Internet Sectoral Overview | Number 1 March, 2021 Year 13

Connecting the unconnected in times of crisis

Overcoming the Rural Digital Divide and COVID-19 Challenges to Achieve the Universal Access Goal

By Maiko Nakagaki[1] and Eleanor Sarpong[2]

Introduction

The COVID-19 pandemic has exposed the shocking inequalities in Internet access and affordability that exist around the world with almost half of the global population still offline. Indeed, it amplified why increasing connectivity is urgent. The United Nations Secretary General (SG)'s Digital Cooperation Roadmaps[3] further acknowledges this as it ranks global connectivity by 2030 to be the SG's number one priority.

The Internet is no longer a luxury for the few, but a lifeline that must be for the many. Nevertheless, nearly 3.6 billion people are still entirely unconnected (International Telecommunication Union [ITU], 2019). The global community, however, has failed to meet one of the Sustainable Development Goals established for 2020 – to achieve universal affordable Internet access – which at the current growth rate will not be met until 2043.[4] The digital divide – that is, the disparity between those who have access or ability to use the Internet and those who do not – continues to worsen across many regions. Most of those who are offline today live in low- and middle-income countries where Internet access is out of reach due to costs, with women and people in rural areas representing the majority. Without access to reliable connectivity and devices, billions of rural populations risk being further cut off from vital information on health, safety, online learning, opportunities to voice their views and engaging in commerce.

Even before the pandemic hit, bringing affordable Internet to many was a challenge. In a report the Alliance for Affordable Internet (A4AI) partnered with the ITU, an estimated $428 billions of investment is required over the next ten

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[3] Find out more: https://www.un.org/en/content/digital-cooperation-roadmap/

[4] The 9.c target is to "significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020." The Sustainable Development Goal 9 refers to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation." Find out more: https://sdgs.un.org/goals/goal9.

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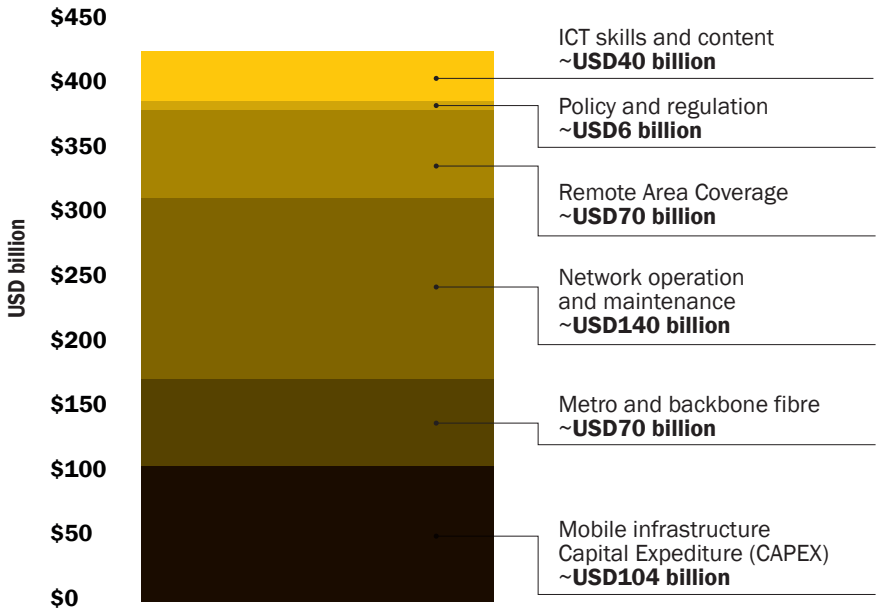
years to deliver high-quality broadband for the world's remaining unconnected population by 2030. Of that amount, a large segment refers to connecting the rural and remote areas, as shown in Figure 1.[5] Encouraging such investment is a daunting task ahead for the involved stakeholders, yet it is a much needed urgent task to close the global digital divide to ensure everyone has Internet access.

FIGURE 1 – INVESTMENT NEEDED TO ACHIEVE UNIVERSAL ACCESS TO BROADBAND CONNECTIVITY BY 2030



Source: ITU (2020a).

Current Scenario of the digital divide in Rural Areas

INTERNET ACCESS

The vulnerable population hit hardest with the digital divide are those in rural and remote areas. Globally, 72% of urban households have Internet access while only 37% of the rural households do. This rural-urban digital di-

[5] Universal Internet access is defined in the ITU's Connecting Humanity report as connecting 90% of the global population who are above 10 years old, and 4G speed is used as a proxy for broadband. This report is available at: http://handle.itu.int/11.1002/pub/81630581-en

vide is more acutely felt in developing countries, where only 28% of households in rural areas have Internet access – in Africa this proportion reaches a mere 6% (ITU, 2020b).

The issue of digital divide is further aggravated by climate change. In Mozambique, 68% of the country's population lives in sparsely populated rural areas, with 60% living along the coastline. Besides presenting unique connectivity challenges, the region is also susceptible to climate shocks (United Nation Development Programme [UNDP], 2021). In 2019 and 2020, Beira, Mozambique's second largest city, and its surrounding rural areas experienced major disruptions from the impact of multiple cyclones, resulting in limited Internet connectivity.

When everything went online in 2020 as a result of the lockdown measures adopted in face of COVID-19, rural and remote communities around the world became further pushed away from accessing public services, telemedicine resources, remote learning, and just keeping in touch with families and friends. This especially impacted rural children and young people in low- and middle-income countries from receiving education, as they were less likely to have access to the Internet at home.

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MEANINGFUL CONNECTIVITY

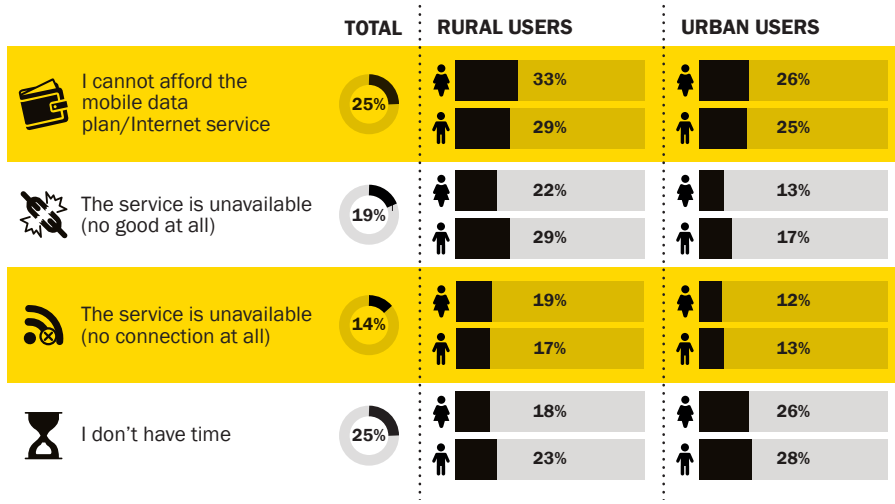
Rural areas are also at a disadvantage from the perspective of "meaningful connectivity"[6] – a comprehensive measure of the quality of Internet access that takes into account speeds, data allowance, device type and regular access. In Latin America and the Caribbean, at least 77 million rural populations do not have meaningful connectivity (Inter-American Institute for Cooperation on Agriculture, Inter-American Development Bank, & Microsoft, 2020). With the pandemic, the rural-urban digital divide was exacerbated by the significant increase in Internet access around the world (World Bank, 2020).

