly not identified in the qualitative stage, a question for the interviewed managers about their knowledge of other community networks was included at the end of the electronic questionnaire. If they knew other community networks, the names of these networks were requested, and if they had not yet been mapped, they were also included in the base listing of the study universe and became eligible for the quantitative stage. Almost all of the networks mentioned at this point had already been mapped in the previous stage, and only one interview carried out was based on a contact obtained exclusively in the quantitative stage of the study.

Table 1 shows the number of identified networks – the mapped universe – and the total number of interviews effectively conducted in the study, by region of the country. It is also worth noting that only 3 of the 40 networks identified and interviewed were located in Brazilian capital cities, whereas the other 37 were located in noncapital cities.

3 Network managers were considered to be the persons responsible for the daily maintenance of the networks and/or for their implementation.

TABLE 1 – DISTRIBUTION OF THE COMMUNITY NETWORKS IDENTIFIED AND INTERVIEWED BY REGION

REGION	MAPPED UNIVERSE		SAMPLE	
	N	%	N	%
Center-West	4	6.3%	3	7.5%
Northeast	19	30.2%	13	32.5%
North	17	27%	11	27.5%
Southeast	20	31.7%	12	30%
South	3	4.8%	1	2.5%
TOTAL	**63**	**100%**	**40**	**100%**

Among the networks identified and interviewed, not all were operating at the time of the interview. However, since a significant part of the questionnaire addressed the time when the network was created and first implemented, perspectives for the future, and the location profile of the network territory, the interviews conducted with networks whose activities were interrupted or that were inactive at the time of the study were also included in the final sample. Different open-ended questions included in the questionnaire were coded and made up the analysis of the results. Table 2 shows the operating status of the networks at the time of the survey.

TABLE 2 – DISTRIBUTION OF THE OPERATION STATUS OF THE COMMUNITY NETWORKS INVESTIGATED AT THE TIME OF THE INTERVIEWS

STATUS OF THE NETWORK AT THE TIME OF THE INTERVIEW	N	%
Active	**24**	**60%**
Temporarily closed	10	25%
Under implementation	4	10%
Permanently closed	2	5%
TOTAL	**40**	**100%**

Finally, it is worth noting that the database with the results of the 40 interviews conducted was anonymized, and the identification data was used only for study control and handled exclusively by the researchers involved in the study. All the results presented throughout the publication were prepared seeking to guarantee the privacy and non-identification of the networks participating in the study. The characterization of the networks' locations was analyzed with the compilation of secondary data, but always considering the set

of networks, not allowing their identification. The study also respected all the protocols required for compliance with the Brazilian General Data Protection Law (LGPD).

CHAPTER I

Challenges, opportunities, and the state of the art of community networks in Brazil: A qualitative study

This chapter presents the results of the qualitative stage of the research on Brazilian community networks, with the aim of identifying the current understanding of the theme and its relevance to the public debate. In addition, the study sought to identify the main challenges and opportunities for creating policies and programs to foster community networks in Brazil. The study started with a literature review on the theme and included 19 in-depth interviews with key actors who are experts on the subject and work in different fields, including: governments, civil society organizations, academia, market institutions, and community networks.[1]

The following pages present the main results of this study, starting with a debate on the definition of community networks, based on the understanding of the interviewees. In addition to identifying converging and diverging aspects, this first section aims to describe the elements considered to be important for comprehending the concept of community networks.

This chapter is not intended to present a single and unique concept of community networks. The objective is to illustrate the main issues present in the debate on the subject, since there is no consistent consensus in the literature about what characterizes a community network, that is, what the lowest common denominator of this type of experience would be. Wide-ranging topics are found in the debate about community networks, such as guaranteeing connectivity to isolated, digitally excluded or partially included populations and territories; implementation and participatory management of infrastructure; the importance of considering equity-related issues (gender, race, etc.) in the design of networks; ensuring network neutrality; being nonprofit; providing free access; and operating autonomously in infrastructure.[2] Choosing a

1 For more details on the methodological procedures and general objectives of the qualitative stage of the study, see the chapter "Methodological Notes."
2 For some definitions on the topic, see: Belli (2018); Internet Society Community Networks Special Interest Group (2018); Internet Governance Forum (2017); and Jancz (n.d.).

specific cutout of the concept would limit research capacity at this exploratory stage.

The second section of this chapter outlines the main challenges and success factors involved in the process of developing a community network in Brazil, further investigating three different stages: (i) initial stage – conception, planning, and mobilization for the network creation; (ii) implementation stage – community training and network installation; and (iii) maintenance stage – network sustainability after its implementation.

The third section is dedicated to deepening the debate on community networks in the Brazilian context. The aim was to identify the importance of the theme in the national public debate, in light of the existing opportunities and the problems that such strategies can help solve or minimize. We also sought to explore the main structural barriers that the Brazilian scenario imposes on the development of this theme.

The fourth section describes the perceptions of the key actors interviewed about the existing community networks in the country, investigating experiences considered successful in their implementation and those that were not established as expected. This effort sought to understand particularly what characterizes the initiatives considered successful and what aspects hindered the sustainability of the networks, to generate lessons to improve other strategies in the future.

Finally, the chapter closes with some considerations that translate into possible guidelines for actions to promote community networks in Brazil, based on the analysis conducted in the previous sections.

WHAT ARE COMMUNITY NETWORKS?

The qualitative stage of the study on Brazilian community networks aimed to gather and summarize the current views on this subject from the perspective of key actors in the debate. The in-depth interviews encouraged the respondents to present their understanding of the topic and the determining aspects for the definition of a community network, exploring functions, arrangements, characteristics, and problems that it can solve.

The definition of community networks was not unanimous among the interviewees. In general, differences in the under-

standing of community networks were related to different views of the problems they aim to solve and the benefits they can offer. Based on their answers, it was possible to identify at least two major approaches regarding the theme.

Some of the interviewed actors tended to frame the discussion about community networks in a broader debate about **connectivity, development, and rights** – guided by more general ideas of local development and mobilization in communities that usually face situations of vulnerability. Other interviewees were guided by a more specific proposal for **individual access to the Internet**.

The first orientation considers community networks to be technical-political-social instruments, rather than purely technological, and understands that they address problems that are more structural and issues that go beyond connectivity. For this set of actors, community networks may or may not involve the Internet. In some cases, the lack of connectivity can be partially solved by other communication tools, since community radios or local networks without Internet access (Intranet networks) can meet the specific needs of some locations and be considered community networks.

This understanding of community networks as a tool for social and community development, focused mainly on access to connectivity, predominated among interviewees who worked in civil society organizations, academia, governments, and communities. It is interesting to note that most of the actors and institutions that share this vision had previous professional experiences related to the Internet as a social and political instrument. They had been involved, for example, in debates on topics such as free software, net neutrality, freedom of expression, privacy, the Brazilian Civil Rights Framework for the Internet, community media, and social movements.

"What I usually say is that [the community network] is a socio-technical arrangement, in which you have technology involved (not necessarily the highest, such as broadband and Internet access), but it needs to be autonomous and serve the territory. [...] Internet access is important, but there are territorial particularities and community demands that can be benefited by certain communication technologies. [...] Technology is important, but the main issue has to do with political and rights issues."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"Thinking about what [the community network] is not: It's not defined by technology. It's not a wireless, fiber, mesh network... What defines a community network is the social organization around this Internet structure. And then we add some characteristics to this community organization: being nonprofit and self-managed, [...] and technology appropriation."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"They [the community networks] have an interesting characteristic [...], which is the sharing of an infrastructure, the idea that they [people] own that infrastructure for access, that they can regulate and decide what the rules of access will be, that they can strengthen the community bond and community decisions. [...] They also require a certain level of technology appropriation that we often don't have. [...] So, having two, three, four people in the community who understand a little better how that network is working, how it's managed, and how it's maintained, this is very powerful."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"Self-management is the key to distinguishing commercial from community networks."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"These are networks that are managed, built or deployed and have their decisions made by the community that manages it [...], [even if] it's not the whole community that decides about the community network."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"The networks are not only concerned with providing Internet, but with understanding the Internet as something that helps facilitate access to rights, and which also involves technopolitical issues that need to be addressed."

(SOCIAL ORGANIZATION REPRESENTATIVE)

The set of actors and institutions related to the Internet access field includes mainly small Internet service providers (ISP) and their associations. They operate in the area of Internet access provision targeted directly to end consumers, and are configured as market players. Many of these enterprises, according to the interviewees, include in their contractual clauses that the access sold to end users cannot be shared, which is a barrier for nonprofit community networks. However, these small ISP tend to reach locations where large ISP have little interest in operating. Because of this, the activities of small ISP, which almost always operate on a local scale, are often identified, by themselves and by other actors in the field, as socially oriented businesses. Most of the interviewees of this study, however, emphasized the differences between these "social businesses" and community networks.

For this group of business representatives, the priority proposal should consider providing access to locations and people who are excluded from the Internet (by selling a service). The focus of this approach is on extending connectivity as a strategy to address the lack of Internet access via a commercial service delivery solution.

"The way I see it, a community network is a network that serves a location where there's a group of people who need Internet access, whether it's a rural village, a rural neighborhood, or a more remote neighborhood that doesn't have any network provision. So, when you have a situation like this, you need to gather a group of people to provide Internet where it doesn't exist, either by private initiative or by a group from the community itself. [...] Community networks today in Brazil are meant to take Internet where it doesn't exist, because Brazil has a vast territory and there are many people living without connectivity."

(BUSINESS SECTOR REPRESENTATIVE)

"I understand that if you have shared Internet, created a local network, and the operator only reaches the door of your network, that is a community network. So, I understand that Alphaville and the *quilombolas* are at the same level. The guy from Alphaville spent BRL 150,000 to build the network, but, from the point of view of a community network, it's the same thing: You share a service, a network, and you self-manage the network (it's out of the ISP control)."

(BUSINESS SECTOR REPRESENTATIVE)

"To achieve digital inclusion, we have the option of promoting small ISP [...]. Internet used to be available only in large centers, at a very high cost, telecommunication enterprises didn't want to foster it, so we [institution] encouraged small ISP. [...] So, in this case, it wasn't community Internet, but a cooperative movement of small enterprises to achieve the objective of being part of the Internet."

(BUSINESS SECTOR REPRESENTATIVE)

It is interesting to note that these two different perceptions also resulted in different answers to the question about the main challenges and difficulties related to the proposals on community networks in Brazil. While for the first group, the difficulties are more related to technological appropriation or the community social mobilization, the second group emphasizes the tax burden or the operation costs for the network implementation in hard-to-reach locations.

Another difference between these two concepts, which did not appear directly in the interviewees' remarks, is that while the networks that operate within a market model (albeit as a social business) have end users as their target audience (ultimately, consumers), community networks focus on collective social agents (the communities, usually represented by legally formed associations).

Finally, it is important to note that some interviewees understood that there is an intermediate arrangement between these two models, which would configure the "access sharing networks," also called by other interviewees a condo solution, exemplified as:

> "It's just a group that wants to have a communication service, that takes responsibility for splitting the bill, but there isn't an assembly and collective decision making (which usually happens in an association), it's more practical, like what happens in condo. Now, the difference from a commercial ISP [...] is that [in the latter] the focus is specifically on making profit."
>
> *(SOCIAL ORGANIZATION REPRESENTATIVE)*

The different perspectives of the social actors involved in the debate and their trajectories triggered different definitions of community networks. In addition, they produced distinct orientations as to what this debate should include when informing public policies and programs.

Despite the controversies, it is possible to say that most of the interviewees in the study, as well as most of the literature systematized[3], were more aligned with the first idea of community networks. Considering some differences, in general, these actors/institutions defined community networks relying on three main principles:

- **Nonprofit:** Community networks are nonprofit networks, with or without Internet access, in which the costs of installation and operation can be financed externally or shared among the community members. However, as a matter of principle, they are not meant to generate profit.
- **Self-management:** Community networks are self-managed networks. They consist of arrangements that depend on the organization and deliberation of the communities, even if they choose to pay technicians responsible for network maintenance (usually community members) and have to outsource some stages of their operation to other suppliers (contracting signals from commercial providers, for instance). The identification and operationalization of solutions to activate and maintain the networks are processes that are discussed and managed by the communities, which can review and reformulate these solutions over time according to their needs.
- **Technology appropriation and autonomy:** Community networks involve some level of autonomy

3 Important references include Belli (2018); Internet Society Community Networks Special Interest Group (2018); and Jancz (n.d.).

over technical and technological decisions (network settings) and technology appropriation by the communities (managing, caring for, and maintaining the social and technical arrangements of the networks). Autonomy and appropriation demand some level of technical and technological knowledge to assess the choices that best meet the needs of the communities. Community networks cause a shift from the condition of being passive service users to exercising power over technology. However, the exercise of autonomy in making technical decisions also depends on a context in which there are options so the communities can evaluate. In Brazil, many community networks are installed in adverse contexts, where there are few connectivity options, and the quality is unsatisfactory. Therefore, despite the existence of autonomy, the options for configuration and use of the networks may be quite limited in some of the communities.

In summary, according to these defining elements, community networks ideally presuppose the existence of communities that are locally organized and engaged in appropriating knowledge about management, technical decisions, and technological issues.

According to one interviewee, considering the context of Global North countries, network sharing technologies are more commonly used in alternative communities, organized by activists, who are interested in living unconventional lifestyles, but are not necessarily affected by social vulnerabilities (as is the case of some Brazilian community networks). In Brazil, this technological arrangement is more incorporated into development projects for vulnerable communities, which include individuals affected by social exclusion. In this sense, an important aspect in the definition of community networks by Brazilian interviewees refers to the promotion of equity and access for traditionally excluded groups and populations. Although these are controversial topics, the production of local content and net neutrality are desirable elements, but are not determinants of community networks.

Based on the interviews conducted and the literature reviewed, the predominant view of community networks is that

of connectivity arrangements that i) are primarily nonprofit, ii) are self-managed, and iii) require some degree of autonomy over decisions and technology appropriation. These arrangements differ from networks established by small commercial ISP (for-profit, but which could eventually be framed as social businesses) and access-sharing networks (presented as condo solutions). However, it is important to highlight the enormous diversity of existent practices within each of these guidelines.

HOW ARE COMMUNITY NETWORKS CREATED AND DEVELOPED?

One of the objectives of the study was to understand the main challenges and success factors involved in the process of building community networks in Brazil. Three major steps in building networks were considered:

1. **Initial stage:** conception, planning, and organization.
2. **Implementation stage:** community training and network installation.
3. **Maintenance stage:** network sustainability.

For each of these three stages, the study participants were encouraged to identify the aspects considered decisive for a successful experience and the main challenges, including the ones considered to be the main obstacles for a favorable experience of community network development.

The results of this data collection, presented below, were systematized based on five analytical dimensions. These dimensions are based on the analysis of the answers, i.e., were not directly addressed in this way. These dimensions were created to systematize the data and allow better visualization and understanding of the elements, although they are not exhaustive and are interrelated in the investigated processes. These dimensions are:

- **Social, cultural, and political dimension:** Refers to the social and cultural characteristics of each community, including vulnerabilities and strengths. It also concerns the processes of political and community engagement and organization.
- **Technical and technological dimension:** Involves the technical and technological processes of community network construction, such as technical studies,

specialized knowledge, and acquisition, handling and installation of equipment and materials.

- **Regulatory dimension:** Concerns the processes and actions necessary for the formalization and regularization of community networks in the face of Brazilian government bureaucracies.
- **Material and financial dimension:** Refers to the material requirements for building and maintaining community networks, involving their financing and financial management processes.
- **Territorial and infrastructure dimension:** Includes the physical characteristics of community territories (and their surroundings), as well as the availability of basic infrastructure services such as electricity, water, sewage, and telecommunications.

