RURAL CONNECTIVITY IN LATIN AMERICA AND THE CARIBBEAN

STATE OF PLAY, CHALLENGES AND ACTIONS FOR DIGITALIZATION AND SUSTAINABLE DEVELOPMENT

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PREFACE

The key to tackling two urgent priorities: connecting rural areas and enhancing their development

Manuel Otero
Director General of the Inter-American Institute for Cooperation on Agriculture (IICA)

As of 2020, given the crisis resulting from the spread of COVID-19, the Inter-American Institute for Cooperation on Agriculture (IICA), in collaboration with other highly prestigious institutions, resolved to spearhead a series of studies on rural connectivity in the region, the situation of women and youth within the context of new technological developments and the need for the entire rural population of Latin America and the Caribbean to develop digital skills.

This body of work, which soon became an indispensable reference source on the topics studied, stemmed from the urgency of addressing, tackling and reducing existing gaps in these areas, and alerting countries about critical areas that must be prioritized, in order to successfully reduce inequalities and capitalize on the opportunities offered by new technologies.

Moreover, in addition to undertaking this research that provided valuable and unprecedented statistics about the status of rural connectivity and the capacity of rural inhabitants to capitalize on opportunities offered by new technologies, in every forum in which we participated, we highlighted the importance and relevance of bolstering national policies aimed at inclusion and digital empowerment.

In 2021, under the coordination of IICA, the countries of the Americas unified positions in preparation for the UN Food Systems Summit and coalesced around 16 key messages highlighting the invaluable role of agriculture.

The messages pointed out that farmers and agrifood systems workers are an essential and key link in the chain and that without agricultural production there would be no raw materials to transform into food.

They also emphasized the fundamental importance of agriculture in ensuring poverty eradication, spurring rural development and protecting the environment, while stressing the urgent need for rural communities to fully harness science and technology innovations, digitalization and the bioeconomy and to implement them through adequate levels of public and private investment, with the support of international cooperation and financing.

At the Summit of the Americas 2022, which took place in Los Angeles, we presented the document "Proposals on Strengthening Collective Action in the Americas to Tackle Food Insecurity and Ensure Sustainable Development", which included four thematic areas of work, one of them being "science, technology and innovation as key tools for efficient and sustainable agro-industrial production".

Here again, IICA coordinated collective action among countries in the Hemisphere, mobilizing the will of the countries to capitalize on the opportunities opening up as a result of current scientific, technology and innovation developments, with a view to reducing social and production gaps.

As is known, the onslaught of the pandemic demonstrated the importance of not only ensuring adequate connectivity, but also competence in the use of new technologies, while also starkly revealing that, without connectivity, the world's inequalities are replicated in the online universe.

The pandemic accelerated digitalization and yet the rural world—a strategic area for the world's food security and its political, economic, social and environmental sustainability—continues to face a major challenge in incorporating these technologies, which are essential for the development of a knowledge-intensive, sustainable and inclusive agriculture sector, with a human face.

However, this process is occurring at varying speeds. On the one hand, there are technologies that are making huge strides. On the other hand, the support that they require, for example, investment, infrastructure, regulatory frameworks and/or user learning, are taking place at a much slower rate and are not keeping pace with the changes that we are seeing.

This document, which was prepared with the invaluable support of the World Bank, Bayer, CAF-Development Bank of Latin America, Microsoft and Syngenta, provides a map that illustrates the status of rural connectivity in Latin America and the Caribbean, updating the information for the 2020-2022 period.

On the basis of the report, we can confirm that approximately 72 million rural inhabitants from 26 countries in Latin America and the Caribbean are unable to access connectivity services that meet the minimum quality standards. From 2020 until now, we have seen a 12% improvement in significant rural connectivity in the region.

Despite the positive data, it is alarming that 72 million rural inhabitants of Latin America and the Caribbean have no access to significant connectivity. The urban-rural connectivity divide has widened slightly (2 percentage points in relation to the 2020 figures, with 79% of the urban population accessing significant connectivity services in comparison to 43.4% of the rural population.

The data shows that we must adopt decisive actions and innovative solutions. The challenge is to improve rural conditions, offer decent living conditions to ensure the retention of women and youth in these areas, and to plan sustainable development in a way that will foster better quality agriculture that protects the environment and fosters food and nutritional security.

As we always say, the agriculture and rural sector can offer structural solutions to the pressing social, economic and environmental problems that we face. Thus, it should be prioritized in public agendas, relying on the full participation of the private sector, international cooperation and civil society organizations.

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1 The authors wish to thank Jorge Werthein, Guido Nejamkis and Daiana Sainz for their critical reading of and contributions to this document; all the members of staff of the IICA offices who provided institutional material to enrich this document; and Rodolfo Daldegan and Edwin Prado for their efficient coordination and assistance while carrying out field interviews.

EXECUTIVE SUMMARY

- In recent years, the presence of digital technologies has expanded exponentially and there is a challenge in rural areas to incorporate these technologies so that they can contribute to expanding and developing sustainable agriculture and transforming the countryside into an area of prosperity and development.

- Although there is no turning back as far as these technologies are concerned, the process is occurring at varying speeds, particularly in rural areas. On the one hand, there are technologies that are making huge strides. On the other hand, the support that they require, for example, investment, infrastructure, regulatory frameworks, affordable prices, user learning, etc. are taking place at a much slower rate and are not keeping pace with the changes that we are seeing.

- This document, which was prepared with the invaluable support of the World Bank, Bayer, CAF-Development Bank of Latin America, Microsoft and Syngenta, provides updated data and a map of the status of rural connectivity in Latin America and the Caribbean, providing similar information for the 2020-2022 period. It also gives an exhaustive account of the experiences in the region over the last two years in terms of rural connectivity and the use of digital technologies, whether through public policies, public and private sector associations and international cooperation. Finally, the material outlines the needs in terms of digital skills training for the general adult population, young people and women living in rural areas.

- According to the calculations in this study, there are an estimated 72 million rural dwellers in Latin America and the Caribbean (LAC) that are unable to access connectivity services that meet the minimum quality standards. Compared to the data from the previous report in 2020, this indicates a 12% improvement in significant rural connectivity in LAC for the 2020-2022 period. Yet, despite the improvement, it is alarming that 72 million rural residents still have no access to significant connectivity.

- As far as the urban-rural connectivity divide is concerned, this study concludes that 79% of the urban population has significant connectivity services (as opposed to 71% in the previous report), whereas in rural areas the percentage is 43.4% (in comparison to 36.8% reported in 2020). Thus, the existing urban-rural divide is 36 percentage points. Therefore, although the significant rural connectivity percentage improved by 7 percentage points, there was a 2-point increase in the urban-rural significant connectivity gap during the period since the previous study.

- The 26 countries have been classified in three clusters, according to their percentages of significant rural connectivity (SRC):

- The low significant rural connectivity cluster (Bolivia, Guatemala, Guyana, Haiti, Honduras, Nicaragua and Venezuela) accounts for 30% of the rural population of the 26 countries. Due to improvements in their SRC in 2022 vis-à-vis 2020[2] Jamaica, El Salvador, Belize, and Peru have moved to the mid-level significant rural connectivity cluster.

- The mid-level significant rural connectivity cluster (Colombia, Ecuador, El Salvador, Jamaica, Mexico, Peru, Dominican Republic, Paraguay and Suriname) is a group of nine countries that together represent 46% of the rural population of the 26 countries. Of this group, Bolivia, Honduras, Mexico and Peru experienced the most significant advances in terms of the percentage of rural inhabitants that benefited from improved connectivity.

- The high significant rural connectivity cluster (Argentina, Barbados, The Bahamas, Belize, Brazil, Costa Rica, Chile, Panama, Trinidad and Tobago and Uruguay) is a group of 10 countries that account for 24% of the rural population of the countries that were studied. Belize and Barbados were the countries in this group that displayed the most progress in comparison to the previous

2 The data was estimated based on information available for the years 2021 and 2017 respectively

assessment, with more than 50% of rural dwellers increasing their access to significant rural connectivity, followed by Trinidad and Tobago, Costa Rica, Uruguay and Argentina, with increases of close to or more than 30% in the percentage of rural dwellers with significant rural connectivity.

- The data presented demonstrates that there is a persistent urban-rural divide. Therefore, efforts must seek to adopt decisive actions and innovative solutions, given that although countries are mobilizing resources and developing plans, they are still insufficient to cauterize a problem that persists, is evolving and must be addressed without delay.

- Some of the difficulties in accessing connectivity include persistent obstacles to the use of universal access funds in most countries; installation problems, due to the infrastructure in the countries (lack of electricity, the condition of roadways, etc.); elevated investment costs and less cost effectiveness of operating companies; limited incentives to spur rural investment; and the inaccessibility of the most remote areas, all of which impedes the advancement of connectivity.

- The gaps in access, use and harnessing of new technologies must be addressed concurrently. With respect to the latter two, digital skills training for upcoming generations must be prioritized, as well as the retraining of the economically active population, with a view to incorporating the benefits of digitalization into production activity and improving the quality of life in rural areas.

- Overcoming the rural connectivity and digital literacy gap requires a combination of public policies, private sector participation and international cooperation to resolve the current situation. While countries in the region are undertaking actions to update regulatory frameworks and to develop digital agendas and policies, they have not been able to implement large-scale solutions and have significant requirements in terms of infrastructural investment. Many advances are still transient and therefore there is a risk that the gains achieved will be lost.

- Improving and investing in connectivity is an approach that will facilitate countries' economic growth. There is evidence of a positive link between infrastructure use and gross domestic product (GDP). Connectivity, the development of mobile networks, and investment for their sustainability and eventual expansion will contribute significantly to the post-pandemic economic recovery process and regional development.

- The connectivity and digital literacy gap is not static and cannot be resolved definitively. Modifications in the digital ecosystem and the modernization of technology, among others aspects, are producing continuous changes that keep moving the goalposts with respect to these gaps (for example, once rural areas access 4G services, the rollout of 5G begins in the cities and the built-in obsolescence of devices and their replacement makes it more difficult for the rural population to access them, given the costs of more modern equipment, etc.). This divide, given its dynamic nature, calls for ongoing actions and therefore cannot be definitively resolved.

- The document describes association models and strategies for increased rural connectivity, as well as the transformation of public policies to address the problem. It outlines public and private sector collaborative strategies, as well as community-based initiatives. Advances in recent years are primarily within the framework of pilot projects that have still not been expanded on a larger scale. Thus, a combination of both public policies and the involvement of different stakeholders (the private sector, international cooperation, among others) is essential to resolve the current situation. It will call for the generation of governance models to spur the introduction of quality connectivity options to rural areas.

- The challenge is to develop the rural environment, offering conditions that will encourage women and young people to remain in these areas, and to plan sustainable development so that it will facilitate an improved agriculture sector that protects natural resources .

INTRODUCTION

Digital transformation is spurring an unprecedented technological revolution that is defining the evolution of societies at the global level. This rise in the digital world is creating new possibilities for social, production and recreational activities, affecting the spectrum of human activity, which increasingly involves information and communication technologies.

Currently, the severe economic and social consequences of the COVID-19 pandemic, the climate change challenge and the ongoing geopolitical crisis due to the Russia-Ukraine war, are resulting in a global realignment, which is impacting Latin America and the Caribbean. Given this situation, the region will have to reassess the conditions needed to contribute to economic recovery and the opening up of opportunities for development. In this context, the evolution of food systems, as well as the contribution of digital technologies and their incorporation into agriculture are key to generating resilient and sustainable systems.

The availability of digital resources opens up endless opportunities to improve the standard of living or rural inhabitants. However, there are restrictions that have come to light recently as a result of the COVID-19 pandemic, which has demonstrated the vital importance of new information and communication technologies. This situation is cause for reflection on the potential of rural connectivity, the need to reassess the problem of obstacles to its expansion and the lag in achieving digital literacy in the population.

Promoting connectivity and the adept use of new technologies is an indispensable condition and priority to enable the full spectrum of production, social and community activities to take place in rural areas. The transformation of technologies and their application in production, with the consequent economic benefits, will require the promotion of policies and initiatives that bridge the gap in terms of access to and use of these new technologies.

Technological changes in rural areas have contributed to an increase in crop productivity. Connectivity has great potential, for example, to improve price transparency in the production chain and to facilitate the inclusion of women, youth and indigenous peoples in production processes. In short, advances in connectivity and the adoption of new technologies will contribute to halting the vicious cycle triggered by insecurity, poverty and rural flight today, which has a negative impact on generational succession.

This document compares data collected for the same indicators in 2020 and presents the advances and still persistent obstacles to the expansion of rural connectivity in Latin America and the Caribbean. It proposes a calculation methodology to identify the urban-rural connectivity gaps, as one of the fundamental components of the digital divide. Therefore, it provides a starting point to establish the necessary actions to expand high quality services to facilitate greater digital equity among persons and between the countryside and the city. The document seeks to amass information to assess these shortcomings, using reports prepared for the region and bearing in mind diverse sources of data on households and persons.

In order to compile information for a comparative analysis of countries and urban and rural areas, a Significant Rural Connectivity Index (SRCi) and a Significant Urban Connectivity Index (SUCi) have been developed, as a means of measuring the quality of connectivity, based on information available in official statistics and other existing indices, namely the Broadband Index of the Inter-American Development Bank (IDB); the Mobile Connectivity Index of the Group Special Mobile Association (GSMA); and the General Connectivity Index, used by the International Telecommunications Union (ITU).

The findings of this study reveal that approximately 72 million rural inhabitants in 26 countries of Latin America and the Caribbean do not have access to connectivity that meets the minimum acceptable quality standards, according to the concept of Significant Connectivity, shared in this study. Compared to the SRCi published in 2020, 9 million additional rural inhabitants now have access to significant rural connectivity, equivalent to a 12% improvement in significant rural connectivity in LAC in the 2020-2022 period. Yet, despite this improvement, it is still alarming that 72 million rural residents have no access to significant connectivity. **It is worth noting that not only is it critical to ensure connectivity, but this connectivity should be of sufficient quality to facilitate production, education, health services, or any other type of public service. In short, the extent of connectivity is equally important as that of quality.**

In terms of the urban-rural connectivity gap, the situation has worsened in relation to the calculations presented in 2020 (based on the 2017 data). The current study indicates that 79% of the urban population has significant connectivity services, whereas the percentage for rural populations has fallen to 43.4%, a 36 percentage-point gap. Although with respect to the 2020 report, the significant rural connectivity gap improved by 7 percentage points, the urban-rural significant connectivity gap increased 2 points during the period, as compared to the previous report.

It is important to highlight the following key problems of the rural digital divide in the region:

- **Currently, half of Latin America countries have specific ways to measure rural connectivity** (Bolivia, Brazil, Colombia, Costa Rica, Chile, the Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Paraguay, Peru, Suriname and Uruguay). The scarcity of available data is due to the fact that official statistics do not capture information that differentiates between connectivity in urban and rural areas. Formulating global targets that focus on disadvantaged territories calls for increased efforts that will ensure this essential coverage.

- **Limitations in information** restrict not only the ability to measure existing gaps in rural connectivity, but also the possibility of creating a climate that would facilitate evidence-based formulation of relevant public policies.

- With regard to **difficulties in infrastructure,** the following must be underscored: obstacles to the use of the universal access funds; installation problems, due to the infrastructure of countries (lack of electricity, the state of roadways, etc.); elevated investment costs and less cost effectiveness for operating companies; scarcity of incentives to boost rural investment; and inaccessibility of the most remote areas, which impede the advancement of connectivity.

- **The gaps in the access to and use of new technologies must be addressed simultaneously.** In terms of the latter, the training of new generations in digital skills must be prioritized, while also promoting the upgrading of skills in the economically active population, in order to incorporate the benefits of digitalization into production activity and improve the standard of living in rural areas.

- **Overcoming the connectivity and digital literacy gaps in rural areas requires a combination of public policies, private sector participation and international cooperation to resolve the current situation.** While countries in the region are undertaking actions to update regulatory frameworks and to develop digital agendas and policies, they have not been able to implement large-scale solutions and have significant requirements in terms of infrastructural investment. Many advances are still transient and therefore there is a risk that the gains achieved will be lost.

- **The connectivity and digital literacy gap is not static and cannot be resolved definitively,** whether it be because of constant changes in the digital ecosystem, technological transformations, etc. Thus, changing conditions in one sector could have repercussions in another, thus giving rise to another adverse situation. This divide, given its dynamic nature, calls for ongoing actions and therefore cannot be definitively resolved.

This study presents the state of play regarding changes in rural connectivity during the 2020-2022 period, focusing on the following areas: production of public policies; development of projects, based on international cooperation; public-private initiatives and the promotion of community-based alternatives. It also presents fundamental areas for the development of digital skills training in secondary schools linked to agricultural activity, which is still in the incipient stages, forging generational succession in the countryside. Equipping youth with digital skills and their effective application in agriculture is a priority for training human resources in the latest technological advances and providing opportunities in terms of employability and development potential.

The G20 Leaders' Summit in Bali (Indonesia) acknowledged the importance of digital transformation in achieving the Sustainable Development Goals. The final declaration states that: "We will advance a more inclusive, human-centric, empowering, and sustainable digital transformation". Within the framework of the Summit, digital

technology was presented as the key to recovery, by enabling innovation, collaboration and inclusion in vast sectors. Thus, it will ensure the development of food systems and a resilient and sustainable agriculture sector, the generation of jobs, trade facilitation, industrialization and integrating investments, while increasing productivity and unleashing the potential of the future economy. During that meeting, there was an appeal to international cooperation to continue developing digital capacities and digital literacy, with a view to harnessing the positive effects of digital transformation, particularly for women, girls and vulnerable individuals. The participants also agreed on common systems of measurement for digital skills.

Correcting the rural connectivity gap in the immediate future is a core challenge, considering that the recession triggered by the COVID-19 pandemic is the worst recorded in the history of Latin America and the Caribbean. ECLAC estimates indicate that the decline in economic activity was so marked that at the close of 2021, the GDP per capita of Latin America and the Caribbean was comparable to 2010 levels, meaning that there had been a ten-year regression in the per capita income level and a negative impact on employment, with an estimated 47 million jobs lost at the regional level.

According to CAF (2022) in the next 10 years, a further 31 submarine cables will be installed in Latin America. Today, the region is connected by 68 submarine cables, with its capacity having increased five-fold in the last 20 years. However, of these 68 systems, 23 are older than 15 years and 18 are more than 20 years. Thus, they are approaching the end of their 25-year life cycle. Moreover, there is limited interconnection at the local level.

Improving and investing in connectivity will facilitate countries' economic growth. There is evidence of a positive link between infrastructure use and the gross domestic product (GDP). Connectivity, the development of mobile networks and investment for their sustainability and eventual expansion will contribute significantly to the post-pandemic economic recovery process and regional development. The potential for economic rehabilitation can be seen in the impact of digitalization on the gross domestic product (GDP). According to IDB estimates (2020), if the gap in the digital infrastructure did not exist, Latin America could improve its gross domestic product (GDP) by between 2% and 17%, depending on the case. This poses a considerable challenge for rural areas, which are extremely important for the promotion of production and development, calling for innovation and technology to add value to the products of regional economies and to address the food challenge.

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CHAPTER 1

Updating the Significant Rural Connectivity Index (SRCi) of Latin America and the Caribbean[3]

Connectivity is an increasingly important factor for sustainable development that cuts across all human activities, significantly affecting economic growth, social inclusion and environmental sustainability (Zeballos and Iglesias, 2021).

In general, the collection of connectivity data for Latin America and the Caribbean (LAC) is undertaken at the national level, without differentiating between urban and rural areas. To date, various indexes have been developed to analyze the status and evolution of connectivity in Latin America and the Caribbean, such as the Information and Communication Technologies Development Index (IDI), developed by the International Telecommunications Union, the Mobile Connectivity Index (MCI) of the Global System for Mobile Communications (GSMA), and the IDB's Broadband Development Index (BDI).

The authors would like to say special thanks to Daiana Sainz for collecting and systematizing the information used in the preparation of this chapter of the document.

These indexes are an important source of connectivity analysis, but unfortunately do not provide information that is stratified by rural and urban areas. Accurate, specific and strategic information is fundamental and necessary for the implementation of effective and differentiated public policies, aimed at improving connectivity in rural

3 The authors would like to say special thanks to Daiana Sainz for collecting and systematizing the information used in the preparation of this chapter of the document.

areas of Latin America and the Caribbean. This study proposes an approach based on the quality and frequency of access to digital services and content by rural and urban populations, as was done in a previous study (IICA, BID, Microsoft, 2020). In this study, we will once again calculate the gaps in urban-rural connectivity, as one of the fundamental components of the digital divide, which, although not the only one, is a starting point for establishing the actions needed to expand quality services to ensure greater digital equity among people and among geographic areas.

1.1 Conceptual framework for Significant Connectivity

Connectivity is a complex and multifactorial phenomenon that must be evaluated not only on the basis of people's ability to access the internet with a device, but must also consider whether their basic needs are met, according to the standards of the digital age in which we live. The concept of Significant Connectivity, recently proposed by the Alliance for Affordable Internet (A4AI)[4] defines the elements needed to undertake a basic analysis of the quality of connectivity, considering not only whether a person has access to the internet, but also the regularity and quality of the available connection. This concept of Significant Connectivity is based on four pillars or fundamental dimensions, and defines minimum standards for its analysis:

1. **Regular use of the internet:** Takes into account whether people have regular and consistent access to the internet.
2. **Appropriate devices:** Considers whether people have the requisite devices to connect when needed.
3. **Sufficient data:** Analyzes whether people have access to sufficient data to carry out daily activities on an ongoing basis.
4. **Adequate connection speed:** Verifies that the connection speed is sufficient to meet the demand.

These pillars establish an up-to-date approach to connectivity that makes it possible to measure people's real ability to access the internet and to make full use of it, with the requisite frequency, speed and devices to meet the demands of the moment.

4 Meaningful Connectivity (A4AI, 2020), at https://a4ai.org/meaningful-connectivity/

1.2 Estimating the Significant Connectivity Index

In order to obtain information to facilitate a comparison between countries and between urban and rural areas, the Rural Significant Connectivity Index **(SRCi)** and the Significant Urban Connectivity Index **(SUCi)** were estimated, by combining the following indicators for each of the elements identified for Significant Connectivity:

Regular use of the Internet

Indicator: Percentage of the population using the Internet on a daily basis.

Source: National information and communication technology (ICT) statistics available from ongoing annual household surveys.

Suitable devices

Indicator: Average percentage of the population with access to mobile devices (smart phones) and percentage of individuals with access to a personal computer (PC), laptop or tablet.

Source: National ICT statistics obtained from ongoing household surveys.

Adequate data

Indicator: Percentage of the population with access to fixed broadband. .
Source: National ICT statistics obtained from ongoing household surveys.

Sufficient speed

Indicator: Percentage of the population with 4G technology coverage.

Source: Taken from Indicator 9.c.1 of the Sustainable Development Goals (SDGs)[5].

At the time of doing this survey, information on this last indicator on 4G technology coverage was available at the national and urban level, but not for rural areas. Therefore, an adjustment factor was used to obtain rural 4G coverage.