There are stark disparities in how men and women in rural areas access and use the Internet. This digital gender divide is significant for planning purposes. According to the GSMA, people living in rural areas in low- and middle-income countries are 37% less likely to use mobile Internet than those living in urban areas (Bahia & Delaporte, 2020), a challenge that is further intensified when examining how gender impacts connectivity: Women in rural areas from low- and middle -income countries are 20% less likely than men to use mobile Internet (Bahia & Delaporte, 2020). This is the case for a variety of reasons, including affordability, unreliable connection, and lack of service, as shown in Figure 2.

[6] Meaningful connectivity is defined as when one can use the Internet every day using an appropriate device with enough data and a fast connection. Find out more: https://a4ai.org/meaningful-connectivity/

(...) rural and remote communities often experience compounding effects of other forms of social exclusion, such as gender, socio-economic class, ethnicity or race.

Figure 2 – TOP FACTORS LIMING MORE FREQUENT USE FOR INTERNET USERS (% OF PEOPLE)



Source: World Wide Web Foundation, 2020.

Unique challenges of rural connectivity

Throughout the globe, rural areas face a unique set of challenges when expanding connectivity. Among the reasons for this, five factors stand out (Alliance for Affordable Internet [A4AI], 2020). First, rural areas are often separated from existing infrastructure by significant distances and challenging terrain. Connecting them to the Internet is typically substantially more difficult and expensive than connecting urbanised areas, thus creating a disincentive for operators and Internet providers to expand to rural communities. Secondly, rural areas often lack the resources and supportive infrastructure necessary to facilitate broadband deployment, such as technical skills and access to reliable electricity sources. This is especially true in emerging markets.

Thirdly, rural areas have lower population densities than more urbanised ones, meaning the number of potential customers in these areas is smaller. This makes it difficult to support the traditional business case for the large investments necessary to deploy broadband infrastructure in rural areas. Moreover, rural populations often have average incomes below those in urban areas, creating affordability challenges—particularly when coupled with higher rates charged in these areas.[7] Lastly, rural and remote communities often

[7] A4AI defines affordable access as 1 GB of broadband mobile data by the cost of for 2% or less of a given country's average monthly income. This "1 for 2 affordability target" is in line with the UN Broadband Commission's target as well. Find out more: https://a4ai.org/affordable-internet-is-1-for-2 and https://www.broadbandcommission.org/about/Pages/default.aspx

experience compounding effects of other forms of social exclusion, such as gender, socio-economic class, ethnicity or race.

Recommendations on expanding rural broadband connectivity

Eliminating the inequality in Internet access in rural areas must be a priority for countries seeking to achieve digital transformations and be globally competitive. Governments can make progress towards closing the gap through the development and implementation of specific policies to support rural broadband development. To this end, there are eight elements that policymakers should consider when advancing rural broadband in their countries (A4AI, 2020).

- *HARNESS MARKET COMPETITION WHILE ADDRESSING MARKET FAILURES*. Policymakers should harness competitive market dynamics for the benefit of consumers in rural areas by staying out of the way and promoting targeted regulations where necessary. This means supporting competition for encouraging innovation and investment, and supporting consumer choice in service providers. In particular, encouraging infrastructure sharing at the wholesale level is recommended because it promotes competition for consumers at the retail level. Rural broadband infrastructure is often prohibitively expensive for any single operator to deploy; consequently, the extension of such needed infrastructure is rarely done, and consumers are left without any service. Operators can overcome this obstacle by sharing infrastructure on a wholesale basis and effectively sharing the associated costs.

- *STREAMLINE REGULATORY PROCESSES.* Policymakers should create a supportive enabling environment for nascent rural operations and innovations to scale. This can be done by eliminating policies and regulations that may not achieve well-defined objectives, getting rid of punitive fines, streamlining market-entry regulations for rural areas and the permitting processes for obtaining access to rights-of-way.[8] Policies should also leverage the advantages of dig-once policies.[9]

- *INVEST IN IMPROVING PUBLIC ACCESS AND UNIVERSAL SERVICE AND ACCESS FUNDS (USAFs)*. Given the limits for the private sector's willingness to operate in rural and remote communities, governments should finance rural public access solutions. Public access points are telecentres, community centres, post offices, libraries, and public

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[8] Rights-of-ways enable operators to deploy facilities in rural areas by leveraging existing roads, ducts, and other infrastructure.

[9] Dig-once policies aim to reduce the infrastructure deployment costs by considering the shared use of terrestrial infrastructure for the passage of ducts and cables.

Wireless communications technologies can be leveraged as a key means of helping to overcome impediments to extending broadband services to rural areas.

Wi-Fi networks that provide people with affordable or free access to computers, tablets, and other communication devices and associated services with an Internet connection. Established by the government, USAFs are typically financed by mandatory contributions by mobile network operators, telecommunications providers or utilities to support investments in expansion of broadband infrastructure to rural areas, with a special focus on connecting public institutions and facilities. The goal should be to provide start-up funding for complementary providers (such as community networks) and to increase individual access (through devices, for example). Additionally, USAFs should be used to reduce the digital gender gap as a step towards ensuring universal Internet access by addressing the specific barriers faced by women.

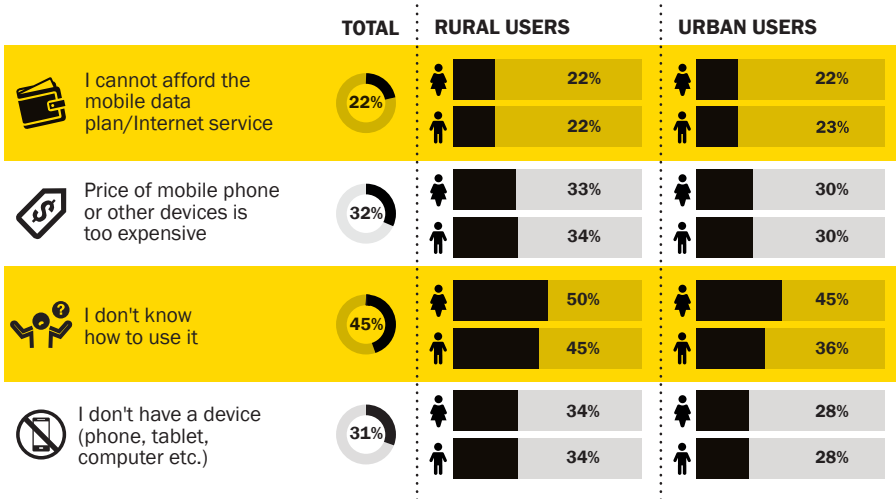
- *EFFECTIVELY MANAGE SPECTRUM RESOURCES*. Wireless communications technologies can be leveraged as a key means of helping to overcome impediments to extending broadband services to rural areas. These technologies sidestep many of the significant costs associated with deploying wireline networks in rural areas, including laying fibre over great distances or through rough terrain. To use such technologies effectively, operators must be able to access and use sufficient radio frequency spectrum. Policymakers, therefore, should manage spectrum resources seeking to "unlock" licensed and unlicensed spectrum, creating incentives for operators to use their licensed spectrum resources in a timely manner that benefits rural areas, and enabling unlicensed use of spectrum at additional frequency bands.

- *LEVERAGE INNOVATIVE TECHNOLOGIES, ARCHITECTURES, AND BUSINESS MODELS*. New technologies, business models, and other last-mile connectivity solutions can reduce costs and complexity of rural deployments, as well as support viable business cases for rural operations. Policymakers should encourage operators to utilize any technologies, standards, or architectures to meet the minimum service standards, to design and implement networks efficiently. In addition to supporting network cooperation, this will ensure rural populations get the same speed data service standards as in urban areas.