INITIAL STAGE: CONCEPTION, PLANNING, AND MOBILIZATION

This stage includes the initial actions to create community networks, and includes identification of demand, initial coordination of communities of interest, awareness-raising of strategic stakeholders, recognition of territories, and all efforts to plan and create networks (definition of models, coverage, technology, and infrastructure).

Interviewees from different social organizations related to the subject emphasized the importance of this stage to make the whole process successful. There was a prevalent perception that this initial stage tends to be carried out without due diligence, which would explain later failures and difficulties.

The perceptions of critical elements in the initial stage, as well as the obstacles and difficulties encountered in this work phase, are summarized below.

Social, cultural, and political dimension

According to the interviewees, it is important that **connectivity be previously identified as a need by communities and represent their desire** (rather than being external proposals). The recognition of this need and the appreciation of the effort to meet it constitute a decisive aspect for engaging communities (and maintaining this engagement) in the pro-

cess of building community networks. Interviewees mentioned experiences in which the process of building community networks was promoted by external organizations, aiming to take advantage of funding opportunities. In these situations, communities initially perceive advantages and support the proposals, but gradually disengage, as the process presents challenges and/or other more urgent demands arise in the territories.

Another central aspect is the **organizational capacity of communities**. According to the interviewees, capacities for organization and mobilization prior to the development of community networks are crucial for communities that wish to implement them. Their construction requires powers of coordination, accountability, and collective deliberation – which are historically developed capacities. Community networks are hardly feasible in the short term. Thus, they would be instruments to strengthen group organization in contexts where there are already mobilization mechanisms. According to the interviewees, one cannot expect that the process of building community networks will be able to establish these links and mechanisms in contexts of fragile or incipient organizations.

"I think that the first thing is negotiation with the community, for them to express their desire to have the network. The network happens when different actors, community people, more technical-activist people meet [...]. It's important to have the different actors meeting to collaborate, as well as the desire of the community itself, which will influence sustainability later."

(SOCIAL ORGANIZATION REPRESENTATIVE)

Several interviews highlighted the central role of **local mobilization** and close dialogue with local leaders or entities that have the conditions and legitimacy to mediate the relationships between communities and organizations implementing community networks. This aspect is important throughout the process, but especially in the initial phase, because the technical teams that will implement community networks usually do not know the territories or the groups that live there and, therefore, depend on strategic information for network planning. Moreover, to achieve good engagement, it is important to introduce projects for communities, and present them by key actors with internal recognition and community legitimacy, rather than by external actors.

The respondents also emphasized that the **planning carried out by communities** is decisive for successful community network experiences, and should involve communities from the beginning. In this sense, a set of initiatives that constitute community action plans becomes important, such as: i) listening to and understanding community demands; ii) identifying local leaders with legitimacy and mobilization power; iii) aligning expectations about the nature of community networks to understand that they are a resource with strengths and limitations, but that it is not about providing services; and iv) identifying people with interest and/or technical knowledge in communities.

The difficulties and obstacles in the initial stage that involve the social, cultural, and political dimension are:

- **Competition with other, more urgent demands of communities:** Interviewees highlighted that one of the main obstacles faced in the initial stage is the high vulnerability of communities facing urgent social demands. Even if there is a demand for connectivity, there are situations in which communities are directly affected by pressing problems such as hunger, violence, and territorial conflicts, or lack of energy or water. In these cases, it will be difficult to keep communities engaged and mobilized to develop community networks.
- **Internal conflicts (within communities):** As mentioned in some interviews, another factor that can negatively impact the development of community networks is the existence of conflicts within communities or among local leaders. This condition makes community mobilization more difficult. In this regard, an interviewee mentioned a situation in which there was a dispute among local leaders for the leading role in the process of building the network. In this case, the process becomes especially complicated, and the success of community networks is compromised.
- **Resistance, fear, or lack of interest on the part of communities:** According to some interviews, the expansion of access to connectivity can awaken negative reactions in some communities (or parts of them),

generating resistance and hindering the process of engagement in the construction of community networks. As pointed by some of the interviewees, communities that live in critical situations of digital exclusion may manifest little adherence to proposals due to lack of knowledge about the social benefits of connectivity and the Internet. Communities in territories that face agricultural or environmental conflicts, for example, may fear surveillance and exposure. Traditional, *quilombola*, or Indigenous communities may fear the weakening of their practices and traditions.

"The first element is to understand what the needs and expectations of the community are, because that will help define the requirements. Some communities have no access at all, not even to a telephone line, in the Amazon, for example, these are communities that resist new technologies. The mobilization process would first include the understanding of why this is an opportunity. [...] Some communities that are close to areas of agricultural conflict, of settlements, report the fear of being connected and being watched, because any form of communication ends up being a vulnerability."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"It's essential that the people involved in the process know the territory well. They have to think about the geography of the territory. But they also have to understand the geopolitics of the place and learn how to make important partnerships work. Territories have their conflicts, and you have to know how to walk through these local conflicts, because they are going to show up. [...] When the conflicts are greater than the interest in connection, then it's over, it's finished."

(COMMUNITY TECHNICIAN AND SOCIAL ORGANIZATION REPRESENTATIVE)

Technical and technological dimension

According to interviewees, carrying out an exhaustive **diagnosis** of information to support the planning of community network deployment logistics is fundamental in the initial stage. At this point, it is necessary to collect detailed data on the geography and topography of the territories, map local leaders and public facilities, understand community customs and local event calendars, as well as identify connectivity options in the regions and the limitations of communication infrastructure. Based on this information, technical teams will be able to develop in-depth studies that will enable the preparation of robust technical plans.

This detailed diagnosis is the basis for making a series of technical decisions that constitute the **technical plan** for the deployment of networks themselves. As reported by the interviewees, this step is decisive for the construction of

community networks that are technically robust and less susceptible to failures and problems over time.

The technical planning should include steps such as: i) design of strategies to overcome physical and topographical obstacles in the territories; ii) identification of the best options for equipment and network infrastructure, considering the specificities of the territories (such as installation of towers or use of posts/trees to install routers); and iii) identification of the best options for connectivity technology (such as radio, cable, or fiber optics) and signal contracting and distribution (satellite Internet, ISP, etc.).

"So, first, it's necessary to get closer to the community, align expectations and what is feasible to do. And then there's a more material planning, what kind of technology is going to be used, and how it's going to be implemented. [...] It takes: community planning, technical planning, and legal planning."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"Another important dimension is a more technical one, involving technology and geography. So, doing topographical analysis, locating the distances between two or more villages. On the outskirts of a big city, you need to analyze the use of the spectrum, understand what equipment is needed, and what its range is."

(SOCIAL ORGANIZATION REPRESENTATIVE)

Regulatory dimension

Considering that the process of **formalization and regularization of community networks** can be long and depends on certain institutional conditions, some interviewees highlighted the need for legal/institutional planning for networks formalization from the initial stage.

To enable subsequent formalization and regularization, communities must be able to register local organizations, with an active and compliant National Registry of Legal Entities (CNPJ), as responsible for networks with the regulatory agencies in the country (National Telecommunications Agency [Anatel]). Since not all communities have this institutional condition, a previous effort is required to make it feasible, formalizing existing local entities or regularizing some that have pending bureaucratic issues or debts.

"In the field of bureaucracy, it's fundamental to know if the association has a CNPJ. If we are going to formalize the network through the association, the first step is to understand what is needed in terms of bureaucracy."

(SOCIAL ORGANIZATION REPRESENTATIVE)

IMPLEMENTATION STAGE: COMMUNITY TRAINING AND NETWORK INSTALLATION

The implementation stage includes technical training of the communities and subsequent installation of the structure and equipment of the community networks. Next, we will detail the decisive elements and the barriers to the development of this stage, according to interviewees.

Social, cultural, and political dimension

For this stage to develop well, a prior period of **awareness-raising, mobilization, and planning** (initial stage) is essential, in which project technical teams depend on the involvement and participation of communities in both training activities and the installation itself. Engagement and motivation of local communities in this stage were considered decisive factors by several interviewees.

According to the interviewees, **the roles and responsibilities** of everyone involved in the process should be well defined at this stage, both between communities and partner organizations (implementing and funding entities) and within communities (among their members). It is important to define roles and responsibilities, such as who does the maintenance, who takes care of access passwords, who has the right to access networks within communities, and who takes care of financial contributions and pays ISP, among other activities essential to the operation of networks.

"It's important to establish community agreements, remembering that for us the community network is not about technology, but about technological appropriation. The essential thing is that it has well-founded principles, in terms of self-management, that it has well-established rules. And, in terms of technological appropriation, we don't want a farmer to be an expert in networks, but rather to be able to dialogue about this subject."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"When it's time to implement it, people are going to get their hands on it. If it's going to be implemented by people outside the community who are not going to be there afterwards, you are going to have one result, and it has a 99% chance of going wrong. It has to be implemented by people who are going to use it, who are from the community, but who don't have technical know-how."

(COMMUNITY TECHNICIAN AND SOCIAL ORGANIZATION REPRESENTATIVE)

Technical and technological dimension

According to the people who participated in the study, the **technical training of communities** is considered strategic. If it does not achieve the goal of preparing communities to manage and maintain community networks over time, the whole process may be compromised. The appropriation of technical knowledge that can result from this experience is decisive in building autonomy in relation to community decisions about networks.

To achieve this objective, most of the interviewees emphasized the need to favor a more practical model of training that takes into account local knowledge and difficulties and seeks to increase participants' interest and curiosity. They consider it necessary to avoid a more technical teaching methodology and, at the same time, to focus on inclusive training, which seeks to include women and older people, because they are the ones who remain in the communities when young people leave to study or work.

There is also the concern that good training requires time and availability of participants. Therefore, it is important not to compete with community schedules of events and to consider the school hours, care requirements of participants' children, and meal distribution. These measures allow for greater adherence of communities to the training process.

According to several interviewees, time spent in the implementation stage is a decisive factor. It is important to dedicate the necessary time to each action, respecting the time frame of the implementation process without skipping or rushing steps. The negative effects of providing training too quickly, which does not allow participants to appropriate and consolidate what they have learned, were also highlighted. Time becomes an especially important aspect for the implementation of networks in territories with difficult access, where travelling is costly and time-consuming, in addition to the possibility of unforeseen climatic events (heavy rains and river flooding) or other imperative demands. For these reasons, it is essential to create schedules that allow for flexibility.

Finally, in the implementation stage of community networks, it is essential to have **teams of technical experts** with experience in installation under adverse conditions and

in community mobilization. This aspect was emphasized as a success factor in some interviews.

Some of the main obstacles related to the technical and technological dimension and identified at this stage are:

- **Contracting connection signals/links for redistribution:** Difficulties in communicating and negotiating with commercial ISP to contract signals to be redistributed by community networks was frequently mentioned by civil society representatives. The following challenges stood out: standardized service offerings that do not meet the demands of communities, sale of signals exclusively in retail as end users, poor signal quality, lack of technical support, and little willingness to facilitate processes. According to several people who participated in the study, these barriers result from a mistaken perception of competition between commercial ISP (especially small enterprises) and nonprofit community networks.
- **Other technical barriers:** Some interviewees pointed out technical barriers in the implementation stage, and two of them stood out. The first was the process of installing antennas for signal distribution, which is an expensive and difficult procedure that, when necessary, can make the installation especially technically challenging. The second barrier was the unavailability of good and affordable equipment in the country. According to some interviewees, it is necessary to buy it outside Brazil.

"Sometimes people don't have a Secondary Education, but they need to learn how things work in a network. They are not going to become technicians the very first time, but they need to learn how to ask for help, to see what is wrong. This community appropriation is a fundamental step. It's not enough to get there with the technology, the resource, and then leave. Knowledge must be shared during implementation."

(COMMUNITY TECHNICIAN AND SOCIAL ORGANIZATION REPRESENTATIVE)

"You can't do the training (technical and social) of a community network in ten days, in addition to installing a solar panel, for example. It's humanly impossible to do it all in this period."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"This support [training] would have to be provided for a longer period, until people have appropriated technical knowledge. So in this implementation stage, you need more people involved, which makes it easier, narrowing the relationship between the technical community and the community interested in the community network."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"The training and capacity-building process is fundamental, having partnerships with those who can help in this moment. Regarding the management issue, for example, it's important to rely on local political leaders who will also lead the network distribution process. In addition to producing content and aligning it with the community's interests, you have to be careful so that process is not too fast, because it can fail."

(SOCIAL ORGANIZATION REPRESENTATIVE)

Regulatory dimension

Difficulties in registering and formalizing community networks were mentioned by several interviewees. This aspect becomes especially critical for communities that do not have an active and compliant CNPJ to register networks with Anatel. But, in general, even when this barrier does not exist, the process is challenging because it is bureaucratic, requiring technical knowledge about communication technology, digital skills (because the procedure is online), and being familiar with legal terms and government procedures and services.

"Regularization is a difficult issue for community networks, very bureaucratic. This issue needs to be thought of as a legal support process, involving the legal staff. And Anatel itself needs to consider this to facilitate access and digital inclusion."

(SOCIAL ORGANIZATION REPRESENTATIVE)

Territorial and infrastructure dimension

As pointed out by the interviewees, the physical and structural characteristics of territories, such as locations that are hard to reach, can represent major barriers to network implementation. The further away from large urban centers and the harder the access (riverside or mountainous regions, lack of or poor quality of roads, etc.), the more complex the logistics of implementation. In these situations, transportation of staff and equipment is more costly and complicated, and operations to connect to the Internet or radio signals become much more difficult.

In addition to geographic location, size of territorial areas and dispersion of communities over large areas can also pose challenges for community network implementation. That is because the larger the territories and the areas to be covered by the communication signals, the more complex the network installation. In situations where families are dispersed over large territories, more routers and more antennas need to be installed to distribute signals. Very irregular territories require higher and more expensive antennas, which are

more complex to install. In this sense, the topographical characteristics of territories can also represent additional difficulties in the implementation stage.

Finally, it is worth noting that some interviewees also pointed to the infrastructure characteristics of the territories as possible obstacles. Communities with poorer infrastructure may live without electricity, which would require the additional effort of installing alternative power sources (such as solar panels) and would make the process of installing community networks more costly.

MAINTENANCE STAGE: NETWORK SUSTAINABILITY AND IMPROVEMENT

The maintenance stage includes the processes of preserving, repairing, and improving community networks after the equipment installation. The following sections describe the success factors and the main difficulties related to this stage.

Material and financial dimension

For the long-term sustainability of community networks, the interviewees believe that **local financial organizations** or the provision of systematic external funding are necessary. Community network implementation projects usually consider resources only for the initial stages, as there is an expectation that communities will be able to self-finance the projects. It is important for communities to be able to guarantee financial resources to pay for links, besides a reserve for maintenance and repair – and, when necessary, for the remuneration of the people responsible for networks. Some respondents believe that relying exclusively on volunteer work for network maintenance makes the sustainability of networks more fragile. Furthermore, if it is necessary to expand community networks to cover large territories or serve more people, there will be a demand for new resources.

One of the main obstacles to maintaining networks is the challenge of ensuring their financial sustainability over time. The aspects related to this problem, as highlighted in the interviews, are:

- Most projects for implementing community networks do not consider resources for the network maintenance stage, leaving this responsibility to communities.

- Communities that implement a network are exposed to different social and economic vulnerabilities, which makes ensuring network financial resources a challenging aspect. It is important to emphasize that this financial management must consider, besides the regular cost of connection signals, funds for exceptional needs such as repair and equipment replacement.
- It is common for organizations that have implemented networks to offer distance technical support to communities for a few months. However, there are no resources to afford on-site technical visits, which may be necessary in some cases and can be costly when communities are located in hard-to-reach areas.