5 UNDESA Statistics Division - Indicator 9.c.1 Sustainable Development Goals. En http://www.sdg.org/search?categories=goal%209

The calculation of the adjustment factor was done via two procedures. First, those antennas identified as 4G technology were selected from the geographic database of mobile network antennas, according to country. The second step was to calculate the number of 4G antennas in rural areas, using information from the Global Human Settlement Layer (GHSL)[6] developed by the European Union's Joint Research Commission (JRC). The GHSL divides the world's territory into a grid of 1 km2 cells, each of which is then classified according to its population density and the density of the adjacent cells. In this way, 4 characteristic types are obtained:

1 **High Density Cluster (HDC):** Represents urban centers-

2 **Low Density Cluster (LDC):** Represents towns and suburbs-

3 **Rural Area (RUR):** Represents small rural villages or scattered populations

4 **Uninhabited areas:** Areas that are uninhabited or with very dispersed populations.

The number and percentage of rural 4G antennas was obtained for the LDC, RUR and uninhabited areas classes. Using this indicator, the available data on 4G coverage at the national level was adjusted to obtain the percentage of 4G technology coverage at the rural level, which is the fourth indicator used to estimate the Significant Rural Connectivity Index.

The values for each indicator were adjusted to a common base for comparison, corresponding to percentages with respect to populations in rural or urban areas.

The analysis was conducted for ten countries (Bolivia, Brazil, Costa Rica, Chile, Colombia, Ecuador, Honduras, Paraguay, Peru and Suriname), which, at the time of this study, had available data for rural areas, with the required emphasis on those quality-related aspects that are part of the concept of significant connectivity.

In terms of the problem of connectivity access, as mentioned before, the available information has limitations and gaps in addressing the issue of significant rural connectivity in all the countries of the region. Therefore, one of the objectives of this study is to use the selected countries as a starting point to make extrapolations to the rest of the countries of Latin America and the Caribbean, and to extend the analysis based on the available information.

6 Global Human Settlements Layers, Settlement GRID (2016). At https://ec.europa.eu/jrc/en

1.3 Significant Rural (SRCi) and Urban (SUCi) Connectivity Index

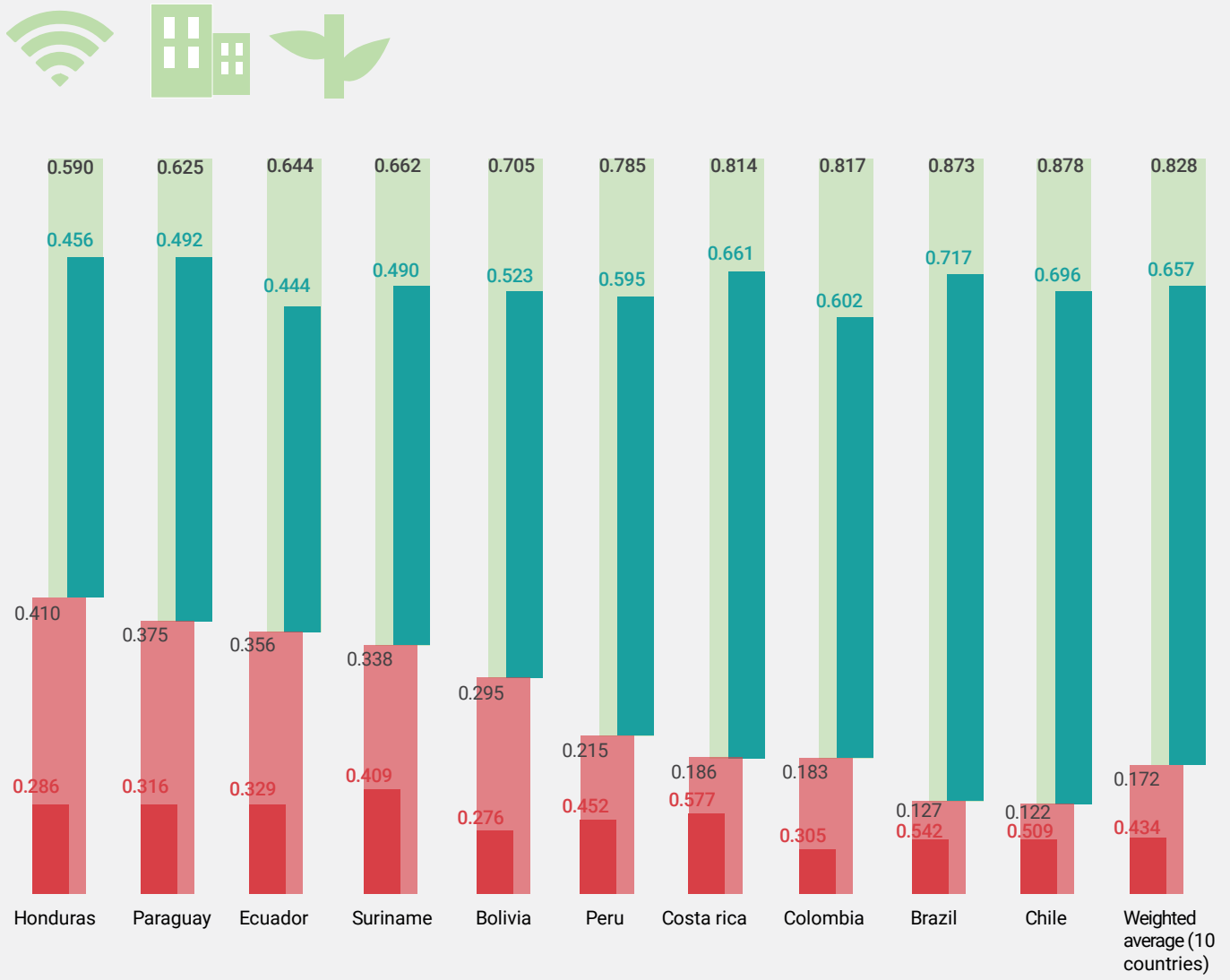
The Significant Connectivity Index establishes values of between 0 and 1 and is calculated by simply averaging the four indicators of internet access, equipment, broadband services and 4G coverage technologies. The index multiplied by 100 may be interpreted as the percentage of internet penetration in the population. The averages were weighted according to the relative size of the rural, urban and national populations of each country with respect to the total sample.

A pioneering study on rural connectivity was presented in 2020 (IICA, IDB and Microsoft, 2020). That study, in addition to this updated report, assesses people's real ability to access the internet and to make full use of it, with the adequate frequency, speed and devices, in keeping with current needs in rural areas. This is what is defined as significant rural connectivity (SRC). Of the total number of countries in Latin America and the Caribbean (LAC[7]), the SRC data compiled for 10 countries revealed that, on average, 43.4% of rural inhabitants have significant connectivity (Graph 1). In other words, 56.6% of rural dwellers in these countries cannot access connectivity at the minimal acceptable standards of quality, defined in terms of people's daily access to the internet, to equipment (personal computer of mobile phone), to sufficient data or to a connection at the adequate speed (broadband or 4G). The calculations were done using the data available up to October 2022; most of them were updated to 2021[8]. In 2021, there were a total of 63.9 million rural inhabitants in the ten countries in the sample, 36.2 million of which had no access to significant connectivity.

7 Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Paraguay, Peru, Suriname

8 Available data used to calculate the SRCi as at 2021 for the following countries: Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras and Paraguay. Data available as at 2020 for Chile, Ecuador, Peru and Suriname.

GRAPH 1. SIGNIFICANT RURAL (SRC) AND URBAN (SUC) CONNECTIVITY; (SHARE AND PERCENTAGE OF THE TOTAL POPULATION)



Source: Prepared by the author

The ten countries included in this study had sufficient data to calculate the SRCi and they account for 53.5% of the total of 119.3 million rural inhabitants[9] in the 26 LAC countries that were included in the calculation of the IDB Broadband Development Index (IDBA). Compared to the previous study in 2020, which used data from 2017 for seven countries, this study adds three additional countries (Chile, Colombia and Suriname). The IDBA, which does not disaggregate data into the rural versus the urban population, was used to extrapolate the significant rural connectivity results from the 10 countries included in this update to other countries in the region (see results below)..

The significant rural connectivity of the 7 countries included in the 2020 study[10] (with data from 2017) improved by 9 percentage points in 2021 (from 36.8 to 45.6), indicating that there are 4.8 million more rural inhabitants with significant connectivity in Brazil, Bolivia, Costa Rica, Ecuador, Honduras, Paraguay and Peru. Despite this improvement, 28.8 million rural inhabitants from these countries still have no access to connectivity at the minimal acceptable standards of quality. The comparison of results from this updated study in 2021 to the results of the 2020 study, not only takes into account the seven countries included in the previous study, but also deducts for changes in the number of rural inhabitants in these countries, which fell from 52.5 million in 2017 to 52 million in 2021. In other words, there are half a million fewer rural inhabitants.

As illustrated in Graph 1, countries with a greater proportion of rural inhabitants (Honduras, Paraguay, Ecuador, Suriname and Bolivia, where close to or more than 30% of the population is rural), are also the countries with the lowest level of rural connectivity, with an SRCi of nearly 30%, with the exception of Suriname that has an SRCi of 40.9%. In countries with a lower proportion of rural inhabitants, such as Chile, Brazil and Costa Rica, the SRCi is more than 50%. Colombia and Peru, which have an intermediate share of rural dwellers, have a SRCi of 30.5 and 45.2%, respectively.

In terms of urban-rural significant connectivity gaps, countries with a greater level of rurality have a significant urban connectivity figure of up to 2.7 times more in proportion to their rural areas (for example, Honduras[11]) and in some countries the gap is more than two times more (for example in Bolivia, Colombia, Ecuador, Paraguay and Suriname). In the rest of the countries of the survey sample, significant urban connectivity is approximately 1.5 times more than significant rural connectivity. On average, the 10 countries exhibit an urban-rural significant connectivity gap of 1.8, as in urban areas, the average SUCi is 0.794, as compared to the SRCi, which is 0.434.

9 Rural population data taken from the World Bank database (WDI, 2022)

10 Brazil, Bolivia, Costa Rica, Ecuador, Honduras, Paraguay, Peru

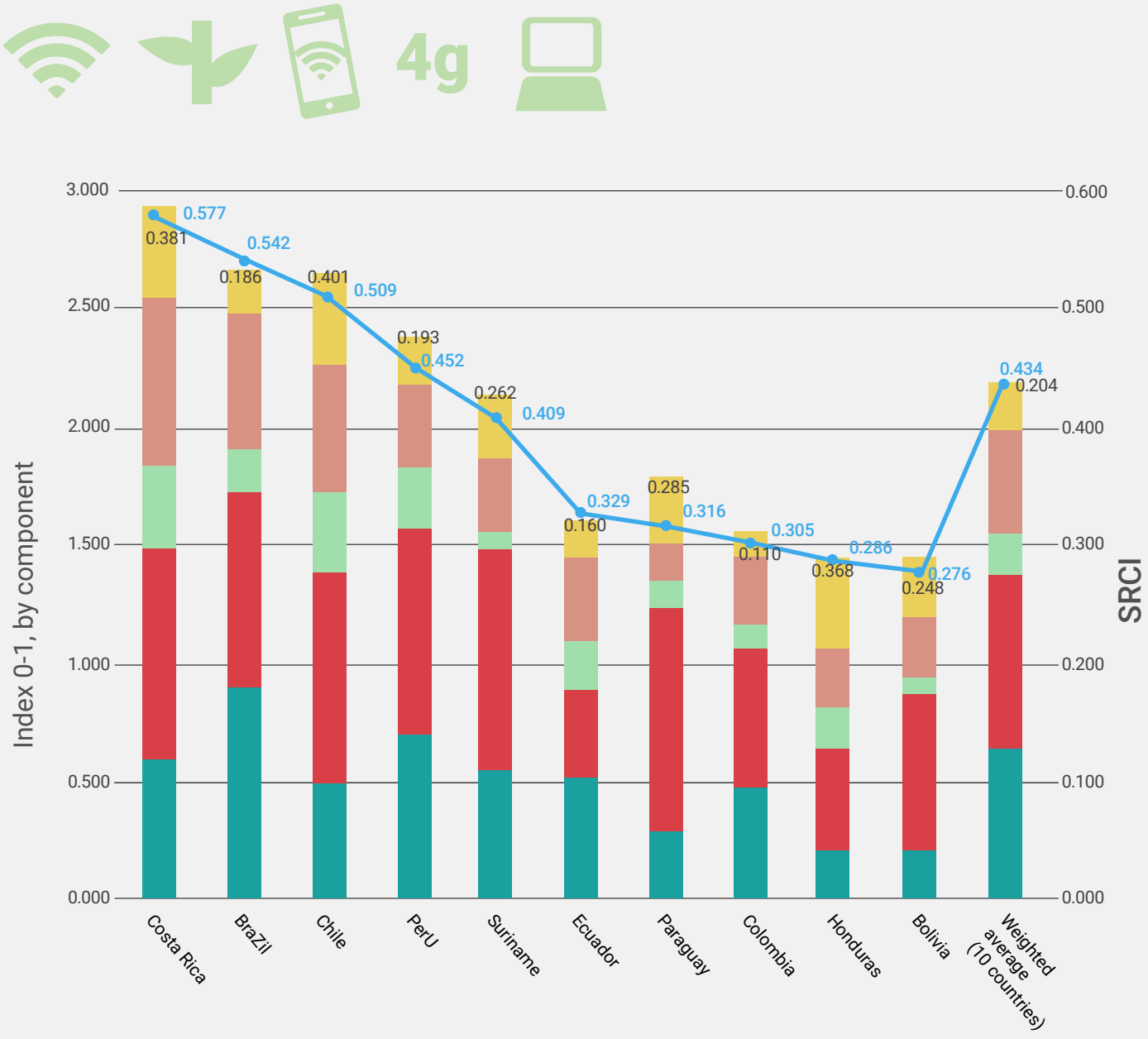
11 This means that, if significant rural connectivity in Honduras is 0.286, in urban areas the significant connectivity is 0.77, that is, 2.7 times more.

Bearing in mind the pillars of significant connectivity (Graph 2), despite the high levels of ownership of smart phones or regular mobile phones (a weighted average of 72.7 percent of rural dwellers owning one), fixed broadband access is the factor that most contributes to significant connectivity, followed by ownership of a personal computer. This relationship is evident in Graph 2, in observing the more direct relationship between the level of fixed broadband access (correlation of 91%) and the ownership of a personal computer (correlation of 70%), which are also closely interrelated (correlation of 75%).

In other words, there is a significant link between ownership of a personal computer and the level of broadband access, as well as between the latter and daily use of the internet. By contrast, the availability of 4G technology contributes relatively little to significant connectivity, and is also associated with low levels of daily internet use. A possible explanation for this behavior is that the availability of 4G technologies in the region in and of itself does not guarantee that rural inhabitants will have access, whether this may be due to their inability to afford the devices, the high costs for these services, or even to equipment that is inadequate or not compatible with this technology.

It must be pointed out that rural areas with greater access to broadband also have greater access to 4G, and conversely, the lower the availability of 4G technology, the lower the access to broadband. This may possibly be explained by the relative levels of rural development that contribute to improving both broadband and 4G technology services.

GRAPH 2. SIGNIFICANT RURAL CONNECTIVITY INDEX (SRCI), ACCORDING TO ITS DIMENSIONS



Source: Prepared by the author

A detailed analysis of the SRCi, which is based on the 4 fundamental pillars or dimensions, and establishes minimum quality standards, reveals the following:

1 **Regular internet use:** Assesses whether people have regular and permanent Internet access and is used as an indicator to measure the percentage of the population that use the internet daily. The results indicate that the rural population in ten countries has this access and that there has been a significant uptick in daily internet use, compared to the 2020 study, with an average of 65.1% of rural people using the internet daily, compared to 48.6% in 2017. This figure is 16.5 percentage points (p.p.) more (or 20.7 additional p.p., comparing only the seven countries in the original study). Thus, 44.3 million of the 63.8 million rural inhabitants in the ten countries surveyed in this analysis are accessing the internet on a daily basis. The countries that showed the most significant changes in regular internet use compared to 2017 were Peru (56.5 additional percentage points), followed by Ecuador (22.8 p.p.) and Brazil (17 p.p.). Nonetheless, in those countries there are still 19.6 million rural dwellers without daily internet access. Along the same lines as the previous study using 2017 data, there is a significant link between daily internet use in the rural areas of the ten countries and the greater availability of broadband and ownership of a personal computer, and not so much between the daily usage and the availability of 4G technology, which is low in the countries surveyed.

2 **Appropriate devices:** Assesses if people have adequate devices for connection, when they need it, which is measured by using the average percentage of the population with access to mobile devices (or smart phones) and the percentage of individuals with access to a personal computer (PC), laptop or tablet. An average of 44.9% of rural dwellers in the ten countries have this equipment, primarily mobile or smart phones, which means that 55.1% of rural dwellers do not have adequate devices. The percentage of the population with this equipment fell on average by 1.8 percentage points or only 0.6 p.p., if we only compare figures from the seven countries surveyed in the original study, using 2017 data. This decline was explained primarily by a decline in availability in Ecuador (11.9 p.p.), Bolivia (10.9 p.p.) and Paraguay (1.2 p.p.). This fall-off was partially offset by the increased availability of equipment in Peru (5.1 p.p.) and Brazil (4 p.p.). On average, the availability of computers in the seven countries of the previous study fell 4.5 p.p. and the availability of mobile or smart phones increased 3.3 p.p. in 2021 vis-à-vis 2017, which means that the availability of equipment decreased by an average of 0.6 p.p. in 2021, compared to 2017. The small decline in the availability of equipment did not affect most countries or average daily internet use, which benefitted from greater access to broadband and 4G technologies, as shown below.

3 **Sufficient data:** Assesses if people have access to sufficient data on a permanent basis, to undertake their daily activities. This is measured using the indicator on the percentage of the population with fixed broadband services. An average of 43.2% of rural inhabitants from the 10 countries have access to broadband, which is 9 p.p. more than in 2017 (or 11.4 p.p. more if the comparison is made using only the 7 countries included in the 2020 study). Costa Rica, Peru, Bolivia and Honduras are the countries with the greatest increases in broadband access, with increases of 45.7, 28.4, 24.0, and 15.4 p.p., respectively. It must be noted that 56.8% or 29.5 million rural inhabitants from the ten countries still had no access to fixed broadband services in 2021. As analyzed previously, it is important that advances continue in this area, given that the availability of fixed broadband services is the factor most associated with the greatest daily use of the internet, along with ownership of a personal computer, although there is a shift towards greater use of mobile phones and of 4G technology. However, there is a limited availability of this latter component of significant connectivity in the region, as we will see later on, and its affordability for rural inhabitants is limited.

4 **Adequate connection speed:** Assesses if the connection speed is adequate to satisfy the demand; and in this study, it is measured as the percentage of the rural population with 4G technology coverage. To do so, we utilized a specific methodology to adjust the available data, given that this indicator is only available at the national and urban scale, but not for rural areas[12]. The results for the ten countries show that only 20.4% of rural inhabitants have connectivity, although they do not necessarily have the ability to access 4G technologies, which means that almost 80% of the rural population is not able to access this service, which is equivalent to 41.3 million of the 54.4 million rural dwellers in the ten countries. Chile, Costa Rica and Honduras are the countries in which the availability of 4G is more than 30%, and Colombia and Ecuador are the countries with the lowest levels (11% and 16%, respectively). With respect to the 2017 data, countries with the greatest improvement in the availability of 4G technologies were Honduras (19.8 p.p. more), Costa Rica (12.5 p.p. more), and Paraguay (12.4 p.p.).

This updated assessment of connectivity demonstrates the need to improve rural conditions, so that people may have the real possibility of accessing the internet and making full use of it, with the frequency, speed and devices that are adequate to meet their needs at that time.

12 As indicated in the previous study, in order to calculate rural 4G coverage, an adjustment factor was done via two procedures. First, those antennas identified as 4G technology were selected from the geographic database of mobile network antennas, according to country. The second step was to calculate the number of 4G antennas in rural areas (see further details in IICA-IDB-Microsoft, 2020).

1.4 Extrapolation of the results to other countries in Latin America and the Caribbean

This rural connectivity study was conducted for ten countries in Latin America and the Caribbean, due to the unavailability of data disaggregated into rural and urban areas for the rest of the countries. Like the study published in 2020, this study revealed a high correlation (77.2%) or link between the Significant Rural Connectivity Index (SRCi) calculated in this study and the infrastructure dimension of the IDB's Broadband Development Index (IDBA), which was recently updated (2022). Given the high correlation between these indexes, it is possible to extrapolate from the measurements in rural areas in ten countries in the region to the rest of the countries in Latin America and the Caribbean. The high correlation between the two indexes is understandable, given that the indicators included in the infrastructure dimension of the IDBA index are similar or directly linked to indicators used to calculate the SRCi, such as 4G coverage, homes with a personal computer, homes with internet access, broadband access and internet speed.

Graph 3 shows in blue estimates for the SRCi and its correlation to the infrastructure component of the IDB's Broadband Development index for the ten countries included in the study. Based on a simple extrapolation of the results to the rest of countries in Latin America and the Caribbean (16 countries), a logarithmic adjustment formula was used[13]. Thus, the graph illustrates the results for 26 countries in the region, ten of which are estimates undertaken in this study.

The 26 countries that were included in the 2021 study account for 119.3 million rural inhabitants out of a total of 122.6 million in Latin America and the Caribbean. In other words, this extrapolated sample is representative of 97.3% of the rural population of the region. With respect to 2017 (the year from which the data used in our 2020 study on rural connectivity was taken), the rural population of LAC decreased 1.5% or 1.9 million rural inhabitants (World Bank, 2022)[14]. This reduction in the rural population is a critical factor that must be taken into account when making net estimates of the rural population affected by or benefitting from changes in significant connectivity.