- *ADOPT APPROPRIATE TAX AND FEE STRUCTURES*. While taxing the digital infrastructure appears to be a popular measure for generating revenue for governments, policymakers should instead adopt tax and fee structures that encourage the rollout of broadband infrastructure and services in rural areas. This includes reducing or eliminating municipal taxes and fees charged in those areas, ensuring the tax regime is competitively and technologically neutral, and ensuring that tax regimes do not make broadband services unaffordable at the retail level.

- *STIMULATE DEMAND FOR BROADBAND SERVICES*. Supply of rural broad infrastructure is not enough: On the other side of the equation, it is necessary to create demand. As illustrated in Figure 3, one of the top reasons rural populations are often excluded from the online space is because they lack digital literacy.

Figure 3 – TOP BARRIERS TO INTERNET USE FOR NON-USERS (% OF PEOPLE)



Source: World Wide Web Foundation, 2020.

Policymakers must address this usage gap by providing digital skills training in rural areas. Moreover, to increase demand, they should promote creating more content relevant to rural communities, such as local news, weather forecast for farmers or market rates content in local languages.

- *MONITORING AND ACCOUNTABILITY*. For real change to happen, monitoring the progress of policy implementations and creating accountability mechanisms for policy leaders are key. Stakeholders can motivate policymakers to take action, respond to new evidence, and re-evaluate the course of action to have the greatest possible impact while ensuring that rural broadband policies are effectively working to bring affordable access to the targeted areas.

In addition to these recommendations, there are specific policy interventions needed to rapidly deploy connectivity to rural areas during the COVID-19 pandemic. Governments should provide support to keep citizens connected by adopting connectivity pledges and solidarity plans to encourage companies to implement policies that ensure citizens remain connected. Examples include removing late fees and maintaining services for those behind on bills or subsidies on data plans as Mozambique and Cape Verde did (Jorge, Sarpong, & Nakagaki, 2020).

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Let's embrace this current global emergency as an opportunity, commit to collaborate and play our parts to address this pressing challenge of bringing the unconnected online.

Policymakers should also take regulatory actions to increase access and affordability, such as what Panama did, to expand services to rural communities and make it easier for complementary solutions like community networks to thrive. Similarly, the Central American telecoms commission (COMTELCA) issued a set of international good practices on access that its members should adopt, including freeing up spectrum and downgrading online contents to lower resolution. Public private partnerships, on the other hand, can enable access by providing free or subsidized devices or establish a fund to support device sponsorship for low-income students and households (Jorge, Sarpong, & Nakagaki, 2020).

Conclusion

Securing affordable and meaningful connectivity for everyone must be a global priority that must involve all stakeholders. Without urgent action within this decade, billions of people will be excluded from the life changing opportunities that access to the Internet provides. Affordable and meaningful connectivity is the resolute way to ensure an inclusive and empowering digital equality that will eventually help us dismantle the gaping digital inequalities that persist between rural and urban areas, as well as among genders.

Ultimately, multi-stakeholder cooperation at the global, regional, and national levels are needed to meet the 2030 target of attaining universal access. The aforementioned United Nations Secretary General's latest Roadmap for Digital Cooperation provides clear guidance at the global level to advance digital equality. It's up to stakeholders to ensure it is successfully implemented. With its more than 100 members and partners, A4AI, the broadest global technology coalition, works to make broadband affordable and meaningful for all, aiming at universal connectivity. Let's embrace this current global emergency as an opportunity, commit to collaborate and play our parts to address this pressing challenge of bringing the unconnected online.

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Interview I

Internet Sectoral Overview (I.S.O.)_ How can country code Top-Level Domain (ccTLDs) contribute to the Internet and digital economy ecosystems in Latin America and the Caribbean? What factors impact the acquisition of ccTLDs?

Patricio Poblete (P.P.)_ The domain name system is a crucial part of the network infrastructure. Currently, there are literally thousands of alternatives to choose from to register domains, but us, the ccTLDs, have an identification with our respective countries and a closeness to our community, that give us an opportunity and a responsibility to support the digital development of the country and the region. At NIC Chile we have long aimed to provide high-quality services for a price within everyone's reach, with a wide range of payment methods, support through different channels for users and a domain name dispute resolution system well established in the community. We also actively participate in the regional organization Latin American and Caribbean Top-Level Domain (LACTLD), through which we share experiences and collaborate with our colleagues to continue permanently improving the services we provide.

Patricio Poblete
Director of
NIC Chile.

"(...) [the map of fiber optic connectivity] is being used in the bidding processes for new digital services that aim at incorporating new mobile technologies and also securing connectivity for a large number of rural locations that did not have access to these services until now."

I.S.O._ Due to the COVID-19 pandemic, many companies, especially SMEs, had to migrate their businesses to digital platforms. What are the main challenges that this audience faces to benefit from having a domain name? Have any initiatives been developed to overcome these challenges in the context of the sanitary crisis?

P.P._ At the beginning of the pandemic, our priority was to ensure that our services were not interrupted, despite the sudden migration to a totally remote work routine. Having had to operate under difficult conditions during the protest in Chile – the "*estallido social*" – at the end of 2019 helped us to be better prepared. With our operation secured, our focus was on supporting our user community. Due to the quarantine, many had to forcibly migrate to the virtual world. For current domain name holders, we extended the renewal payment deadlines by one month, and to make it easier to start new digital services, we created a "URL redirection" resource. In a fairly simple way, this tool enables a domain to be linked to other websites that are already available to the users, or to platforms such as Facebook and Instagram.

At the same time, we support the continuity of education in several ways. Through an agreement with Chile's Ministry of Education, we provided free one-year domain registrations to nearly one thousand schools, so that they could create their websites rapidly and conduct distance learning. Also, considering that many rural schools do not have the connectivity needed to access the online educational material provided by the Ministry, we compacted this content so that it could fit in a pen drive, which we sent to hundreds of municipalities to use in their schools.

I.S.O._ How have Latin American and Caribbean countries prepared to guarantee the resilience of ccTLD operations during situations of natural disasters? What were the lessons learned that came in handy to face the pandemic? Are there cooperation initiatives developed among such countries?

P.P._ NIC Chile has been working for years on mapping fiber optic connectivity in our country, initially in our research laboratory and now as part of our regular work. This was driven by the effects of the 2010 earthquake, which highlighted the vulnerability of the network. The result is a detailed and updated map of the network infrastructure throughout all of Chile. This material was made available to authorities and is being used in the bidding processes for new digital services that aim at incorporating new mobile technologies and also securing connectivity for a large number of rural locations that did not have access to these services until now. This mapping also seeks to strengthen the network and recommend redundant connectivity schemes.

Additionally, we have also been working with other ccTLDs, within the LACTLD, for an Anycast Cloud,[10] a collaborative network that will be available to all members who wish to use it. This is a very important step to improve the resilience of our services, in face of natural disasters or attacks that may affect our infrastructure.

[10] Find out more: https://anycast.lactld.org/

Article II

Challenges to connectivity in Latin America: Traditional policies and the emergence of community networks[11]

By Carlos Baca[12], Luca Belli[13], Erick Huerta[14] and Karla Velasco[15]

Internet access is transforming the social, economic, and political context of all the countries in Latin America and the Caribbean. It is widely accepted that an accessible, open, and affordable Internet plays a fundamental role in allowing individuals, businesses, and governments to benefit from the information society.