"Money and technical support to make visits from time to time are essential. A good part of the networks don't succeed because we don't have the money to maintain this mediation in all the networks. The most common scenario is: Some equipment broke down, they couldn't fix it by themselves, and they didn't have the money to hire someone to do it."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"Institutional strengthening [is decisive in maintenance], because most projects cover CAPEX, which is the initial funding for Internet and equipment, but it runs out. In the training process, you must teach the communities how to obtain resources. Partnerships with larger organizations, institutionally structured to work with this, like universities, are also important. Public policy can be important in this part of funding, for exemption from the payment of Internet charges. But this alone would not be enough, because equipment can break down. Financing has to be broader."

(SOCIAL ORGANIZATION REPRESENTATIVE)

Technical and technological dimension

One of the most decisive aspects for the sustainability of community networks is that there must be groups of local stakeholders who understand how the networks work and are able to maintain the equipment and make simple repairs, in addition to being able to identify any problems in order to contact remote specialized technicians, if necessary. The technical knowledge acquired in the training process must be mobilized and used constantly, or it is forgotten. In the initial stage, it is essential to ensure the involvement and **appropriation of technical knowledge** by community members who will be responsible for maintenance.

To ensure technological appropriation, it is preferable to provide continuous training for communities, since technical problems change over time. The provision of periodic

training that follows the needs of each stage of maturity of networks can contribute to the longevity of these initiatives. Finally, it is important that there is availability of materials and tools suitable for repairs on site, so communities can exercise their autonomy in the maintenance of networks.

Some obstacles reported in this dimension are:

- The remote technical support strategy offered by deployment organizations is seen as a difficulty. This solution depends on someone in communities to adequately identify problems and report them to distance consultants. This is not always satisfactory, and the whole process of distance technical support is compromised.
- Another difficulty that can arise at this stage is the need to replace equipment. This process can take a long time, because pieces of equipment are difficult to find. And, in the meantime, networks are inactive, and communities are unserved.

"Those who are planning to build the network must follow up on this process. So, I say again that the continuing training process is definitive for the maintenance of a network."
(COMMUNITY TECHNICAL REPRESENTATIVE)

"Follow up is essential. Setting up knowledge exchange groups so that we can always be in contact with people, because they always have doubts, I have doubts. People become developers. [...] We build this bridge so that people are not alone in the community, so that they are supported. People also feel more confident to try new things because they are being more followed up."
(COMMUNITY TECHNICAL AND SOCIAL ORGANIZATION REPRESENTATIVE)

"The continuing education process is very important, because technology is one of the most fluid things nowadays, there's something new every day."
(SOCIAL ORGANIZATION REPRESENTATIVE)

Technical and technological dimension

According to the interviewees, when technology is **appropriated by communities**, networks become powerful instruments of social transformation. The analysis points out the importance of networks being socially useful, suitable to expand access to other rights besides connectivity, helping solve community problems, strengthening social ties, and encouraging the production and sharing of cultural content.

Another key aspect to ensure perpetuation of community networks over time, in the perception of the interviewees, is the **in-**

volvement and protagonism of older people and women in the processes. This is important because it is often young people who are interested and engaged in building networks, but they end up leaving territories in search of study and work, and communities end up without people responsible for technical maintenance. Women and older people in communities are those who stay in territories the most and, when they have appropriated the technology well, they tend to invest time and energy in the conservation of community improvement resources.

The obstacles found in this dimension include:

- Maintaining community engagement and participation in the long-term management of networks.
- The process of managing and taking care of networks demands time and energy from community members, and reports of fatigue and frustration by the most active participants are not uncommon. Over time, the continuous process of failures and need for technical repairs can cause deterioration, as well as conflicts in the collection of shared fees to finance networks.
- The possibility of political manipulation and clientelism when community leaders try to use access to connectivity as a bargaining chip for local political support and favors.

"Keeping the community interested, active, and participating is an issue, because generally the older people in these communities are afraid of the equipment, unless they're electricians. And younger people tend to leave the territory to study and work and send money to their families. So, there's a lot of descontinuity regarding the people who could run the project. We also had difficulties keeping young women in the process, because, besides this, there's the gender issue, they have responsibilities with their families and homes."

(SOCIAL ORGANIZATION REPRESENTATIVE)

"The challenge of maintenance, at the macro level, is the issue of public policies. In the micro, it's the non-appropriation, losing meaning in the community, generally, when the process happens too fast."

(SOCIAL ORGANIZATION REPRESENTATIVE)

Regulatory dimension

Some regulatory challenges were also mentioned regarding the network maintenance stage.

First, it was pointed out that, until communities complete the network formalization process, community networks (and those responsible for them) are vulnerable to sanctions such as fines and criminal prosecution.

At a later stage, if it is necessary to adapt or change the equipment, it may be necessary to undergo a new equipment homologation process with Anatel. In other words, there is an additional demand that local actors usually do not know how to solve and, if they do not conclude this stage of homologation, networks are again vulnerable to the application of sanctions.

The interviewees emphasized that the regulation of community networks is very bureaucratic and rigid, generating disproportionately harsh sanctions. The results indicate the need for regulators to develop specific instruments to address community networks. The mechanisms currently used are not considered by the experts to be fully satisfactory.

COMMUNITY NETWORKS IN THE BRAZILIAN CONTEXT

One of the main objectives of this study is to understand the role of community networks, considering the specificities of the Brazilian context, its strengths and limitations.

For this purpose, the present study with representatives from different sectors sought to identify the relevance of the theme in the national public debate vis-à-vis the existing opportunities and the problems that this model can help solve and/or minimize. It also aimed to identify the main structural barriers that the Brazilian scenario imposes on the development of this issue.

The interviewees were asked to reflect on the opportunities and obstacles facing the expansion and development of this debate in Brazil. The perception that prevailed among the respondents was that, considering the particularities of the national context, the community network proposal has a great potential for development in the country and can contribute to mitigating the persistent problems of expanding access to connectivity, which have not yet been solved by other initiatives, either from governments or the private sector.

The following sections present a systematization of the main results of the study regarding the problems that community networks can solve, and the main obstacles involved in this process.

TERRITORIAL AND INFRASTRUCTURE DIMENSION

According to several interviewed representatives, especially those from civil society, the country is still very dependent on the market to provide access to communication and connectivity.

However, due to the geographical and occupation characteristics of the Brazilian territory – featured by huge territorial extension, with areas that are hard to reach and have a low population density – the business model is not able to provide access to the entire population. The expansion of commercial services to certain regions of the country demands high investments that will not convert into advantageous financial returns for the enterprises.

Given these territorial inequalities, community networks are an interesting and low-cost solution to expanding Internet access in areas far from large urban centers, with difficult access and poor infrastructure. They represent an alternative to serve communities in areas that are not served by commercial ISP due to their low profitability, and consequently promote their digital inclusion and access to other rights and benefits.

According to most of the interviewees, this would constitute the main strength of the proposal in the country. However, in order to develop effectively, more structured coordination efforts between commercial ISP, government initiatives, and unserved communities are needed in Brazil.

SOCIAL, CULTURAL, AND POLITICAL DIMENSION

A significant number of the interviewees highlighted the potential for communitarian and political strengthening of community networks in socially vulnerable and geographically isolated communities in the country. As one of the main opportunities, they mentioned that community networks foster community development, which can strengthen the pursuit of political and social demands, local economies, and the expansion of access to other rights and public services. Connectivity achieved through community networks becomes a tool to access other social benefits and promote greater social inclusion of vulnerable communities.

Some interviewees believe that community networks can also be powerful tools for communal communication, promoting not only closer social ties, but also the resolution of local problems and the production and sharing of cultural content. This communitarian communication does not need Internet signal and can even be operationalized by other forms of connection such as radio and Intranet. This type of resource can even be used for internal security strategies and territorial monitoring by communities in areas affected by agricultural and environmental conflicts.

Finally, community networks are perceived by the interviewees as a potential instrument for building technological appropriation and autonomy of these communities in relation to commercial ISP.

Lack of knowledge about community networks in Brazil was pointed out by the interviewees as one of the obstacles to advance in this debate in the country. It is still a little explored and publicized alternative. Digitally excluded communities, which could benefit from this alternative and actively pursue it, do not know about it, its strengths and benefits. The study participants believe it is necessary to increase the effort to advertise and disseminate this idea to society to expand the knowledge about it, so communities willl demand it.

MATERIAL AND FINANCIAL DIMENSION

One of the main difficulties mentioned by the participants was the lack of resources and incentives for the promotion of community networks in the country. According to the data collected, projects related to this topic are currently financed in Brazil almost exclusively by international organizations. The interviewees also highlighted the absence of national public and private funding.

Within this topic, it is important to mention that both civil society organizations and small ISP require resources from the Universal Service Fund (Fust) to finance community networks in the country.

REGULATORY DIMENSION

The interviewees indicate that the regulatory dimension presents some obstacles to the development of the debate in the country. Several participants pointed out that the regulatory environment in Brazil has improved, but it is still not very friendly toward community networks, and there is not a specific regulation for this type of network. The formalization and regularization of networks of this nature involve bureaucratic processes that require specialized technical knowledge, in addition to an active and compliant CNPJ. Furthermore, the sanctions for non-formalized networks are very severe.

Representatives of civil society organizations also pointed out that public authorities have been investing in incentives and facilitators for market players, such as small ISP, but have not developed incentives and support for nonprofit experiences, such as community networks. Finally, they demand initiatives to regulate the coordination between commercial ISP and nonprofit networks, aiming to establish complementary and non-competitive

arrangements. This would allow, for example, to sell signals at wholesale to community networks rather than as end users.

TECHNICAL AND TECHNOLOGICAL DIMENSION

In the technical and technological dimension, the interviewees pointed out at least two difficulties imposed by the Brazilian context on the strengthening of this debate.

The gap in education and knowledge about technology is a comprehensive and structural problem. For the participants, the country does not prioritize efforts in high performance education and technological and technical training. It would be difficult to build connectivity arrangements based on autonomy and technological appropriation, such as community networks, without minimum levels of training and knowledge.

Another problem pointed out in this regard was access to and availability of affordable and good quality equipment for the installation of community networks in Brazil.

COMMUNITY NETWORK EXPERIENCES

Finally, the study sought to collect perceptions about concrete experiences of community networks in the country, investigating the features of those considered successful and those that had problems regarding their implementation and/or sustainability. In this effort, we sought to understand mainly which elements and characteristics were important for the success of the experiences and for the difficulties encountered, as inputs for future lessons.

FACTORS CHARACTERIZING SUCCESSFUL EXPERIENCES

It is important to highlight that the interviewees expressed difficulty in mentioning successful experiences, because they consider that the vast majority of community networks in the country face difficulties that make them vulnerable in one or more aspects, and the frequency of demobilization (temporary or permanent) of these networks is high. One of the main indicators of success is sustainability. Networks that overcome the various challenges related to their sustainability (social and financial organization, and capacity and technical problems) and last for years are considered successful experiences.

The main distinctions and success factors of these cases, as cited by the people interviewed, reiterate the aspects described above.

In summary, they are:

- **Technological appropriation:** Communities understand how networks work and are capable of doing their maintenance, repair, and even improvements. In communities, there are people with minimum technical knowledge to keep the networks running and to seek solutions to eventual problems.
- **Financial organization:** Communities should be organized to finance network costs and build autonomy in relation to the resources of partner organizations.
- **Community participation in network management:** The greater the community involvement in decision-making processes, the greater the chance that these initiatives will achieve longevity. Consequently, the lower the risk that technical knowledge and strategic decisions are concentrated in a few actors, networks are demobilized over time and/or do not reflect community needs.
- **Making community networks instruments of community engagement:** Community networks that manage to transform technology and connectivity into instruments to achieve access to other rights and public services are considered successful.
- **Building robust strategies to overcome territorial and geographical barriers:** Networks that are capable of developing good solutions to overcome challenging territorial and geographical barriers are also perceived as examples that worth highlighting.

FACTORS NEGATIVELY IMPACTING EXPERIENCES

Community experiences considered unsuccessful are usually those that have had short durations of activity and are now inactive, or those that, despite being still active, face enduring maintenance problems.

It is important to explain that some initiatives were mentioned by different interviewees with distinct perspectives about the same experiences.

The main problems faced by these initiatives that are considered unsuccessful include:

- **Not achieving technological appropriation:** Cases in which communities were not able to achieve sufficient tech-

nical autonomy to keep networks active and solve eventual technical problems.

- **Financial unsustainability:** Experiences in which communities were not able to afford network costs (signal and equipment repairs) and became dependent on external resources and/or defaulted on commercial ISP.
- **Weakening of community engagement:** Networks that have failed to keep communities interested and participating in long-term decisions and have experienced decreases in participation and financial contributions. In these situations, there may be frustration with the constant need for repair and maintenance, followed by dissolution of the arrangement in favor of contracting commercial ISP services. In these cases, internal conflicts may also emerge and weaken the initiatives. This demobilization can also occur when the people responsible for the technical maintenance and organization of networks leave the territories (mainly young people) and are unable to pass on this role to other community members.
- **Territorial and geographical barriers:** Community networks that fail to build strategies to overcome territorial and geographical barriers are pointed out as unsuccessful experiences. Generally, these are experiences in which there is a lack of in-depth study of the territories to support planning and installation of equipment.
- **Execution schedule:** Community networks that were implemented following short schedules that do not respect the timeline of the processes and do not consider eventual unpredicted events tend to have problems over time. Rushing complex processes and skipping strategic steps can compromise the results of the experiences.

FINAL CONSIDERATIONS: NOTES FOR THE PROMOTION OF THE DEBATE FOR COMMUNITY NETWORKS IN BRAZIL

This section consolidates possible guidelines for actions to promote community networks in Brazil, based on interviews with representatives of different segments related to the subject. In view of the analysis presented in the previous sections, this study generates proposals to be considered by both public actors (through direct

promotion or even regulation) and civil society organizations/markets engaged in this topic.

As evidenced in the different stages of the study, one of the main challenges for the debate of community networks is their scale and the possibility of replication in different territories and communities. In order to be considered as a possible answer to connectivity problems, this solution needs to be developed in the sense of gaining reach and visibility, which involves efforts by the different types of actors involved in these proposals. The following section offers some suggestions for guidelines to be addressed in a multisectoral set of proposals for the promotion of community networks in Brazil.

KNOWLEDGE PROMOTION: PUBLICIZING/ DISSEMINATING/EXPANDING THE DEBATE

The first point to be highlighted is the need to expand the debate on community networks as a possible solution to connectivity issues. This information still reaches few social groups and, especially, few digitally excluded communities. Consequently, it is an alternative that is still underexplored. Strategies to minimize the lack of information about community networks in Brazil could involve actions mobilized by governments and civil society organizations, in the sense of publicizing successful cases and their benefits, as well as coordination with organizations that work on other dimensions of social exclusion, and public calls for proposals that are publicized and explained comprehensively, among other possible actions. This dissemination of information can be combined with programs for promotion and funding or training of agents, as described below.

MECHANISMS FOR COORDINATION BETWEEN ENTERPRISES AND CIVIL SOCIETY ORGANIZATIONS

The discussion about possible partnerships between small ISP and community networks (nonprofit) should be broadened to develop mechanisms, including regulatory ones, aligned with a vision of collaboration rather than competition between these actors. This involves recognizing community networks as arrangements that are autonomous, nonprofit, and committed to local development projects, generally in vulnerable communities - and that, therefore, they should not be treated in the same way as other market agents or consumers.

INTEGRATION WITH UNIVERSITIES

The study pointed out an opportunity to involve universities in discussions about community networks, for example, through university extension projects, with the payment of scholarships for trainers, facilitators, and replicators in communities. Investing in the expansion of technological education appears to be a fundamental condition for digital autonomy, and universities, especially those outside large centers and close to communities without access, could be engaged in this task.