Approximately 72 million rural inhabitants from 26 countries do not have access to connectivity at the minimal acceptable standards of quality, in line with the concept shared in this study on Significant Connectivity. Compared with the SRCi published in 2020, using 2017 data[15], 9 million additional rural inhabitants are enjoying significant rural connectivity, which is equivalent to a 12% improvement in significant rural

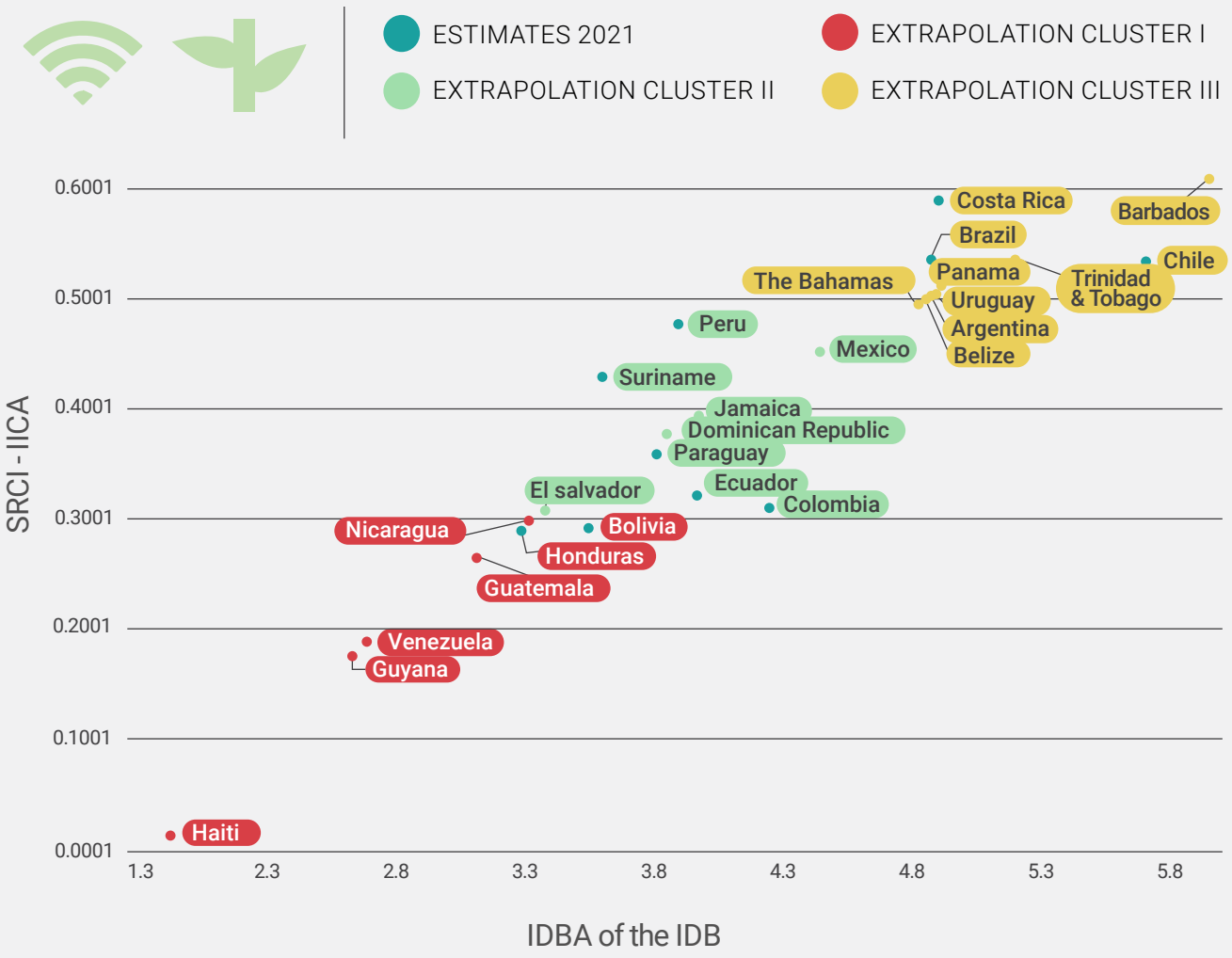
13 The R2 obtained from this logarithmic adjustment was 0.69.

14 World Bank. 2022. World Development Indicators. Available at https://databank.worldbank.org. Consulted on 28 October 2022.

15 This was discounting for two factors, one for the fact that the 2020 study included fewer countries (24 countries and this study includes Haiti and Suriname) and that the rural population in LAC decreased 1.5% from 2017 to 2021.

connectivity in LAC. Despite the improvement, it is still alarming that 72 million rural inhabitants in Latin America and the Caribbean still have no access to significant connectivity. Due to the size of their rural populations, Brazil, Mexico and Peru were the countries with the greatest increases in the number of rural dwellers benefitting from significant connectivity, amounting to 2.4, 1.9 and 1.8 million rural inhabitants, respectively. In proportion to the size of their rural populations, the greatest percentage increases, in order, were seen in The Bahamas, Barbados and Peru, with increases in the SRCi of more than 50% in 2021 vis-à-vis 2017. They were followed by Costa Rica, Trinidad and Tobago and Uruguay, which experienced increases of between 30% and 40% in the SRCi.

GRAPH 3. CORRELATION BETWEEN THE SIGNIFICANT RURAL CONNECTIVITY INDEX (SRCI) AND THE IDB'S BROADBAND DEVELOPMENT INDEX (IDBA), VERSION 2021



Source: Prepared by the author

Given that this methodology is similar to the one applied in the 2020 study on rural connectivity, in order to compare the results, the extrapolation of the results (Graph 3) facilitates the identification of three clusters of countries, marked in red, yellow and green on the graph:

LOW SIGNIFICANT RURAL CONNECTIVITY CLUSTER: Bolivia, Guatemala, Guyana, Haiti, Honduras, Nicaragua and Venezuela. This group of seven countries is home to 30% of the rural population of the 26 countries or 21.3 million inhabitants. The Index for this group of countries ranges from 29.7 (Nicaragua) to 1.4% (Haiti), which means that between 71 and 99% of the rural populations of these countries have no access to connectivity services of sufficient quality. Due to improvements in the SRCi of 2021 over 2017, Jamaica, El Salvador, Belize and Peru were elevated to the medium level of significant rural connectivity. Please note that the connectivity indexes of Bolivia and Honduras (marked in blue in Graph 3) are real estimates by this study, whereas the indexes for the rest of the countries are extrapolations, using the methodology explained above.

MID-LEVEL SIGNIFICANT RURAL CONNECTIVITY CLUSTER: Colombia, Dominican Republic, Ecuador, El Salvador, Jamaica, Mexico, Paraguay, Peru and Suriname. This group of nine countries accounts for 46% of the total rural population of LAC, which is equivalent to 32.9 million people. The Significant Rural Connectivity Index for this group ranges between 30.7 (El Salvador) to 47.4% (Peru), which means that between 69.3 and 52.6% of the rural population of this group of countries has no access to connectivity services at the minimum standards of quality. Of this group, Peru, Mexico, Honduras and Bolivia have seen the most significant increases in terms of the percentage of rural inhabitants that improved their connectivity conditions vis-a-vis 2017, with increases of 50.8%, 17.4%, 12.9% and 11.4%, respectively.

HIGH SIGNIFICANT RURAL CONNECTIVITY CLUSTER: Argentina, Barbados, The Bahamas, Belize, Brazil, Costa Rica, Chile, Panama, Trinidad and Tobago and Uruguay. Finally, this group of ten countries accounts for 24% of the total rural population of LAC, equivalent to 17.2 million people. The significant Rural Connectivity Index for this group ranges between 49.4% (The Bahamas) to 60.4% (Barbados), meaning that between 39.6 and 51.6% of this population group does not have access to significant connectivity services. The countries in this group with the greatest improvement with respect to 2017 were Belize and Barbados, which recorded increases of more than 50% of rural dwellers that now have access to significant connectivity, followed by Argentina, Costa Rica, Trinidad and Tobago and Uruguay, with increases in the percentage of rural inhabitants with significant connectivity that were closer to or greater than 30%.

1.5 Opportunities, challenges and decision-making

Much more research remains to be done to facilitate a more in-depth analysis and to scale up this study to other countries in the region, while bearing in mind that differentiating between urban and rural areas is strategic and necessary. This would undoubtedly assist in informing actions in the public and private sector, at the community level, in rural organizations and multilateral credit organizations, as well as in international support and investment institutions, local government and academia, among other multiple stakeholders. Having complete, open and accessible information and data in an appropriate and timely manner is key to the comprehensive management of this challenge. Direct coordination and the development of agreements with national statistics offices, universities, research institutes and observatories is therefore essential for compiling better data on the rural digital divide.

Increasing connectivity and bridging the digital gaps between people and between rural and urban territories should continue to be priorities for policy design, if the benefits are recognized and proven. Improved digital services and connectivity will save time and money, enhance the efficiency of production processes and public and private services, generate employment, boost productivity and the quality of products and services, while expanding opportunities for knowledge and participation in a global culture, which are key factors in achieving the sustainable development of the region's agricultural and food systems. To be viable, this must go hand in hand with the promotion of the competitive, environmentally sustainable and inclusive development of rural areas. It will not be an easy task, since the rural-urban digital divide, in general, and the significant connectivity gap, in particular, are both the cause and the effect of the many gaps observed in Latin American and Caribbean countries (see ECLAC/FAO/IICA, 2019).

In addition to the gaps described in detail in the report, there is a gap that may be the basis for other gaps. The findings of this study show that 79% of the urban population has access to significant connectivity services (versus the 71% recorded in the previous report), whereas in rural populations the percentage drops to 43.4% (against the 36.8% reported in 2020). Thus, currently the urban-rural gap is 36 percentage points. Although, in comparison to the 2020 report, the percentage of significant rural connectivity improved by 7 percentage points, the overall urban-rural connectivity gap increased by 2 percentage points over the same period.

CHAPTER 2

The status of connectivity in Latin America and the Caribbean: advances and pending tasks

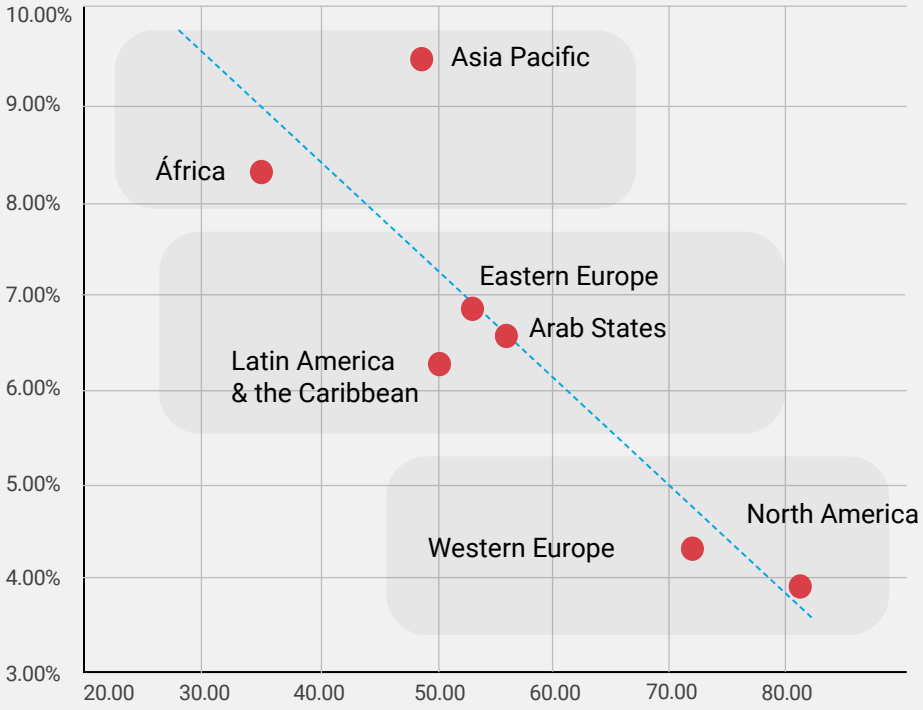
Currently, the world is undergoing unprecedented changes in the field of information and communications, spurred by a technological revolution. In this scenario, digitalization is opening up endless opportunities for economic, social, environmental, health, scientific, cultural and educational development. In short, almost all human activities are affected by the changes in information and communication technology taking place at the global level. The new available technologies are not only more sophisticated tools, but they are also radically changing the very activities for which they are used. Indeed, it is not a matter of simply having access to these new devices, but these tools must allow for transforming production processes, processing data on a large scale, developing forms of artificial intelligence and democratizing access to resources and services, among other aspects.

According to an assessment by the CAF Digital Ecosystem Observatory (2020), the development of the digital ecosystem in Latin America and the Caribbean is currently at an intermediate level vis-à-vis other regions in the world, and "with an index of 49,92[16] (on a scale of 0 to 100), the region is outperforming others like Africa (35.05) and Asia Pacific (49.16). However, despite the significant strides made in the digital ecosystem in the last fifteen years, Latin America and the Caribbean are still at a disadvantage in relation to Western Europe (with an index of 71.06), North.

16 For more details on the preparation of the index, please see: Observatorio CAF del Ecosistema Digital (2020).

GRAPH 4. DIGITAL ECOSYSTEM DEVELOPMENT INDEX (2018) VS. GROWTH RATE (2004- 2018)

Growth rate of the Digital Ecosystem Development Index (2004-18)



Source: Telecom Advisory Services analysis

Not only is the development of the digital ecosystem lagging behind other more advanced regions, but the annual growth rate is also less than other regions. "In effect, Latin America and the Caribbean belongs to the group of emerging countries that have a moderate annual of growth rate in digitalization" (CAF, 2020:13). Currently, more than one third of the region's population still has no internet access.

The crisis triggered by COVID-19 demonstrated the key importance of connectivity and the mastery of the digital skills needed to carry out economic activities and to access education and health services, despite the confinement measures and restrictions imposed by most countries in response to the health situation.

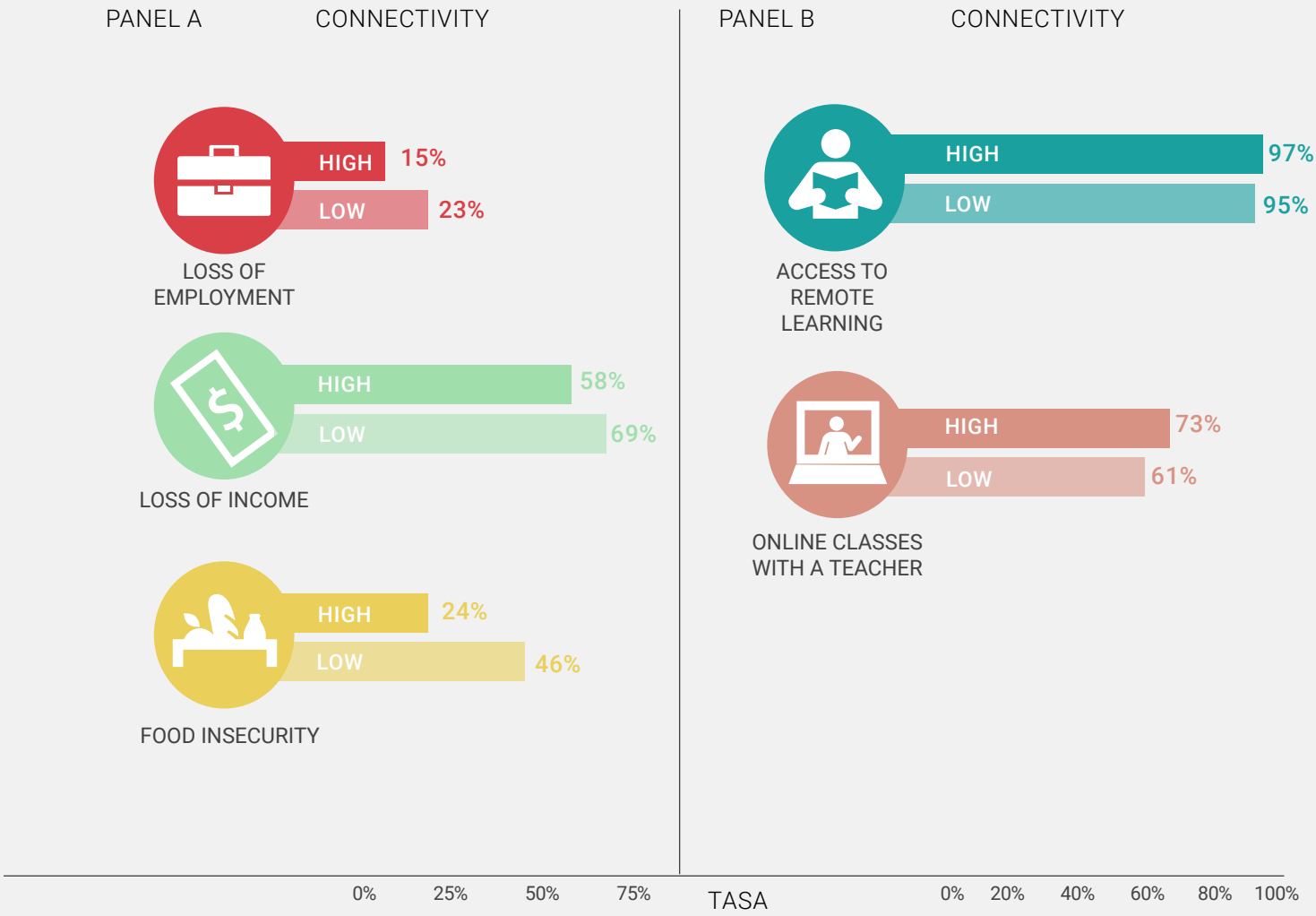
The gaps in accessibility severely restricted efforts to tackle the crisis and pre-existing inequalities were magnified, given the impossibility of accessing basic services. The access to connectivity problem that was identified with the eruption of the pandemic continues to be an obstacle that must be addressed in the current rebuilding process.

The World Bank report, " The Welfare Costs of Being Off the Grid" (2021), indicates that Latin American homes with access to information technologies (such as the internet) have adapted much more effectively than their less connected peers during the pandemic. Conversely, less connected homes experienced greater losses and restrictions than those that were more connected. These trends were replicated even in analyzing households with similar education levels and areas of residence.

The aforementioned report presents data for homes located in rural areas, with low levels of education (primary or below) and relatively high levels of dependence (meaning the number of youth and the elderly living in the home). Moreover, it also indicates the differences between homes with high and low connectivity. Households with higher levels of digital connectivity experienced lower job loss rates than their counterparts (15% versus 23%). Similarly, 69% of less connected households suffered a reduction in their overall family income, which was 11 percentage points more than connected households. Levels of food insecurity were almost two times as much in less connected households – 46% versus 24% (Figure 1, Panel A).

Also worth noting is the fact that high connectivity households had better access and engagement in remote learning activities, as they were able to log in to online classes (73% versus 61%, Figure 1 Panel B). The latter indicator on remote learning demonstrates that high connectivity enables better use and quality of experiences and interactions than more limited forms of access.

FIGURE 1. WELFARE LOSSES, BY SOCIOECONOMIC GROUP AND CONNECTIVITY LEVEL



Note: The differences between high and low connectivity are statistically significant at the 1% level for all indicators. Access to remote learning includes completing tasks assigned by a teacher, educational television and radio programs, online classes with a teacher and educational apps.

Source: World Bank, 2021

As of 2020, the region significantly increased its use of information and communication technologies (ICT) and digitalization processes have accelerated at an unprecedented rate. These transformations affected all those activities requiring the involvement of new technologies and have made it clear that continuing the process of expansion and adoption of these resources is imperative. It also bears mentioning that the extremely pronounced gaps in rural connectivity before the pandemic still persist. As such, in the last two years several initiatives of varying scope have

been introduced to address the limitations in connectivity access, as these shortcomings have created a critical situation for rural development.

Given this scenario, the pandemic served as a major accelerator, driving advancements over a relatively short period of time, which previously would have taken years. According to ECLAC (2020), the adoption of telework solutions and online education increased by 324% and more than 60%, respectively, between the first and latter half of 2020. These increases were unevenly distributed across income levels, genders, ages and regions. According to the "Latin American Economic Outlook" report (OECD, United Nations, CAF and the European Union) of 2020, "Access in Latin America and the Caribbean continues to be closely linked to household level of income. On average, there is almost a 40-point percentage difference between use of the internet by the richest (75%) versus the poorest quintile (37%)".

The aforementioned differences are within the context of greater internet access by the population in the region, primarily due to increased mobile connectivity. The mobile phone is the medium most readily adopted and used to access the internet, given its versatility of uses and greater level of penetration, in comparison to other less affordable devices, such as computers and tablets.

According to the GSMA, a global association of mobile phone operators (2021a), close to 93% of the Latin American population has access to mobile broadband coverage and mobile internet subscribers represent approximately 55% of the population. In 2021, the region recorded 450 million mobile phone subscribers and forecasts indicate that there will be an additional 485 million by 2025, representing a total of 73% of the population. Half of these new subscribers will come from Brazil and Mexico, and countries like Guatemala and Honduras, which have low adoption of mobile phone technology, are expected to experience tremendous growth. However, the urban-rural connectivity gaps discussed in the previous chapter reveal the disadvantages of the rural environment and the burden that this poses for the percentage of the population that still has no internet access. It must also be pointed out that mobile phone use is still not as extensive in rural areas as in urban areas, possibly because of issues of affordability and limitations based on the costs of these services.

2.1 The problem of access to connectivity and the mobile internet: persistent obstacles

According to the ITU report "Digital trends in the Americas Region 2021", the region (using the entire American hemisphere as reference) has experienced continued growth in most areas of ICT infrastructure, access and use over the last four years. By 2021, 77% of the 1 billion inhabitants of the region—and 90% of the youth—were using the internet (which is way below the world average of 69%). However, the urban-rural digital divide remained, given that by that same year only half of rural homes had an internet connection.

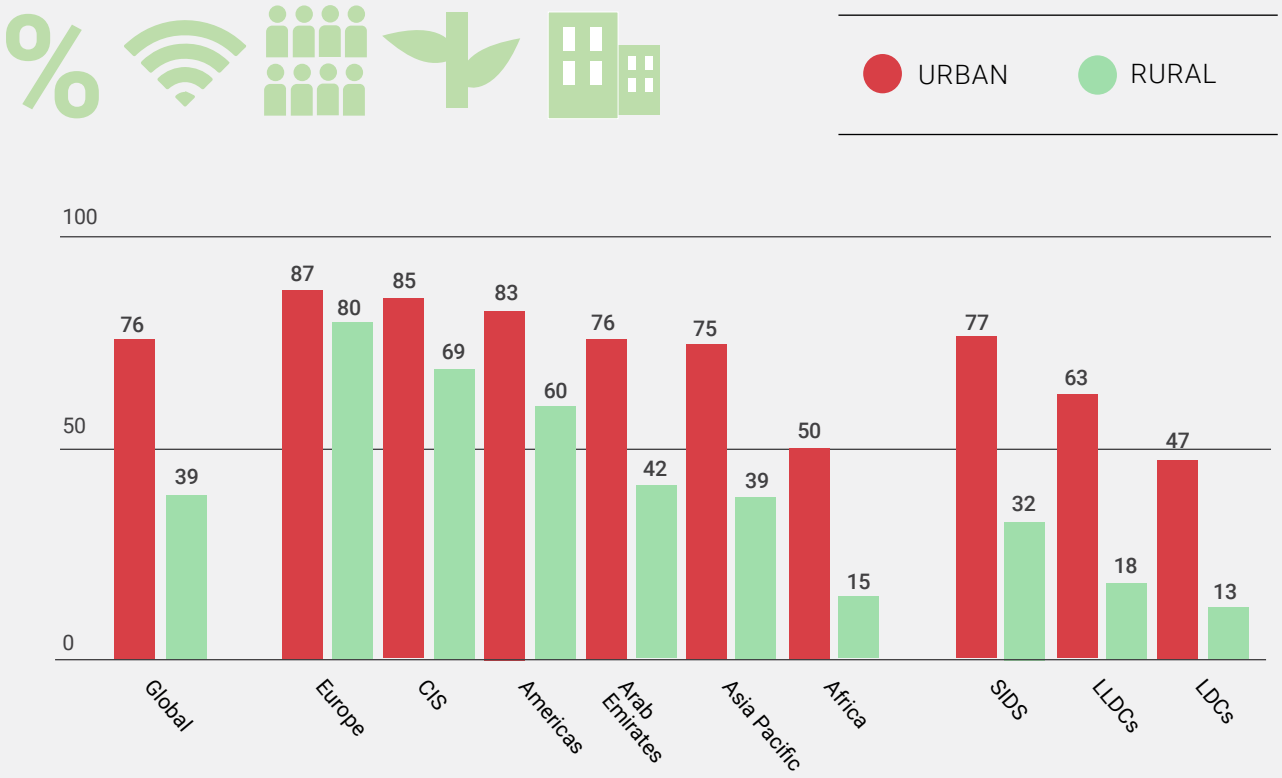
International broadband coverage for the entire region of the Americas has increased over the last three years, climbing from 52 terabits per second (Tbit/s) in 2017 to 141 Tbit/s in 2020. The availability of international broadband coverage has been one of the main priorities in policy development, particularly during the COVID-19 pandemic.

