RURAL CONNECTIVITY IN LATIN AMERICA AND THE CARIBBEAN

A BRIDGE FOR SUSTAINABLE DEVELOPMENT IN A TIME OF PANDEMIC

IICA

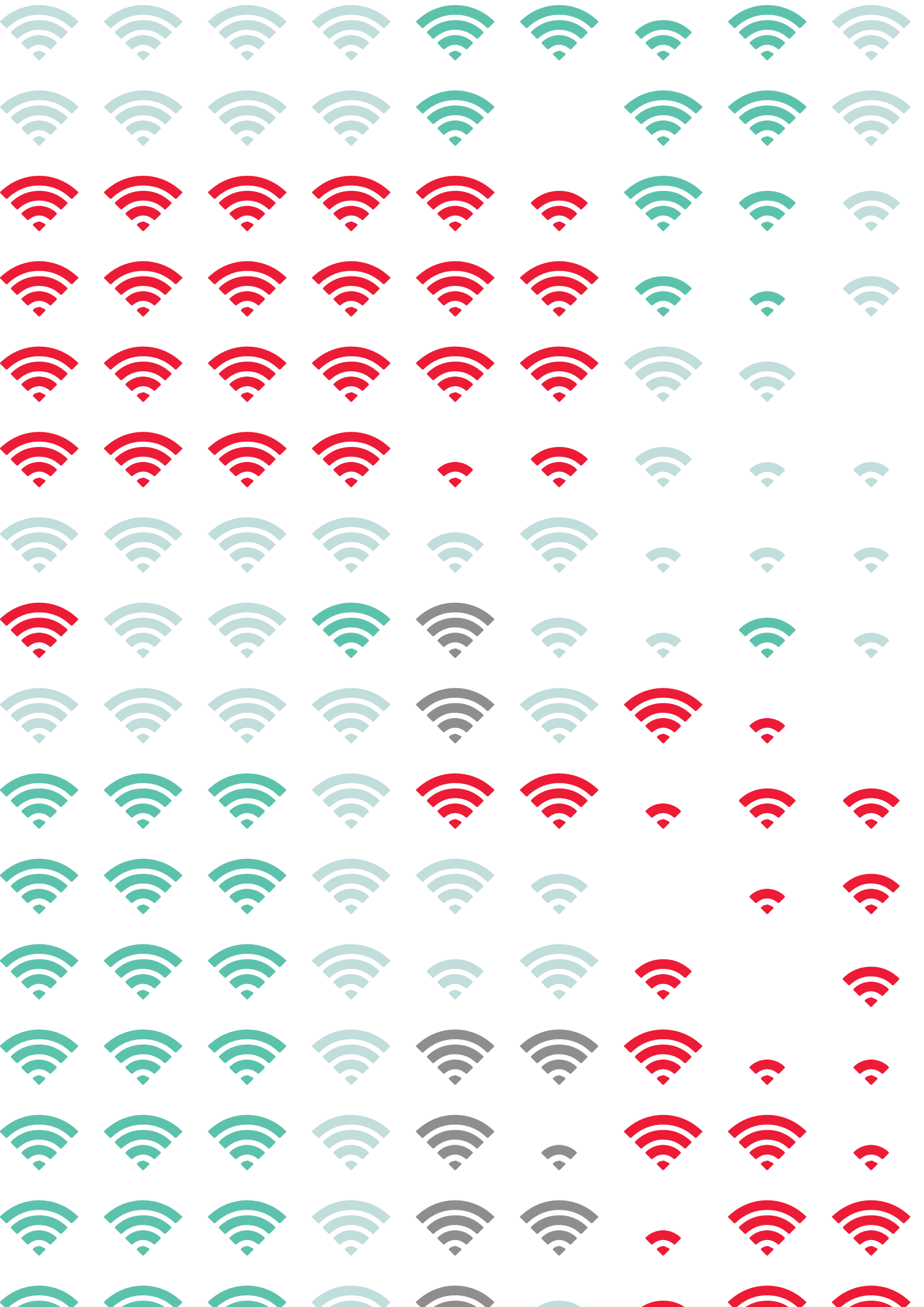
IDB
Inter-American Development Bank

Microsoft

Table of Contents

Table of Contents

Table of Contents



Preface

The imperative of inclusion

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The spread of Covid-19 (CV),[1] declared a pandemic[2] by the World Health Organization (WHO), and the containment measures implemented to limit infections, have forced a large number of people to modify many of their daily activities in order to quarantine at home. Quarantine measures and the sudden need to digitalize many activities, such as work, education and trade, were met with the reality of the Region, which is characterized by the following:

- A large portion of the population is not connected to the Internet and a significant part of the population that is connected faces quality and cost issues.
- Half of the countries in the region do not have Digital Agendas.
- Only 7% of government-related paperwork can be completed online.
- 60% of countries do not possess cybersecurity strategies.
- Only 1 country in the region has implemented the Digital Medical Record.
- Devices to access the internet are limited (smartphone penetration is 69%, while computer penetration is 65.7%).
- 50% of the population lacks access to a bank account or debit card.

During this period of social isolation, those with internet access have been able to continue accessing various services using digital tools. However, it is clear that disparities with respect to connectivity can widen gaps in welfare indicators.

1 1 The World Health Organization regularly updates a map that compiles the main data available on CV cases and deaths in the Americas, which is available at: https://who.maps.arcgis.com/apps/webappviewer/index.html?id=2203b04c3a5f486685a15482a0d97a87&extent=-17277700.8881%2C-1043174.5225%2C-1770156.5897%2C6979655.9663%2C102100

2 *WHO characterizes COVID-19 as a pandemic. Pan American Health Organization (PAHO).* Available at: https://www.paho.org/hq/index.php?option=com_content&view=article&id=15756:who-characterizes-covid-19-as-a-pandemic&Itemid=1926&lang=en

To reduce the digital gap and drive the development of the digital economy, our region will need to overcome the following challenges: **(i)** outdated regulatory frameworks that must evolve by incorporating the various dimensions involved in the development of a digital economy, **(ii)** the need to expand the coverage of Internet services through a greater deployment of infrastructure that provides the entire population with access to quality and affordable services, **(iii)** the improvement of institutional framework and governance models to facilitate public-private coordination with the ultimate goal of guaranteeing the sustainability of solutions, and, of course, **(iv)** the need to develop digital skills that would allow for capitalizing on digital infrastructure and solutions to improve the quality of life of citizens and the efficiency with which governments provide public services.

The enormous production gaps as well as technological and institutional shortcomings undoubtedly stand out as the main obstacles to developing a digital economy in the region and, among other things, the productive development of strategic sectors such as agriculture and rural areas.

Recognition of this issue gave rise to the journey that IICA's General Directorate embarked on with the organization's 34 member countries at the start of 2018, placing technology and innovation at the core of its technical cooperation activities.

This first step in planning an effective response is captured in IICA's new institutional roadmap: its 2018-2022 Medium-Term Plan (MTP), which establishes the need to create a new paradigm regarding the role of rural territories, by abandoning the vision that casts them as generators of poverty and internal migration.

The new focus, IICA's navigational chart for providing technical cooperation, seeks to reposition rural territories as areas that have great potential for progress and prosperity – an ambitious objective that requires solid production linkages, based on access to services, technology and adequate levels of connectivity, while abiding by environmental and social inclusion goals.

As an organization of the Inter-American system specialized in promoting agricultural development and rural well-being, IICA has, in its nearly 80-year history, been able to identify challenges and opportunities and, fundamentally, evolve to better respond to new demands.

IICA's technical cooperation is based on the principles of efficiency and excellence, and its work, in close collaboration with its 34 Member States, is characterized by first listening and understanding their needs and then taking appropriate action to address them.

The institution is committed to achieving results based on a technical cooperation model that is constantly updated, and has been a vehicle for the positive transformation of the agriculture and rural sectors.

Evolving in order to continue this transformation process implies recognizing new and pressing needs.

Against this backdrop, IICA is mobilizing itself to focus its efforts on reducing the multiple gaps that are hindering agricultural transformation in the hemisphere, and therefore need to be corrected.