STRENGTHENING OF THE DEBATE AMONG PUBLIC AUTHORITIES AND SUPPORT PROGRAMS

The interviewees indicated that community networks are still not a common theme in the governmental agenda, either in the scope of the Ministry of Communications, or in the scope of Anatel. Even though there are efforts underway to develop strategies on the subject, these still seem incipient.

The documentary study and the interviews conducted indicate a number of possible paths for a community network proposal to be promoted by the State. The following points were the most frequently mentioned by the experts interviewed, but this is not an exhaustive list.

Programs and funding

- Expansion of public resources for community networks in Brazil, given that the projects related to this topic are funded almost exclusively by international organizations. Civil society organizations in this field advocate for the possibility of using Fust resources to promote community networks, which could help to increase the scale of these initiatives. Market agents, such as small ISP, are also requesting the use of Fust resources for their social businesses. The Management Council of Fust is being established, and entities representing civil society tend to advocate for proposals on community networks.
- Public funding for equipment/materials. The equipment needed to implement community networks is very costly for vulnerable communities. Programs or actions to finance or donate this equipment could make this solution more viable for more territories.

- Public funding for the implementation of community networks, which could involve civil society organizations with a trajectory in this field, or be offered directly by the government.
- Training of local technicians, considering that one of the main problems identified in this study refers to the training of groups from communities to identify and solve problems in networks. These groups are fundamental to guaranteeing the continuity of networks. The interviews also revealed how the issue of technical knowledge is still affected by the gender dimension: There are very few women in technical positions, and there is an opportunity for training actions in this direction. As examples, training programs for community agents in other public policy areas could be analyzed.

Regulation

- Development of a specific regulatory mechanism for community networks, following the example of those available internationally.
- Simplification of processes for formalizing community networks.
- Expanding exemption of the grant for all media (not only those confined) for cases of community networks.
- Exemption of base station registries for community networks.
- Authorization for community networks to use other frequencies.
- Adequate regulation of the relationship between community networks and commercial ISP (for example, allowing community network customers to share signals contracted from ISP).

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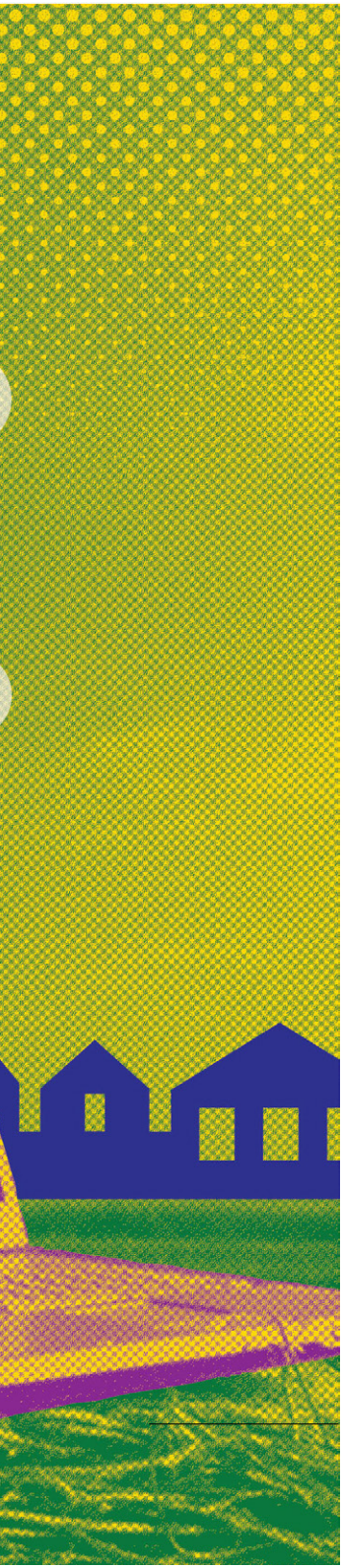
CHAPTER II

Mapping the experiences of community networks in Brazil: A quantitative study



This chapter presents the main results of the quantitative stage of this study focused on the experience of implementation of community networks in Brazil. The study was carried out between November 2021 and March 2022, with the participation of 40 community network managers.[1] After conducting a qualitative and exploratory study on the theme (see Chapter I), the quantitative stage had the objective of mapping the experiences of community networks in Brazil, as well as their current stage of development.

Throughout this chapter, we sought to identify the community networks according to their locations, and to look into different aspects of their operation. At this stage, the focus is on discussing the strengths of this type of experience in bridging important social gaps to guarantee the population's right to connectivity – a debate that is especially important in contexts such as that of Brazil, where different situations of social inequality overlap. The study also allowed us to identify challenges to the implementation, operation, and consolidation of the networks, as well as to gather information about the profile of users, types of services provided, activities carried out, and the precautions related to privacy and security taken by the community networks analyzed.

The chapter starts with a socioeconomic characterization of the territories where the community networks analyzed operate, either by compiling secondary data or by presenting primary data collected through interviews. Based on this characterization and considering the diversity of data sources, we sought to understand the relationship between community networks and population's levels of income and education, population size, and degrees of social vulnerability that feature the municipalities where they operate.

In the second section, quantitative and qualitative data are compared to better understand the context of the emergence of the networks and the motivations for their creation. This analysis includes the presentation of indicators on the participation of different actors within the context

1 For more details on the study methodology, see the "Methodological Notes" section.

of establishing the networks, with emphasis on the involvement of the communities surrounding the facilities and the presence of local organizations and external support institutions for the implementation of the projects.

The third section explores the profiles of the managers of the community network initiatives identified and their bond with the territories. Subsequently, seeking to understand the current scenario of the mapped networks (fourth section), as well as the barriers and opportunities for maintaining their activities, information is presented on the current status of the networks, in particular portraying the reasons for interruption or definitive ceasing of activities, in cases in which this occurred. Indicators are also presented on the links of community networks with institutions, groups, and organizations inside and outside their territories of operation. These partnerships were highlighted as essential for the operation of these networks in the qualitative study, which was also presented in this publication (Chapter I).

The fifth section highlights data on active networks. The difficulties of formalization and financing are identified, as well as the main sources of resources invested in the operations. It also discusses the ownership of the equipment used, the existence of information exchange among the members of the community networks, and the initiatives for the technical training of users and network operators.

The final sections present indicators on the services offered by the community networks, who the main users are, and the most recurrent uses in the perceptions of the interviewed managers. The role of users in the management of the networks was also investigated, aiming to characterize the models of participation in management. Closing this discussion, managers' perspectives regarding the continuity and expansion of the activities implemented are presented.

COMMUNITY NETWORKS AND TERRITORIES WHERE THEY OPERATE

Universalization of Internet access is part of the agenda for the Sustainable Development Goals (SDG), as a target of the Goal 9, which aims to build resilient infrastructure, promote inclusive and sustainable industrialization, and foster

innovation (United Nations [UN], 2015). Despite the global growth in Internet access, a large number of people are still disconnected from basic telephony services. This exclusion affects areas considered to be "unprofitable" in market terms, which are generally the territories where the most vulnerable groups are found (Baladrón, 2018; Rey-Moreno et al., 2017). In the debate about community networks, there is a recurrent discussion about their importance as a strategy to reduce inequalities, not only in access to connectivity in historically excluded territories, which, in general, are distant or isolated from large urban centers, but also in the type of appropriation that is achieved in relation to the use of the Internet in these places and its effects. Considering that they develop in areas of greater social vulnerability, community networks can be an important agent in guaranteeing and exercising citizenship (Baca et al., 2018; Belli, 2018; Castro et al., 2018; Ramos, 2018; Zanolli et al., 2018).

This section presents a socioeconomic characterization of the territories where the networks analyzed were located. The following data on the location of the networks was processed with a sufficient level of aggregation to prevent the identification of the networks in question, ensuring the respondents' privacy and anonymity.

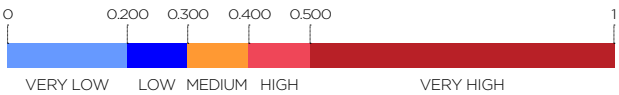
Initially, the presence of community networks in territories characterized by high social vulnerability of their populations is striking, which can be inferred from the Social Vulnerability Index (SVI) of the Institute for Applied Economic Research (Ipea) (2015).[2] The index of the territories of the mapped networks, calculated from the average of the municipalities where the facilities were located, is around 0.433, whereas the average for Brazil is 0.326. Considering that the higher the value of the index, the greater the vul-

2 The SVI is the result of the arithmetic mean of the following sub-indices: Urban Infrastructure SVI, Human Capital SVI, and Income and Labor SVI, which are included in the final SVI calculation with the same weight. To calculate the sub-indices, 16 indicators based on the demographic censuses of the Brazilian Institute of Geography and Statistics (IBGE) were used for the years 2000 and 2010. Equivalent weights for each indicator were used to build each dimension of the SVI, and maximum and minimum parameters had to be adopted to turn it into a standardized indicator, with values ranging from 0.000 to 1.000. Each indicator had its value normalized on a scale ranging from 0 to 1, in which 0 corresponds to the ideal or desirable situation, and 1 corresponds to the worst situation (Ipea, 2015). For more details, see https://ivs.ipea.gov.br/images/publicacoes/Ivs/publicacao_atlas_ivs.pdf

nerability, the result shows that Brazilian community networks are predominantly located in regions with greater socioeconomic fragility. When breaking down the index into its three dimensions (Urban Infrastructure, Human Capital, and Income and Labor), the municipalities of the community networks also show lower performance than the national average. In terms of Urban Infrastructure, while the Brazilian population is concentrated in areas of low social vulnerability, the result observed in the municipalities of the community networks indicates medium vulnerability. In the case of the Human Capital and Income and Labor dimensions, the country presents medium vulnerability, whereas the result of the municipalities of the networks reflects areas of high social vulnerability (as illustrated in Table 1).

TABLE 1 – SOCIAL VULNERABILITY INDEX – BRAZIL VS. MUNICIPALITIES OF THE COMMUNITY NETWORKS

SOCIAL VULNERABILITY INDEX	BRAZIL (2010)	MUNICIPALITIES OF THE COMMUNITY NETWORKS (2010)
General	0.326 (medium)	0.433 (high)
Urban Infrastructure	0.295 (low)	0.396 (medium)
Human Capital	0.362 (medium)	0.471 (high)
Income and Labor	0.320 (medium)	0.432 (high)



SOURCE: PREPARED BY THE AUTHORS, BASED ON IPEA (2015).

Regarding economic indicators, 28 of the 40 mapped networks (i.e., 70%) are located in municipalities that have a Gross Domestic Product (GDP) per capita below the national level (IBGE, 2020). Assuming that GDP per capita is a measure of the wealth produced by local economic activity, it is worth noting that 13 networks (one-third of those mapped) are in the group of municipalities that represent the poorest 25%, or territories with the worst economic performance in Brazil. This economic fragility is consistent with the data available on poverty. Data obtained at the local level indicates that 30 community networks are located in the quartile of Brazilian municipalities with the highest concentration of

poor families registered in the Unified Registry for Social Programs of the Brazilian government.[3]

The data on the school performance of children and young people enrolled in public schools also reinforces the social vulnerability that features these municipalities. Considering the community networks mapped, 21 are in the municipalities that concentrate 25% of the worst scores on the Basic Education Development Index (Ideb), for the initial and final years of Elementary Education. In the case of Secondary Education, the distribution is almost identical, with 20 networks (that is, half of them) operating in the municipalities with the lowest Ideb scores (National Institute for Educational Studies and Research Anísio Teixeira [Inep], 2021).

One of the factors related to the economic and social difficulties of populations residing in the municipalities where the community networks are located concerns their distance from state capitals and regions with a greater supply of services and urban infrastructure. While in the North region, the community networks are distant from capital cities (on average 986 kilometers away), in the Center-West region, the average distance is 565 kilometers, followed by 234 kilometers in the Northeast region, and a little more than 150 kilometers in the South and Southeast regions.[4]

According to data about broadband access density per federative unit (connections per 100 inhabitants) from the National Telecommunications Agency (Anatel), of the 27 Brazilian federative units, only 7 are in the range with higher average density of broadband access (above 20 connections per 100 inhabitants), which includes all the states in the South and Southeast regions, except for Espírito Santo. Thirteen states are concentrated in the range between 11 and 20 connections per 100 inhabitants, and the others (that is, 7 states) have the lowest densities observed, less than 10 connections per 100 inhabitants (Chart 1).

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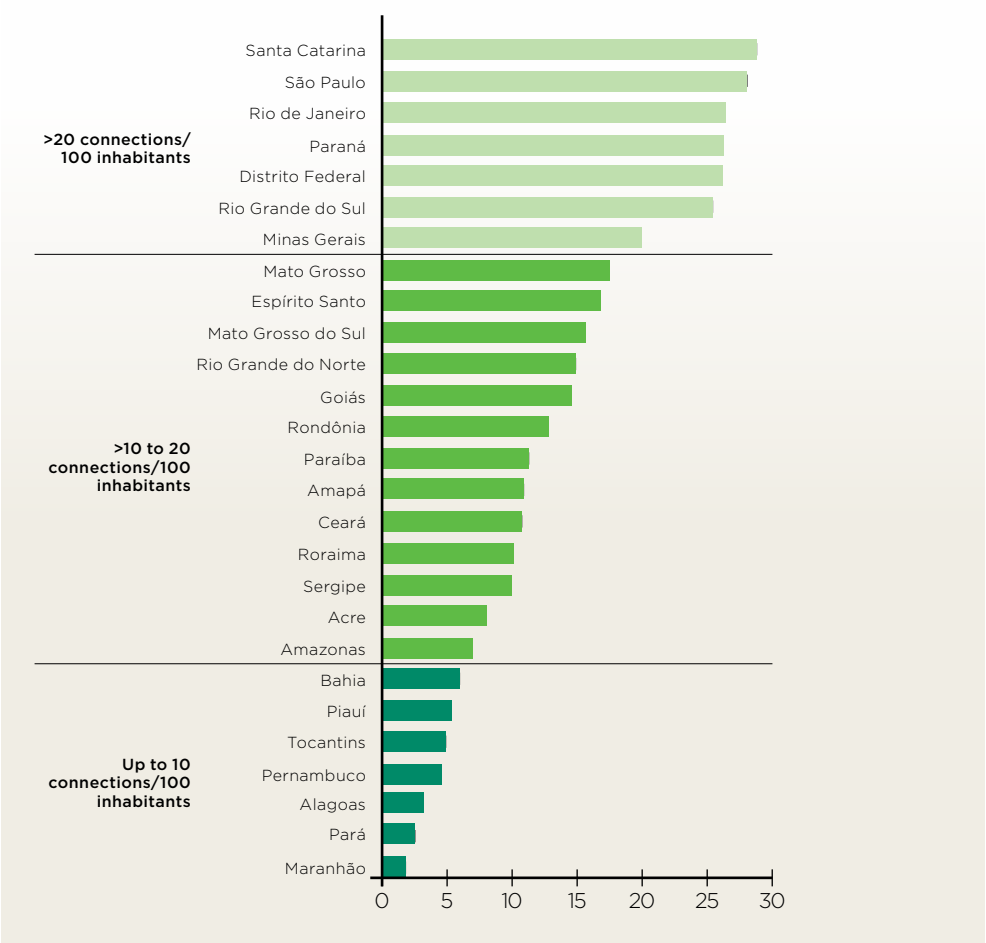
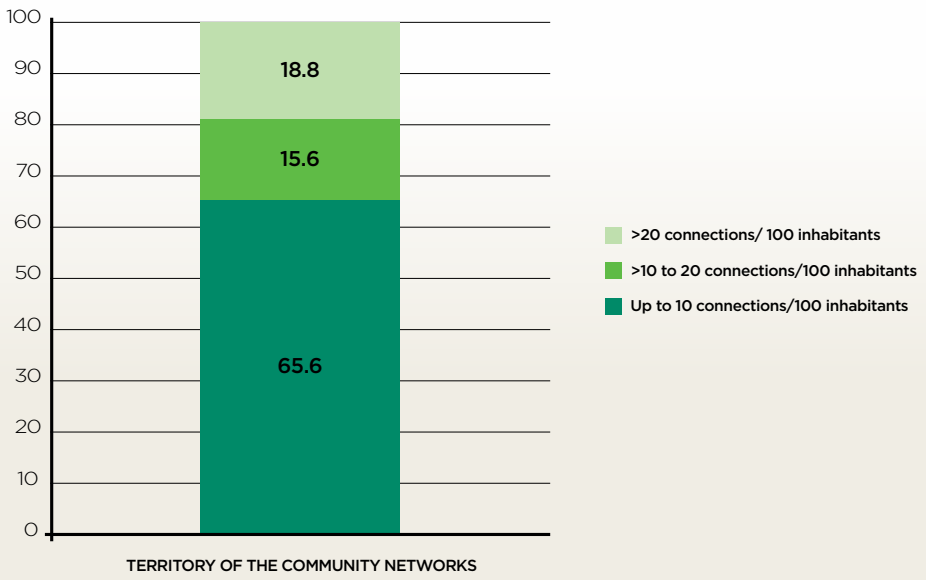
3 More information at https://www.gov.br/cidadania/pt-br/acoes-e-programas/cadastro-unico

4 Data retrieved from Google Maps, Brazil. More information at https://www.google.com/maps/place/Brazil/@-14.4086569,-51.31668,4z/data=!3m1!4b1!4m5!3m4!1s0x9c59c7ebcc28cf:0x295a1506f2293e63!8m2!3d-14.235004!4d-51.92528?hl=en

An analysis of the same indicator for the municipalities where the community networks are located shows a higher concentration of networks in areas with low density of broadband access. In this case, starting from the lowest density range to the highest, there are 21 networks (or 66%) in municipalities with up to 10 connections per 100 inhabitants; 5 (or 15%) in municipalities with 11 to 20 connections; and another 6 networks (19%) in municipalities with more than 20 connections per 100 inhabitants (Anatel, 2022).