However, if we review only the data from Latin America and the Caribbean, the trends are more discouraging. Currently, according to A4AI (2020) less than 50% of the population of the region has fixed broadband connectivity and only 9.9% has a household fiber optic connection. Although 87% of the population lives within reach of a 4G connection, the real use and penetration of this technology continues to be low (37%). Moreover, only 4 in every 10 Latin American households in rural areas have connectivity options, in comparison to 71% of urban households.

The costs of internet-ready devices and data plans are prohibitive for the region's poor. The cost of a 1GB data plan is equivalent to 2.7% of the average monthly family income (or between 8% and 10% in some countries), which far exceeds the 2% affordability threshold suggested by the International Telecommunications Union. According to an A4AI report (2020), the cost for a basic and more economical smart phone accounts for between 4 and 12% of the average family income in a large part of the region; between 31 and 34% in Guatemala and Nicaragua, and as much as 84% in Haiti.

The access gap widens further in the inland areas of the region, between the urban and rural population, between men and women, for youth and older adults, and also for the indigenous population and other marginalized groups in the lowest income quintiles.

GRAPH 5. URBAN-RURAL GAP. PERCENTAGE OF THE POPULATION, ACCORDING TO INTERNET USE IN URBAN AND RURAL POPULATIONS, 2021



Source: ITU (2021).

Estimates at the global level suggest that the percentage of internet users in urban areas in 2020 was two times greater than in rural areas (see Graph 5). In all regions, there is an urban-rural divide, but the greater the overall internet use, the lower the urban-rural divide. In Europe for example, where there is almost universal internet use, urban use was less than 10% more than rural use. In stark contrast, in Africa, internet use in urban areas was almost 3.5 times more than in rural areas. Lower use in rural areas is partially due to infrastructure, but there are other factors. Rural areas tend to have lower income levels, and the educational levels and the ICT knowledge of the population is usually relatively lower. All of these factors are negatively correlated with internet use.

If we focus solely on Latin America and the Caribbean, on average, the difference between urban and rural internet access is 28 percentage points. According to IICA, IDB and Microsoft (2020), there are vast rural areas in LAC with no internet coverage, given that dispersed populations and the geography are not profitable for private op-

erations, not to mention the issues involving access to devices and connection services (where these services are available), affordability problems and the economic limitations of the people who reside in these areas.

2.2 Connectivity challenges for the post-pandemic recovery

The COVID-19 crisis has had a profound impact on Latin America and created the need for resilient and inclusive recovery. Greater digital access is a key priority and calls for policies and a regulatory program, as well as increased infrastructural investment.

The internal and external instability resulting from the pandemic caused a contraction in economic activity in the region and a deeper recession than the ones brought on by the global financial crisis of 2008-9 and the Latin American debt crisis in 1980. According to ECLAC estimates, the fall-off in economic activity was so extensive that at the end of 2021, the per capita GDP of Latin America and the Caribbean was comparable to 2010. In other words, there had been a ten-year regression in the level of income per inhabitant and a negative impact on employment, with an estimated 47 million jobs lost at the regional level.

According to the ITU (2022), connectivity became more expensive in 2021, due to the global economic recession brought on by the COVID-19 pandemic. After years of steadily declining, the portion of income spent on telecommunications and internet services increased in 2021. The average cost of a basic broadband plan in most countries increased to more than 2% of the gross national income per capita, which is the affordability threshold established by the Broadband Commission for Sustainable Development.

In this context, connectivity, the development of mobile networks and investment for their sustainability and eventual expansion will contribute significantly to the post-pandemic economic recovery process and regional development. The potential for economic rehabilitation can be seen in the impact of digitalization on the gross domestic product (GDP). A 10% increase in mobile broadband penetration creates an additional 1.2% increase in GDP in the economies of Latin America and the Caribbean (ITU, 200). The GSMA (2021b) reports that in 2020 mobile technologies and services generated 7.1% of the GDP of Latin America, representing more than USD 340,000 million of economic value added. By 2025, it is estimated that the economic contribution of the Latin America mobile ecosystem will increase more than USD 30 billion, generating benefits in terms of productivity and efficiency, because of the adoption of mobile services.

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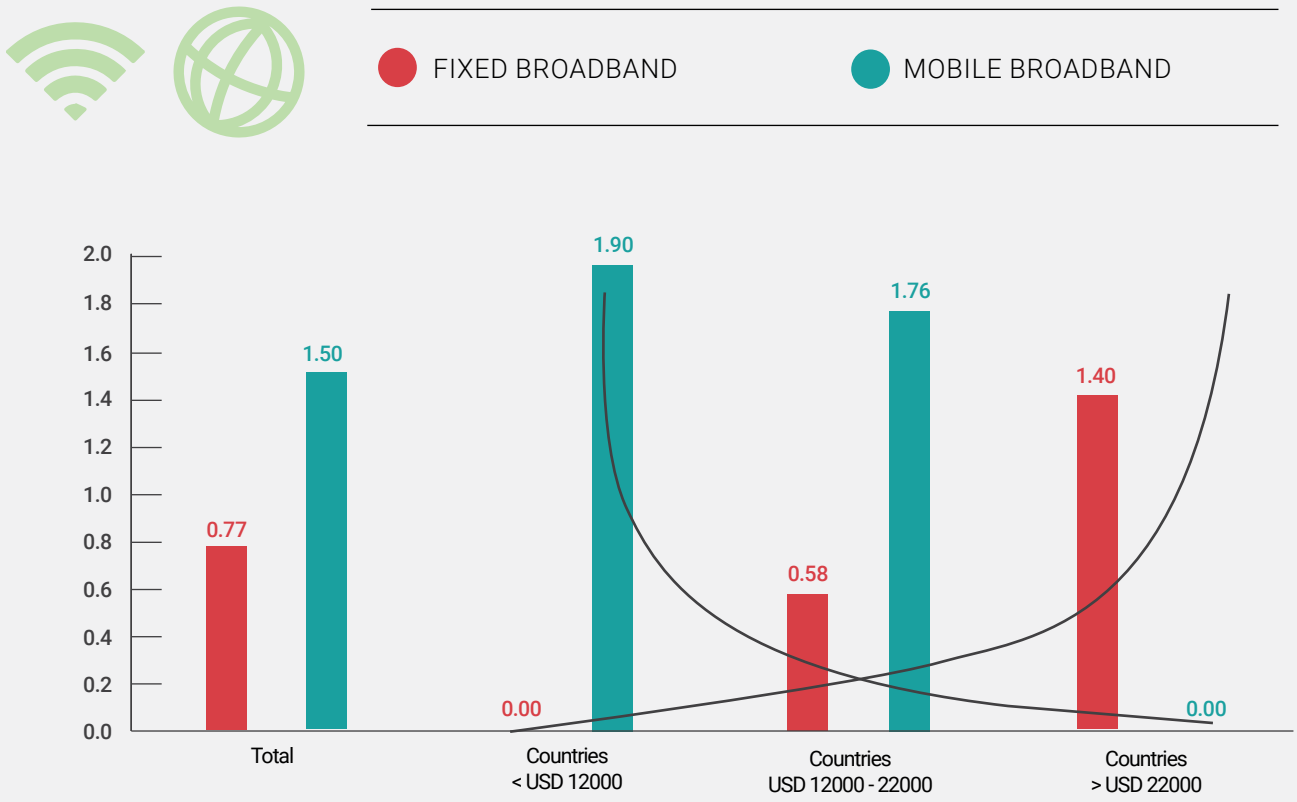
GRAPH 6: GLOBAL ECONOMIC IMPACT OF BROADBAND, 2010 - 2018



Source: ITU (2020)

LAC's progress in the areas of connectivity has decreased the gap between the region and the OECD countries, according to the Broadband Development Index (IDB, 2021), which measures the current status of broadband services in the region. However, there are still important differences in two of the four pillars that are part of the index, namely "Infrastructure" and "Public Policy". With respect to the former, according to data from CAF, per capita investment in telecommunications infrastructure in LAC (PPP or purchasing power parity) over five years is USD 462.80, almost half of the investment made by OECD countries (USD 852.18).

COVID-19 has revealed the importance of digital technologies within the development plans of Latin America and the Caribbean and has demonstrated that they can vastly improve the living conditions and welfare of the rural population. These conditions must be addressed in a context in which generational succession in the

countryside is at risk. If we take data for Latin America and the Caribbean, based on estimates provided by the World Bank, in 2021, there were 122,600,000 people living in rural areas. This number has been decreasing systematically since the end of the 80s, due to the uninterrupted increase in the population settling in urban areas. At the same time, the rate of increase in the population over 65 years has been growing steadily since the decade of the 60s. Thus, there is an exodus of the younger population and the aging of those who remain in these rural areas.

In this context, the governments of the region are increasingly recognizing the importance of formulating an agenda of digital policies aimed at boosting investment in digital infrastructure, improving digital governmental services (e-Government), and promoting the development of digital skills, while facilitating access to the marginalized segments of the population.

Thus, the region is facing a major challenge in terms of investment and the development of public policies to address the lag and to facilitate advancements in the adoption of new technologies to enable regional development and improved living conditions for the rural population.

2.3 Broadband access and its impact on rural connectivity

According to ECLAC (2021), in 2019 the rural poverty rate in Latin America was almost double the urban poverty rate. This data shows that, although the region has intermediate levels of development, rural poverty is a persistent issue. In fact, indicators for the most impoverished areas closely resemble those of the least advanced regions at the global level.

Rural poverty in Latin America has long been tied to restrictions in the access to resources and institutional factors that represent high costs for rural dwellers, as well as limited opportunities to generate income (López and Valdés, 2000). The issue has been further aggravated by the situation of women, children and youth experiencing intergenerational poverty, a process that results in the reproduction of structural disadvantages.

With respect to rural poverty, Galperin et al. (2022) examines a series of studies that suggest that the dissemination of information and communication technologies (ICTs) can contribute to mitigating the conditions that put people at the greatest disadvantage (Chong et al., 2009; Bahia et al., 2020). Multiple studies provide evidence of the potential of mobile phone use to increase agricultural productivity by providing access to information on weather, inputs such as fertilizers and the adoption of new production techniques (Cole and Fernando, 2012). Studies show that new ICTs can reduce transaction costs and information asymmetries in agricultural input and product markets (Aker, 2010; Jensen, 2010). Lastly, certain studies suggest that ICTs can drive economic diversification and generate non-agricultural employment opportunities beyond traditional activities (Nakasone and Torero, 2016), as well as

advantages in terms of rural women's labor market insertion, which are associated with mobile phone use (IICA, Oxford University, IFAD, 2020).

Network deployment in developing countries has prompted analyses of the economic impact of ICTs in rural areas. Among other topics, studies have examined the impact of the availability of high-speed broadband on the location of rural businesses (Mack, 2014). With respect to broadband deployment, areas that received a high-speed connection showed an increase in labor income and employment (Galperin et al., 2022).

Results also suggest that opportunities vary among population groups. On the one hand, the benefits associated with broadband access favor the youngest workers (mostly men), due to their familiarity with digital devices (Akerman et al., 2015; Barrantes and Cozzubo, 2019). This is a significant finding that warns of the efforts required to reduce gender inequality in rural contexts. On the other hand, internet access generates advantages for women (Galperin and Arcidiacono, 2021), by facilitating telework and fostering their participation in the workforce. Similarly, a study by IICA, Oxford University and IFAD (2020) found correlations between women's mobile phone access and greater job opportunities, as well as benefits associated with productive tasks outside of homemaking and caregiving.

In short, the studies demonstrate a positive impact on the determinants of rural poverty, including work income and employment. They also indicate that broadband availability fosters economic diversification and is a key factor in alleviating poverty among landless families and small landowners. These resources make it possible to engage in other activities that complement the cyclical nature of agricultural activities, increasing the well-being of rural households.

Within this context, investments in infrastructure play an important role in stimulating economic activity and creating new opportunities for income generation in rural areas (Escobal, 2002). These trends reinforce the need to foster network deployment as part of the strategies aimed at reducing poverty and driving economic diversification.

Connectivity conditions and obstacles in overcoming the coverage gap in Latin America and the Caribbean, as well as the benefits associated with mobile phone and broadband access, establish an agenda of needs and challenges that must be prioritized in rural areas, especially considering the major challenges for future development.

CHAPTER 3

The state of rural connectivity in Latin America and the Caribbean: initiatives as of 2020

The purpose of this chapter is to identify key trends with respect to rural connectivity from 2020 to date.

A survey of initiatives aimed at overcoming rural connectivity gaps during the 2020-2022 period allowed for identifying contributions in the following areas:

- **Public policymaking**
- **Project development based on international cooperation**
- **Development of initiatives and public-private partnerships**
- **Promotion of endogenous, community-based solutions**

3.1 Public policymaking

States themselves are key players in the process of developing connectivity, by drafting public policies that promote laws, regulations, digital agendas and development plans. Within this context, they can draft policies aimed at increasing connectivity, generate instruments to drive the sector's development, as well as produce and broadly disseminate public information to facilitate decision making.

Regulatory reforms can play a fundamental role in maximizing the economic contribution of broadband. In several countries across the region, facilitating access to unlicensed spectrum bands has fostered investment in networks in previously unserved rural areas. As noted in Chapter 1, broadband availability is a key determinant of significant connectivity in rural areas.

In recent years, the region has developed a body of specific telecommunications laws, along with a series of regulations governing development plans on the subject, a few of which address conditions in rural areas. The situation triggered by the COVID- 19 pandemic also led to amendments to or the creation of ad hoc regulations to address the issue of access to connectivity. The table "Connectivity Plans, Regulatory Frameworks, Rural Connectivity Policies and Specific COVID- 19 Measures, by country", included in Annex I, details the situation in each country.

An analysis of telecommunications programs and laws shows that a little over half of Latin American and Caribbean countries (20 out of a total of 33) have specific legislation aimed at reducing the digital divide. Less than 40% of countries in the region have implemented programs and strategies to address the differences between urban and rural areas or the problem of rural connectivity up to 2020. Recently, it was found that 14 countries (less than half of countries in the region) had introduced regulations in the wake of the COVID-19 pandemic, mostly to regulate access to content and the cost and conditions of services.

During the 2020-2022 period, several rules and regulations had as a common denominator the development of alternatives to foster connectivity through different mechanisms, most notably spectrum auctions to reach remote areas; installation of public access facilities; incentives for local stakeholders, such as cooperatives, small-scale companies and community networks in rural areas; as well as the promotion of investments aimed at installing and sharing infrastructure. Within this context, it is feasible to identify policies to encourage investors to allocate part of their payment for use of the radio spectrum to the installation of 4G antennas in areas lacking services of any kind.

With respect to regulations aimed at expanding connectivity, one noteworthy example is Brazil's Fund for the Universalization of Telecommunications Services (FUST), aimed at expanding the use and increasing the quality of telecommunications networks and services, as well as reducing regional inequalities and driving the use and development of new connectivity technologies to foster economic and social development.

The Fund for the Universalization of Telecommunications Services (FUST), established in 2020, sets an important precedent for funding the expansion of rural connectivity, insofar as resources must be allocated, in whole or in part, to rural or urban regions with a low Human Development Index (HDI). Investments are geared towards programs, activities and policies aimed at fostering technological innovation in telecommunications services in rural areas, under the coordination of the National Technical Assistance and Rural Extension Agency (ANATER).

As part of the regulations, a Management Council has been established to determine the manner in which funds should be executed. ANATEL, the regulatory agency for telecommunications in Brazil, oversees the Executive Secretariat, which is comprised of representatives of various ministries, including the Ministry of Agriculture, Livestock and Food Supply (MAPA). According to Eduardo Jacomassi, Manager of Universalization and Expansion of Access at ANATEL and a member of that advisory council, the greatest challenge moving forward will be drafting policies to strategically utilize these funds, which can greatly improve access conditions in rural areas.

In 2021, ANATEL carried out a spectrum auction that assigned the 700MHz band to mobile services, which is key to promoting 4G and creating public services that facilitate internet access. The auctioned licenses included coverage commitments and schedules designed to enable mobile operators to benefit from exclusive service offerings in certain areas, while also requiring them to deliver their services in other areas, both urban and rural. These measures explicitly encourage telecommunications operators to share infrastructure in order to lower costs—a goal that has been effectively achieved.

One of the expected results of ANATEL's work is the establishment of infrastructure sharing agreements among Brazil's four largest operators, which would provide coverage for more rural areas with populations of 30,000 or less. Brazil is unique in that, in addition to the largest operators, there are about 10,000 small-scale providers that offer mobile phone and internet services at affordable prices in low population density areas. Nilo Pasquali, Superintendent of Planning and Regulation at ANATEL, notes that these small companies have a lower cost matrix, due to their proximity to the areas in which they operate; they also service areas in which larger companies are generally not interested due to their low profitability.

Before the onset of the pandemic, Uruguay had achieved significant progress with respect to rural connectivity, installing facilities to provide services to 98% of the rural territory. The state-owned communications company ANTEL plans to further expand coverage during the 2022-2023 period, to reach the most isolated areas that still lack coverage. ANTEL offers mobile phone services to 48% of the market, while the rest is shared by two other major providers (Claro and Movistar).

Humberto Roca, Deputy General Manager of Technological Development at ANTEL, explained that, during the pandemic, the company demonstrated the network's capacity to address user needs. However, he underscored the importance of continuing to invest in order to further expand access, given that data consumption in rural areas is increasing and there is a growing demand for more far-reaching services from operators.

In rural and sparsely populated areas, the company is considering complementing fiber optics with 5G FWA and LTE, as well as assessing the use of overhead power lines and different types of materials to make fiber deployment more efficient. It is also developing a program to equip rural schools with LTE Relay technology and plans to expand coverage in very small towns. In 2021, it began to deploy 5G technology in less populated areas in a more cost-effective manner, following the

auction of low and medium spectrum bands. The company has developed pilot versions of 5G fixed wireless access (FWA) in the 28GHz band, but has yet to overcome limitations for its mass deployment.

Among other measures, States have continued to develop free or low-cost universal access points for rural and low-income populations with limited connectivity, which are funded with resources from universal service and access funds, as determined by applicable regulations.

By way of example, in 2019, the Jamaican government announced additional funding to establish new Community Access Points in St. James and Portland, two rural areas on the island. The hotspots provide internet access at little or no cost to people of all ages and offer a variety of digital services. People can bring their own devices to areas covered by the Universal Service Fund (such as libraries) and take free training courses there.

This strategy demonstrates the potential of community institutions, such as libraries, to align with the mandate of Universal Service and Access Funds to provide unserved communities with more affordable connectivity. These options are unique in that they reduce cost barriers and capitalize on equipment to drive skills development, by providing educational support at public access points.

Similar efforts have been undertaken in The Bahamas, which has expanded internet access and connectivity on the island through free public access points. In August of 2022, the government launched the Park Connect project, which will provide free Wi-Fi to citizens across the country and support online government services, while

providing greater access to education and digital skills development. The creation and upgrading of 47 public parks as part of the pilot project is aligned with efforts to create a digital society.

Furthermore, ALIV, a private communications provider, has brought new telecommunications services to rural areas in different islands. Recent investments in the network system and infrastructure have allowed for reaching remote areas with low population density.

Colombia's Ministry of Information and Communication Technologies has set up Rural Digital Zones in public access points, providing free internet access on smartphones, tablets, laptops and other devices. As part of this program, 1,550 digital zones have been installed in 514 municipalities in 31 departments across the country, providing communities with free internet access and, in turn, preventing their displacement and contributing to the competitiveness and productivity of these regions. Since 2019, 25 Business Digital Transformation Centers (CTDE) have been established in 30 departments of the country. Likewise, the Development Plan with a Territorial Focus (PDET), implemented as part of the peace agreement with the Revolutionary Armed Forces of Colombia—People's Army (FARC-EP), has allowed for providing the municipal capitals of 170 municipalities with high-speed internet connections. Lastly, through the Digital Solutions for the Countryside project, a digital agricultural extension initiative is being carried out for the benefit of 150,000 producers from 30 different production chains.

In April of 2022, the Andean Community (CAN), which is comprised of Bolivia, Colombia, Ecuador and Peru, launched its Andean Digital Agenda, a roadmap to guide the digital transformation of the four countries in an integrated manner, as well as improve connectivity between their territories. One noteworthy aspect of this roadmap is that countries will agree on a joint definition of broadband internet, in terms of speed, to harmonize the concept among all countries. They will also conduct an assessment of the current status of telecommunications services with respect to coverage and access in rural areas and areas of social interest, with special emphasis on the shared Amazon region, in order to develop joint broadband projects.

In the case of Bolivia, according to an IDB report (2022), the government has undertaken proactive efforts in matters related to universal access and spectrum management, as well as in the development of its national broadband plan. These tools have contributed to improving access conditions. However, the country is at a disadvantage, given the lack of investment in infrastructure in the most remote areas, the deployment of fiber optics only in the most densely populated areas, bandwidth limitations and the higher prices it must pay, given its inability to directly access submarine cable networks, due to its geographic location.

In 2011, Bolivia established the National Telecommunications Program for Social Inclusion (PRONTIS), overseen by a unit of the Ministry of Public Works, Services and Housing. The program's funds are geared towards expanding telecommunications networks, developing content and applications, as well as achieving universal access in rural areas and areas of social interest.

Within the context of the pandemic, the government has proposed expanding connectivity in rural areas through the National Telecommunications Company (ENTEL). Efforts include the installation of base stations to provide free Internet access and foster online education. Furthermore, the state-owned company and local governments in the department of Chuquisaca agreed to expand fiber networks and deploy cellular antennas. These efforts form part of a national program aimed at improving connectivity in rural communities, particularly in towns with up to 2,000 inhabitants. To date, the government has installed antennas in 2,391 locations throughout the country. ENTEL previously indicated that it had deployed more than 800 base stations and that, by the end of phase three of PRONTIS, it will have benefited 2,494 towns throughout the country.

In 2021, Bolivia was in the process of designing the 2025 Digital Agenda, a public policy on information and communication technologies that will define and align short and medium-term goals in different areas and sectors of society. It will seek to include the contributions and perspectives of citizens.

Paraguay's National Communications Plan 2021-2025 aims to provide affordable, universal internet access in low-income urban, suburban and rural areas, facilitating shared internet access to encourage take-up. The plan proposes to provide unrestricted access to the internet, for a minimum charge, in community centers, schools, bookshops and other relevant institutions. The project has not yet been developed in the country, except at public access sites (known as "Infocentros" and "Infoplazas").

Ecuador has recently designed its Ecuador Digital Transformation Agenda 2022-2025, which has seven main concepts: digital infrastructure, digital culture and inclusion, digital economy, emerging technologies for sustainable development, digital government, interoperability and data processing, and finally, digital security and trust.

The Agenda proposes a Universal Service Plan for ICTs as a right of all Ecuadorians. The Plan seeks to make the service universal, fostering the deployment of telecommunications infrastructure, increasing ICT service penetration in the population and ensuring its use regardless of economic and social conditions or geographic location.

In partnership with the Ministry of Agriculture and Livestock, the Agenda is designed to "strengthen the Ecuadorian agriculture sector, by fostering an ecosystem that promotes innovation and technology solutions; by optimizing the sector's productive processes, through the appropriation and use of new technologies; as well as increasing productivity, the quality of products and sustainability, in order to improve quality of life for farmers and consumers" (p. 35).

Since 2021, Ecuador, through its Ministry of Telecommunications and the Information Society, has been undertaking the Provision of Telecommunications Services in Priority areas—Digital Family project, which has considerable reach in rural areas. It includes a number of components for internet access, taking into account difficulties identified in the years prior to the COVID-19 pandemic.