As noted by the Organization for Economic Cooperation and Development (OECD) and the Inter-American Development Bank (IDB), the dissemination of connectivity and, consequently, the greater availability and efficient use of the services provided over the Internet foster social inclusion, productivity, and good government.[16] The expansion of connectivity generally has two types of positive impacts. First, based on data published by the World Bank, in Latin American countries a 10% increase in broadband penetration can result in a gross domestic product (GDP) growth of up to 3.19%, with benefits ranging from the generation of services and jobs to an increase in family income (World Bank, 2016). Second, connecting a previously unconnected population generates positive effects for the dissemination of information and knowledge and an increase in social wellbeing. Thus, the construction and deployment of telecommunication networks promote a country's economic, social and technological development, connecting as many citizens

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[11] This text is an edited version of "Community Networks in Latin America: Challenges, Regulations and Solutions," published by the Internet Society (ISOC). To read the original study, please visit: https://www.internetsociety.org/resources/doc/2018/community-networks-in-latin-america/

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[13] Professor at the School of Law of Fundação Getulio Vargas (FGV) and associate researcher at the Centre of Comparative Public Law at University Paris 2 (France). A member of the Alliance for Affordable Internet (A4AI) board and director of the Latin-American edition of the Computers, Privacy and Data Protection conference. At FGV, he heads the CyberBRICS project.

[14] Holds a PhD degree in Rural Development from Universidad Autónoma Metropolitana Xochimilco (Mexico) and a master's degree in Social Administration with a Specialty in Community Development from the University of Queensland (Australia). General coordinator at Redes por la Diversidad, Equidad y Sustentabilidad (REDES A.C.) and an expert at the ITU for connectivity issues in remote areas and indigenous peoples. Designed the legal strategy of the first Indigenous Community Mobile Network in the world.

[15] Graduated in International Relations from Instituto Tecnológico Autónomo de México and Sciences Po (France). Latin America Regional Coordinator of the project "Connecting the Unconnected", which was implemented by the Association for Progressive Communications (APC) and by Rhizomatica. A specialist in regulation, policy, and gender, she is an associate rapporteur at the Inter-American Telecommunication Commission (CITEL), as well as the coordinator of International Affairs at REDES A.C.

[16] Available at: https://www.oecd-ilibrary.org/science-and-technology/broadband-policies-for-latin-america-and-the-caribbean_9789264251823-en

(...) the expansion of connectivity generates a virtuous circle, expanding access to information and knowledge, improving productivity, and increasing the income of the connected populations.

as possible and allowing these individuals to discover the importance of new technologies in their daily life.

In this sense, the expansion of connectivity generates a virtuous circle, expanding access to information and knowledge, improving productivity, and increasing the income of the connected populations. Consequently, this situation promotes an increase in the demand for information and communication technologies (ICT) services, which increases the penetration of services and is reflected in the dissemination of knowledge, increased productivity and the efficiency of local populations. It also fosters innovation and sustainable development and offers new opportunities for social participation in democratic institutions.

In Latin America, connectivity and quality of service have been increasing steadily, while, at the same time, the prices in real terms of Internet access have decreased considerably. Nevertheless, the main digital divides between urban and rural populations and between the different income quintile groups persist.

There is no denying that, to address the connectivity challenge, most governments in the region have developed broadband plans, defining quite detailed objectives and specifying compliance dates. In this context, the efforts of Latin American and Caribbean governments to disseminate Internet access services have led to a reduction of the number of people who are unconnected.

However, approximately 250 million Latin Americans – that is, more than half of the region's households – are still unable to access the Internet and the region maintains one of the world's highest levels of income inequality (Alliance for Affordable Internet [A4AI], 2017). Several socio-demographic characteristics still represent barriers that affect Internet adoption. Particularly, there are still major differences in terms of Internet access for city dwellers and the rural population, as well for those of the various income quintile groups.[17] In this context, on average, only 40% of the population with the highest income can afford to purchase 1 GB of data (A4AI, 2017).

It should be noted that 20% of the Latin American population lives in rural, often isolated areas where the geographical conditions make it difficult to develop infrastructure.[18] Thus, in addition to not being connected to the Internet, the persons living in these areas are also affected by a significant shortage of access to a broad range of basic services, such as electricity, education and health. Individuals living in rural areas of Latin America still lack adequate infrastructure, and the majority of those who are not connected believe that Internet access is too expensive or that the Internet is not relevant.

An analysis of the socio-demographic characteristics of those who are connected and those who are unconnected shows that the latter tend to be "older, poorer, less educated and more likely to live outside major urban centers" and, therefore, "they represent a much less attractive market for network operators and content or application providers" (Galperin, 2016). Unfortunately, policy makers have not considered these differences when making public policy and

[17] Available at: https://repositorio.cepal.org/bitstream/handle/11362/39965/S1600175_es.pdf

[18] Data obtained from the United Nations, Population Division website. To obtain this figure, the total urban population and the rural population were added and then the average was calculated.
Available at: https://population.un.org/wup/DataQuery/

no strategy seems to take into account the complexity of these factors which, if they are to be mitigated, require not only technological innovations and new business models, but also radically different public policies.

What strategies have been implemented in the region and how successful have they been?

In general, the strategies implemented by the governments of Latin America and the Caribbean consist of broadband deployment plans and the modernization of existing regulations. Several governments have actively encouraged the sharing of resources among different operators and have therefore created Universal Access Funds (UAFs) to support policies aimed at increasing the available infrastructure.

As Méndez Jiménez (2018, p. 96) points out, during the eighties, the birth and dissemination of mobile telephony represented a true revolution in telecommunications, especially in the type of infrastructure needed to provide the service, which made it essential to "install antennas that would allow receiving and transmitting on the radio spectrum, a finite natural resource allocated by the State." Later, in the 1990s, public access policies were defined based on the resolutions of the Latin American Forum of Telecommunications Regulators (Regulatel).

Participating governments committed to reducing the digital divide in their countries by establishing strategies to promote a competitive market and creating access opportunities for rural and urban populations of little economic interest to operators by means of shared subsidies (Barrantes & Agüero, 2011).

UNIVERSAL ACCESS OBLIGATIONS

Starting in 2005, based on the recommendations of the Regulatel, some of the countries in the region, including Brazil, Bolivia, Panama, Mexico, Cuba, and Venezuela, established obligations for operators to promote universal access to telecommunication services in all sectors of the population. While these measures resulted in significant progress in the deployment of infrastructure, they did not promote connectivity to populations considered unprofitable by the market. In this context, UAFs were created through which telecommunications companies are obliged to hand over part of their income for the establishment of access programs in marginalized populations. As Barrantes and Agüero (2011) point out, while at first glance these universalization funds appear to be successful, a closer inspection shows that the most important issues were the implementation, its use, and, frequently, the fact that these funds are diverted.

In this context, the deployment of broadband infrastructure has been a government priority to serve rural and urban areas. Investments in these areas have originated a series of projects that encourage telecommunications companies to

(...) the deployment of broadband infrastructure has been a government priority to serve rural and urban areas.

Digital literacy and access to tools such as e-learning have been promoted to increase the formal education levels of the rural population, yet this has been done without considering proper, relevant content for the specific context in which people are immersed (...).

participate in tenders and procurement processes for the provision of these services.[19] However, the costs involved in establishing the necessary infrastructure have not allowed setting affordable pricing for users. In this sense, even though these deployments have enabled greater access to ICT, this does not mean that the population can make use of these technologies given their high cost as compared to their income.

TELECENTERS

Telecenters or public access points (in libraries, schools, government buildings etc.) were installed throughout the region. At first these programs appeared to be effective since they promoted connectivity through specific connection points. The reality, however, is that these centers are now commonly abandoned due to a lack of equipment maintenance, low quality in the services they offer, a complete absence of capillarity of access within the communities, and the lack of production of – and access to – content that is relevant to their users.