CHART 1 – BROADBAND ACCESS DENSITY PER FEDERATIVE UNIT AND IN THE MUNICIPALITIES WHERE THE COMMUNITY NETWORKS ARE LOCATED (CONNECTIONS/100 INHABITANTS)



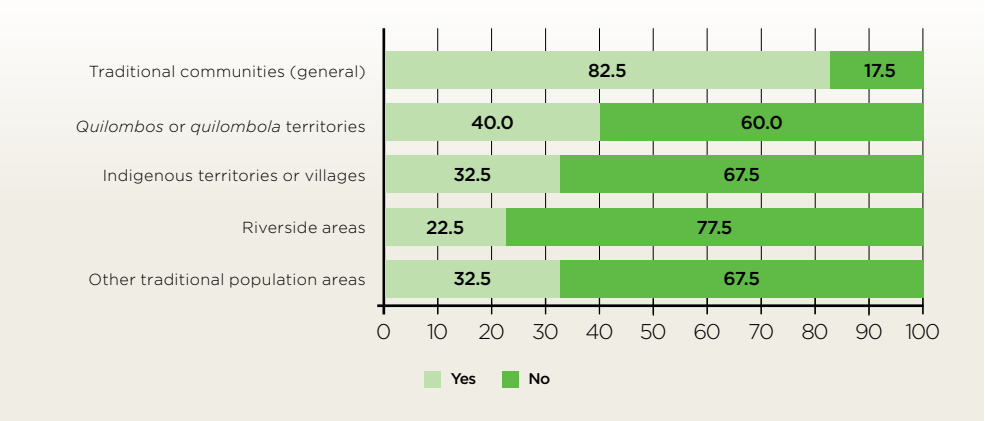


SOURCE: PREPARED BY THE AUTHORS, BASED ON ANATEL (2022).

As for the nature of the communities served, 82.5% of the networks are located in territories where there are traditional communities (Chart 2). Among them, 40% are located in *quilombos* or *quilombola* territories, 32.5% in Indigenous territories or villages, and 22.5% in riverside areas. Among the interviewed networks that mentioned being located in other areas of traditional populations, some of the situations mentioned include settlements, extractive communities, and coastal communities, among others. The data indicates a trend in Brazil to implement community networks precisely in regions and locations that have traditionally been excluded, especially those where traditional people and communities live.

CHART 2 – COMMUNITY NETWORKS BY TYPES OF COMMUNITIES WHERE THEY ARE LOCATED

Total number of community networks (%)



In relation to territories, therefore, the analysis of secondary data reinforces the evidence that community networks emerge mainly in areas with greater social vulnerability, with a significant presence of poor families, poor economic and school performance, limited Internet access, and that are geographically distant or isolated from large urban centers. All these conditions identified in the territories reinforce the importance of community networks, given their potential to contribute to overcoming difficulties in access to education and cultural exchange, with the exercise of citizenship and their ability to boost local economic initiatives.

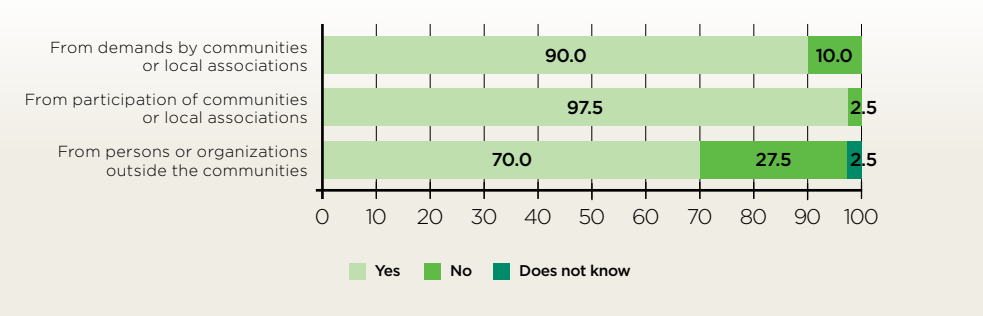
CONTEXT OF CREATION OF THE COMMUNITY NETWORKS

This section explores aspects of the creation of community networks, with the objective of understanding how the connection between a demand previously existing in the community and the support of nongovernmental organizations (NGOs), activists, and/or universities takes place. Chart 3 demonstrates that the creation of most community networks resulted from community demands (90%) and had the involvement of residents or local associations (97.5%). At the same time, most of the interviewees stated that the idea of

implementing a community network came from a person or organization from outside the community (70%). The results reveal that the construction of these networks is a two-way street, arising from a combination of the demands of local populations and initiatives and support from institutions inside and outside the communities.

CHART 3 – COMMUNITY NETWORKS BY ORIGIN

Total number of community networks (%)



When asked, in general, the interviewees pointed out that improvements in connectivity were among the factors that motivated the creation of the networks. It was not uncommon to have reports of difficulties in accessing online pedagogical activities, healthcare services such as the Mobile Emergency Care Service (Samu), and other barriers due to lack of communication. In some cases, they reported the need to go long distances to reach the nearest telephone signal, and even to travel to cities with greater infrastructure, where it is possible to access a greater diversity of services. In addition, they emphasized the impossibility of contracting Internet links, either because it was not financially feasible, or because there were no conventional ISP in the regions.

The creation of community networks was, therefore, a way to meet such demands. They gained better communication both inside and outside the communities, no longer requiring long trips. The reports pointed out that the importance of the networks for the communities was, above all, related to social, economic, educational, and security issues. They met the needs of different groups, including those seeking

government services, local workers (such as farmers, fishermen, teachers, traders, and healthcare professionals), young people who craved the Internet and needed access to online education, and the so-called "Guardians of the Forest," a group of vigilantes in the Indigenous lands of the Amazon region, who aim to protect their territories from miners, loggers, and other environmental detractors.

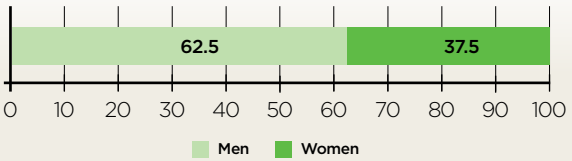
The participation of sponsoring institutions (civil society organizations and/or scientific institutions) was also frequent in the debate on the creation of the networks and, as mentioned in the previous chapter, they regularly offered workshops on technological appropriation for the communities, highlighting the importance of the autonomy of the beneficiaries, who are usually residents of these areas. Because the communities, in general, had little technical knowledge, the participants reported the importance of the role of these sponsoring institutions in the implementation process, as well as that of local associations that coordinated the efforts between these organizations and the communities. Although the support of organizations from outside the communities is paramount, the sustainability of the networks involves ensuring that they do not adopt a "top-down" mode of operation. That said, the results presented here emphasize: (i) the importance of the community engagement and participation of different organizations in the development of community networks; and (ii) the importance of the alignment or convergence between the demands of the communities, the coordination with local social organizations, and the support provided by the institutions promoting this agenda.

PROFILES OF MANAGERS

The people responsible for the daily maintenance or implementation of community networks – defined here as managers – identify themselves mostly as men (62.5%, which corresponds to 25 cases) (Chart 4). There was a predominance of males in the management of these facilities, a point of concern identified in the qualitative study for the maintenance and sustainability of the networks, since the interviewees mentioned that, in general, women tend to stay in the communities longer than men.

CHART 4 – COMMUNITY NETWORK MANAGERS BY SEX

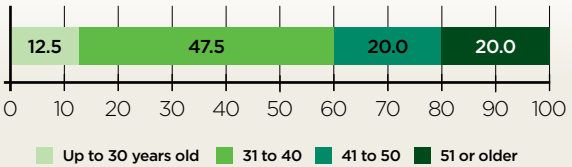
Total number of community networks (%)



Regarding the managers' age range, the larger group was between 31 and 40 years old (47.5%), followed by the groups from 41 to 50 years old and 51 years old or older, with each representing a proportion equivalent to 20% of the cases. Young people, up to 30 years old, had low participation (12.5%) in the mapped universe of managers (Chart 5).

CHART 5 – COMMUNITY NETWORK MANAGERS BY AGE GROUP

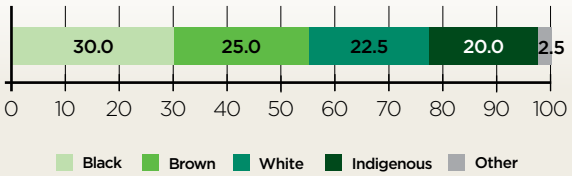
Total number of community networks (%)



Regarding the color or race self-declared by the interviewees, although the representation of Black and Brown people among the managers (55%) was similar to their participation in the Brazilian population (56%), the participation of White individuals was comparatively lower (22.5%) (Chart 6). The presence of managers who declared themselves as Indigenous (20%) was higher than that observed in the national population average, which corresponds to approximately 0.4% (IBGE, 2020). The data confirmed that the implementation of community networks relies on the involvement of historically excluded population groups, reinforcing their inclusive potential.

CHART 6 – COMMUNITY NETWORK MANAGERS BY SELF-DECLARED COLOR OR RACE

Total number of community networks (%)

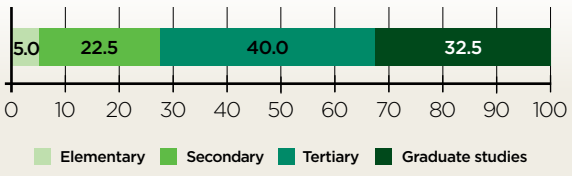


Another specific characteristic of the universe of community network managers was revealed by the data on their level of education. While only 21% of the adult Brazilian population (i.e., over the age of 18) stated that they have studied up to Tertiary Education (complete or incomplete), among community network managers, this percentage reached 40% (Chart 7). In relation to graduate studies, this difference was even greater: While only 5.3% of the Brazilian population attended or completed a graduate program (IBGE, 2020), among our respondents this percentage was 32.5%. Considering that most respondents self-declared themselves as Black, Brown, or Indigenous, this educational performance was even more significant, given the recognized history of barriers for the "non-White" population to access Tertiary Education (Lima & Prates, 2015).

The data showed an additional challenge: the expansion of these networks, in traditionally excluded locations, also depends on strategies and policies that take into consideration the necessary training of the potential local network managers.

CHART 7 – COMMUNITY NETWORK MANAGERS BY LEVEL OF EDUCATION

Total number of community networks (%)

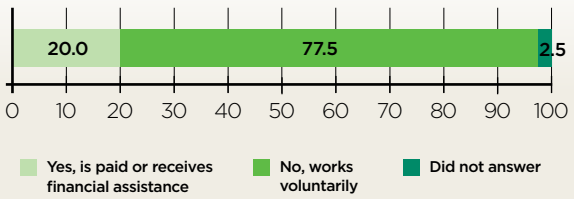


Concerning the place of residence, 70% of the managers interviewed reported that they currently lived in the locations served by the community networks. Among those who did not live in the communities (who had moved away or had never lived there), a high level of education was common among them: 10 of the 12 managers who lived outside the communities had completed Tertiary Education (6 of whom also had graduate degrees). This shows that the networks tend to be managed by the residents themselves, those with roots and ties in the communities. In addition, community network managers who move away, although there are few of them, are qualified professionals, with a high level of formal education.

Regarding the managers' remuneration, only 20% of them were paid or received some financial assistance in exchange for their activities; in this case, the vast majority dedicated themselves to the networks voluntarily (Chart 8). If, on the one hand, this makes it difficult to retain or continue the work of qualified professionals, on the other hand, it may encourage the participation of community members who are taking technical courses or capacity-building workshops, without which the guarantees of fair and democratic access to the Internet are threatened.

CHART 8 – COMMUNITY NETWORK MANAGERS BY WHETHER THEIR WORK WAS REMUNERATED

Total number of community networks (%)



CURRENT STATUS OF THE NETWORKS, ALLIANCES AND PARTNERSHIPS

Of all the community networks interviewed, 60% were active. The others were divided into 25% that were temporarily closed, 10% that were under implementation, and 5% that were permanently closed (making the total 40% for inactive networks).

Although most were in operation, the high number of networks that had stopped working or were experiencing an interruption in their activities was noteworthy. Among the reasons given for inactivity, situational factors and economic issues were the most mentioned among networks that were inactive, but they still consider the possibility of resuming their activities.

Among the situational aspects mentioned, the main reason reported for inactivity was the effects of the pandemic, which aggravated financial, maintenance, and human resources problems. A common statement among the interviewees was that, to avoid new infections, it was not possible to leave or enter the locations, which hindered the logistics of equipment and the arrival of technicians needed in cases of maintenance.

However, it was not only the pandemic that hindered operations and made it impossible to carry out maintenance. Structural problems were also reported, such as the difficulty of bearing the costs of equipment and technicians, in addition to the adversities caused by weather conditions that caused equipment problems. The respondents also mentioned lack of personnel with the technical knowledge required to perform daily maintenance or even explain the problems experienced so that possible repairs could be carried out with the help of technicians remotely. This reinforces the importance of technological appropriation by communities. Still, the respondents that reported temporarily closed networks also expressed the prospect of resuming activities as soon as possible. Among the reasons for inactivity, respondents from the definitively closed community networks highlighted competition with conventional ISP in the location.

"[We ceased our activities] because of the pandemic, but we intend to resume. We would leave the village to work and study and then had to quarantine to re-enter, so there was no way we could take care of maintenance."

"First, there was the pandemic and we had to close because most of the activities were face-to-face; also because of the team, because we are not remunerated to manage the network, so everyone ends up working elsewhere and going to the community network when possible. We are waiting for the approval of some projects to continue."