The project seeks to install external Wi-Fi access points, via existing last mile connections and/or satellite links, harnessing public communications infrastructure (Infocentros) in priority areas, educational institutions and other public institutions. There is also a proposal to provide tablets to encourage ICT access and develop citizens' digital skills.

Another country that has recently made progress in drawing up its digital agenda is Chile, which in 2022 established the guidelines of the Digital Transformation Strategy – Chile Digital 2035. The Chilean Senate's Transportation and Telecommunications Committee is spearheading this initiative, with the support of ECLAC, the Association of Telecommunications Companies (Chile Telcos) and the Chilean Chamber of Digital Infrastructure. It outlines a State agenda and policies to cover the next three presidential terms. Numerous sectors were involved in its development, defining goals in relation to infrastructure, digital skill development, digital rights, digitalization of the economy, digitalization of the State, cybersecurity and governance. During the period covered by the document, the aim is to focus on educating the generation now starting elementary school until they finish mandatory education, as part of a decision to institute a long-term public policy.

Peru has developed a number of initiatives targeting rural areas, such as the Digital Access Centers (CADs) project, implemented in 104 towns, in partnership with local and regional governments, which is seeking to provide digital skills training to increase productivity and employability. The Digital Public Spaces project facilitates free Wi-Fi access in over 300 rural communities in the regions of Ayacucho, Huancavelica, Apurímac, Lambayeque and Cusco, benefitting over 900,000 inhabitants.

In 2021, 38,000 people in Peru gained access to internet and mobile phone services for the first time. The country is also making headway in wireless telecommunications services, promoting the use of TV White Spaces (TVWS, frequencies between 470 and

698 MHz on the UHF range) to provide broadband and Internet of Things (IoT) connectivity in rural areas.

The Connect the Jungle initiative, developed by local and regional governments, the Ministry of Education and the Ministry of Health, involves the installation of satellite internet in rural communities (in the regions of Loreto, Amazonas, Madre de Dios and Ucayali) to benefit over 180,000 inhabitants. Lastly, the Regional Projects are State interventions to increase telecommunications in rural communities, through the deployment of fiber optic and radio relay systems. By October 2022, 21 regional projects were under development, benefitting 3,377,600 inhabitants, with implementation at 36.21%.

TABLE 1. PRODUCTION OF PUBLIC POLICES AFTER 2020 (SUMMARY)

INITIATIVE TYPE	CASES
RURAL CONNECTIVITY REGULATIONS	**BRAZIL:** Fund for the Universalization of Telecommunications Services (FUST)
ACCESS IN PUBLIC SPACES	**BOLIVIA:** Base stations (free internet) **COLOMBIA:** Rural Digital Zones **JAMAICA:** Community Access Points in public libraries **PERU:** Digital Access Centers
DIGITAL AGENDAS (ADDRESSING RURAL CONNECTIVITY)	**BOLIVIA:** Digital Agenda 2025 **CHILE:** Digital Transformation Agenda—Chile Digital 2035 **ECUADOR:** Ecuador Digital Transformation Agenda 2022-2025 **PARAGUAY:** National Telecommunications Plan 2021-2025

3.2 Project development through international cooperation

With respect to the work model involving partnership with and investment from international cooperation resources, since 2020, there have been multiple initiatives promoting rural connectivity.

In 2017, Telefónica and CAF-Development Bank of Latin America joined forces and have been working in the areas of connectivity, digital transformation, training and education.

The "Internet for All" (IpT) initiative in Peru includes the participation of CAF, Telefónica, IDB Invest and Facebook, and seeks to reach over 6 million Peruvians in rural towns and villages in coastal, mountain and rainforest areas, with 4G mobile broadband coverage. IpT was launched in May 2019 and in two years has reached over 2 million Peruvians and 12,000 communities in 23 of the 24 departments of Peru, providing the benefits and opportunities of connectivity as a means of accessing telemedicine, digital education and economic activities.

In 2020, CAF, with the support of Telefónica, launched the Regional Strategy for the Digital Transformation of Productive Sectors, providing practical recommendations for the digitalization of the agroindustrial chain of Valle de Ica in Peru. This strategy promotes the use of digital infrastructure and technologies in production processes, while contributing to overcoming productivity problems in the region. The creation of digital transformation roadmaps for production chains was also approved for Ecuador and the digitalization model is being developed throughout 2022.

Another area of collaboration focuses on addressing inequalities, by investing in digital skills training and qualifications. Training sessions are being offered on the digital agenda, data use and artificial intelligence, with 87,000 people participating to date. The initiative has developed a comprehensive knowledge and training agenda for authorities and regulators in the region.

Lastly, an IBEI-ECLAC-CAF Summer School was held with the support of the Cátedra Telefónica. This initiative addressed the challenges of digital transformation and innovation in Latin America, aiming to present and explore a number of issues in relation to digitalization and its impact on bridging the digital divide; employment; the digitalization of production, through Big Data; artificial intelligence and blockchain technology, as well as the regulation of innovation in Europe and Latin America, from a comparative perspective. Approximately 150 digital policy authorities from 16 countries of Latin America participated in the initiative.

The CAF board approved three loans for Argentina, for a total of USD 544 million, which will have an impact on 12 million Argentinians, through initiatives that promote digital inclusion and modernization, educational transformation and infrastructure development.

The first loan, for USD 243.8 million, will help complete broadband satellite internet coverage in inaccessible areas in Argentina and partial coverage in neighboring countries, through the development, manufacture and launch into orbit of the geostationary satellite ARSAT-SG1, while ensuring the investment necessary for its proper operation.

This operation aims to benefit 200,000 rural homes in Argentina and 80,000 rural homes in Bolivia, Chile and Paraguay, providing reliable, high-quality internet access for approximately 996,000 people. ARSAT-SGI will be the first Argentinian high-throughput Ka-band satellite (HTS), with a data traffic capacity of over 50 Gbps. Some 80 tech SMEs in different provinces are expected to participate in the implementation of the initiative. With its launch slated for 2024, it will offer high-quality satellite broadband connection in remote places, with total coverage in Argentina and partial coverage in neighboring countries, at affordable prices.

CAF has approved a loan of USD 100 million for the digital inclusion and education transformation program, Santa Fe More Connected, which is seeking to expand and modernize the connectivity infrastructure in the province of Santa Fe, Argentina, to provide a high-quality internet service to promote digital inclusion, transform education, bridge technological gaps and provide public services more efficiently.

The Program will extend the provincial fiber optics network by 3,400 kilometers, providing broadband coverage to 53% of all municipalities and benefiting approximately 95% of inhabitants in the province. It will also modernize the provincial education infrastructure by building and equipping schools, installing facilities for digital fabrication laboratories (Fab Labs) and enhancing skills and qualifications for digital appropriation and transformation, among other benefits.

The main direct beneficiaries are divided into three groups: the more than 3 million Santa Fe inhabitants with a better internet connection; the more than 48,661 families residing in 164 low-income neighborhoods that today lack internet connectivity, who will receive internet free of charge; and the over 25,000 students and 35,000 teachers who will receive training.

In 2022, the International Finance Corporation (IFC), part of the World Bank Group, announced that it was granting a new loan of USD 184.5 million to Telecom Argentina (Telecom), a leading telecommunications company in Argentina. This seven-year loan seeks to foster digital connectivity, especially in remote areas.

The loan will make it possible to expand and improve 4G/4.5G mobile and fiber optic networks nationwide, including remote regions in the major urban centers of the Salta, Tucumán, San Juan, Mendoza and Neuquén provinces.

In terms of international cooperation in the application of new digital technologies to agriculture, the IICA Brazil delegation is supporting government projects to assist in the digitalization process in rural areas, by providing the relevant international technical cooperation. At present, alternatives are being assessed to develop a business plan to broaden internet connectivity in the Alto Solimões microregion in

Amazonas, while also considering the border towns of Leticia in Colombia and Santa Rosa in Peru. The Ministry of Regional Development is developing the proposal. This improved digital connection infrastructure will be critical in fostering the implementation of investment projects and promoting the sustainability and expansion of public and private companies established in the area, through the expansion of e-commerce channels and digital interactive technology networks.

IICA, through a partnership with Precision Agriculture for Development (PAD), a global organization co-founded by 2019 Nobel Prize Laureate in Economics, Michael Kramer, helps family farmers in Brazil to incorporate digital agriculture technical assistance and rural extension services. This has been essential in enabling one of the most disadvantaged areas of the agriculture sector to improve performance and increase income, contributing to its productive and social inclusion, as well as to economic development and environmental protection.

Another initiative is the development of a pilot project to disseminate technical agricultural information on production chains, produced by the Hubtech Family Farming Project. Family farmers, most of them beneficiaries of the Terra Brasil - National Land Credit Program in the northeast region, will be able to access information via their mobile phones, to improve their knowledge of production and sales processes, within the scope of the PCT BRA/IICA/14/002 initiative – Strengthening Land Governance Instruments to Reduce Rural Poverty and to Ensure Social and Productive Inclusion and Economic and Sustainable Environmental Development.

The Virtual Hubs Project aims to improve the access of family farmers in the northeast region of Brazil to information on technological innovations, through the use of

digital information and communications technologies. It will also finance the creation of virtual technology innovation centers (or virtual hubs) for the management and dissemination of technological information, which will serve as pilot experiences from which new centers will be created, funded either by the Northeast Agro Program or by MAPA.

Finally, there is the Digital Territories project, coordinated by the Ministry of Agrarian Development (MDA) and the Ministry of Communications, with IICA as an institutional partner. This was a unique digital inclusion initiative, targeting the rural population, and strategically aimed at improving the quality of life of families in rural areas. The results of the technical cooperation between IICA and the Brazilian government were presented in the publication "Digital Territories: an Experience of Digital Inclusion in Rural Areas of Brazil" (in Portuguese only), which recounted successful experiences and discussed the improvement of strategies and the rethinking of public policies.

In Colombia, ANDITEL is executing the Rural Women, Agents of Digital Transformation program, with funding from USAID and Microsoft. It aims to address the rural connectivity gap, through the construction and outfitting of three digital centers, where children over five, young people and the elderly can go to learn, access government social assistance programs, take technical and professional courses, and explore new markets with cocoa-based business ventures. The Program seeks to bridge the digital divide, by establishing high-speed internet connections in remote areas, while also implementing empowerment projects in rural communities, especially for women.

3.3 Development of initiatives and public-private partnerships

Since 2020 there have been a number of public-private sector collaborative initiatives in the region that have helped promote connectivity in rural areas. Below are some experiences whose scope and impact show the trends in different countries in the region.

ARGENTINA

According to data published in the report "Connectivity and Communication in Rural Areas of Argentina," presented by INTA in late 2021, "Over 40 percent of the towns and villages surveyed had no internet connection. This percentage doubles if areas with poor or average connectivity are included. Eight in ten places with limited access are linked to family farming". The study collected information from 311 rural towns and villages in Argentina, in 21 of the 24 provinces.

Argentina's Digital Agenda 2030, through initiatives, such as the Federal Internet Plan, the Connecting Equality and the Digital Country Plan, as well as lines of action aimed at improving infrastructure, is seeking to create a "data-based Argentina" that ensures the digital inclusion of rural areas and their production systems. Gustavo López, Vice President of the telecommunications regulatory agency ENACOM, pointed out that in 2019 the agency had invited stakeholders to access the 450 MHz band. The process targeted small and medium-sized entities (SMEs) and telecommunications cooperatives, requiring the use of the spectrum in towns and villages with fewer than 30,000 inhabitants and located more than 180 kilometers from the city of Buenos Aires. The thrust of this process was to take connectivity to previously unserved areas, licensing a provider in each area, to enable them to develop sustainable businesses. As a result of this policy, various initiatives are now taking place in collaboration with the private sector throughout the vast territorial expanse of this country. Some, although not all of the experiences, given the high number, are detailed as follows:

In 2022, Microsoft and the Argentine government agreed to sign cooperation agreements to enable a group of provinces, known as the "Norte Grande" (namely, El Chaco, Misiones and Formosa), to make technological investments to facilitate increased connectivity for rural populations in these provinces and to promote precision agriculture. The Fundación Avina, a Microsoft Airband partner, also set up new networks in Formosa and Tucumán, to provide broadband access to the Gran Chaco region, where 1600 craftswomen of the Pilagá Indigenous Community benefited from the program and had the opportunity to learn digital skills through the MS Philanthropies Skills for Jobs initiative.

In 2022, the National Institute of Agricultural Technology (INTA), along with the Argentine State Telecommunications company, ARSAT; the Telecommunications Regulatory Agency, ENACOM; the Marandú company (Misiones) and the General Office of Sectorial and Special Programs and Projects of the Ministry of Agriculture, Livestock and Fisheries, implemented the Provincial Program for Rural Connectivity. This initiative seeks to provide internet in rural areas in the province of Misiones.

It is one of the lines of action included in the Agro 21 program, Climate Smart and Inclusive Agrifood Systems, promoted by the Ministry of Agriculture, Livestock and Fisheries. This national program for the agriculture sector is financed by the World Bank, the national government and the private sector.

The company Alvis participated in the spectrum process and assumed responsibility for providing services to 36 municipalities. In late 2021, the first services were provided in Chacabuco and Venado Tuerto, located 212 and 373 kilometers from the city of Buenos Aires, respectively, as part of a larger plan to expand coverage to other towns and villages. The service consists of the installation of a base station, providing coverage of 30 kilometers for fixed and mobile connectivity and 60 kilometers for the Internet of Things

Alvis developed a number of devices to broaden mobile connectivity. One of them is a portable device that connects mobile phones via the 450 MHz network, making it possible to be online all the time, even for video streaming. A second device offers the same feature, but is a fixed connection, allowing a given location to have connectivity, even if the mobile network signal is weak. A third device provides fixed connectivity in areas with more broadband requirements.

Alvis CEO Marcelo Dumanjó said, "This is the first native narrow band IoT network that allows me to connect thousands of devices to the base station", and explained that Alvis has partnerships with companies that develop agricultural solutions for rural areas, such as security cameras, and sensors for silo bags, moisture, cattle ear tags, humidity, electricity, and gas, among others, which can be added to the network. Another advantage is that users can be connected all the time, even when they are on the road, providing permanent connectivity. Thanks to this technology, each production area becomes an "intelligent field", as the activities that are uploaded to the network can be monitored remotely. The service is a last mile connectivity solution. A landline and mobile internet connection, via a state-of-the-art LTE network, provides coverage in homes, rural areas, companies and also government agencies and municipalities.

As result of the spectrum tendering process, Orbith, an Argentine satellite internet company, has connected rural schools in the province of Buenos Aires that previously did not have internet access. The project, which began implementation in 2022, has a reach of 50,000 students from all education levels, as well as the teaching and administrative staff of their schools. Under the slogan "Connecting the Disconnected," Orbith is positioning itself as an HTS Ka-band satellite technology provider, with over 10,000 satellite terminals installed. The rural schools connectivity project falls under the Strategic Public Administration Modernization Plan, with oversight by the Under-Secretariat of Digital Government of the Province of Buenos Aires.

Orbith has launched a service for medium- and large-scale agricultural and agroindustrial companies in rural areas. With this technology, the service enables IP telephony communication, video calling, cloud storage, remote camera monitoring and online collaboration. This is a high-speed satellite technology service with coverage in various provinces, with plans to expand to Colombia and Brazil.

Sygenta has developed the Cropwise digital agriculture platform, making it possible to manage variables throughout the agricultural cycle, from a computer or mobile phone. This tool connects knowledge and data, facilitating decision making on sustainability and productivity, with absolute precision.

Once the farm boundaries and monitoring parameters have been uploaded, Cropwise enables digital, remote monitoring of the land, including crop conditions. The platform provides performance indicators, weekly reports on field and crop conditions, crop summaries, recommendations on variable applications, data based on real-time and reliable observations, and seeding and crop-spraying instructions, among other variables, to facilitate a more accurate planning process.

Marcos Bradley, Marketing Director for Syngenta Latin America South, points out the differences between active users, those who are just beginning to explore these tools and those producers that still use more traditional planning. A long adoption process still lies ahead for these uses to become more widespread.

BARBADOS

Barbados is one of the countries that has made the most progress in rural connectivity, as compared to the 2017 to 2021 period. It has increased the number of rural inhabitants with significant connectivity by 50 percent and is now part of the high significant rural connectivity cluster.

Its most recent innovations include the incorporation of its first 4G Open RAN network, which, among other functionalities, addresses security and emergencies. Parallel Wireless and Neptune Communications announced the deployment of the first 4G LTE Open RAN network in the Caribbean, providing voice and data services to dif-

ferent government agencies of Barbados. These services will be channeled through the 700 MHz band recently acquired by the company.

Furthermore, Open RAN has considerable reach in rural areas. Parallel Wireless' agreement with Neptune in Barbados is the first of its kind in the Caribbean, with a focus on 4G. The operator says that this deployment will facilitate the creation of a platform of resilient, wireless network services and next generation digital solutions.

The decision to use Open RAN in Barbados provides another wireless service alternative to respond during emergency situations, by providing communications amidst climate disasters, with a high response capacity, at a time when there is a need for resilient networks, as demonstrated by the health crises and extreme weather conditions in the Caribbean.

COLOMBIA

In 2020, the Colombian Ministry of Information and Communication Technologies (MinTIC) published its National Rural Connectivity Plan, whose main strategies are to implement optical fiber infrastructure and high-speed connectivity, and to offer community internet solutions to bridge the digital divide in the country.

To expand the connectivity infrastructure, the Ministry's work is based on three plans: the National Fiber Optic Project (PNFO), the National High-Speed Connectivity Project (PNCAV) and the coordination of development plans with a focus on rural areas, covering each priority municipality. Implementation of the two national projects, which were proposed several years ago, will be completed in 2022. The fiber optic plan will operate until 2031 and the other until 2026. The disbursement for the PNFO has already been executed, when Azteca Comunicaciones was selected as the company to administer and operate this network.

Another pillar of the Colombian rural plan involves taking community internet access solutions to 639 towns and villages in the country (10,000 communities), to be installed in education centers. To connect these remote areas, the MinTIC will have an element of satellite support.

It is estimated that this deployment will require an investment of more than USD 1.3 million, including the resources to be spent on satellite technology, which will come out of the ICT Fund. The community internet program will be implemented between 2022 and 2023 and will provide services until 2031, according to the schedule.

The Ministry's plan is to equip the municipalities with high-speed digital networks. The optical fiber project already reaches 96% of these territories, having installed 19,000 kilometers of optical fiber. However, there is still a need to ensure internet access in rural areas, where the service is expected to be provided free of charge and over wireless networks, mainly to rural schools, indigenous communities, natural parks, clinics and neighboring communities in 32 departments. The project seeks

to provide not only a free internet connection, but also access to apps to manage agricultural and fishing processes, virtual courses, transactions, etc.

As part of this project, the company OhmyFi, along with Claro and the Colombian Government (MinTIC), will provide free, high-quality quality internet services for eleven years to 14,000 rural schools in the aforementioned education centers. The initiative will provide this free internet connection, via wireless technology, to schools, staff and students and all the residents of the rural areas where the digital centers are located.

As part of the same initiative, Claro is proposing to provide rural connectivity via 4G mobile internet coverage in 2021, as part of its first year commitment to deploy the 700 MHz spectrum in 280 towns and villages that do not have connectivity (Amazonas, Chocó, Guaviare, La Guajira, Putumayo and Vaupés, among others). The company will also provide free internet to 7,468 digital centers in 17 departments, as part of the MinTIC 10K Digital Centers Plan, one of the rural connectivity projects in the country providing free connectivity for schools.

Carlos Tellez, Director of Regulation and Interconnection of the mobile telephone company Tigo (Colombia), indicated that, based on the tender for the 700 MHz spectrum auction, the company committed to connect 1,236 rural towns and villages, indicating that 600 towns and villages have already been connected and 2,500 antennas installed. Furthermore, the company has developed plans to provide training in digital literacy and entreneurship for rural women, in collaboration with the Colombian Farmers' Society. Tellez said that future plans for implementing rural connectivity will depend on the costs of the spectrum to be tendered in 2023, and that, not only is there a need to ensure connectivity in the most remote rural areas, but also to reach semi-urban/rural towns and villages in the hillside areas of Bogotá and Medellín, which have no connection whatsoever.

Microsoft, along with Anditel and Telecaribe, has facilitated broadband access in the region of Montes de María for 650 children from eight rural schools in Sucre. This initiative provided the region with internet connectivity for the first time, which has created a major impact on the area, as summarized in the following short video. Microsoft Colombia's General Manager, Jaime Galvez, says that the Airband Initiative in Colombia will continue to contribute to and complement the Colombian government's access to broadband programs, with an additional four million people slated to benefit by the middle of this decade.

Lastly, American Tower's Villas Digitales program is a global initiative that is being developed in Colombia. The program is creating facilities in remote and rural areas, where children, teenagers and adults can access broadband connectivity and effective tools to develop their technological skills. American Tower has recently teamed up with two technological partners in Colombia to provide internet access in remote areas of the country.

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ECUADOR

Microsoft Airband has promoted an initiative, in partnership with the National Telecommunications Company, to provide internet to schools in the municipality of Sigchos, in the province of Cotopaxi. This pilot program was carried out with TVWS technology and led to the authorization of this type of technology in the country. The pilot involved an initial cohort of 150 students, providing internet access for the first time at speeds higher that 10 Mbps. In this particular pilot program, the departments of Education, Government Affairs and Agriculture formed a partnership to take digital equity to schools, promoting collaborative work between students from Cotopaxi, Ecuador and a school in Arequipa, Peru, over 2000 kilometers away.

Bayer is implementing the We Can project, funded by the private sector, with public participation, and led by the Association of Innovation and Entrepreneurship (AEI) – a network that brings together public and private stakeholders and academia to promote entrepreneurship and innovation in the country.

The program creates new business opportunities in rural areas, encouraging entrepreneurship and providing training for agripreneurs. This initiative connects agripreneurs directly with buyers, without intermediaries. Bayer Digital's Customer Solutions Manager, Ana Paulina Posso, explained that the project seeks to sensitize agripreneurs, so that their actions will have an impact on Sustainable Development Goals 3, 4 and 5. The program has conducted training activities and issued 4,600 certificates to date, targeting 10,000 agripreneurs in the country.

Also in Ecuador, Bayer is implementing the use of the BayG.A.P. Verify platform, a digital training tool that teaches farmers how to implement good agricultural practices and obtain relevant information about soils, crops, irrigation, etc. The platform seeks to connect the end consumer with small farmers and ensure the traceability of products, enabling farmers to obtain a fair price and consumers to access a quality product, by shortening the value chain. To date, a pilot project is being undertaken in Ecuador with 25 farmers, providing training, especially for women, to work with the data used on the platform. This work will make it possible to improve the platform and to enhance the development of digital agriculture.

EL SALVADOR

La empresa de telefonía Tigo anunció en 2021, llevar conectividad a más de 350 mil The telephony company Tigo announced in 2021 that it would bring connectivity to over 350,000 inhabitants in rural areas, in 67 municipalities of El Salvador. The intention is to provide more high-speed coverage and connectivity in 95% of municipalities. The company set a goal for 2021 to increase internet speed on the mobile network in 187 municipalities in the country, enabling 3 million Salvadorians to browse the internet at up to twice the current speed.