This brings us to another characteristic of the public policies that have been developed in the region and which encouraged the use of ICT in education. Digital literacy and access to tools such as e-learning have been promoted to increase the formal education levels of the rural population, yet this has been done without considering proper, relevant content for the specific context in which people are immersed (Rey, Salazar, & Peña, 2011). This is the reason why telecenters and digital education programs have been strongly anchored in schools.

By way of an example, Ramos (2010) presents an analysis of the government telecenter programs implemented in Mexico. The access policy focused on the e-Mexico program, which, among other strategies, encouraged the development of Community Learning Centers (CCAs, by their Spanish acronym). These spaces were consolidated as information technology schools and commercial enterprises based on the creation of content with the support of the Monterrey Institute of Technology and Higher Education (ITESM).

The implementation of these programs, however, was not very relevant for rural and indigenous populations, where CCAs were located. This type of projects focused primarily on learning to use computers, as the rationale was that, simply by having the skills required to use a computer, users would have access to better job opportunities in urban contexts. In general, according to this study, the failure of CCAs had to do with the disconnect between the context of the communities that the CCAs were intended to benefit and public policy decisions, which were not based on an analysis of the specific needs of these populations.

There are models that still consider providing access by establishing spaces such as telecenters, shared access or incentives for major companies. However, the reality is that these solutions are successful in terms of the number of people they connect to the Internet, but they are usually not sustainable over time.

[19] Examples include the Austral Fiber Optic Project in Chile, which seeks to build three terrestrial backbones as well as submarine backbone connectivity. Find out more: http://foa.subtel.cl/proyecto-fibra-optica-austral-2/

The challenges of rural areas and the non-sustainability of subsidies

As highlighted, aspects such as equipment maintenance and quality of service add to the costs required to deliver services to these populations compared to the benefits that might be obtained. The expansion of connectivity in rural areas would allow a very slight increase for operators in terms of their number of users and revenue, considering that rural populations are generally very scattered and low-income, while the costs of infrastructure deployment and maintenance are typically higher than in urban areas.

Based on market logic, this means that revenues are insufficient to cover the costs and that returns do not justify the necessary investment. So, as pointed out by Galperin and Girard (2011, p. 4), "while large private utility companies are efficient organizations when it comes to building backbone networks and marketing services in urban areas, their advantages tend to decrease as they approach the last mile in communities characterized by high costs and low income."

When this data is presented in the discussion of public policies on access to telecommunications, it is generally considered a market failure; in other words, as if the only possible solution were to develop plans based on the economic strategies used for large telecommunications companies. However, as noted, while these strategies may be ideal for the deployment of infrastructure and obtaining economic benefits in urban contexts, their limitations are evident when attempting to meet the connectivity needs of the country's poorest populations, particularly those in rural areas.

Another option is for the governments themselves to provide solutions through their programs and budgets, generally by organizing subsidy schemes for the deployment and operation of infrastructure. However, the efficiency of this alternative is usually strongly limited by the clientelism dynamics of those currently in office.

Community networks: Sustainable and alternative solutions

For all of the above, the search for alternative solutions to the traditional connectivity strategies that have been implemented to date is not only desirable but truly necessary to avoid the evident inefficiencies of the existing digital divides. In this sense, as pointed out by the International Telecommunications Union (ITU), projects where the communities themselves are the decision-makers and responsible for the operation of last mile networks are the only initiatives that have been shown to offer functional options for the sustainable development of connectivity in remote areas.[20]

In this context, a significant number of communities has sought to escape the failures of market logic or the inefficiency of State subsidies to solve their connectivity problems by creating community networks. These are networks built in a collaborative, bottom-up fashion by groups of individuals who develop and manage new network infrastructure as common goods.

(...) the search for alternative solutions to the traditional connectivity strategies that have been implemented to date is not only desirable but truly necessary to avoid the evident inefficiencies of the existing digital divides.

[20] Find out more: https://www.itu.int/en/ITU-D/Digital-Inclusion/Indigenous-Peoples/Pages/M%C3%B3dulo-3.aspx

Community networks are connectivity projects that base their organizational and technological models on the form of organization and way of life of the communities of which they are a part.

The Declaration of the 1st Latin American Community Networks Summit held in September 2018 brings the following definition:

> Community networks are networks collectively owned and managed by the community for non-profit and community purposes. They are constituted by collectives, indigenous communities or non-profit civil society organizations that exercise their right to communicate, under the principles of democratic participation of their members, fairness, gender equality, diversity, and plurality.[21]

As explained in the Declaration on Community Connectivity, prepared in 2017 by the Dynamic Coalition on Community Connectivity (DC3) of the Internet Governance Forum, community networks are "are structured to be open, free, and to respect network neutrality. Such networks rely on the active participation of local communities in the design, development, deployment, and management of shared infrastructure as a common resource, owned by the community, and operated in a democratic fashion".[22]

Thus, as noted by Belli (2018; 2017), these initiatives are driven by the community that benefits directly from the connectivity and its positive externalities, giving rise not only to new infrastructure, but also to new governance models, business opportunities and access to information, making it possible to fill the gaps left by traditional strategies for the provision of Internet access.

In Latin America and the Caribbean, many communities still maintain organizational, economic, and political features not completely anchored in market logic neither in the organizational dynamics outlined by the State. The telecommunications initiatives developed by some of these communities serve this alternative way of life. Community networks are connectivity projects that base their organizational and technological models on the form of organization and way of life of the communities of which they are a part. In other words, community networks are a reflection of the communities that develop them and, consequently, the social and political structures that characterize the Latin American communities most disconnected from the Internet are also those that shape the community networks in the region.

Complementarity between community networks and "traditional" strategies

It is important to highlight that such models should not be considered antagonistic either to the State or to the market: On the contrary, they serve as a valid complement that allows filling the obvious gaps in both public and private strategies. Thus, the implementation of participatory mechanisms and logics based on the management of common assets allows the consolidation of projects that address the need for access to telecommunications, as well as stimulate the generation and sharing of content, applications and services that can meet the specific needs of the inhabitants of unconnected areas.

These initiatives differ from state or commercial projects, as the same people who use the networks are those who build, maintain, and operate them. In this context, users become active members of the network, thus increasing the

[21] The full Declaration of the Summit is available at: https://www.internetsociety.org/wp-content/uploads/2018/12/2018-Community-Networks-in-LAC-EN.pdf#page=51

[22] The full Declaration on Community Connectivity is available at: https://www.intgovforum.org/multilingual/index.php?q=filedepot_download/4391/1316

odds for sustainable connectivity projects and impacting network evolution with the fruits of their innovation and creativity and having a direct contribution on the evolution of a decentralized and participatory Internet.

In this sense, the emergence and dissemination of community networks allows individuals and communities to self-determine in the purest sense of the term: To enjoy their fundamental right to pursue their economic, social, and cultural development through the opportunities that connectivity can offer (Belli, 2018; Belli, 2017).

Although these general characteristics are shared by most of the projects, the form of technological appropriation varies between the different experiences that have occurred in the region. In Argentina, for example, Altermundi has developed an Internet access model based on a mesh network architecture.[23] Other initiatives, such as Telecomunicaciones Indígenas Comunitarias A.C. (TIC A.C.) in Mexico have focused on access to mobile telephony based on self-management and ownership of infrastructure in the indigenous communities of Oaxaca. Other experiences have created a bank of digital content relevant to the community which can be accessed through closed networks, as they have done in the community of Ciudad Bolívar in Colombia, or the Baobáxia projects in Brazil and the Yaj'noptik Intranet in Mexico. Also, the socio-demographic contexts in which these networks are immersed are also very different: Some are located in semi-urban areas, others in more rural regions and/or within indigenous villages.