Similarly, the **Inter-American Development Bank (IDB), cognizant of the impact that the development of digital infrastructure would have on economic and social development in Latin America and the Caribbean, has been supporting countries throughout the region in establishing the necessary framework to develop inclusive and equitable digital agendas.** Efforts in this regard have focused on: **(i)** the deployment of digital infrastructure to improve connectivity in rural areas and public venues, **(ii)** the development of digital skills with the ultimate goal of fostering the adoption and use of various technological solutions and digital services, for which inclusive capacity-building will be crucial, **(iii)** updating of the regulatory framework with the goal of strengthening the digital economy, and **(iv)** the development and strengthening of institutional frameworks and governance models that facilitate interinstitutional coordination and the participation of the private and academic sectors as well as civil society.

According to ECLAC, there is a significant connectivity divide between urban and rural areas. In the region, 67% of urban households are connected to the Internet, compared to just 23% of rural households. In some countries, such as Bolivia, El Salvador, Paraguay and Peru, more than 90% of rural households do not have an internet connection. In countries that are better-off in this regard, such as Chile, Costa Rica and Uruguay, only about half of rural households are connected.

The differences with respect to connectivity generate distinct disadvantages that explain the relatively lower level of well-being in rural territories and the persistent poverty that affects a significant portion of the rural population.

These disadvantages are further compounded by the problems of limited access to markets and productive resources such as water, land and financing. The handicaps reach a point that is truly unacceptable when inadequate physical connectivity and telecommunications isolates these areas from access to knowledge and innovation, which in turn fuels problems that extend far beyond the rural environment.

Within this context, connecting rural households is a crucial measure to address the health and economic crisis. Technologies enable the population to continue participating in economic activities and accessing key services, including work-from-home, distance learning and telemedicine.

This document, which is the result of close collaboration between the IDB, IICA and Microsoft, is in itself a great contribution, by identifying and attempting to quantify the true extent and implications of this limited connectivity.

To this end, an interdisciplinary, collaborative effort allowed us to create the Substantial Rural Connectivity Index (SRCi) and Substantial Urban Connectivity Index (SUCi) to examine the core factors impeding or hindering the large-scale dissemination of improved telecommunications services in Latin America and the Caribbean.

In this vein, the document highlights the social and production implications of connectivity as a driving force for inclusion and productivity, as well as for inclusion and economic support once the health crisis is over.

In practical terms, and specifically in the agriculture sector, reducing gaps in rural connectivity would enhance the transfer of technology, with the aim of raising crop production levels in regions that are severely disadvantaged; expanding access to social services such as education and health; increasing transparency in production chains with fairer prices for producers; and ensuring the decisive inclusion of women and youth in the productive processes, thus driving rural development.

In view of the foregoing, the authors of this document underscore the strategic importance of digital infrastructure as a catalyst for equitable productive development and inclusion.

They also reiterate their commitment to continuing to explore this issue of key importance for the digital development of our societies and economies, confident that expanding rural connectivity will contribute directly to sustainable development.

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3 **Acknowledgements:** The authors wish to thank Mariana Alfonso, Maldiery Altagracia, Elena Arias Ortiz, Luciano Braverman, Antonio García Zaballos, Guido Nejamkis, Marcelo Pérez Alfaro, Eugenia Salazar, Eduardo Trigo, Federico Villareal, Jorge Werthein and Pablo Zoido Lobaton for their critical reading and contributions to this document.
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1 EXECUTIVE SUMMARY [4]

The world is experiencing a huge transformation in the field of information and communication, driven by an unprecedented technological revolution.

Within this context, digitization affords endless possibilities that impact various areas of human activity that are increasingly dependent on information and communication technology.

These technologies generate opportunities to advance development and boost knowledge creation. Simultaneously, they present challenges that must be addressed to avoid widening the gaps that exist in advanced economies, between urban and rural areas, and between the different productive sectors, and to move towards democratizing their access and use.

Currently, the Covid-19 crisis requires us to undertake some initiatives that will help to reduce the digital gap in Latin America and the Caribbean.

This situation leads us to consider the potential of promoting connectivity at this time, and the necessary downsizing of the problem in terms of obstacles that prevent it from reaching rural areas.