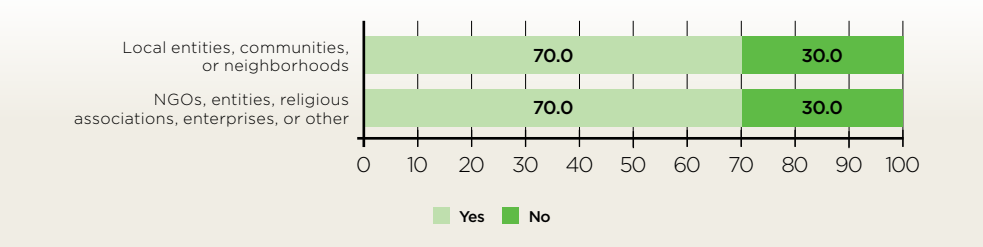
"Because it has been two years that the cost of maintenance could not be paid for, because a part was broken."

"Because there were no technicians in the location, because I moved to a neighboring municipality, and also because an ISP provided access there via fiber optics."

When asked about alliances and partnerships, 70% of the mapped community networks (active and inactive) indicated that they were associated with some local entities or organizations, and maintained partnerships and projects with NGOs, entities, and other associations (Chart 9). Among the most mentioned were Artigo 19, Coolab, IBEBrasil, Nupef Institute, Forum of Traditional Communities (FCT), Interstate Movement of Babassu Coconut Breakers (*Movimento Interestadual das Quebradeiras de Coco Babaçu* [MIQCB]), universities, churches, government organizations, and national and international enterprises. It is worth mentioning that, among the active networks, 75% mentioned having alliances and partnerships with local or external entities and associations. Among the inactive networks, 62.5% reported having these types of partnerships.

CHART 9 – COMMUNITY NETWORKS BY ALLIANCES AND PARTNERSHIPS MAINTAINED

Total number of community networks (%)



Furthermore, 85% of the interviewed networks said they knew of or had heard about other community networks. On average, respondents mentioned three other community networks. Regarding exchange between community networks, just over half of the respondents (57.5% of the total networks) indicated that they exchanged or had already exchanged experiences with other networks. It should be noted that this factor was considered critical by respondents in the qualitative stages of the study, indicating that increased exchange between networks can contribute to their maintenance and sustainability.

CURRENT OPERATION OF NETWORKS

Almost all the mapped community networks (92.5%) defined themselves as nonprofit organizations. And, when investigating the costs for the operation of networks, both active and inactive, only a quarter of them (23%) said they depended on an average monthly investment of more than BRL 1,000.00 to remain active (Table 2). Most of the networks declared lower costs: 15% declared no costs; 20% declared up to BRL 500.00; and 17.5% of the networks were in the range between BRL 500.01 and BRL 1,000.00. It is worth noting that 7 of the 40 networks interviewed (17.5%) did not know their average operational monthly costs.

TABLE 2 – COST OF MAINTAINING COMMUNITY NETWORKS, ACCORDING TO MANAGERS

Total number of community networks (%)

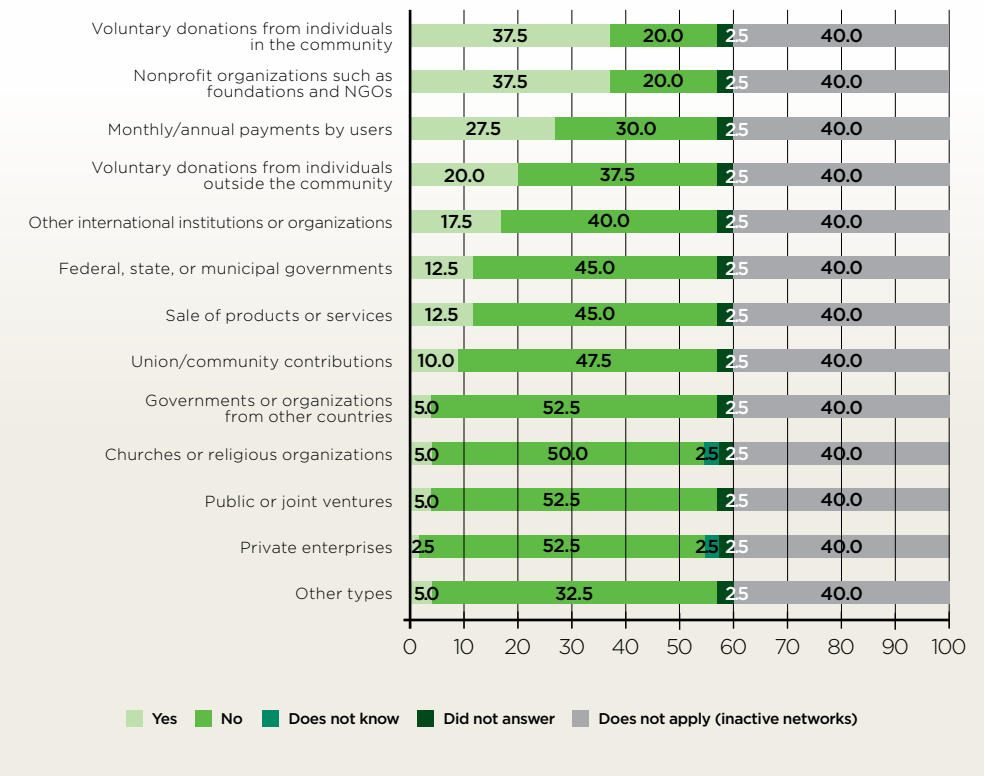
MONTHLY COST	N	%
No costs	6	15%
Up to BRL 500	8	20%
Between BRL 500,01 and BRL 1.000,00	7	18%
More than BRL 1.000,00	9	23%
Does not know	7	18%
Did not answer	3	8%
TOTAL	**40**	**100%**

To accomplish this monthly investment, at the time of the survey, 37.5% of the community networks relied on voluntary donations from individuals in the community (Chart 10). If the focus of this analysis is only on the universe of active networks, these donations were declared as sources of activity financing by almost two-thirds of the networks. Another important source was the contribution of NGOs, foundations, and other nonprofit organizations, which also reached almost two-thirds of the active networks. Next, emphasis goes to the monthly fees paid by users, which occurred in approximately half of the active networks, followed by donations from people outside the communities, present in three out of ten active networks. Other possible funders, such as government agencies at the federal, state, and municipal levels, had low levels of participation; funding from partnerships with private enterprises was practically nonexistent.

The strong presence of donations among the investigated types of financial contributions points to a challenging context for the financial sustainability of networks, considering that most of them relied on donations from users and civil society organizations as a source of funding. However, the interviews showed that there was room for the expansion of partnerships, especially with public authorities, which could contribute to the financial security of these experiences.

CHART 10 – COMMUNITY NETWORKS BY TYPE OF FUNDING

Total number of community networks (%)

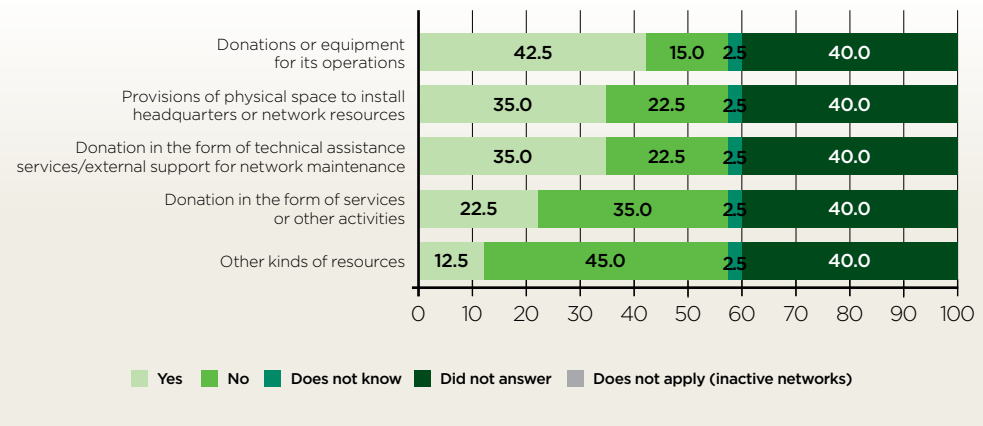


In addition to financial resources, another important form of support was donations of equipment, which occurred in 42.5% of the total number of community networks (Chart 11). Loaned physical space for the installation

of headquarters and their infrastructure, and donations in the form of technical assistance services or network maintenance were also important.

CHART 11 – COMMUNITY NETWORKS BY FORMS OF NON-FINANCIAL SUPPORT OR RESOURCES RECEIVED

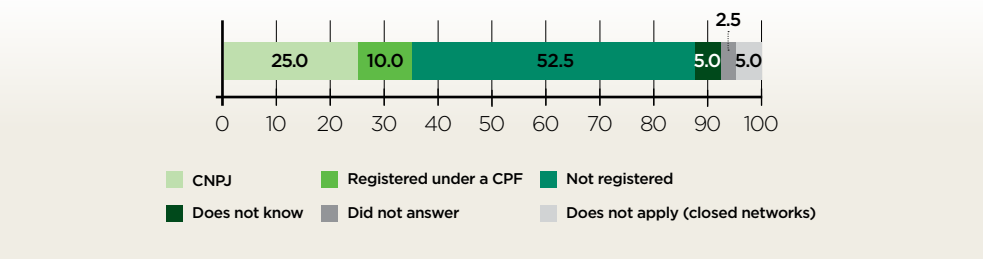
Total number of community networks (%)



Currently, the regularization of community networks and the formal recognition of their functioning are central to the process of designing networks, in addition to their sustainability and ability to raise resources. A possible first step towards regularization, pointed out by the interviewees in the qualitative stage of the study, was the presence in the communities of local organizations with active listings in the National Register of Legal Entities (CNPJ), free of pending legal issues or tax debts, and able to attend and account for their activities. Data on the processes of legal or formal recognition of networks reveals that only 25% were associated with organizations that had active and regularized CNPJ listings (Chart 12). Another portion (10%) indicates being registered under the Individual Taxpayer Registry (CPF) of one of their members. More than half of the total networks mapped in the study were operating, or had previously operated, without formal records of their functioning.

CHART 12 – COMMUNITY NETWORKS BY TYPE OF OPERATING RECORDS

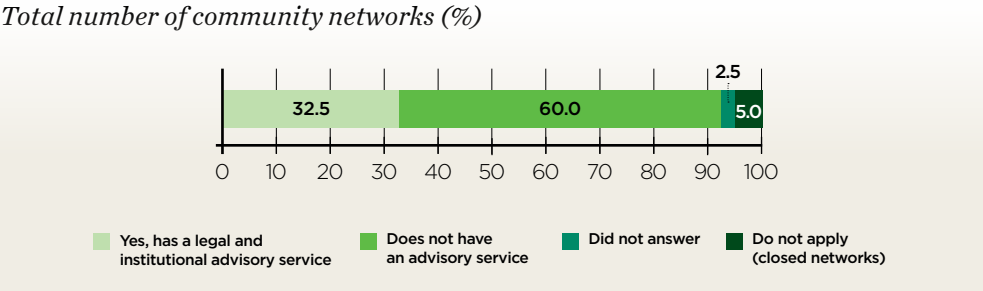
Total number of community networks (%)



One action that could minimize lack of training would be the provision of legal and institutional advisory services relative to the networks' operations. The data, however, revealed that only 32.5% of the networks said they had these types of legal advisory services during their operation, with most (60%) still operating today without any specialized assistance in this regard.

CHART 13 – COMMUNITY NETWORKS BY PRESENCE OF LEGAL AND/OR INSTITUTIONAL ADVISORY SERVICES

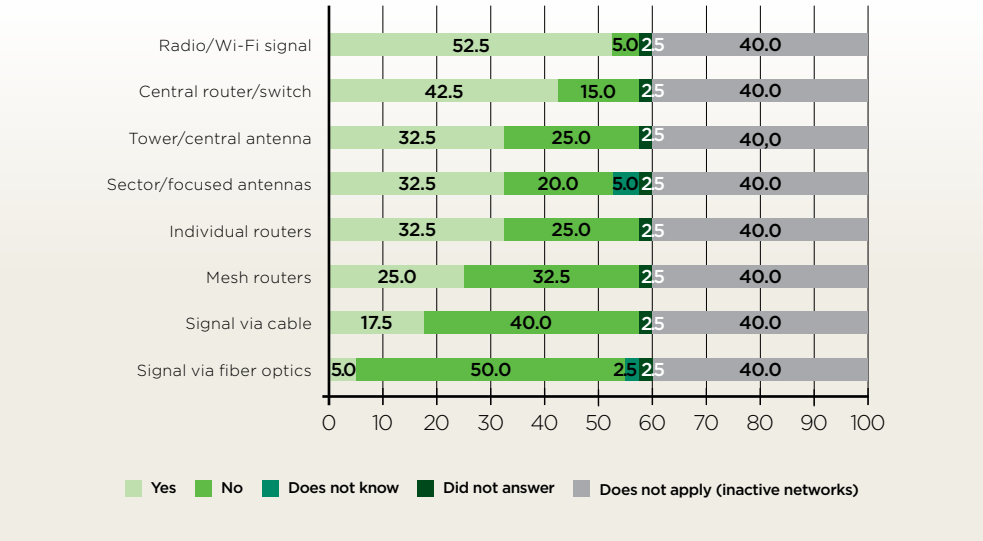
Total number of community networks (%)



In relation to the asset of the networks, almost all of them currently operate with their own equipment. To distribute Internet signal to users, the most-used technologies were radio or Wi-Fi signal, followed by the use of central router or switch. A second group of technologies, with intermediate presence, includes the use of tower and central antenna, sector or focused ones, and individual routers. Other technologies, such as mesh routers and cable connections, were less mentioned, with fiber optics used for signal distribution by only 5% of the total mapped networks.

CHART 14 – COMMUNITY NETWORKS BY TECHNOLOGIES USED TO DISTRIBUTE SIGNAL TO THEIR BENEFICIARIES

Total number of community networks (%)



Of the total number of community networks mapped, only 47.5% offered Internet access in the last three months. In addition to inactive networks (40% of the total), a part of the active networks function only as Intranet or radio communication (Chart 15).

Considering the types of connections of community networks (Chart 16), they were divided almost equally between those that had connections to ISP via radio (17.5%), those that had satellite connections (17.5%), and those that had fiber optics connections (12.5%).

CHART 15 – COMMUNITY NETWORKS BY AVAILABILITY OF INTERNET ACCESS IN THE LAST THREE MONTHS

Total number of community networks (%)

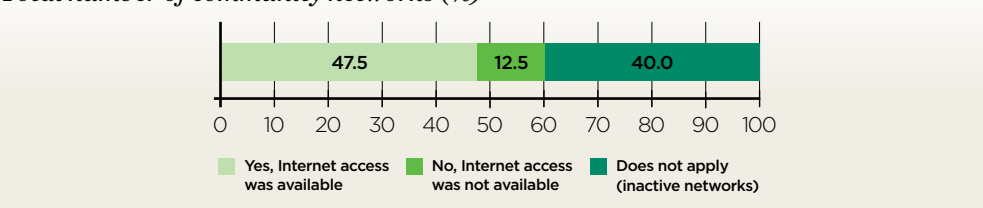
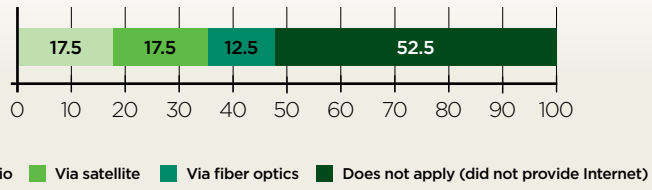


CHART 16 – COMMUNITY NETWORKS BY TYPES OF INTERNET CONNECTIONS ESTABLISHED WITH ISP

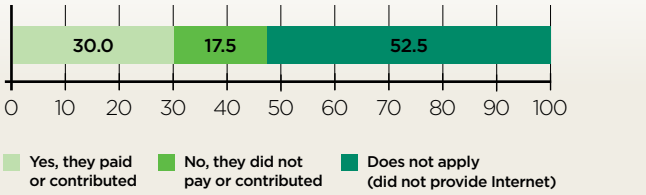
Total number of community networks (%)



In relation to the time and speed of the connections offered, eight out of ten active community networks claimed to provide the speed packages available to their users. Related to payment for services, 17.5% of the mapped networks operated free of charge to users, while another 30% charged fees and tariffs for services (Chart 17). In total, the average cost of monthly tariffs was BRL 38.40, with 42% of the values reported by the networks concentrated in the range between BRL 20.00 and BRL 40.00.