Community networks as a reflection of a decentralized and generative Internet and society

Because they are born from the communities themselves, these telecommunication projects contain each community's values and ways of life, using technology to transform them according to their economic, political, and social forms of organization. Thus, technology does not determine how social relations develop; instead, it adapts to the characteristics of local social organizations and is transformed to allow particular ways of utilization, generation of content, applications and services, and infrastructure.

On the other hand, under a different connectivity model, Galperin and Girard (2011) describe the characteristics and strength of microtelcos (small local telecommunications operators) to solve the dichotomy between full government operation and the search for solutions that promote actions by major companies. These examples are additional evidence that alternative strategies are possible and can be very successful in promoting the expansion of connectivity.

In terms of public policies that are able to promote community network projects, microtelcos and similar initiatives, a transformation is required in the regulation of radio spectrum licensing, concessions or permits — depending on the system in place — and the mechanisms that can help or hinder the expansion of this type of networks.

The establishment of a favorable regulatory environment is essential to facilitate the expansion of community networks and allow people in areas affected by market failure to enjoy their fundamental rights and reap the benefits of connectivity, thus contributing to the social, economic, and democratic progress of Latin America (Belli, 2017; Belli, 2018).

Also, the socio-demographic contexts in which these networks are immersed are also very different: Some are located in semi-urban areas, others in more rural regions and/or within indigenous villages.

[23] The term "mesh" or "mesh network" refers to "a network topology in which each node is connected to all others, so that messages can be sent from one node to another through different paths. If the network is fully connected, there can be absolutely no interruption in communications." Find out more: https://es.wikipedia.org/wiki/Red_en_malla

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Interview II

Internet Sectoral Overview (I.S.O.)_ In what context have community networks emerged in Brazil and what is their role? Could you please provide examples?

Oona Caldeira Brant Monteiro de Castro (O.C.)_ The programs for democratizing Internet access started in the late 1990s, when inequality of access was stark and only a small part of the wealthy population was connected. Civil society organizations and local, state, and federal governments developed initiatives aimed at preventing this digital divide from growing, which would further exacerbate social inequalities. At the time, the most common programs were characterized by the construction of telecentres, community access centers, physical spaces with computers connected to the Internet, which were managed to a greater or lesser extent by the community that lived in the neighborhoods where they had been installed.

Since then, the infrastructure has been expanded; public policies have been implemented; broadband universalization programs have been designed; mobile Internet has popularized access, especially in urban centers; and new initiatives have emerged. However, Brazil still has a precarious – or nonexistent – infrastructure in several areas of the national territory and, as always, the most affected people are vulnerable populations, whose rights are under constant threat. Even where there is infrastructure, last mile offers are often inexistent, which prevents

the service from reaching users; when there are last mile offers, services are often unaffordable. It is also important to note that the further the service is from high population density centers and the lower the purchasing power, the more expensive the service is. Thus, whereas in rural communities the monthly price paid for 80 GB of data allowance ranges from BRL 600 to BRL 700 (reaching BRL 1,800 depending on the location), in many city capitals it is possible to pay BRL 100 for unlimited Internet access. Given these conditions and in tandem with the development of technologies – software, middleware, and hardware – initiatives to promote Internet access have undergone significant changes in the past 20 years. With the available technology, some strong-willed groups working in training and knowledge sharing, and changes in the regulatory environment, Wi-Fi and mesh community networks started to gain strength, but they are still rare if we take into account the size and needs of the country. Many of the Brazilian community networks emerged in this context of profound social inequality and digital divide, especially in rural areas, indigenous villages, settlements, quilombola communities,[24] coconut breaker communities,[25] among others. The creation of a shared infrastructure that enables the development of technical knowledge in communities has become a powerful tool not only to allow access to the Internet, but also to create a culture of familiarity with technologies, encouraging autonomy to maintain the networks.

Another part of these community networks has emerged in contexts where their creation is essentially a political choice for the collective management of infrastructure, which ensures greater control over it. In these cases, it is assumed that technical systems are also political systems and have enormous strategic importance. This perception also supports the activities of several groups and organizations that are dedicated to implementing networks in partnership with communities that do not have any access alternatives. The main motto here, however, is political choice, not the lack of feasible options that characterize other contexts. In this sense, the Latin American network of surveillance, technology, and society studies (Lavits) describes the importance of networks as follows: "By proposing that the means of connection be governed locally by and for the community, community networks emerge as a means of resistance and escape the process of concentration of power over the network infrastructure".[26]

Instituto Nupef[27] began to develop digital inclusion actions in the 2000s. Since 2016, it has been intensifying its activities in the creation of wireless and mesh community networks with indigenous peoples, quilombola movements, and babassu coconut breakers. Between 2017 and 2020, in dialogues with local leaders and their communities, eight community networks were implemented in the Brazilian State of Maranhão. The objective is to contribute to the enforcement of human rights and the strengthening of these movements through their articulation, the promotion of their security, and the dissemination of their ideas. Many of these communities were unable to contact, from their territories, human rights defenders, movement coordinators, and public authorities, hindering the realization of

Oona Caldeira Brant Monteiro de Castro

Director of Institutional Development at Instituto Nupef.

[24] Note: As stated in the Brazilian Decree no. 4.887/2003, remnants of quilombo communities are ethnic-racial groups, defined by self-attribution criteria, that have their own historical trajectory, are endowed with specific territorial relations, and there is presumption of black ancestry related to resistance of the historical oppression suffered.

[25] Note: Coconut breaker communities – *comunidades de quebradeiras de coco* – are communities of women that extract babassu palm tree coconuts, located in forested areas, especially in the Legal Amazon basin.

[26] Available at: https://lavits.org/as-redes-comunitarias-como-resistencia-a-concentracao-de-poder-sobre-meios-de-informacao-e-comunicacao/?lang=en

[27] Created as a unit of the Rits – Rede de Informações para o Terceiro Setor, Instituto Nupef became an independent organization in 2009.

"(...) we explain to the community how networks can work, we hear about how the community works, its local cultural, political, and geographic aspects, and we seek to collectively define the characteristics that the network will have during the on-site implementation (...)".

the necessary complaints for the preservation of the environment and to communicate for the protection of the lives of people under threat, just to mention a few examples.
However, the role of community networks goes beyond these urgent and paramount issues. The Internet provides access to online public services, information on health, educational content, cultural assets, and channels for disseminating local culture. The need for local maintenance of networks also encourages the appropriation of knowledge to handle technologies, training activities provide a better understanding of network security and allow the discovery of tools that, although not necessarily popular, are very useful, such as cloud file sharing software, IP telephony and messenger programs that are local and more secure.
An example of the impact promoted by these community networks is the case of a quilombola community in Maranhão that, in the first month of the network's existence, issued hundreds of Brazilian individual taxpayer registries (Cadastro de Pessoas Físicas – CPF) to its residents. The fact that many people did not have any documents made it impossible for them to access government programs that support economic activities income for the population. Another important example is related to a community of babassu coconut breakers. According to the community, the network created in 2019 made it possible for them to continue selling their products in the midst of the COVID-19 pandemic.

I.S.O._ How are community networks managed and how do communities participate in their development? What is the role of local leaders?