According to Tigo, with the installation of its 4.5G LTE technology in 2020, the number of people using its LTE network increased 40 percent in 10 months. Residents in

202 municipalities now have more stable and faster internet. The demand for data doubled on the mobile network between the pre-pandemic period and post-pandemic period and increased by 70% in the case of domestic internet use. Since 2021, Tigo has sought to boost its capacity to increase speed and to bring connectivity to a wider population, as part of a process to redefine priorities, as a result of the pandemic.

HONDURAS

Honduras developed a number of public policies in 2020 to address the problem of internet access in rural areas. A key initiative was the creation of the Connectivity Subsidy for Vulnerable Homes program, as part of the National Broadband Plan, with a view to providing timely and efficient access to services at affordable and competitive prices for homes lacking the necessary resources to access this service, thereby promoting digital teaching and education. Furthermore, programs were promoted to transform digital education and e-government. The 2018-2022 Strategic Government Plan seeks to increase broadband internet and mobile phone coverage. Although the country has seen a considerable increase in mobile phones in the last two years, there is still a need to develop spectrum auction policies that will facilitate connectivity in more remote areas.

In relation to public-private cooperation, the Tigo Communities program contributes to bridging the digital, gender and education gap. This program has connected over 450 institutions at the national level, benefiting public education centers and over 13,900 children and young people at Youth Outreach Centers in the USAID-FUNADEH GENESIS project.

MEXICO

In late 2021, the Mexican government launched the 2021-2022 Social Coverage Program (PCS) to provide internet to 7,537 unserved towns and villages, home to 4.8 million people. The program is intended to "bridge the digital divide," "achieve universal coverage" and "define priority attention areas." The goal is to progressively expand national coverage through the Internet for All framework program.

Of the 126 million inhabitants of Mexico, 84.1 million are internet users, of which 70.8 million live in urban areas, according to the National Survey on Technology Availability and Use 2020 (Endutih 2020). Thus, only 60.6% of Mexican households have internet access. Over 77,000 towns and villages with no coverage, home to 8.3 million people, were identified. For the time being, the plan will focus on a little over half of this population.

Mexico has formulated the 2020-2024 Business Plan of the Productive State Enterprise (EPS) – CFE Telecommunications and Internet for All (CFE TEIT). As the plan states: "The main goal of CFE TEIT is to provide not-for-profit telecommunications services to guarantee the right of access to information and communication technologies, by installing wireless internet throughout the country, on highways, in public squares, health centers, hospitals, schools and community spaces, to contribute to fighting marginalization, integrating economically depressed areas into productive activities and bridging the digital divide, by providing all citizens with the opportunity to access information and communications technologies, particularly those in vulnerable situations" (p.4).

In addition to designating digital exclusion areas, the strategy's priorities include capitalizing on the deployment of the shared network to install free internet access points at public sites, identified as Priority Attention Points, such as community integration centers, rural medical units, health centers, the Banco del Bienestar development bank, education centers and community centers, among others. The plan will provide internet coverage for those without internet access, through the deployment of the CFE-TEIT and Internet for All project at public sites.

The plan is aiming to connect the highest number of isolated towns and villages and public spaces in Mexico that have no internet connection, providing connectivity to 200,000 geographical points nationwide during the project implementation period.

The Federal Government of Mexico has started to develop an initiative to address the need for internet connections in remote rural communities. In this context, the

Spanish company GlobalSat has contributed its experience in the integration of satellite solutions with wireless technologies for rural communities. Through this initiative, broadband connectivity services are provided, using satellite technology. Since 2022, the initiative has made it possible to deploy connectivity points in 500 remote towns and villages in Mexico, providing free Wi-Fi access to inhabitants.

PERU

Peru has been promoting a number of projects to develop connectivity in rural areas even before the pandemic. These are currently underway. Although some have been affected by the health crisis, they continue to be implemented and have succeeded in reaching different areas and institutions in the country.

One of the most ambitious projects in terms of its scope is the Internet for All (IpT) program, a public-private partnership created in 2019. The initiative was developed by Telefónica, Facebook, IDB Invest and CAF, to bridge the digital divide in Latin America, via a sustainable model that has allowed the country to overcome the obstacles involved in taking connectivity to rural and geographically complex areas. In three years of operations, the benefits of the digital world have been provided to more than 2.9 million people in over 15,000 rural towns and villages throughout Peru and it is hoped that 3.2 million will benefit by the end of 2022.

As a tool for bridging the digital divide, the IpT program has adopted an income-sharing model to reduce network implementation costs, deploying an Open RAN network architecture, offering wholesale access to the 3G and 4G broadband infrastructure, and working in collaboration with local communities to help reduce deployment costs.

Peru has also implemented the National Telecommunications Program (PRONATEL), which aims to provide universal access to telecommunications services, develop the broadband network; promote services, content, applications and digital skills; and bridge the communications infrastructure gap at the national level, in coordination with public agencies. At present, PRONATEL includes 21 regional projects that are seeking to expand internet coverage in populated rural centers and to satisfy the demand of public institutions (education institutions, health centers and police stations). PRONATEL is developing partnership agreements with companies, local governments and other entities (universities) to reach different towns, villages and geographic locations and to provide connectivity in previously unserved areas.

Some of the proposals that are being developed include:

- The We Connect You, Peru project, led by Andesat, is a social initiative that aims to expand mobile networks to previously unserved rural communities. Its project partners are Intersat, ZTE Corporation and ST Engineering iDirect, and they have secured a Rural Mobile Infrastructure Operator (OIMR) license.

The project is slated to expand LTE mobile coverage to the Amazon rainforest, the Andes Mountains and desert areas, which will benefit from high-quality communications services.

- The rural internet project of the YOFC Network Consortium (2018-2023) is led by PRONATEL and the YOFC Network Consortium, which consists of the Chinese company Yangtze Optical Fibre and Cable (YOFC) and the Peruvian entity, Yachay Telecommunications. It will cover 7,500 kilometers, reaching 1,700 towns and villages in the departments of Ancash, Arequipa, La Libertad and San Martín.
- The Bandtel Consortium rural internet project (2019-2023) is also led by PRONATEL, which has signed a funding contract with the Bandtel Consortium (made up of the Peruvian firms Bandtel, DHMONT Contratistas Generales and DHMONT & CG & M, belonging to the real estate development company DHMONT and the operator Telkom) for the execution of the project Creation of Broadband for Integral Connectivity and Social Development of the Huánuco and Pasco Regions", benefiting over 300,000 people in 612 rural towns and villages. The goal is to install 2,257 kilometers of optical fiber via broadband transport networks. This will benefit schools and health centers and provide free Wi-Fi to public and open spaces.
- The Cajamarca Regional Government and the Universidad Nacional de Ingeniería (UNI) signed an inter-institutional agreement (May 2022) to implement a pilot project that will provide internet to rural areas in the region, using white spaces on the radioelectric spectrum as an innovative strategy to provide internet to communities, thereby bridging digital connectivity gaps in the region.
- An initiative undertaken jointly by the Cajamarca Regional Government, the Ministry of Transport and Communications (MTC) and the operating company Bitel will provide free internet services (Wi-Fi) to 90 rural and indigenous communities in Cajamarca. The project includes the construction of 90 antennas between June and October 2022 to benefit over 70,000 inhabitants.
- The Everyone Connected Plan implemented by PRONATEL, in partnership with the private sector (Microsoft, Facebook, Sistemas UNI, EdTeam), aims to bridge the connectivity gap, democratize internet access and generate digital skills, to enable more people to improve their quality of life by using this service and to ensure global inclusion. It includes the execution of three internet infrastructure and connection projects in rural areas: Digital Access Centers or CADS (implementation and activation of 104 rural CADs); Digital Public Spaces or EPADs (implementation and activation of 300 rural EPADs); and Connect the Jungle (an internet service for 1,316 education institutions and health centers), thereby ensuring a better quality of life for over 1.6 million Peruvians living in rural areas with no internet coverage or access. Although implementing connectivity in inaccessible areas via satellite is a burdensome alternative, with a lower presence in the region, it is still being implemented.

URUGUAY

In 2021, the National Telecommunications Administration (ANTEL) of Uruguay signed a mutual cooperation agreement with MEVIR—an organization that seeks to guarantee rural workers the right to quality housing—with the aim of providing connectivity to farming areas. The agreement will have a minimum duration of five years.

MEVIR will allow ANTEL access to lands that it owns to install technological infrastructure. The project is seeking to reach sparsely populated areas that still have no internet connection. The initial goal is to connect 99 percent of towns and villages with fewer than 500 inhabitants in 2022.

In 2022, Uruguay reached its most isolated communities with no internet connectivity in the department of Tacuarembó, with the installation of two base stations. A number of projects have been started to bring optical fiber access to other remote towns and villages (Balneario Iporá and San Gregorio de Polanco). Mobile connectivity will also be provided in Rincón de Zamora, Paso de los Novillos and Cerro del Pastoreo.

Due to high levels of connectivity in most of the territory, Uruguay is now expanding the service to remote towns and villages.

OTHER REGIONAL EXPERIENCES

A document produced by ECLAC, FAO and IICA (2019) provides details on various projects to promote the installation of a satellite network covering all the territories of the world. The Kuiperde Amazon project proposes the creation of an interconnected network of 3,236 satellites to deliver high-quality, low-latency connectivity to communities with no internet connection worldwide.

The Starlink SpaceX project seeks to create a network of 11,000 satellites to cover the Earth. Since 2022, this project has made headway in providing connectivity to remote towns and villages with no internet resources or infrastructure (EMOL, 2019) and it is estimated that it will reduce costs and improve service quality. Starlink has recently expanded into southern Brazil, the Dominican Republic, Puerto Rico and Mexico.

Starlink reports that it is progressing in talks with Argentina and Paraguay. The project will be activated in Peru, Ecuador, Jamaica, Colombia and Panama in the third quarter of 2022, and in Bolivia, Costa Rica, Guatemala, and areas north of Rio de Janeiro, Brazil, in 2023.

The company is aiming to provide connectivity services to different countries in the region, many of which, due to various geographic conditions, require satellites to provide internet access for their inhabitants. In a presentation at the Mobile World Congress in Barcelona in 2021, Elon Musk said he would seek to expand the commercialization of his services, which could be combined with future 5G technologies that are also gradually being deployed in Latin America.

At the same event, in the "A Rural Manifesto for Latin America" session, Telefónica Hispanoamérica proposed the need to establish public-private partnerships to reach rural areas. This would require the formulation of an innovative approach in the different areas involved: technological, operational, commercial and regulatory, to bridge the access gap. Also discussed was the opportunity and need to apply an innovative approach to commercial and operational models for remote areas, designing solutions that address the specific needs of these areas. These specific characteristics must be taken into consideration in drawing up regulatory frameworks, so as to incentivize the deployment of networks in rural areas as part of private sector investment.

In this regard, the private sector is insisting that coverage be provided using sustainable business models, so that the provision of access does not depend exclusively on subsidies or extraordinary contributions, but rather is financially self-sustainable, based on administrative, operational and commercial characteristics. Given that the provision of services in rural areas requires higher investment and operational levels, the sector is calling for tax cuts, fiscal incentives, efficient use of resources from universal service funds and the harnessing of infrastructure that has already been deployed.

3.4 Promotion of endogenous alternatives in the communities

There is consensus among those interviewed that the arrival of connectivity in more remote areas is the result of solutions put forward by small local operators, community networks and the activity of technology hubs. These are endogenous alternatives that emerge in communities, and alternatives in which connectivity is supplied by providers, via very small-scale local commercial initiatives, which are not reflected in the statistics.

Those that are advocating for the endogenous solutions model point out that connectivity strategies are often not designed jointly with the inhabitants of these places, considering their conditions and needs, due to three concurrent factors: centralized decision-making in the region; the extrapolation of urban solutions to the rural environment; and a perspective that considers connectivity to be a technical matter rather than a development matter or a social issue. Some stakeholders also note the diversity of situations present in rural areas.

The formation of community networks to reach more remote places is an alternative in the region for cases in which the support of operators is needed to expand on a larger scale. These include start-ups operating in remote places that generally use a micro base station and a backhaul solution connected to a basic mobile operator network.

The options of smaller companies, in addition to bringing connectivity to inaccessible places, in many cases drive the development of rural connectivity policies associated with the development of agriculture, with the participation of the inhabitants.

In Mexico there are precedents of this type that are facilitating the remote connection of isolated communities, through the activities of Rhizomática (a non-profit organization)[17]. The cost of these networks is lower than the installation of a conventional network. This is a proposal within the reach of local communities, whose scalability possibilities need to be analyzed. .

In Argentina, a project by the organization NonoLibre and El Valle (Córdoba) aims to install wireless internet infrastructure for communities in the Traslasierra Valley, where internet access is limited or non-existent. The province foresees the installation of a solar station and the deployment of a meshed network of over 30 hubs, using LibreRouters and home routers. The project is proposing to complete the link between the Universidad Nacional de Córdoba and villages in the Traslasierra Valley and to interconnect the community networks of the Paravachasca and Traslasierra Valleys.

17 This initiative made it possible to connect a community of 500 inhabitants in San Juan Yaeé (Mexico) www.rhizomatica.org.\

The Intelligent Communities initiative is a similar experience taking place in the indigenous Lenca community of Azacualpa, in the municipality of Yamaranguila (Honduras); it is facilitating a last mile connection to the most isolated towns and villages, where there are no private sector operators.

Community network support initiatives have been undertaken in recent years. The ITU has supported manager training plans in indigenous community networks in Mexico to develop communication projects. In Argentina, the vice president of ENACOM telecommunications regulating agency, Gustavo López, said that the current policy subsidizes the operation of those local cooperatives that reach towns and villages of up to 30,000 inhabitants, and the State finances the installation of infrastructure, incentivizing the growth of solutions offered by community networks.

The connection networks mentioned in this sector are mostly associated with perspectives that encourage agricultural practices in these communities. This perspective is also present in one of the conclusions of the youth forum organized by IICA[18]. In their conclusions, participants stated that their aim is to strengthen family farming and eco-agriculture and that, to this end, technologies must meet the need for information to innovate and communicate effectively, and to open new markets and forms of trade.

Eric Huerta has developed the indigenous diploma in rural connectivity and works with community networks in Oaxaca (Mexico). In the interview, he stressed that "the problem is that there are no technological policies that strengthen communities in peasant farming and family farming, which is the most important kind of farming because it is closely related to the conservation of ecosystems. The technology programs promoted by Latin American states are conceived for large industries".

Regarding young people's perspectives, Yeisully Tapias, Director of the Association of Rural Youths of Latin America (Asociación de Jóvenes Rurales de Latinoamérica) said that technology access proposals "should focus more on building solutions for young people, guaranteeing that the technologies reach them but also that young people can define what they really need (…) Rurality should not be confined to agricultural production. Rural youth do much more than just farming. Young rural people who go to study elsewhere want to return to the countryside, but what happens if they return and the conditions are not there to empower these young professionals and help them to contribute to developing rural areas? Not only must we harness these skills in production and trade, but we must also advocate for resources to be allocated to transform farming and build distribution centers, collection centers, etc. That way, those who have studied marketing and sales can develop their skills, or those who have studied photography can produce content. But that's impossible without connectivity" (IICA, IDB, Microsoft, 2020).

18 https://www.iica.int/es/prensa/noticias/juventud-rural-de-las-americas-plantea-necesidades-para-su-incidencia-en-la

Regarding the scope of connectivity solutions, many of the people interviewed in this study mentioned, as the present section argues, that technological solutions must be adapted to uses, purposes and requirements, arguing that each remote community should have a specific combination of technologies. Similarly, Maryleana Méndez, Secretary General of the Inter-American Association of Telecommunications Companies (ASIET) said that "it is important to think of advanced solutions but which are close to the populations. All these processes must be on the same level of the development of skills associated to living forces of the region".

In sum, the perspective that associates the search for solutions with community building is in line with those developing endogenous solutions. These also state that there is no single technological option and that these must be selected according to the different contexts. Raúl Echeverría said, "I think that the technologies are there. We need to draw up a menu of technologies like Altermundi and Rhizomática have done. There is technology like satellite access that doesn't make sense in a neighborhood with multiple fibers, but it does in a remote location. We have to consider the different technologies, their benefits, the best fit in each case, sometimes occupying frequencies and other times Wi-Fi". Similarly, Maryleana Méndez said that "there is a (technological) ecosystem, the solutions are complementary and necessary, depending on the investment, the people involved and distances. For example, satellites are used to carry transport from tower to tower when it can't carry microwaves or mobile connectivity lines. There are complementary technologies, in fact there are all sorts of options".

In short, the diversity of technologies and solutions comes in addition to the multiplicity of stakeholders involved in solving the problem of rural connectivity. According to CAF, to increase investments and for these to be effective, countries must adopt an integral vision of rural development, with a framework of public policies that takes into consideration the particularities of rural communities with an emphasis on the most disparate and vulnerable populations, such as indigenous peoples

Recommendations

1 The initiatives show the importance of **PROMOTING AND UPDATING** the use of universal service funds for connectivity projects designated to rural, remote or unattended areas.

2 **ENCOURAGING** rural connectivity policies that prioritize projects that show sustainability and efficiency to address the existing lag in rural areas.

3 **STIMULATING** public and private investment, public-private partnerships, international cooperation and the activity of community networks, as it is necessary to use all options and alliances to develop connectivity solutions in rural areas.

4 **INCENTIVIZING** the participation of small operators and community operators to address areas not covered by specific licensing measures, access to infrastructure and programs geared towards social coverage.

5 **EXAMINING** rural connectivity legislation periodically to dynamically meet connectivity demands and needs in these territories.

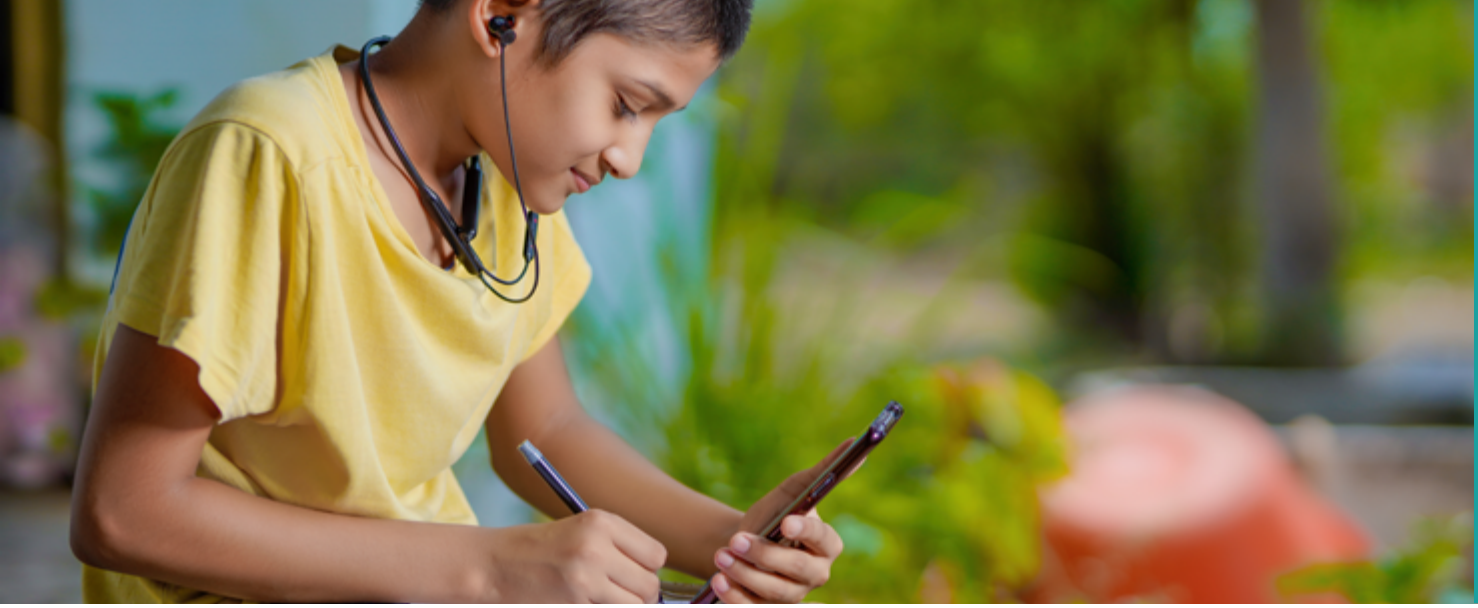
6 **CONSIDERING** the diversity that rural life entails and offering solutions to areas of different scope (semi-rural areas, more remote and sparsely populated rural areas).

7 **ENSURING** that future spectrum licensing processes improve their costs or at least do not imply setbacks in the countries that have made progress in rural connectivity solutions, as a result of affordable spectrum access policies for service providers.

8 **PROMOTING** the development of a connectivity mapping system, identifying places with installed infrastructure and connectivity, as well as existing gaps.

9 States and companies must begin **ENGAGING IN EFFECTIVE COLLABORATION AND ENCOURAGING** necessary policies intelligently to bridge existing gaps. These policies can serve as an incentive for the private sector to reach areas that are not profitable at present.

10 **CONSIDERING** policies to encourage investments in new territorial and satellite solutions that can provide short-term connectivity services.



CHAPTER 4

The demand gap problem and digital skills development in rural areas: a vital need for the future of the region

The adoption of digital skills by the rural population of Latin America and the Caribbean is a topic neglected in public debate because obstacles to rural connectivity access have often taken all the attention, and the use of these resources and the need to educate the population so that it is capable of incorporating such technologies take second place. However, both aspects (access and use) are two major factors that must be addressed simultaneously.

The proliferation of new technological resources and their incorporation into agriculture and the food value chain poses major challenges in emerging countries, particularly in rural areas. Obstacles with respect to infrastructure, high costs of accessing technology, and limitations in the population's digital literacy slow down the digital lift-off process.

With respect to the development of food systems, digital technologies and their incorporation in agriculture are essential to transform food production and consumption practices[19]. . Furthermore, these technologies open up opportunities that can transform rural lives. The availability of information, changes in production systems,

19 The United Nations Food Systems Summit 2021 puts the need to generate conditions to improve global food systems at the top of the agenda in order to meet the Sustainable Development Goals (SDGs) and the Paris Agreement.

access to education, access to telemedicine, as well as the possibility of reducing distances and engaging in more frequent communication benefit from these resources and can bring major advantages for people's wellbeing. Considering the demographic decline of the rural population in the region, and especially problems in generational succession in rural areas and in farming, new technologies become increasingly important and have the potential to bring about improvements.

In this regard, it is not technology per se that can bring about change through its adoption, but rather, as experts advise, human talent and organizations than facilitate such transformations (Toyama, 2015). Providing access to technology universally does not guarantee that it will be used fully, consciously and thoughtfully (Tedesco, 2017) and it is necessary to promote training in digital skills to develop qualifications that constitute a qualitative leap for users.

Various studies show that there are major disparities in the adoption of digital technologies in rural areas in Latin America and the Caribbean. In their use there are patterns and inequalities that exist in the "offline" world that persist in "online" environments (IICA, Oxford University, FIDA, 2022); Barrantes and Vargas, 2019; Barrantes and Cozzubo, 2019). Thus, it is acknowledged that a new digital divide exists today in the different ways in which the internet and multiple digital technologies are used, which leads to the argument that the gap is not only limited to supply and access. In addition to the foregoing, there is also a demand gap, also known as a second-level divide (Bucy, 2000; Peter and Valkenburg, 2006; Van Deursen and Van Dijk, 2014, among others).