4 The current study condenses the joint work between IICA, IDB and Microsoft, with the aim of producing a document that compiles and produces information on the state of rural connectivity in LAC. Given the lack of official statistical data available, an effort was made to compile different sources of information as well as create instruments and an index that facilitates the creation of an approximation of the problem at hand. Likewise, the study was complemented by a series of 39 semi-structured interviews applied to different profiles within the countries, with the aim of advancing knowledge on the state of affairs regarding rural connectivity. Annex IV of the document provides a detailed list of the interviewees. The information used in preparing this document was information available as at 24 September 2020.

Promoting connectivity therefore is an indispensable priority to facilitate the development of all productive, social and communal aspects of life in rural areas. Technological transformations and their use in rural-area production, and the resulting economic benefits they generate, require supportive policies and initiatives to bridge the rural connectivity gap.

Technological change in rural areas has helped to increase crop productivity levels in the most underdeveloped regions[5]; and thus, connectivity has great potential to contribute to price transparency in the production chain, for example, and to facilitate the inclusion of women and youth in production processes. In short, improved connectivity could offset the vicious circle that is currently creating insecurity, poverty and migration.

This document advances towards proposing a method of calculation to identify urban-rural connectivity gaps as one of the basic components of the digital divide; as such, it represents a starting point for laying out the actions necessary for expanding quality service for greater digital equity among people and between rural areas and cities. Furthermore, it brings together information that aims to measure the extent of these gaps, using reports developed for the region and taking into consideration the diverse data sources on households and persons.

The Substantial Rural Connectivity Index (SRCi) and Substantial Urban Connectivity Index (SUCi) were formed to obtain information between countries and between urban and rural areas; these indices would measure the quality of connectivity, based on information available in official statistics and on other existing indices (Broadband Index of the Inter-American Development Bank, IDB; the Mobile Connectivity Index, Group Special Mobile Association (GSMA); and the General Connectivity Index, used by the International Telecommunications Union (ITU).

Based on the study's conclusion, a total of approximately 77 million rural dwellers across 24 Latin American and Caribbean countries do not have connectivity at the necessary minimum standards of quality, according to the concept of Significant Connectivity, as shared in this study. Seventy-one percent of the urban population has significant connectivity, while for rural populations the percentage drops to 36.8%, a gap of 34 percentage points. It is worth noting that not only is it crucial to have connectivity, but that connectivity should be of sufficient quality to provide educational, medical, or any other type of public service. In short, the goal of connectivity is just as important as that of quality.

5 The productivity gap between countries within LAC is 10:1 (IDB, 2016). https://publications.iadb.org/publications/spanish/document/Innovaci%C3%B3n-y-productividad-en-las-empresas-en-Am%C3%A9rica-Latina-y-el-Caribe-El-motor-del-desarrollo-econ%C3%B3mico-(Resumen).pdf

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

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

- **Limited information** restricts not only the ability to measure existing gaps in rural connectivity, but also the possibility of creating a situation that facilitates evidence-based formulation of related public policies.

- There are a series of **factors that are impeding increased connectivity** and its introduction to more remote and far-flung areas.

- 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; inaccessibility of the most remote areas, whether due to geography or violence in the region; lack of affordability to access devices and the huge cost of mobile phone services and internet for rural residents; the existence of obsolete regulatory frameworks; and the absence of infrastructure maps with information on telecommunication networks, which would allow us to identify areas without coverage and potentially connect them quickly.

Overcoming the rural connectivity gap requires both coherent public policies and private sector participation to resolve the current state of affairs. Regional countries continue to require sizeable investments in infrastructure; there is also a need to generate new mechanisms and regulations to drive private sector investment and thus promote the arrival of quality connectivity in rural areas.