O.C._ Each organization and group that operates in the implementation of community networks has a particular approach. However, the concern with exchanging and sharing knowledge with the local community seems to be, if not unanimous, at least widespread. What varies is the emphasis on different aspects of training and management in accordance with the capacities and priorities of each community and each agent that contributes to the network implementation.
At Instituto Nupef, we seek community involvement and participation since before the networks are built. In general, our dialogue begins with social movements that represent or support the communities with which we will work. Based on the work initiated by these movements that promote dialogues with the villages or communities, the localities with the most urgent demands are identified by such movements. Then we explain to the community how networks can work, we hear about how the community works, its local cultural, political, and geographic aspects, and we seek to collectively define the characteristics that the network will have during the on-site implementation: Ranging from where the routers will be installed to who will be in charge of maintenance. The rules of use are defined by the community, and we can offer suggestions or information regarding the management of the network. Once this is plan is carried out, we start the on-site implementation.
This stage is, in itself, a training process. From the presentation of the equipment to the final set up of the networks, we show, explain, and implement things all at the same time, always working collectively. This is why, during the network building days, it is important that community members are available to work with us, and the role of local leaders is essential. In general, they are the ones who mobilize people, organize the community to meet up, and discuss what they want from the networks, whom they should serve, who will be involved in their construction and maintenance from the technical, managerial, and financial standpoints. In addition, when we are

on site, the leaders also act as the main link between us and the rest of the community. It is also common that during the on-site work other more direct relationships are created and strengthened and that new local leaders emerge, who will work more intensely on the networks. Several movements have seen networks as an opportunity for greater engagement of young people, who often take on a very relevant role in this process.
Community involvement is also key to the sustainability of networks. It is important to note that the networks are not ours; we build them together with the communities and, when they are implemented, they are theirs. The communities are responsible for ensuring the maintenance and continuity of the networks. To this end, we provide the necessary tools and spare materials for any replacements. We offer remote support and talk about improvements, new possibilities, and expansion, because we know that this process does not end when the network is installed. However, the communities must play the main role. It is a resource, their asset, and sustainability depends essentially on them. When necessary, we send them new equipment, but we explain from the beginning that the sharing of costs among beneficiaries involves the creation of a fund for repair and replacement of equipment that, over time, may deteriorate.

I.S.O._ Is Internet connection the main priority for community networks in Brazil? What are the other demands?

O.C._ Although we value the set of possibilities that arise from the networks, what we see in practice is that, yes, the priority of community networks is Internet connection. The provision of access causes many changes. In the communities, we often hear about how much they miss their families and friends who live far away; in this sense, the Internet is essential. It is also relevant for political purposes –articulation, complaint, protection – and economic reasons – buying and selling products and services. Two of our most striking experiences, however, were with communities where we structured the networks before we were able to connect them to the Internet. In both cases, although it is not my intention to establish systematic relations of cause and effect, the valorization of the network, the appropriation of knowledge, and the use of other tools were quite solid. In one of the communities, there was a one year interval between the implementation of the network and the installation of the Internet link. Although residents initially used the tools to access the local network, in addition to offline versions of Wikipedia and other resources, over time the interest in these “not news anymore” has decreased and the demand for Internet access as such has increased.
We are enriching the offline contents – especially the educational ones – that we leave in the communities so that they can be accessed locally, because we have realized that they can be useful for youngsters in training and even contribute to reduce the consumption of data in online research activities, for example, by extending the use of data allowance. This is a major challenge: Even though we seek to implement networks to enable access by communities that would otherwise not be able to do so, the data allowances offered are still limited and expensive. Thus, depending on data consumption and the provider, the community can have very precarious access for most part of the month, despite the high cost paid for the service.
Finally, we note that, in addition to the demands mentioned (communication with loved ones, public services, political articulation, access to health, information, and education), the search for entertainment – videos, films, music etc. – is quite high. We do not have data on the consumption of bytes for each of these types of use, but we noticed during conversations and activities to evaluate the use of the network that this aspect is very relevant for the communities, especially for the younger population.

"The provision of access causes many changes. In the communities, we often hear about how much they miss their families and friends who live far away; in this sense, the Internet is essential. It is also relevant for political purposes –articulation, complaint, protection – and economic reasons – buying and selling products and services".

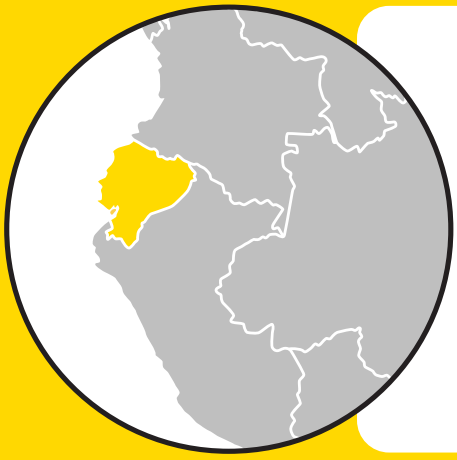
Community networks and COVID-19 in the Americas region[28]

The Americas region has been deeply affected by the COVID-19 pandemic, experiencing high levels of infections since early 2020. The consequences derived from the spread of the virus, from the social distancing measures established for its containment and mitigation have been exceptionally harsh for sectors of the population with limited access to education, formal employment, health and the use of ICT, especially the Internet.

Community networks have responded to the challenges posed by this scenario. It is particularly important to understand the value of these initiatives in promoting Internet openness and sustainability in the region and beyond. Below, we provide some concrete evidence based on some of the experiences shared by community networks in Argentina, Ecuador and Mexico.

• ARGENTINA

In the City of Buenos Aires, according to the organization Atalaya Sur, crisis committees in popular neighborhoods have been formed to solve the emerging problems in themes related to health, the economy, and sustainability, which is the case of the Atalaya Sur Villa 20 Community Network. By not having Internet access at home, many people are not able to work or study. In face of this situation, Atalaya Sur has made available relevant educational content for the residents. This content is distributed by the Ministry of Education of the Nation, and is being locally hosted on the network.



• ECUADOR

In the absence of connectivity in the Amazon, the Confederation of Indigenous Nationalities of the Ecuadorian Amazon (CONFENIAE) supported the installation of a radio system in the Suraka community, with the help of the organization Rhizomatica, which trained network installers. The initiative has benefited five base communities in Sapara territory (Tistsanu, Suraka, Nima Muricha, Pumayaku and Pinduyacu, all in Pastaza) to maintain good connectivity and communication during the health emergency of COVID-19 and other contingencies in the territory. Radio systems were also installed in Shiwiar territory, in the communities of Kapirna, Kawau, Yandanaentsa, Ikiam and Kurintsa.

[28] Adapted from the original text elaborated by REDES A.C. in collaboration with APC and published at: https://www.apc.org/en/news/community-networks-and-covid-19-americas-region under the license Attribution 4.0 International (CC BY 4.0). For more information regarding the license, access: https://creativecommons.org/licenses/by/4.0/.

• MEXICO

The Union of Tosepan Cooperatives, which is based in the municipality of Cuetzalan, Puebla, launched the Tayolchikawalis Initiative that seeks to generate "actions to have a strong heart" as a way to respond to the pandemic with regard to health, but also socially and economically. From Radio Tosepan Limakxtum, capsules and special programmes have been created to inform the population in the Nahuatl language. Recently launched, the initiative's website[29] offers truthful and relevant content for the communities in the region.

Community networks have also been used by rural teachers in order to enable children to fulfill their studies and tasks through local networks. In Tuxpan, Bolaños municipality, the local network wixarika.org has its own server where a web platform was installed for students and parents to access the digital content of their classes. Additionally, the community of Xochitepec, in Guerrero, decided in an assembly to rehabilitate a computer centre, cooperate with a local server and an antenna that gives access to the Internet, as well as adapt educational material to their language, Tlapaneco.