The issue of digital skills for the adoption and effective use of information and communication technology resources, and the question of relevant content to incentivize the frequent use of such resources, has a subordinate place and is relegated in public discussions on the benefits of connectivity and the problems associated with its absence. In this regard, there are critical nodes and obstacles in technology use in rural areas, and this is not only a problem of technology access (which is indeed present), but also it is essential to address the conditions and skills necessary for using these technologies. Both obstacles need to be addressed with different strategies and policies, and although they are connected, it is not necessary to solve one of the problems to then address the other; rather, they must be tackled simultaneously (IICA, IDB, Microsoft, 2021).

There are many reasons why it is important to address the development of digital skills. First, the issue of connectivity is not merely a question of material installation. Access is naturally a necessary and basic condition, but it in no way resolves the barriers to effective and intelligent use of technology currently available. Second, any connectivity expansion program must consider its effective and full incorporation into users' practices and everyday lives. The United Nations Food Systems Summit 2021 prioritized the need to generate conditions to improve food systems worldwide to meet the Sustainable Development Goals and the Paris Agreement. The contribution of digital technologies and their incorporation into agriculture are essential for transforming food production and consumption practices.

In this context, it is strategic to situate rural areas, which today are lagging behind in terms of connectivity and technology use, on the most advanced line of debate on the potential of digital transformation to drive rural development in the region. In short, the intention is to place in the front line the sector that is most behind in access and expansion of the benefits of digitalization and which urgently requires digital lift-off for its full development.

Given the availability of technology, it is not only a question of "connecting" rural areas but also of deciding on the means so that resources are used effectively. This is not a criticism of digital technology; on the contrary, this is of great importance as digital tools are an essential instrument for productive, social and cultural life today. As seen during the COVID-19 crisis, the limitations and absence of full use of digital technologies forms a barrier between those who are included or excluded from such exchanges in contemporary society. Access limitations bring with them new conditions of exclusion and contribute to worsening pre-existing inequalities.

One of the premises that inspires this document is the statement made by Bayer Vice President Natasha Santos in a public conversation with IICA Director General Manuel Otero, when she said that digital technology is of the utmost importance because of what it enables people to do. It is precisely a matter of understanding technologies as something that affects humanity, rather than a merely instrumental

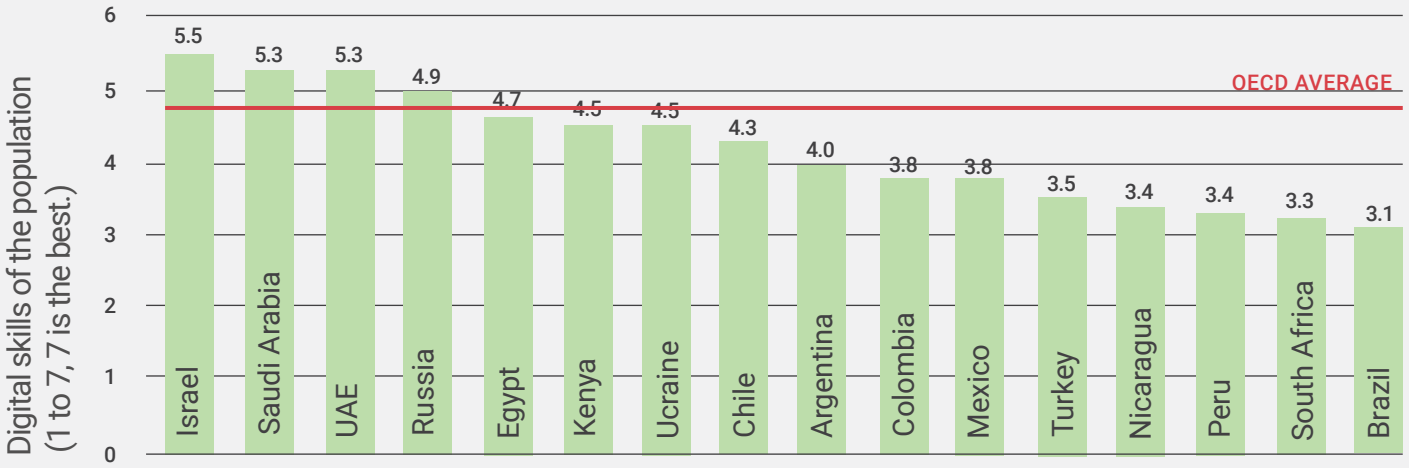
or technical question. For farming and life in general in rural areas it is clear that technology creates prospects that do not exist if the technology is not present. In particular, it is known that the potentialities that digital agriculture brings and the incorporation of technologies into commercial chains create opportunities for production that cannot in any way be substituted in the absence of such technologies. For this reason, the digitalization of rural areas has great potential, and barriers to development (in terms of content, education and skills necessary for its full use) require urgent attention.

Digitalization in rural areas creates new opportunities and at the same time requires an intervention to address the differential conditions between countries and, above all, the existing distances within countries in terms of diversity of stakeholders involved in agriculture. Although productivity growth is the main driver of economic growth (Solow, 1988), the dynamics of innovation and technology are associated with production structures, labor relations and income distribution. So the effects of digital technologies on productivity will be the result of access to such technologies, the dynamism of stakeholders in incorporating them, the participation of companies and SMEs in digital transformation, the presence of suitable skills and a competitive environment that benefits the digital economy (OECD, 2019).

The development of digital skills has an influence on the possibilities of insertion into the global digital economy. On a global scale, the digital skills gap carries a cost. Accenture estimates that by 2028, G20 countries risk forgoing up to $11.5 billion in cumulative GDP growth if the digital skills gap is not addressed. That is equivalent to losing approximately 1.1 percentage points in cumulative GDP growth (in the 14 countries measured)[20]. The growth risk may vary according to the economic structure of the country, the industry and labor distribution. The study states that the digital skills gap in India has the greatest risk of GDP growth loss (an average of 2.3 percentage points per year), followed by South Africa and Mexico (1.8 percentage points of annual GDP), and China and Brazil (1.7 percentage points of annual GDP). In a similar vein, graph 7 shows the untapped potential in emerging markets that is relegated due to a lack of digital skill development.

20 Australia, Canada, Argentina, South Africa, Italy, France, United Kingdom, Germany, Mexico, Japan, Brazil, USA, India and China.

GRAPH 7: EMERGING MARKETS HINDERED BY DIGITAL SKILLS DEFICITS



Source: Google, 2019

The Google document "The Digital Sprinters: Driving Growth in Emerging Markets" (2019) states that "Emerging countries cannot participate in the global digital economy unless their workforce has sufficient digital literacy. Skill development contributes to emerging markets in two critical ways. It empowers individuals to find jobs and empowers consumers to use digital products - thereby increasing their demand for digital products and services. For these two reasons, developing skill proficiency is akin to doubling-down -- it not only increases access to a digital workforce, but also boosts adoption and promotes the diffusion of the digital economy".

A number of studies also show that the adoption of digital technologies varies widely between different countries and also within them (Hagsten et al., 2012), depending on companies' capacities and incentives (Andrews, Nicoletti and Timiliotis, 2018). Indeed, the capacity and sophistication of each sector are important in accelerating the benefits that can be obtained with new technologies.

According to the OECD (2020) there is a positive connection between the dissemination of digital technologies at sector level and productivity growth. A study for the European Union (2020) states that there are strong linkages between ICT skills indicators: an increase of 1% in simple ICT skills is associated with a 2.5% increase in labor productivity, and a 1% increase in complex ICT skills with a 3.7% increase in labor productivity. The analysis of this document suggests that cognitive skills and non-cognitive skills show a positive, strong and solid correlation with added labor productivity.

According to a study by the US Chamber Technology Engagement Center, unlocking the digital potential of rural companies in the USA would add over $140 billion to the US economy in the next three years, and create over 360,000 additional jobs in rural communities. The report, based on a survey of 5,300 companies in rural areas of the USA, makes a number of recommendations to the public and private sectors to help unlock the economic potential of rural areas in the country, including: increasing rural companies' access to digital training and digital tools so that they can scale up their businesses; increasing digital skills training (38% of small rural companies reported that they cannot hire personnel with required digital skills); and increasing digital connectivity in rural areas.

According to World Economic Forum (2019), the fourth industrial revolution will add $14.2 trillion to the global economy in the next fifteen years. This expansion of productivity will be the result of the combination between the application of artificial intelligence, automation through cyberphysical systems and the use of the cloud in production processes and associated services in value chains. However, these estimates on a global level will probably encounter restrictions due to the unprecedented economic crisis triggered by COVID-19 in the region and which particularly affects the most vulnerable groups. The slowdown in economic activity in Latin America and the Caribbean had negative repercussions on the labor market, which only in 2022 began a slow recovery. According to the ILO (2022), unemployment in Latin America decreased from 8.7% in the first quarter of 2021 to 7.9% in the first quarter of 2022 and returned to pre-pandemic levels. However, the labor outlook in the region is characterized by informality and poverty, especially among young people. Consequently, the trend in 2022 presents a broad sector of the population that, despite having work, whether formal or informal, do not earn enough to cover their basic needs.

The situation poses a major challenge for rural areas, a territory affected by disadvantaged conditions, and at the same time with great potential in productive terms that requires innovation and technology to add value to what is produced by regional economies and tackle the food problem.

Agriculture is a central activity in the region, one of the few that remained stable and active during the COVID-19 outbreak, and it is expected that for the coming years the advantages of digitalization will be incorporated to a greater extent. There are no estimates yet of how quickly this process will be incorporated and whether it will affect

the food system. For now, it is expected that some activities will be more receptive to the introduction of such innovations, and even indirect jobs that agriculture generates, such as transport and machinery operated by contractors, are affected by the changes that technologies cause in labor markets. In this regard, although the rate at which this technological change will occur is still up for debate, like the process of "destruction" of activities and the rate of creation of jobs due to the incorporation of new activities, it is clear that the ground must be prepared to carry forward this transformation.

4.1 Digital skills in rural areas: the education of new generations and skills reconversion in the economically active population

Addressing obstacles in the development of digital skills requires progressing in the education that new generations receive, and addressing the learning process and incorporation of such knowledge in the economically active population. Although this is the same issue, different approaches are required.

In terms of younger generations' knowledge acquisition processes, the development of digital skills is associated with the population's educational situation. Handling digital devices requires knowledge and literacy in reading and writing, as well as basic mathematical knowledge. There is a prerequisite of knowledge in relation to these skills provided by formal education, and the lack of education opportunities in the region—especially disadvantages in rural areas—generates greater obstacles.

According to Huepe et al. (2022), in Latin America differences still persisted in 2019 in the proportion of adolescents aged 12 to 17 who did not attend school, depending on the territory they inhabited. In all the countries where information is available, there are more adolescents with no schooling in rural areas than in urban areas (see graph 8).

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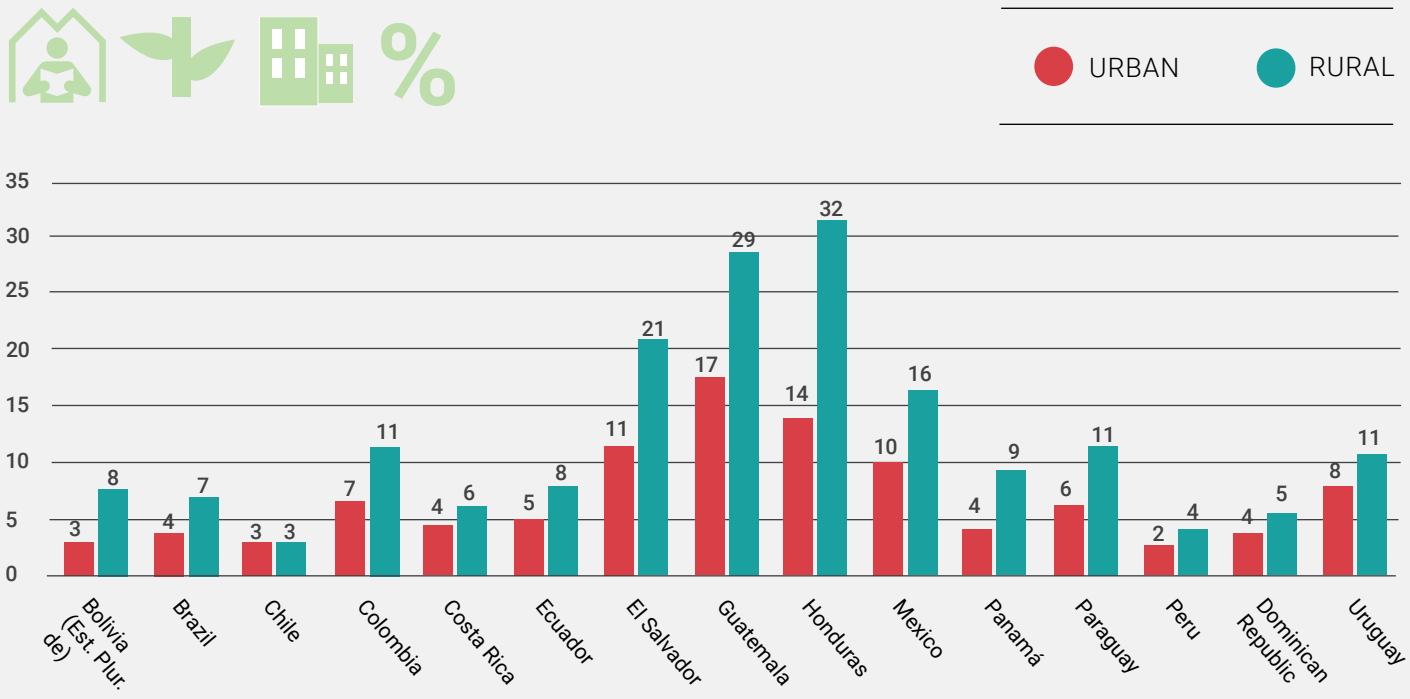
GRAPH 8. LATIN AMERICA (15 COUNTRIES): RATE OF EDUCATIONAL NON-ATTENDANCE (12-17 YEARS), BY URBAN/ RURAL CONTEXT, AROUND 2019 (IN PERCENTAGES)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), based on the Household Surveys Databank (BADEHOG).

The results of the education system and the education conditions of young people are vital in order to have a basic level of knowledge that permits the acquisition of digital skills for the coming changes in digitalization processes. Estimates in 2019 suggested that around 14% of jobs in OECD countries could change drastically to the point of disappearing completely and a further 32% could be transformed significantly (OECD, Manpower Group/ANDI, 2019). Although there is no consensus on what the process of transformation will be in the region, or the rate of expansion, there is widespread agreement on the need to increase the proportion of workers with cognitive and interpersonal skills in Latin America and the Caribbean, as these are among the skills hardest to attain. It is known that the school model on which the formal education system is based was forged in conjunction with the development of the industrialization process over the course of the twentieth century and it has formed resources with the necessary training to teach part of this model of organizing labor and production. Technological changes, the need to train personnel more adaptable to living in a changing context, and the importance of not only

knowledge but also "soft skills," pose new challenges and demands for formal education. Although cognitive skills are still very important, there are indications that non-cognitive skills are becoming increasingly important. In a world where job tasks and content are increasingly changing and less repetitive, greater importance lies in employees' adaptability, communication skills and collaboration, problem solving, critical thinking, creativity and willingness to learn. The literature documents how these skills provide workers with better employment and income opportunities, and help counter poverty and social exclusion (OECD, 2019).

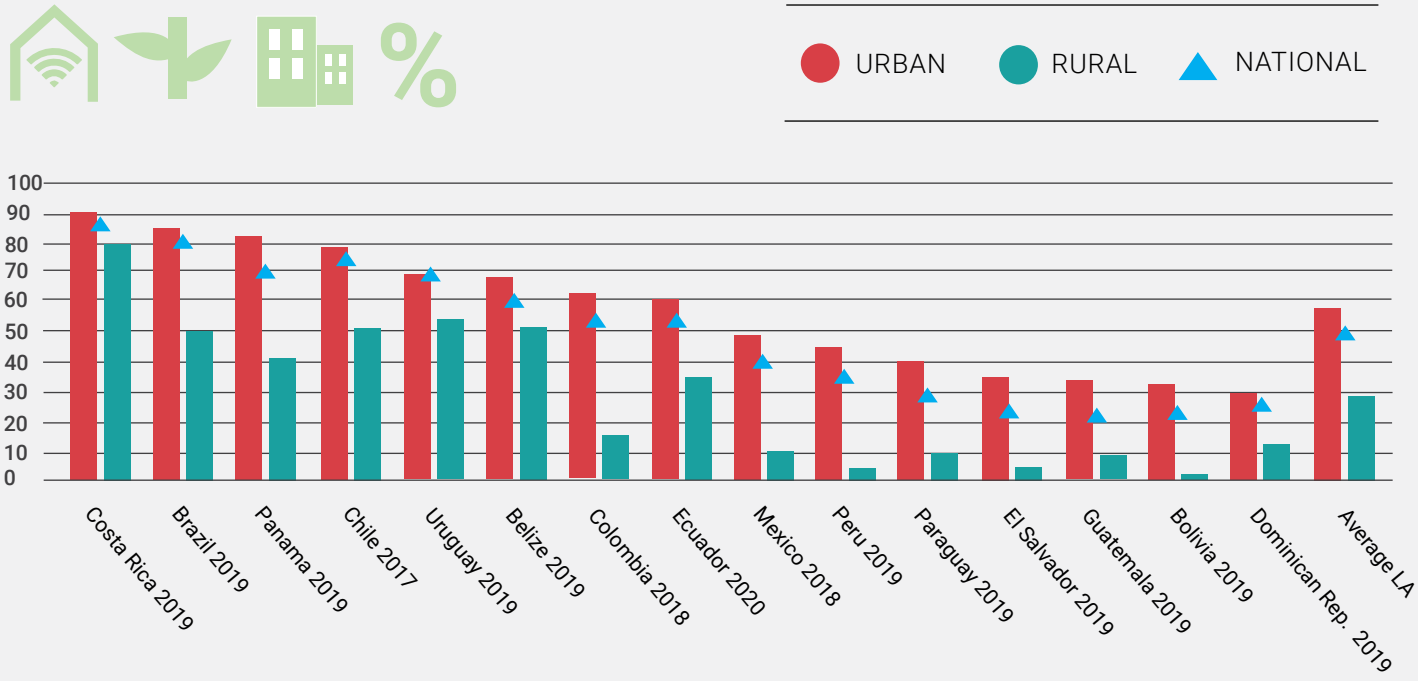
While education systems have undertaken a wide variety of policies in ICT incorporation and training, digital divides still pose an obstacle to incorporating new technology in education in LAC (Lugo, Delgado, 2020). Available data for some countries in the region shows differences that result in opportunities from that digital transformation. According to Van Deursen at al. (2017), digital exclusion magnifies existing inequalities in offline life. Digitalization can increase existing differences if children and young people in rural areas and those from disadvantaged socioeconomic backgrounds have restricted contact with digital education content, or if they only access the benefits of connectivity for its use in activities with reduced cognitive demand and their chances of exploring the broad potentiality of these technologies are restricted.

There is extensive data that shows the existing limitations on the effective incorporation of the benefits of digitalization and ICT us TIC[21].

In Latin America and the Caribbean profound inequalities were recorded in access to internet at home, as a result of inequalities in the different countries. Graph 9 shows the percentage of households with an internet connection in different countries and territories. The graph highlights the situation of Costa Rica, with the highest percentage of connections at home (almost 86%), and the lowest territorial gap between urban and rural households (almost 10 percentage points). At the other extreme is the Dominican Republic, where 26% of homes had an internet connection prior to the pandemic, and Bolivia, where fewer than 2% of rural homes were connected. In all the countries analyzed in Graph 9, rural households have lower levels of connection than urban ones. Particularly striking is the level of connection in rural households in Bolivia, Peru, Paraguay, El Salvador and Guatemala, where fewer than 10% of rural homes had an internet connection before 2020.

21 A review of the existing gaps in access to connectivity in rural households and schools in Latin America and the Caribbean can be consulted in section 4.6 of the document "Rural Connectivity in Latin America and the Caribbean—A Bridge to Sustainable Development During a Pandemic," (IICA, IDB and Microsoft, 2020).

GRAPH 9. LATIN AMERICA AND THE CARIBBEAN (15 COUNTRIES): CONNECTED AND UNCONNECTED HOUSEHOLDS BY GEOGRAPHIC AREA, LAST YEAR AVAILABLE (IN PERCENTAGES OF TOTAL HOUSEHOLDS IN EACH AREA)



Source: ECLAC Regional Broadband Observatory (ORBA) based on the survey of households by the Households Survey Databank (BADEHOG). Note: Simple average.

Restrictions in the access to connectivity of rural households can be countered with opportunities to utilize these resources in school. In this regard, a large number of children and young people in the region have the opportunity to use technological devices and the internet mainly when they are at school, the main environment where these technologies are available (IICA, IDB, Microsoft, 2020).

4.2 Agricultural secondary schools as drivers of digital skills development in youthes

With the expansion of basic education in the region, it is feasible to drive digital skills development in the young population through the education system. In Latin America and the Caribbean, there are institutions in place in rural areas that have plans and programs to provide training in agricultural activities (agrotechnical schools, alternance training, etc.) In these places, a number of needs and demands must be addressed in the coming years, considering the unprecedented transformations that this sector of the economy and rural environments are experiencing.

The bases of such initiatives include:

- Rural schools, especially high schools, should be involved in the development of comprehensive plans that harness interconnections between agriculture and education, to mitigate the negative effects of migration and address modernization in farming. A priority here is to support the training processes of young rural people to encourage the implantation of new digital technologies in rural areas.

- Provide permanent digital skills training in these schools, based on general technification processes and mainly the contribution of new technologies that bring about new education requirements that can be addressed in agricultural education environments.

- Such training can help counter the perception of the countryside as an area that is lagging behind with respect to the opportunities available in cities.

- The use of new information and communication technologies, the development of digital skills and infrastructure, and connectivity conditions are fundamental requisites for rural life today. Digital skills training is a proactive policy that can encourage new opportunities for these groups.

- Rural spaces should address generational succession in agriculture, especially considering the situation of youth and women and their potential for exerting proactive local leadership.

In partnership with Microsoft, and at the initiative of the Presidency of the Cabinet of Ministers of Argentina, IICA has designed the Agroedutec Program "Training in Digital Agriculture for Agrotechnical Education", which seeks to help incorporate knowhow and skills connected to digital technology training for the twenty-first century and their existing applications in agricultural activities. The Program proposes updating content through courses related to basic digital skills development and in the field of agriculture in particular, which can be adopted and replicated in other countries on a larger scale.

4.3 Digital skills in the rural adult population of the region: from ICT access to ICT use

In addition to youth education, a second area that must be addressed is the reconversion process that the rural adult population requires to acquire digital skills. The issue of access and use of ICTs has been studied in developed and developing countries. In Latin America and the Caribbean, digital divides are identified by age, gender, socioeconomic level, native language and geographic location (Barrantes et al.; Mariscal, et al.; Galperin, 2017). Likewise, numerous studies outside of the region explore the problems of access and limitations in rural areas of developing countries, noting problems of persistent gaps and obstacles to incorporate technologies (Dohose, Cheng; 2018; Park et al., 2019; Salemenik, et al., 2017).

These studies show that there is a greater presence of internet subscribers depending on income, education level and the presence of children in rural households. However, although there are determining factors in internet use, such as age, income and education level (which influence internet take-up), they do not predict the types of activities users carry out online (Penard et al., 2015; Kilen Thong, 2014; Prieger et al., 2013). On the contrary, internet use (communication, entertainment, social media and e-commerce) is mostly associated with digital skills (Garín Muñoz, 2019).