Women represent a group that experiences an aggregation of gaps. According to GSMA, in a study of five regional countries (Argentina, Brazil, Dominican Republic, Guatemala and Mexico), 86% of women own a cellular phone and 31 million women are still not connected. There is heterogeneity between countries, some of which (such as Argentina and Brazil) have almost achieved gender equality with respect to mobile phone ownership since 2010, while others (such as Guatemala and Peru) are lagging behind in this regard. On the other hand, in countries like Chile and Uruguay, the female-to-male ratio tends to favor the latter group (IICA, University of Oxford, IDB and IFAD, 2020). Even though there is no specific rural sector data for the region as a whole, estimates exist that suggest that being a woman, living in rural areas, being illiterate, having a low level of schooling and being older than 45 years are characteristics that are largely associated with disconnection. Women's access to a mobile phone and its use under equitable conditions is a goal that will yield opportunities for development and well-being.

In Latin America, a mere 33% of schools have access to broadband or sufficient internet speed; this is less than half the reported average in OECD countries (IDB, 2020). In the case of rural areas, in 8 out of 10 regional countries analyzed for the availability of information, less than 15% of rural schools have access to sufficient broadband or internet speed (CIMA-IDB, 2020).

The study reveals three alternative models that are present in the rural areas where coverage currently reaches. These are public-private partnerships, endogenous community-based alternatives, and collaborative frameworks between the public sector and international cooperation. With respect to the endogenous alternatives, there is visibly a significant presence of local small-scale providers offering connectivity in rural areas, and in many cases, these are under-registered in official statistics.

Correcting rural connectivity gaps in the immediate future is a core challenge, considering that the recession caused by the COVID-19 pandemic is the largest pandemic recorded in the history of Latin America and the Caribbean. It is projected that the 2020 Gross Domestic Product will collapse and will contract between 7.2% (World Bank) and 9.1% (ECLAC). This crisis, inherently unequal, will increase the number of persons below the poverty line from 185 to 231 million, while those in extreme poverty will move from 68 to 96 million (around 15% of

the population, according to ECLAC). This implies a considerable challenge for rurality, a territorial space with enormous importance for production and development that requires innovation and technology for regional economies to add value to their products and tackle the food problem.

Improving and investing in connectivity is an approach that will favor countries' economic growth. Evidence exists that shows a positive link between infrastructure use and Gross Domestic Product (GDP). In developed countries, the addition of 10 broadband lines for every 100 persons will increase GDP by 1.38%, and in developing countries by 1.21 percentage points. On the other hand, the impact of mobile internet access is estimated at 0.11% per year for developing countries, and 0.20% for developed countries[6].

6 Various authors cited by Koutroumpis, Pantelis (2019). What is the impact of investing in connectivity? CDC Investment works. Available at : https://assets.cdcgroup.com/wp-content/uploads/2019/08/28153456/The-Impact-of-Connectivity_28082019.pdf