Domain Report

Domain registration dynamics in Brazil and around the world

The Regional Center for Studies on the Development of the Information Society (Cetic.br) carries out monthly monitoring of the number of country code Top-Level Domains (ccTLD) registered in countries that are part of the Organisation for Economic Co-operation and Development (OECD) and the G20.[30] Considering members from both blocs, the 20 nations with highest activity sum more than 88.79 million registrations. In March 2021, domains registered under .de (Germany) reached 16.82 million, followed by China (.cn), the United Kingdom (.uk) and Netherlands (.nl), with 10.42 million, 9.69 million and 6.18 million registrations, respectively. Brazil had 4.64 million registrations under .br, occupying 6th place on the list, as shown in Table 1.[31]

[29] Available at: tayolchikawalis.org

[30] Group composed by the 19 largest economies in the world and the European Union. More information available at: https://g20.org/

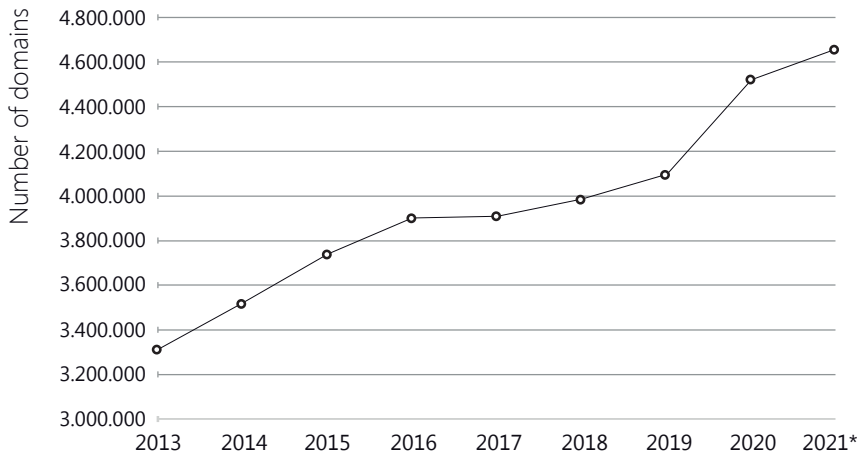
[31] The table presents the number of ccTLD domains according to the indicated sources. The figures correspond to the record published by each country, considering members from the OECD and G20. For countries that do not provide official statistics supplied by the domain name registration authority, the figures were obtained from: https://research.domaintools.com/statistics/tld-counts. It is important to note that there are variations among the reference periods, although the most up-to-date data for each country is compiled. The comparative analysis for domain name performance should also consider the different management models for ccTLD registration. In addition, when observing rankings, it is important to consider the diversity of existing business models.

Table 1 – REGISTRATION OF DOMAIN NAMES AMONG OECD AND G20 COUNTRIES – MARCH 2021

Position	Top 20: OECD + G20 countries	Number of domains	Reference Period	Source
1	Germany (.de)	16,827,148	31/03/2021	https://www.denic.de
2	China (.cn)	10,420,870	31/03/2021	https://research.domaintools.com/statistics/tld-counts/
3	United Kingdom (.uk)	9,691,458	01/03/2021	https://www.nominet.uk/news/reports-statistics/uk-register-s-tatistics-2021/
4	Netherlands (.nl)	6,180,528	31/03/2021	https://api.sidn.nl/rest/counters/domains
5	Russia (.ru)	4,985,825	31/03/2021	https://cctld.ru
6	**Brazil (.br)**	**4,646,530**	**31/03/2021**	**https://registro.br/dominio/estatisticas/**
7	France (.fr)	3,755,094	30/03/2021	https://www.afnic.fr/en/observatory-and-resources/statistics/
8	European Union (.eu)	3,560,275	31/03/2021	https://research.domaintools.com/statistics/tld-counts/
9	Italy (.it)	3,420,044	31/03/2021	https://nic.it
10	Australia (.au)	3,301,680	31/03/2021	https://www.auda.org.au/
11	Canada (.ca)	3,105,541	31/03/2021	https://www.cira.ca
12	Colombia (.co)	2,978,530	31/03/2021	https://research.domaintools.com/statistics/tld-counts/
13	Poland (.pl)	2,496,242	31/03/2021	https://www.dns.pl/en/
14	India (.in)	2,448,545	31/03/2021	https://research.domaintools.com/statistics/tld-counts/
15	Switzerland (.ch)	2,403,687	15/03/2021	https://www.nic.ch/statistics-data/domains_ch_monthly.csv
16	Spain (.es)	1,980,542	17/03/2021	https://www.dominios.es/dominios/en
17	Belgium (.be)	1,718,504	31/03/2021	https://www.dnsbelgium.be/en
18	United States (.us)	1,686,766	31/03/2021	https://research.domaintools.com/statistics/tld-counts/
19	Japan (.jp)	1,630,231	01/03/2021	https://jprs.co.jp/en/stat/
20	Sweden (.se)	1,560,011	31/03/2021	https://internetstiftelsen.se/en/domain-statistics/grow-th-se/?chart=active

Graph 1 shows the performance of .br since 2013.

Graph 1 –TOTAL NUMBER OF DOMAIN REGISTRATIONS PER YEAR FOR .BR – 2013 to 2021*



**Data in reference to March 2021.*
Source: Registro.br

In March 2021, the five generic Top-Level Domains (gTLD) totaled more than 184.04 million registrations. With 153.33 million registrations, .com ranked first, as shown in Table 2.

Table 2 – MAIN GTLDS – MARCH 2021

Position	gTLD	Domains
1	**.com**	153,338,882
2	**.net**	13,270,617
3	**.org**	10,408,355
4	**.info**	3,996,967
5	**.xyz**	3,026,038

Source: DomainTools.com
Retrieved from: research.domaintools.com/statistics/tld-counts

RURAL CONNECTIVITY IN BRAZIL[32]

FOR THE FIRST TIME, IN 2019 MORE THAN HALF (51%) OF HOUSEHOLDS IN THE RURAL AREA HAD INTERNET ACCESS.

Among the households with Internet access in the rural area:

33%
ONE THIRD HAVE MOBILE CONNECTION VIA 3G OR 4G MODEM OR CHIP

48%
LESS THAN HALF HAVE FIXED BROADBAND CONNECTION:

- **16%** connect via TV cable or fiber-optic
- **16%** connect via satellite
- **14%** connect via radio
- **2%** connect via telephone line DSL

Urban Area **Rural Area**

TOTAL HOUSEHOLDS WITH COMPUTERS[33] (2019):
43%
18%

TOTAL HOUSEHOLDS WITH INTERNET ACCESS (2019):
75%
51%

TOTAL HOUSEHOLDS WITH COMPUTERS AND INTERNET ACCESS (2019):
41%
16%

HOUSEHOLDS WITHOUT INTERNET ACCESS BY THE MAIN REASON FOR NOT HAVING INTERNET (2019)[34]:

LACK OF SERVICE AVAILABILITY IN THE AREA OF THE HOUSEHOLD:
3%
11%

LACK OF INTEREST:
20%
13%

TOO EXPENSIVE:
26%
28%

[32] Data from the ICT Household 2019 survey by Cetic.br|NIC.br. Find out more: https://cetic.br/en/pesquisa/domicilios/

[33] According to the methodology of the International Telecommunication Union (ITU), the "computer" category includes desktop computers, notebooks, and tablets.

[34] Other reasons for lack of Internet access collected by the ICT Households survey can be found on: https://cetic.br/en/tics/domicilios/2019/domicilios/A10A/

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ACKNOWLEDGMENTS

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United Nations Educational, Scientific and Cultural Organization

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