There are fewer specific studies of Latin American and Caribbean countries[22]. Gutiérrez and Gamboa (2010) identified that educational restrictions are a significant limitation for internet use in low-income adult populations in Colombia, Mexico and Peru. Grazzi and Vergara (2012) analyzed the effects of language in internet use in Paraguay and showed that where the users' native language (Guarani) is not available in the content circulating in the digital world, there is a cultural barrier that limits ICT appropriation. In the case of Brazil, a study based on information from the years 2005 to 2013 (Nishijima et al., 2017) argued that the factors that encourage internet use are related to a higher education level, income, employment and the number of household members. In the same vein, Correa et al. (2017) show in a survey of 22

22 A systemization of these studies can be reviewed in Martínez Domínguez and Mora Rivera (2020) "Internet Adoption and Usage Patterns in Rural Mexico", Technology in Society, Volume 60, 101226, ISSN 0160- 791X, https://doi.org/10.1016/j.techsoc.2019.101226. http://www.sciencedirect.com/science/article/pii/S0160791X19302684

communities in Chile that age, income, social capital and the presence of children in the household account for the level of internet use.

Martínez Domínguez and Mora Rivera's research (2020) into the rural population in Mexico and Barrantes's studies (2020) for Ecuador, Guatemala, Peru and Paraguay also address determining factors in internet adoption, its use and types of use (communication, entertainment, social media, e-commerce and e-government). These studies represent a breakthrough, since they further investigate a practically unexplored issue in the region regarding patterns of technology use in rural areas.

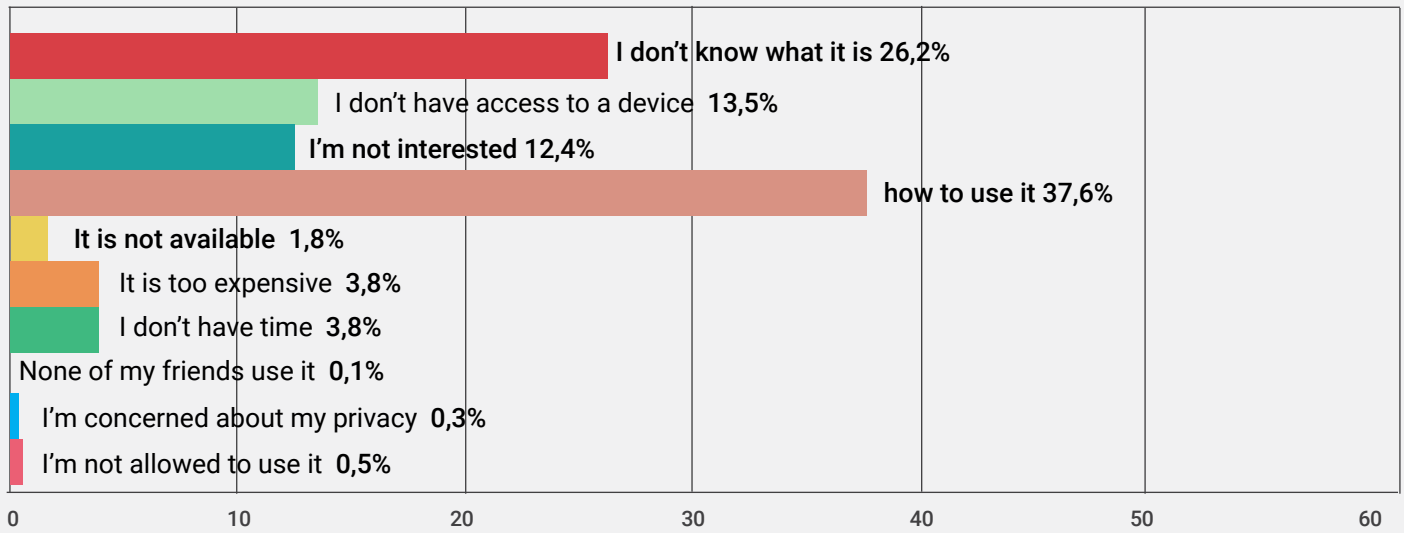
These studies show positive correlations between education level, income and digital skills development. Those with greater education credentials are less likely to lack digital skills compared to those with fewer years of schooling. This is an issue that must be addressed in rural areas in particular, since the most vulnerable groups, such as women, the elderly and other people with limited formal education are those who mostly reside in these territories (Barrantes and Vargas, 2019; Barrantes and Cozzubo, 2019). This situation, in addition to telecommunications infrastructure problems, affordability and lack of digital skills, feeds a vicious circle that prevents this disadvantaged population from using these technologies.

One of the most important findings is that the presence of children under 12 in households means adults are less likely to indicate a lack of digital skills as a main reason for not having an internet service in the household (Grassi, Vergara, 2012; Martínez Domínguez, Mora Rivera, 2020). In these cases, the main obstacle is the cost of internet and mobile telephony. These results shows that children and young people potentially play an important role in transmitting digital skills to adults in the home, and play a role in decisions about investing resources in internet connectivity. This trend shows that there is unsatisfied demand that requires more affordable connectivity for families with school age children, an area that public policies must address.

The data for Mexico indicate that the internet is used more in rural areas by women, young people and people with higher education levels. There is an age difference, whereby older people are less likely to use the internet due to a lack of digital skills. Young people are more involved in technology, while older adults are less likely to use it and are resistant to it. User occupation data shows that business owners are more likely to use the internet and, at the opposite end of the scale, day laborers and manual laborers are less likely to do so.

Women are beginning to use the internet to communicate with family members and friends, reproducing in the digital space the care and support that they tend to provide in traditional environments. For young people, the internet is associated to a greater degree with leisure activities (entertainment and social media) in comparison to older groups. The association between internet use and searching for information is more widespread among students who attend secondary school, where there is a specific use for educational purposes. This trend is recorded by Martínez Domínguez and Mora Rivera (2020) and Grazzi and Vergara (2019). Lastly, internet use increases when a person has sufficient skills to download programs and apps[23]. This digital skill is a determining factor for harnessing the internet's potential.

GRAPH 10. MAIN REASONS FOR NOT USING THE INTERNET IN RURAL HOUSEHOLDS (IN %)



Source: Barrantes et. al, 2020, based on After Access- LATAM

23 This result is consistent with Grazzi and Vergara's study (2014) for seven countries of Latin America and in the Mexico study.

Research by the After Access[24] initiative for Ecuador, Guatemala, Peru and Paraguay, a mass survey of the rural population, shows the limitations in skills for using digital technologies (Barrantes et al., 2020). Among the main reasons for not using this service, those surveyed mentioned "not knowing how to use it" (38%) and "not knowing what it is" (26%). Only four in ten people use these resources in rural areas.

In short, the studies cited suggest that rural internet users are young people with more schooling, who come from households with better economic conditions. Internet use (searching for information, communication, entertainment, social media, e-commerce and e-government) differ significantly depending on gender, age, education level, occupation and geographic location, which leads to the demarcation of the digital divide among internet users and those who do not use it (Martínez Domínguez and Mora Rivera, 2020).

These trends show that it is necessary to produce differentiated approach strategies among youth and adults to encourage the use of technologies and help them to develop the necessary digital skills. The demand gap requires that cultural, geographic and educational conditions be addressed to address differential situations in the adoption of new digital technologies in rural areas.

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Recomendaciones

1 **GUARANTEE** affordable and meaningful connectivity for educational purposes, an issue of great transcendence in Latin America. Providing basic connectivity services for education in the most disadvantaged quintiles remains a challenge for all countries. Simultaneously address the access gap and the demand for and use of new technologies in the population.

2 **ADRESS** the issue of digital skills by segmenting the target groups of initiatives. Differentiated training strategies are required for young people at school and for the economically active population that must undergo the productive reconversion process. Training strategies must include different options based on the target group. There are different uses, levels of adaptability and approaches to technologies among people with higher levels of formal education, different ages, rural women and those most likely to be exposed to digital technologies..

24 https://afteraccess.net/about-afteraccess

3 **CREATE** genuine opportunities for technological immersion and design customized experiences for local users, thereby improving conditions for adopting the necessary digital skills. Young people pursuing agricultural studies must receive training in the digitalization processes of this activity. This population group is willing and adaptable to incorporate technologies and is a sector that promotes the inclusion of these technologies. ICTs can drive work opportunities and wellbeing in rural areas, while encouraging young people to stay in their towns and villages and thus bring about the consequent generational succession of the population dedicated to agriculture.

4 **FACILITATE** the advent of digital technology through formal education. The presence of children and youth in households and the involvement of schools contribute to the incorporation of technologies in rural areas. States should be called on to support ICT policies that drive rural development, foster training for youth to encourage them to remain in rural areas, and provide incentives for technology adoption among adults.

5 Young people must **RECEIVE** digital training, which must be included in academic programs, from elementary school to higher education. Guaranteeing universal access to the internet in rural schools is a necessary condition for digitalization to truly take off.

6 **SUPPORT** studies on digital skills in the region. Sufficient scientific research on this topic, and the evidence that can be gathered from it, are crucial in order to develop policies and initiatives that foster digital skills development in the region. The absence of studies on this topic and the scarce funding lines to produce studies on a regional scale mean that a research and development agenda must be fostered. Providing science and technology state institutions, as well as other relevant agencies (foundations, companies, etc.) with means for funding research is crucial in order to address this priority.

CONCLUSIONS

ElThe present document seeks to compile and produce information on the state of rural connectivity in LAC. It also seeks to gauge the issue of access to and gaps in the use of new technologies, two years since the onset of the COVID-19 crisis.

The document summarizes the efforts undertaken by countries since the start of the pandemic to address problems in digital technology access and use in the region. The data show broad similarities with respect to connectivity access and use between countries and within their rural areas. Hence, those who inhabit rural areas, women, and populations in marginalized socioeconomic contexts are at a disadvantage with respect to the benefits that new information and communication technologies provide. If these limitations are not addressed soon, existing inequalities may worsen, as disconnection restricts opportunities for fundamental exchanges.

A great deal of research has yet to be carried out in order to expand on the analyses generated in this document, given that research is based on the information available, and measurements and projections will need to be reviewed in light of any new data produced. It is essential that official information available in the future takes into consideration differentiation by urban and rural areas. The availability of robust information will facilitate the adoption of actions by the public and private sectors, communities, rural organizations, multilateral credit agencies, international aid and investment institutions, local governments, academia and other stakeholders. The availability of information and complete, open data is essential to address this challenge fully. Consequently, direct coordination and the establishment of agreements with national statistics offices, universities, research institutes and observatories are fundamental to generate data on the rural digital divide.

The document also describes various partnership modalities and strategies that have allowed for bringing connectivity to rural areas, and the transformation of public policies to address this issue and intensify the use of new technologies. Public and private sector partnership strategies and endogenous initiatives in communities are other options in place that could be expanded moving forward. It is necessary to explore how these could be bolstered, given that, although there are numerous pilot experiences, they are of a small scale. To resolve the current situation, it is crucial to achieve progress in harmonizing public policies and driving consensus among various stakeholders (private sector, cooperatives, etc.). Furthermore, governance models must be generated to foster quality connectivity options in rural areas. The projects described here show that it is possible to implement initiatives for women and men who work in farming, who are currently neglected.

One interesting possibility is to promote the creation of a digital cooperation ecosystem for rural areas to encourage an innovation culture and foster digital solutions in food production and agriculture. Connections between different sectors (farmers of different size, technological clusters, 4.0 agriculture companies, international organizations, state agencies, research institutes, etc.) can increase demand for digitalization in rural areas. The development of a rural digital ecosystem is an alternative to promote connectivity, foster ICT skills and encourage their incorporation into farming.

Improving connectivity and closing digital gaps between rural and urban dwellers and territories should be a priority for policymaking if their benefits are recognized and evidenced. Improved digital services and connectivity will generate returns, make production processes and public and private services more efficient, boost employment, improve productivity and the quality of products and services, foster inclusive education and expand the possibilities for knowledge and participation in global culture, which are key factors in achieving sustainable development of the region's agricultural and food systems. This will not be viable, however, unless the competitive, environmentally sustainable and inclusive development of rural territories is fostered.

This will not be an easy task, since the rural-urban digital divide in general, and the significant connectivity gap in particular are both the cause and the effect of the many gaps observed in the countries of Latin America and the Caribbean. As this study concludes, we are facing a persistent and shifting gap, so any attempt to reduce it will always be provisional. Although some progress has been made since 2020, at present only 79% of the urban population has meaningful connectivity services, while in rural populations the percentage drops to 43.4%, a gap of 36 percentage points, up two points compared to 2020. Correcting these disparities in the immediate future is a challenge that must be overcome in planning sustainable development for rural areas, providing youth and adults (especially women) with digital training to facilitate the necessary generational succession and digitalization of rural areas, and generating opportunities to incorporate new technologies into production and rural life.

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Annex I

Connectivity Plans, Regulatory Frameworks, Rural Connectivity Policies and Specific COVID-19 Measures, by country

Country	Plan/Program	National telecommunications laws and other regulations (*)	Mentions rural connectivity policies	Specific COVID-19 measures
Antigua and Barbuda –Barbados–Belize –Dominica– Grenada–Guyana –Jamaica–Saint Kitts and Nevis– Saint Lucia–Saint Vincent and the Grenadines– Suriname–Trinidad and Tobago-	Caribbean Telecommunications Union– Telecommunications plans and programs for member countries. (1989+)		No	
Argentina		Law 27078 "Argentine Telecommunications Legislation") (2014/2014	No	
		Digital Agenda 2030- Decree 996/2018 (2018)	Yes	
	ENACOM Resolution 727/2020		No	
	Program for the Deployment of Networks to Access Mobile Communications Services(2018)		No	
	Development of Internet Infrastructure for Shanty Towns and Settlements in the National Register of Low-Income Neighborhoods in the Process of Urban Integration (RENABAP) (2020)		No	
	Program for the Deployment of Networks to Access ICT Services in Remote and Neglected Areas(2020)		No	
				Ensures the provision of telecommunications services, freezing of rates.

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Belize		Belize Public Service Regulations (2014/ 2014)	No	
		Telecommuting work from home policy (2020)	No	
Bolivia		General Telecommunications Law (2011/ 2016)	No	
		Legislation on the Development of Information and Communication Technologies (2013/2013)	No	
	Bolivia Digital 2025 (2017)		No	
				Regulates work from home as a special modality for delivering services through the use of information and communication technologies (ICTs) in the public and private sectors.
Brazil		Bill PL 4061/2019 "Objectives of the Fund for the Universalization of Telecommunications Services"(2019)	Yes	
		Bill 172/2020 "Objectives of the Fund for the Universalization of Telecommunications Services"(2020)	Yes	
		Law 9472/1997 "Telecommunications Law" (1997/ 2019)	No	
		Decree 9854/2019 "National Internet of Things Plan" (2019)	No	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Brazil	Rural Connectivity Project of the National Agriculture Confederation System/ SENAR (2019)		Yes	
	Digital Government Strategy 2020-2022(2020)		No	
	E-digital Brazilian Strategy for Digital Transformation(2018)		No	
	National Telecommunications Agency			Continuity of services – Support for health services and public security
Chile		Law 18168 "General Telecommunications Law" (1982)	No	
		Law 21172 "Amendment of Law 18168" (2019)	No	
	Digital Agenda 2020 Digital Chile for All (2015)		Yes	
				Performance improvement for the benefit of users. Free social networks. Improvement of digital customer service channels.

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Colombia		ICT Sector Modernization Project (2018)	No	
	Spatial Development Policy: Enabling Conditions to Foster National Competitiveness CONPES 3983/2020		No	
	National Policy to Foster Innovation in Education Practices Through Digital Technologies CONPES3988/2020		No	
	National Policy for Digital Transformation and Artificial Intelligence CONPES 3975/2019		No	
	National Policy for Internet Development, Expansion and Access by Providing Incentives to Meet the National Demand for Internet Access (2019)		Yes	
	National Big Data Policy CONPES 3920/2018		No	
	Policy to Develop and Foster E-Commerce in Colombia. CONPES 3620/2009		No	
	ICT Plan Colombia 2019-2022) (2019)		Yes	
	National Rural Connectivity Plan) (2019)		Yes	
			No	Declaration of telecommunications, radio broadcasting, television and postal services as essential services.

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Dominica– Grenada–Saint Lucia–Saint Kitts and Nevis–Saint Vincent and the Grenadines		Eastern Caribbean Telecommunications Authority (ECTEL). Telecommunications Regulatory Framework. (2000-2014)	No	
Costa Rica		General Telecommunications Law (2008)	Yes	
	National Policy for Knowledge-Based Society and Economy (2017)		No	
	Public Policy on Telecommunications Infrastructure (2015)		No	
	National Telecommunications Development Plan (2015)		No	
	Digital Transformation Strategy towards the Costa Rica of the Bicentennial 4.0 (2018)		No	
	National Science, Technology and Innovation Plan 2015–2021 (2015)		No	
	DDI Digital Divide Index 2016-2018 (2016)		No	
				MICITT - CAMTIC Preferential rates, performance improvement, strengthening of access networks, crisis response teams for rapid action

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Ecuador		Organic Telecommunications Law (2015)	Yes	
	National Telecommunications and Information Technologies Plan 2016-2021 (2015)		Yes	
	National Broadband Development Plan (2013)		No	
	National Digital Readiness Plan- PLANADI (2018)		No	
				Discounts on mobile phone recharges, improvement of online transactions, reduction of costs in e-commerce platforms.
		Telecommunications Law (2010)	No	
	National Innovation, Science and Technology Policy (2019)		No	
		Scientific and Technological Development Law (2013)	No	
El Salvador	National Scientific and Technological Development Law (2010)		Yes	
	Open Government Strategy 2018-2022 (2018)		No	
	National Investment Fund for Electrification and Telecommunications (2016)		No	
				Suspension of payment of utility bills, cable TV, Internet, credit cards and loans for 90 days.

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Guatemala		General Telecommunications Law of Guatemala (1996-2002)	No	
	National Digital Agenda "Technology contributing to the economic and social development of Guatemala" 2016 – 2032 (2016)		Yes	
				#EnMarchaDigitalGt
Honduras		Framework Law on the Telecommunications Sector (1997)	No	
	National Telecommunications Commission (CONATEL)– E-government		No	
		Literacy in Information and Communications Technologies Law (2013/2018)	No	
	Digital Government Master Plan for the Republic of Honduras		No	
				Guarantees the continuity of services for all Hondurans. Basic connectivity package for the entire population.
Mexico		Federal Telecommunications and Broadcast Law (2014)	No	
	Open Data Decree (2015)		No	
	Agenda Digital – México Digital		No	
	Mexico Connected (2016)		Yes	
				Free SMS messages containing information on COVID-19 are sent out. Educational content disseminated through TV programs.

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Nicaragua		Law No. 200 "General Telecommunications and Postal Services Law" (1995)	Yes	
	Telecommunications Investment Fund – FITEL (2006)		Yes	
	Rural Telecommunications Project (2012)		Yes	
	ProFuture Project (2018)		No	
Panama		Telecommunications Legal Framework (1991-2004)	No	
	National Broadcast Plan (1997)		No	
	Strategic Digital Agenda of the State of Panama (2019)		Yes	
	Digital Municipalities Project (2014)		Yes	
Paraguay		Telecommunications Law (1995/2004)	No	
	Digital Transformation Action Plan for the Digital Agenda of Paraguay (2018)		No	
	National Telecommunications Plan 2016-2020 (2016)		Yes	
				Broadband expansion for the public, greater connectivity of public institutions, reduction of service costs, free access to official information on COVID-19

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Peru		Broadband Legislation (2012/2013)	Yes	
		Digital Government Law (2018)		
	National Digital Transformation System (2020)		No	
	Digital Trust Framework (2020)		No	
	Government Laboratory and Digital Transformation of the State in the Presidency of the Council of Ministers (2019)		No	
	Single Digital Platform of the Peruvian State, Gob.pe. and established additional provisions for the development of Digital Government (2018)		No	
	Public Agency Guidelines for the Leadership of the Digital Government (2018)		No	
	Digital Government Committee (2018)		No	
	Supreme Decree No. 118-2018. Establishes the development of Digital Government, innovation and the digital economy with a territorial focus, as a matter of national interest (2018)		Yes	
	National Public Administration Modernization Policy to 2021 (2013)		No	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Peru	Supreme Decree to modify various articles of Law No. 29904, "Broadband Promotion and Construction of the National Fiber Optic Dorsal Network" (2013)		No	
	Urgency Decree No. 041-2019. Declaration of Public Necessity for 21 Broadband and Fiber Optic Projects (2019)		Yes	
	National Policy for the Development of Science, Technology and Technological Innovation- STI (2016)		No	
	National Survey to Co-Design the Development of a National Digital Transformation Policy and Strategy (2020)		No	
	National Competitiveness and Productivity Plan 2019–2030 (2019)		No	
	Digital Agenda for the Bicentennial (2020)		No	
	National Telecommunications Program (2018)		Yes	
	National Financial Inclusion Strategy (2015)		No	
	Digital Government in Peru, Working Closely with Citizens–OECD (2019)			
	Rural Mobile Infrastructure Operator Model – OIMR (2015)		Yes	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Peru	Internet For All (2016)		Yes	
	National Family Farming Strategy 2015-2021 (2015)		No	
	Agrarian Services Platform of the Agriculture and Irrigation Sector-SERVIAGRO (2017)		No	
				Telecommunication services cannot be suspended due to non-payment Distribution of tablets in rural communities and vulnerable populations in urban areas, in order to facilitate access to online classes.
Dominican Republic		(ICT Policies Dominican Republic (2005)	Yes	
		National Development Strategy Bill of the Dominican Republic 2030 (2014)	Yes	
	Digital Agenda–Rural Broadband (2014)		Yes	
	e-Municipalities (2015)		No	
	ICTs in the Education System		No	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Uruguay		Uruguay Digital Policy –Set of laws. (2008)	No	
	Uruguay Digital Agenda (2019)		No	
	Digital Government Plan (2020)		No	
	Digital Government and D9 (2017)		No	
	Uruguay National Development Strategy 2050 (2018)		No	
	Open Government Monitor (2019)		No	
				Coronavirus UY application
Venezuela		Organic Telecommunications Law (2011)	No	
	National Information Technologies Plan (2011)		No	
				Presidential Statement. Prohibition of the Suspension or Shutting Off of Communication Services.

(*) When two dates are included, it is because changes were subsequently made to the regulations.

Annex II | List of interviewees

#	SURNAME AND NAME	ORGANIZATION	POSITION	REGION/ COUNTRY	SECTOR
1	Jacomassi, Eduardo	ANATEL	Manager of Universalization and Expansion of Access	Brasil	Public Sector
2	Lemos, Alejandro	ANTEL	ICT General Manager	Uruguay	Public Sector
3	López, Gustavo	ENACOM	Vicepresidente	Argentina	Public Sector
4	Méndez Maryleana	Inter-American Association of Telecommunications Companies (ASIET)	Secretaria General	Latinoamérica y El Caribe	Technical Community
5	Pasquali Nilo	ANATEL	Superintendent of Planning and Regulation	Brasil	Public Sector
6	Roca, Humberto	ANTEL	Deputy General Manager of Technological Development	Uruguay	Public Sector
7	Tellez, Carlos	TIGO	Director of Regulation and Interconnection	Colombia	Private Sector