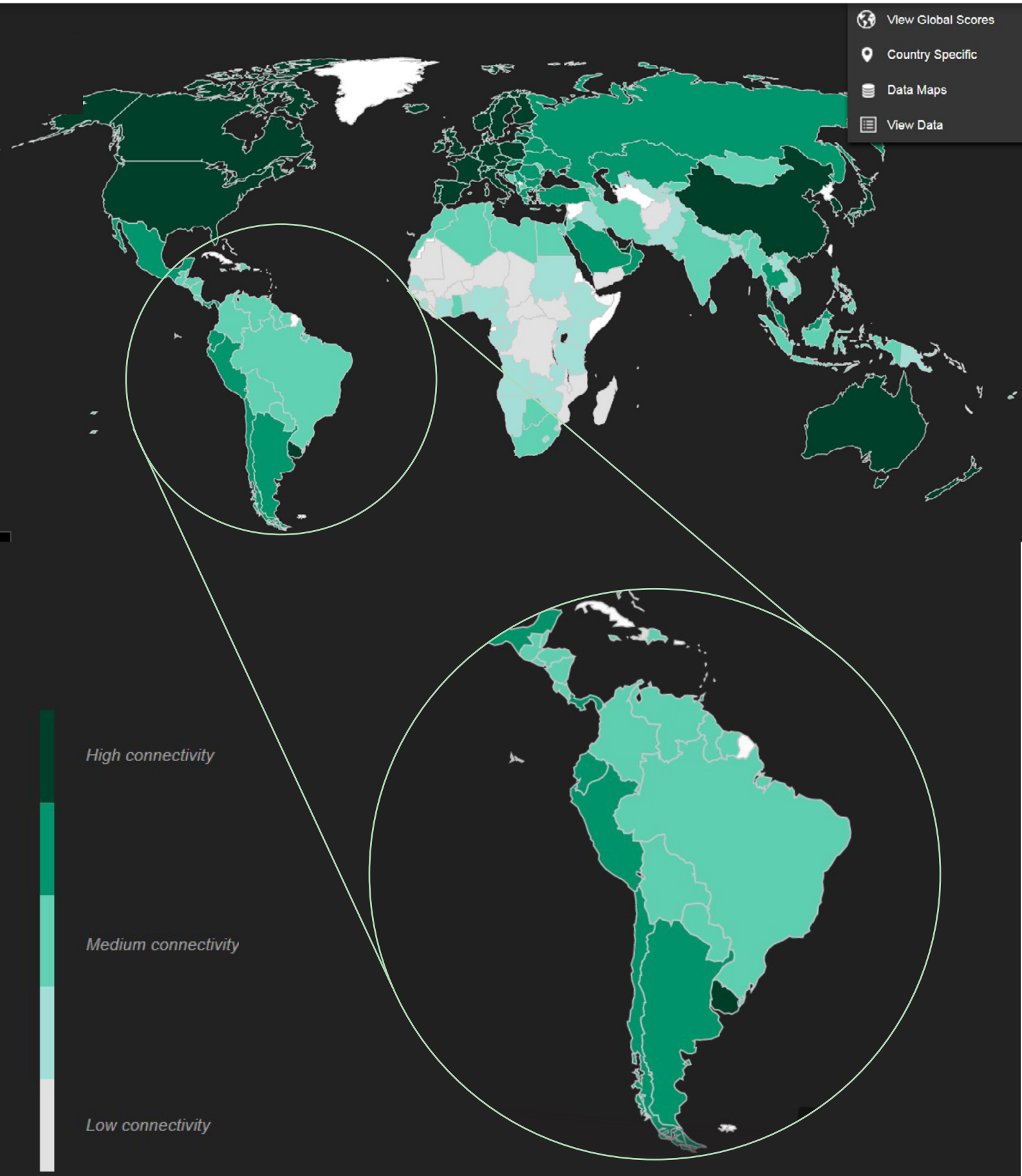
2 The Rural Significant Connectivity Index (RSCI) for Latin America and the Caribbean

Connectivity is a factor of growing importance for sustainable development that permeates all human activities, with significant impacts on economic growth patterns, social inclusion and environmental sustainability (Zaballos and Iglesias, 2019).

In general, the collection of connectivity data in Latin America and the Caribbean is done at the national level without differentiating between urban and rural areas. To date, several indexes have been developed to analyze the state 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 IDB's Broadband Development Index (BDI) and the Global System for Mobile Communications (GSMA) Mobile Connectivity Index (MCI)

https://www.mobileconnectivityindex.com

Mobile Connectivity Index GSMA



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 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. This made it possible to 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 for greater digital equity among people and among geographic areas.

2.1 Conceptual Framework for Significance of 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 also considering 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 an Accessible Internet (A4AI)[7] brings together the necessary elements to address a basic analysis of the quality of connectivity that not only considers whether a person has access to the Internet, but also the regularity and quality of the connection they have. This concept of Significant Connectivity is based on 4 pillars or essential 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 device:** Verifies that people have the necessary devices to connect when necessary.

3. **Sufficient data:** Verifies that 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 for meeting the demand.

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

These standards establish an appropriate approach to connectivity that make it possible to measure people's actual ability to access the Internet and make full use of it, with the appropriate frequency, speed and devices for meeting the demands of the moment.

2.2 Estimation of the Significant Connectivity Index

In order to obtain comparative information between countries and between urban and rural areas, the **Rural Significant Connectivity Index (ICSr)** and the **Urban Significant Connectivity Index (ICSu)** were estimated, by combining the following indicators for each of the features identified for Significant Connectivity:

Regular Use of the Internet

Indicator: Percentage of population with daily Internet use

Source: National Information and Communication Technology (ICT) Statistics available from ongoing annual household surveys

Suitable devices

Indicator: Average percentage of 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 population with access to fixed broadband.