CHART 17 – COMMUNITY NETWORKS BY PRESENCE OF CHARGE FOR SERVICES OR USER CONTRIBUTIONS IN THE LAST THREE MONTHS

Total number of community networks (%)



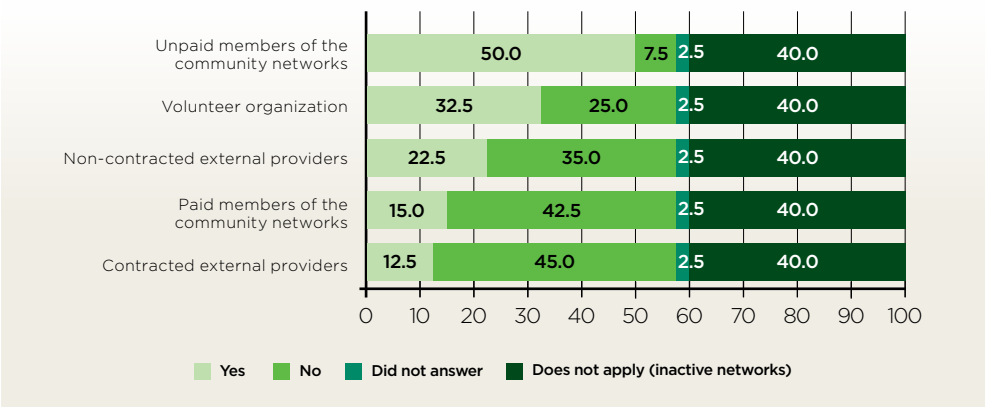
About one-third of the networks mapped in the study operated without usage control rules and access limits; considering that 40% were inactive at the time of the interviews, only 12.5% mentioned having usage control rules.

In case of instability or need for network repairs, about half of community networks rely on work by unpaid people in the communities. Another important source of support was voluntary assistance offered by partner organizations,

mentioned by 32.5% of the mapped networks. The support of non-contracted external partners was mentioned by 22.5% of the total number of networks, while the remuneration of individuals in the communities or the hiring of external service providers were the least mentioned types of technical support (Chart 18). This result reinforces the indications that the first strategy adopted by communities was the search for capacity-building and local knowledge development. In this case, the hiring of services in the market only occurs in times of extreme need and when resources are available.

CHART 18 – COMMUNITY NETWORKS BY TYPE OF TECHNICAL SUPPORT AVAILABLE

Total number of community networks (%)



Training was offered and carried out by community networks on a recurring basis: only 25% of the total mapped networks declared that they had not offered any type of training to their users to develop skills to use technology in the last 12 months. More than half of the active networks claimed to have received training or capacity-building to improve their operations in the last year.

USERS AND TYPES OF SERVICES PROVIDED BY NETWORKS

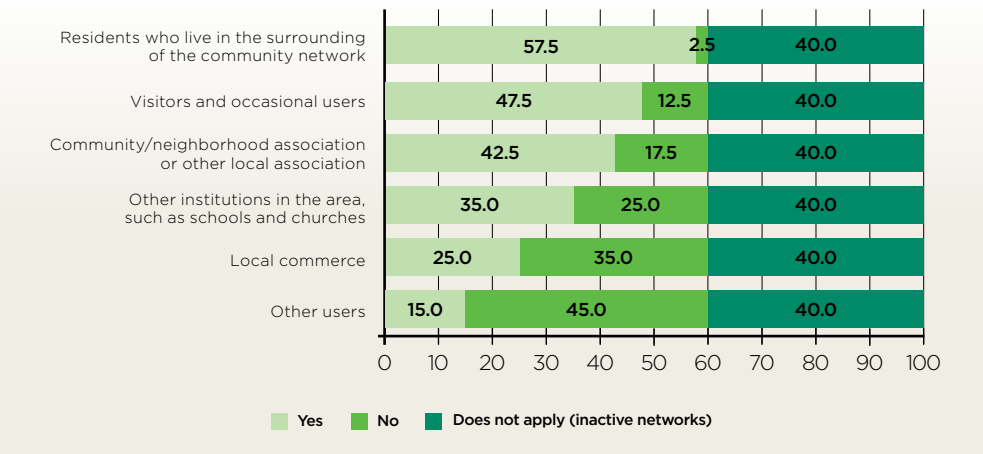
According to the managers interviewed, the main users of the community networks are the residents living in the surroundings of the network facilities, mentioned by 57.5%

of the community networks (Chart 19). The networks also meet the demands of visitors and occasional users, in addition to neighborhood associations or other local community associations. Institutions that also serve communities, such as schools and churches, refers to a third group of users of network services and were mentioned by 35% of networks. The use by local businesses or other types of users was less recurrent, cited only by 25% and 15%, respectively, of the networks analyzed.

The fact that those who reside in the surroundings of the networks were the most frequent types of users of the existing networks in the country reinforces the communitarian nature of these types of networks, including appreciation of the cultural and political aspects associated with them, such as their facilitating role in the promotion of local events (as will be presented below). The networks also seem to meet the demands of individuals who were not assisted by the policies and regular offers of the market and who did not find these services in their areas and homes. In this regard, these networks become very promising initiatives to ensure access to connectivity in remote locations, which have been traditionally penalized for not being attractive to conventional commercial models.

CHART 19 – PUBLIC WHO USES COMMUNITY NETWORKS, ACCORDING TO MANAGERS

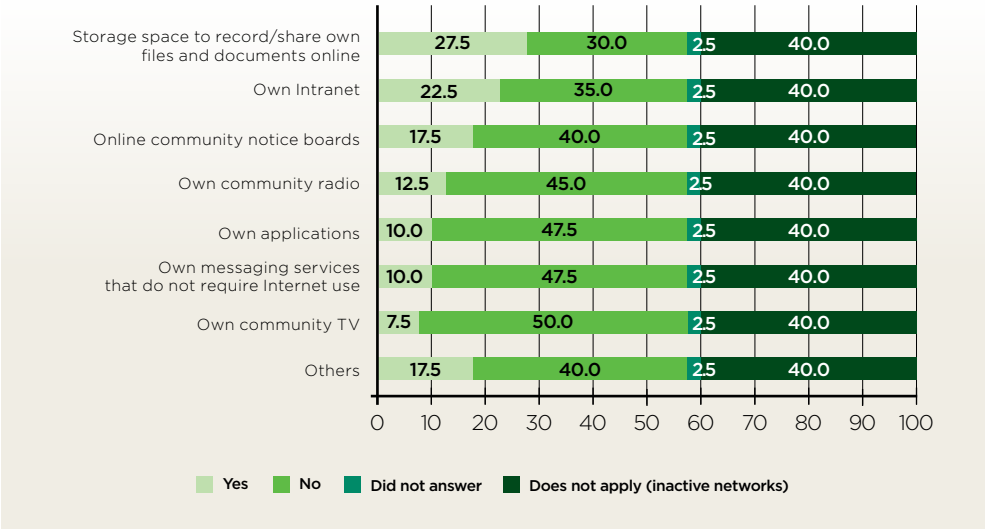
Total number of community networks (%)



On average, each network had approximately 215 users. In terms of services provided by active networks, the main ones were storage spaces to record and share online files and documents and providing access to Intranet and online community notice boards. Community radio services, apps, and the networks' own messaging services were the least mentioned (Chart 20).

CHART 20 – MAIN SERVICES OFFERED BY COMMUNITY NETWORKS, ACCORDING TO MANAGERS

Total number of community networks (%)

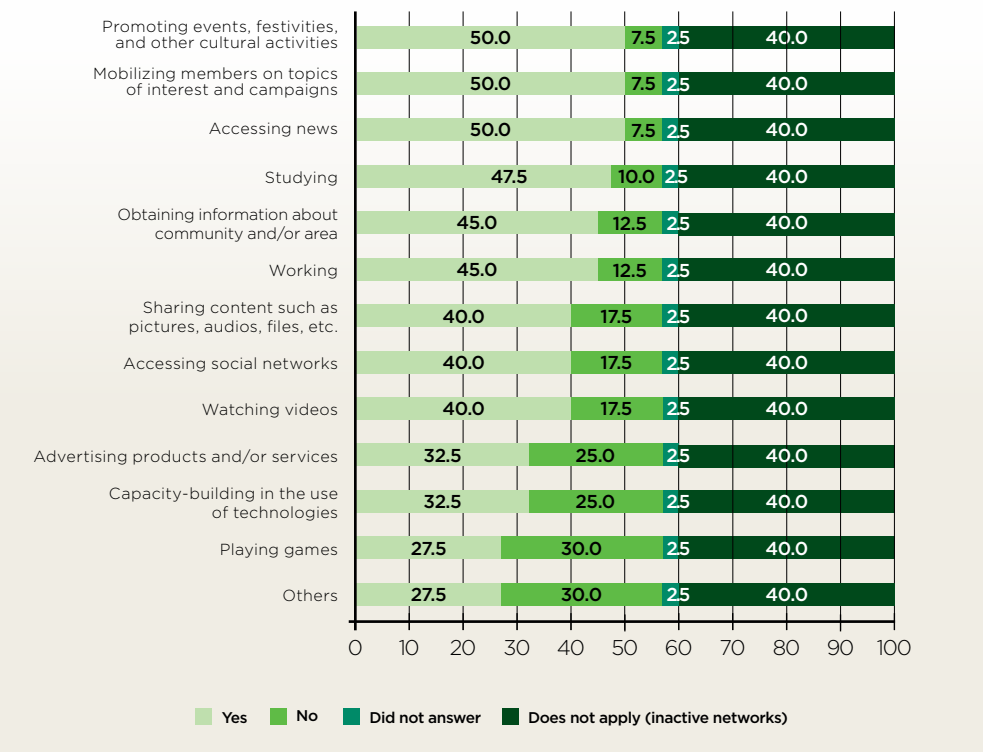


As an attempt to understand the types of uses made of community networks, the managers were questioned about a list of the different types of activities potentially developed by users (Chart 21). Although the results are indirect, that is, according to the perceptions of managers, and not direct observation of what users actually do, they reinforce the importance of networks as mechanisms that favor the promotion of local culture. They promote events, festivals, and other cultural activities and mobilize network members on topics of interest and for campaigns. In addition to giving value to and stimulating local cultural practices, daily activities of great importance for the social and economic development

of users were also commonly mentioned, such as access to news in general and information about the community and use of networks for study and work. Although less frequently, the use of networks to sell services and/or products and to conduct training in the use of technologies was mentioned by 32.5% of the mapped networks.

CHART 21 – ACTIVITIES CARRIED OUT BY USERS OF COMMUNITY NETWORKS, ACCORDING TO MANAGERS

Total number of community networks (%)



In addition to Internet and telecommunication services, 40% of community networks had physical office spaces that were available for different purposes. In these spaces, 23% of the total number of networks provide devices such as computers, tablets, mobile phones, and other electronic devices. Among the services offered, Wi-Fi and computers connected

to the Internet are included. Other services, such as providing access to printers and computer games, were mentioned less frequently, 13% and 10% of the total, respectively.

Among the 40 networks mapped, 15% declared other types of uses for these common physical spaces, such as for holding assemblies and other meetings, and providing public agency services, workplaces, barter networks, and even vegetable gardens. The results indicate that community networks seem to have taken on the functions that telecenters (public) and LAN houses (private) used to have, as places that guaranteed access to information and communication technologies (ICT), but that, with their physical structures, also allowed the development of collective activities and access to services not available in the beneficiaries' homes.

Finally, an essential point to be highlighted is the inclusion of users in decisions about the operation and management of networks. Because they are common and community-owned resources, community networks depend on the active participation of local communities for their development and management (Internet Governance Forum, 2017). The *Declaration of the First Latin American Summit of Community Networks* underlines the self-management and democratic participation of community members in network decisions as determining features, characterizing networks as collectives that exercise their right to communication based on the guarantee of the diversity and plurality of their members (Internet Society Community Networks Special Interest Group [CNSIG], 2018).

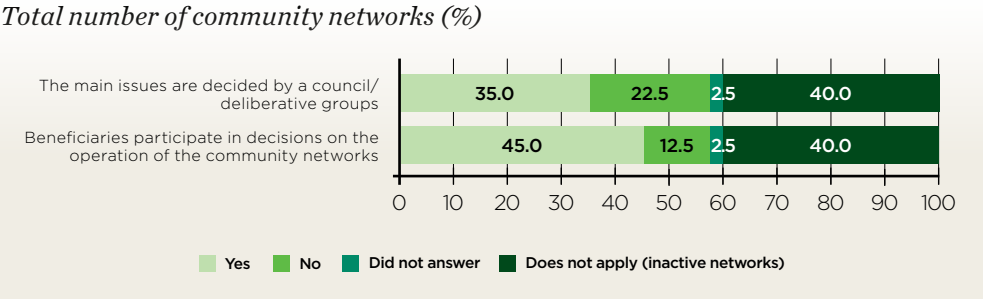
Given that the collaboration of all, without discrimination, is considered essential for good governance (Belli, 2018), it should be noted that diversity, such as the inclusion of women and older people, needs to be foreseen in technological appropriation training, because this will be reflected in autonomy and in subsequent deliberations (Prado, 2019).

Regarding the management of the infrastructure and daily activities of the networks, data about deliberative arenas and conflict resolution procedures indicates that 35% of the community networks have deliberative groups or councils in charge of solving or finding solutions to the main problems of the networks' operations. Given that 40% were inactive

at the time of the study, only 22.5% declared that they do not have management councils. In the case of participation, regardless of the presence of councils, community involvement is also relevant and recurrent, with only 12.5% of the total networks declaring that beneficiaries do not participate in decisions on the operation and services of the networks (Chart 22). It is also likely that this greater involvement of communities helps understand those networks that remain in operation (active) compared to inactive ones, and the actors' perceptions regarding the possibilities that exist for the maintenance of activities in the future, as will be presented in the next section of this chapter.

CHART 22 – COMMUNITY NETWORKS BY TYPES OF DECISION MAKING AND PARTICIPATION IN MANAGEMENT

Total number of community networks (%)

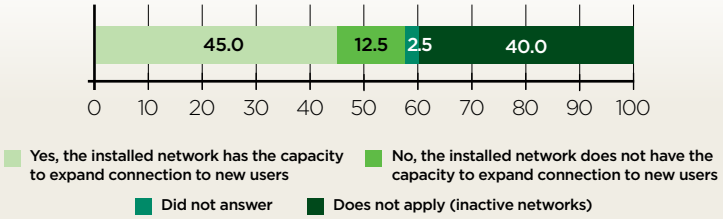


PROSPECTS FOR THE FUTURE

When looking at prospects for the future of these networks, two important results are worth noting. The first addresses the current capacity of networks to expand their services – 45% of the total sample, equivalent to three quarters of the representatives of the active networks, indicated that the installed networks still had the capacity to expand services and the provision of connection to new users in the coming months, even if they were not asked about their intention to expand (Chart 23).

CHART 23 – CAPACITY TO EXPAND THE SUPPLY OF CONNECTION THROUGH THE COMMUNITY NETWORKS, ACCORDING TO MANAGERS

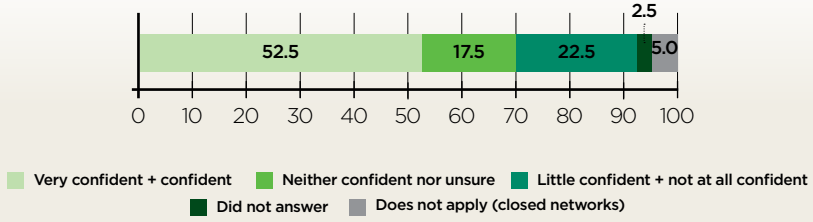
Total number of community networks (%)



The second point investigated in the study deals with the degree of confidence of managers in relation to the sustainability of their networks in the near future. When asked how confident they were that their network would be functioning in the next 12 months, 52.5% of network representatives (21 out of 40 surveyed) said they were very confident or confident; 17.5% said they were neither confident nor unsure; and 22.5% said they had little or no confidence, representing almost a quarter of the networks (Chart 24).

CHART 24 – CONFIDENCE REGARDING THE CONTINUITY OF THE OPERATION OF THE COMMUNITY NETWORKS IN THE NEXT 12 MONTHS, ACCORDING TO MANAGERS

Total number of community networks (%)



Those who declared that they were very confident about the functioning of the networks in the next 12 months gave the following reasons to justify this confidence: aspects related to the networks' structural organization and financial capacity, such as examples of community participation in the management and daily maintenance of activities; and arguments that emphasized technological appropriation, financial sustainability, and existing coordination with supporters.

"Because we get together a lot. We have a WhatsApp group to solve breaking issues. The community itself comes together to fix the network."

"Because we have committed partnerships, we have dedicated staff, and unless a bomb goes off, everything goes as planned."

"Our organization was founded about 30 years ago, and we are organized and we believe that we will still exist in the future."

"We have funding for implementation up to the end of 2023. We are also thinking about means of raising funds through the services offered."

The lack of alternatives and the importance that community members attached to network activities were also mentioned as reasons for being confident about the continuity of activities in the near future. It was common the report that the networks would continue because they were the only means of guaranteed connectivity in the communities.

"We can't stop it because it's the only way for them [the community] to communicate."

"Hope is the last to die."

"Because of our willpower and our need. Since everyone needs it and it's the only network in the village, we'll have to find a way to continue."

"Because there's still a need, no matter how few people there are, there's a need for the Internet."

"Because it's the only way to provide communication."

Regarding the networks that showed a greater degree of uncertainty about the future (neither confident nor unsure), most of the interviewees explained that their existence depended on the confirmation of the continuity of external financial support.

"We have two pre-approved projects, both to help the network run over the next two years, so it may be that the community network will continue to operate, but it depends on their approval."

Financial sustainability was also a challenge for networks that felt little or no confidence. Lack of resources presented itself as the main factor for uncertainty about their continuity, especially with regard to the end of support from NGOs and funding entities, which collaborated in the payment of Internet link, for example, and the high cost of equipment maintenance and replacement.

"We never have a forecast of resources, and something could happen that makes the network impossible to maintain... So, it runs more on faith."

"It's very difficult, especially because of parts that need to be replaced and it's really expensive. We can't pay for it. Not to mention that there's other equipment out of operation. It's a series of situations."

These findings point to a prosperous future on the part of networks that are already guaranteed in terms of infrastructure and management, as well as those that are engaged in meeting the communities' demand for connectivity. Nevertheless, it is important to pay attention to the networks that are unsure about the future, highlighting the importance of financial support – coming from NGOs, sponsoring organizations, or public authorities – and training to develop both technical maintenance and complementary skills, in the last case, including training for fundraising, on how to promote activities that favor community participation in the networks' management and training activities that guarantee users autonomy for self-management.

FINAL CONSIDERATIONS

The mapping of community networks in Brazil shows that they are placed in traditional communities – such as *quilombolas*, Indigenous, and riverside communities – with high levels of vulnerability, both in relation to broadband access and in socioeconomic terms. These initiatives were developed on a nonprofit basis and to meet the demands of these social groups.

Most of the mapped community networks were active (60%), but there was a high percentage of inactive networks (40%). In addition to the difficulties caused by the pandemic, interruptions and closures were fundamentally caused by financial problems that impacted their operation and maintenance. It should be noted that most of the networks operated without formal registration which highlights the importance of having legal consultancy so that they can adapt to legislation without harming the political and economic autonomy of these initiatives.

From the conception of networks' until the stage of their maintenance, there was involvement of both the communities and the promoting and/or partner organizations, with finan-

cial donations, equipment, and technical support. The participation of community members in decisions was notable in most active networks, highlighting this mechanism as an essential element for the sustainability of these experiences. Managers were diverse in terms of color/race; however, most of them were highly educated and self-declared as Black and Indigenous, a characteristic that deviates from the usual patterns commonly observed in the country. This reveals that, on the one hand, the existing networks break the reproduction of racial inequality patterns, but on the other, they demand high qualification for their managers.

Most active networks provided Internet access, and indicated that there was capacity to expand services and provide connection to new users. The communities themselves, in the managers' perceptions, use the networks for various functions, such as to promote their cultural activities, raise awareness about campaigns, mobilize members, and allow users to read the news, study, and work.

Network managers said they were confident about their future, especially when they managed to have financial sustainability, member participation, and technological autonomy. It should be noted that the continuity of activities was also motivated by the importance of these initiatives in their territories, which lack connectivity alternatives.

These results indicate, therefore, not only the importance of community networks as initiatives that respond to the traditionally excluded actors' local demands , but also the factors that ensure their sustainability, such as: participation of local actors in decisions regarding the functioning of networks; capacity-building and training of people in the communities to maintain activities; promotion of self-management; support of external organizations promoting proposals to maintain activities and access to resources and information not available in these territories.

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FINAL CONSIDERATIONS

"What globalizes separates, it is the local that enables union."

(MILTON SANTOS, 2008)

The Internet, a worldwide computer network, can be understood as an environment or instrument that allows, from its innumerable nodes, information exchange on a global scale, from different locations and regions. Based on this dynamic, Internet development aims to establish a direct relationship with the place it builds; however, it has ignored geographical characteristics when seeking to interpret territories as global.

Community networks are great examples that demonstrate how the intersections between the interests, values, and principles of territories and access, development, and even use of the Internet occur. Although under discussion, community networks ideally assume a socially and politically coordinated community to the point of appropriating management, technical, political, economic, and social decisions and knowledge generated from the possibility of being connected in networks.

To understand these networks, in the current scenario of Internet development, it is necessary to consider that the capillarization of the Internet in vulnerable and isolated regions also results in the transformation of several aspects of social life into data. Community networks emerge precisely as a possibility to counteract hegemonic interests, with the legitimate objective of rethinking the development and appropriation of the information society.

The inability of the current model of developing the Internet to expand connectivity to vulnerable populations distant from large cities reveals the undeniable importance of community networks as promoters of local development and digital inclusion. According to the ICT Households 2020 survey, about 30% of the population in rural areas were not Internet users (Brazilian Internet Steering Committee [CGI.br], 2021). Furthermore, digital inclusion policies must consider the increase in inequalities among those who already use the Internet. In this regard, enabling the construction of infrastructure via local organizations is a way not only to provide access, but also to promote the appropriation of technology and community and political strengthening of these communities.

After all, if information and communication technologies (ICT) are the technical basis of community life, it is political action that gives sense to Internet access and use. In this regard, paraphrasing Milton Santos (2008), community networks are meeting points between latent possibilities and preexisting or created opportunities.

From this standpoint, the present research, which was based on the analysis of interviews with policymakers and representatives from academia, communities, and Internet service providers (ISP) sought to diagnose and understand the Brazilian community network scenario, especially in relation to their potential role in digital inclusion. To this end, the study seeks to identify the critical factors for access, the profile of the served populations, and the governance models of the networks, in addition to the perceptions of the actors involved about the main positive and negative impacts of these initiatives, considering social, cultural, political, and economic aspects.

This research included a literature review, workshops, interviews, and surveys, with strategic actors who work on different dimensions and stages of the development of community networks (initial phase, including conception, planning, and coordination; implementation phase, including coverage and installation; and maintenance phase, i.e., sustainability), in addition to a multisectoral and diverse perspective.

MAIN RESEARCH RESULTS, CRITICAL POINTS, AND POSSIBILITIES FOR ACTION

1. THE BUSINESS MODEL WAS NOT CAPABLE OF PROVIDING ACCESS FOR ALL

Expanding commercial services to certain regions of the country requires large investments that will not be converted into advantageous financial returns for enterprises. Therefore, community networks are presented as an alternative to serve communities in areas neglected by commercial ISP due to their low profitability and, consequently, promote their digital inclusion and access to other rights and benefits.

2. THE SOCIAL, POLITICAL, AND CULTURAL FEATURES OF EACH COMMUNITY ARE DECISIVE IN ALL STAGES OF DEVELOPING COMMUNITY NETWORKS

The values, principles, and historical relations of each community with the territory are determining factors for success in conception, installation, and sustainability of networks. Among the initial challenges identified, there are: 1) competition with other more urgent demands of the communities, which indicates the need to treat meaningful access to the Internet as a fundamental right; 2) the legitimate fear of failing to preserve the customs of traditional, *quilombola*, or Indigenous communities, which indicates the need to co-develop proposals that promote and preserve these territories when expanding Internet access; 3) the sustainability of the community networks can also be fostered by the participation of women and older people; and 4) the high demand for time and energy of community members in the process of managing and supporting the networks, with common reports of fatigue and frustration from the most active participants.

3. A MINIMUM LEVEL OF TECHNICAL AND SCIENTIFIC KNOWLEDGE IS NECESSARY TO ENSURE COMMUNITIES' AUTONOMY AND OWNERSHIP OF TECHNOLOGY

In the implementation and maintenance phases, community capacity-building is a decisive, and therefore, strategic stage. This involves technical and technological processes of developing community networks, such as technical studies, specialized knowledge, and acquisition, handling, and installation of equipment and materials.

To ensure technical and technological appropriation, it is essential for the sustainability of community networks that there be groups of local actors who understand the operation of the networks and can maintain equipment and do simple repairs, in addition to the configuration and management of the network. To this end, it is desirable to avoid more technical teaching methodologies and, at the same time, to base training on a transdisciplinary, inclusive, and more practical and flexible model that takes into account local difficulties

and knowledge, and that arises the interests and curiosity of participants. This is also critical to guide digital innovation to meet local needs.

4. IT IS IMPORTANT TO SEEK COMPLEMENTARY ARRANGEMENTS BETWEEN COMMERCIAL ISP AND COMMUNITY NETWORKS

It is important to align understandings between commercial ISP and community networks. Signal contracting for redistribution is often a source of conflict because of the misperception of competition between commercial ISP (especially small ones) and nonprofit community networks. It is important to regulate the relationships between commercial ISP and networks to build complementary arrangements.

5. IT IS NECESSARY TO SIMPLIFY THE PROCESSES OF FORMALIZING AND REGULARIZING COMMUNITY NETWORKS, CONSIDERING DIGITAL INCLUSION POLICIES

At the beginning of the implementation processes of community networks, bureaucratic procedures are presented as barriers to their success. To enable subsequent formalization and regularization, the communities must be able to register local organizations, with an active and solvent National Register of Legal Entities (CNPJ), as responsible for the networks with regulatory entities. Because not all communities have this institutional condition, a prior effort is necessary to make it viable, organizing the initiatives with local organizations that already exist or that can be regulated. Without this approval step, the networks are again vulnerable to sanctions. In the maintenance stage, the interviewees highlighted the slowness of these processes, which must be foreseen in legal and institutional planning.

6. A PUBLIC POLICY FOR COMMUNITY NETWORKS SHOULD CONSIDER LONG-TERM SOURCES OF FINANCIAL RESOURCES

During the training process, the dimension of financial capacity was a central theme. Several investments are required to achieve the resources needed to build and maintain

community networks. These investments can come from programs that promote local economies, to make networks financially viable over time. It is worth noting that this financial management must consider, in addition to the regular cost of the connection signal, financial resources for exceptional needs, such as repair and replacement of equipment.

Within this topic, it is important to mention that both civil society organizations and small ISP can benefit from the resources of the Telecommunications Services Universalization Fund (Fust) to finance community networks across the country. These resources can be used to overcome technical barriers, such as installing antennas and increasing the supply of adequate and affordable equipment. The interviewees pointed out the absence of national public and private funding.

7. THE GEOGRAPHY AND INFRASTRUCTURE OF THE TERRITORIES ARE DETERMINANTS

The geographical characteristics of the territories (and surroundings) of communities, such as their extent and population concentration, were factors that directly affected the implementation of community networks. Moreover, the availability of basic infrastructure services such as electricity, water, sewage, and telecommunications was decisive. This information can eventually be diagnosed with the crossing of social vulnerability indexes to improve the creation and assertiveness of public policies and non governmental organizations' projects.

8. CONNECTIVITY SHOULD BE AN INTRINSIC COMMUNITY DEMAND

According to the interviewees, the previous identification of the need for connectivity by the communities, representing a desire of the communities (and not external proposals) is important. The recognition of this need and the valorization of the effort to meet it constitute a decisive aspect to engage the communities (and maintain this engagement) in the process of developing community networks.

The research mapped community networks in which the development process had been promoted by external organizations to take advantage of funding opportunities. In

these situations, the communities initially see advantages and support the proposals. However, this support starts to decrease over time as the process begins to present challenges and/or more urgent demands arise in the territories.

9. COMMUNITY ORGANIZING SKILLS AND GOOD GOVERNANCE ARE KEY ELEMENTS IN THE SUCCESS OF COMMUNITY NETWORKS

The development of community networks requires mobilization, accountability, and collective deliberation, historically constructed capacities that are hardly viable in short periods of time. Community networks are instruments that can strengthen the organization of groups in fertile contexts, in which there are already coordination and mobilization mechanisms. The evidence collected, however, indicates that the creation of community networks is not sufficient to build these links and mechanisms in contexts of fragile or incipient organization. Community planning that aggregates coordination among enterprises, civil society organizations, ISP, and universities is essential to strengthen the capacity to organize networks.

10. ALTHOUGH IT IS A POLYSEMIC CONCEPT, THERE ARE SOME CONSENSUAL COMMUNITY NETWORK PILLARS AMONG MULTIPLE SECTORS

Even though community networks have been on the Internet debate for more than a decade, there is still no single agreed definition of this concept. This occurs mainly because of the range of diverse interests among the actors that make up Internet governance at the national and international levels and actors that work in the territories, whether these are *quilombolas,* Indigenous, rural, or even peripheral to large urban centers.

The research identified that these differences are related to the diverse views about what (which problems) these networks seek to solve and what benefits they can offer. For example, elements such as local content production and net neutrality were identified, not as determinant, but as desirable. Other points of dissent were identified over the course of the research. Related to this, at least two major approaches

stood out: a broader discussion about connectivity, development, and rights; and a more specific debate about individual Internet access.

In any case, the research allowed for some common understandings about community networks based on a broad consensus about characteristics they share: 1) they are nonprofit initiatives; 2) they may or may not have Internet access; 3) they are self-managed; and 4) they present some level of autonomy and technological appropriation.

In sum, the predominant understanding is that community networks are instruments of social and community emancipation focused mainly, but not solely, on Internet access in vulnerable territories.

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