Source: National ICT Statistics obtained from ongoing household surveys.

Sufficient speed

Indicator: Percentage of population with 4G technology coverage

Source: Taken from indicator 9.c.1 of the Sustainable Development Goals (SDG)[8].

8 UNDESA Statistics Division - Indicator 9.c.1 Objetivos de Desarrollo Sostenible. En http://www.sdg.org/search?categories=-goal%209

This last indicator of 4G technology coverage is available only on a national and urban scale at the time of this study, but not for rural areas. Therefore, an adjustment factor was used to obtain rural 4G coverage.

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 signal 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[9] (GHSL) developed by the European Union's Joint Research Commission (JRC). The GHSL classifies the world territory, in a grid with cells of 1 km2, according to the population density of each cell and 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 not inhabited or with very dispersed populations.

The number and percentage of rural 4G antennas was obtained from the LDC, RUR and uninhabited areas. With 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 Rural Significant Connectivity Index.

The values for each indicator were adjusted to a common basis of comparison to correspond to percentages with respect to populations in rural or urban areas.

Countries included in the analysis: The analysis was conducted for seven countries (Bolivia, Brazil, Costa Rica, Ecuador, Honduras, Paraguay, Peru) that had, at the time of this study, available data for rural areas with the required emphasis on quality aspects that are part of the concept of significant connectivity.

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

As will be discussed in section 3.2 on the issues of connectivity access, the available information has limitations and gaps in addressing the issue of significant rural connectivity in all the countries of the region, and it is therefore an objective of this study to propose, for the selected countries, a starting point for making extrapolations to the rest of the countries of Latin America and the Caribbean, and for extending the analysis in the near future.

With respect to the period of analysis, the temporary nature of the available information made it possible to estimate the Index of Significant Rural Connectivity as of 2017 and, consequently, the corresponding indices at the national and urban levels.

2.3 Rural (ICSr) and Urban (ICSu) Significant Connectivity Index

The Significant Connectivity Index takes values between 0 and 1 and its calculation is based on a simple average of 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 connectivity 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. Weighted averages are calculated with and without Brazil due to the large size of the rural, urban and national populations of that country, which in 2017 represented, respectively, 54, 76 and 72% of the total sample.

Table 1 presents the values of the indices at the rural, urban and national levels, as well as the urban-rural gap of significant connectivity.

For the sample of seven Latin American and Caribbean countries, the urban-rural connectivity gap averages 34.2 percentage points, with variations ranging from 26.1 percentage points in Paraguay, to 31.2 percentage points in Bolivia. The differences in gaps hide even more heterogeneous levels of significant rural connectivity among the countries in the sample. In ascending order, Honduras, Peru and Bolivia obtain relatively low scores for significant rural connectivity (from 19.6 to 21.1%; identified in red in Graph 1), Ecuador and Paraguay obtain medium scores (from 29.5% to 30.5%; in yellow) and Brazil and Costa Rica are positioned in the region with higher percentages of significant rural connectivity (from 43.2 to 46.9%; in green).

TABLE 1. RURAL, URBAN AND GENERAL SIGNIFICANT CONNECTIVITY INDEXES (ICSR, ICSU AND ICG) AND URBAN-RURAL GAP (THE MINIMUM SCORE IS 0 AND THE MAXIMUM IS 1). SELECTED COUNTRIES, YEAR 2017

Countries	ICSr	ICSu	ICg	Urban rural gap (p.p)	Urban rural gap (ratio)
Bolivia	0,211	0,523	0,495	0,312	2,480
Brasil	0,469	0,763	0,773	0,294	1,627
Costa Rica	0,432	0,717	0,704	0,285	1,661
Ecuador	0,305	0,591	0,574	0,286	1,939
Honduras	0,196	0,462	0,367	0,267	2,365
Paraguay	0,295	0,556	0,494	0,261	1,887
Peru	0,207	0,514	0,467	0,306	2,479
Weighted average	0,368	0,710	0,696	0,342	1,931
Weighted average excluding Brazil	0,249	0,542	0,498	0,292	2,172

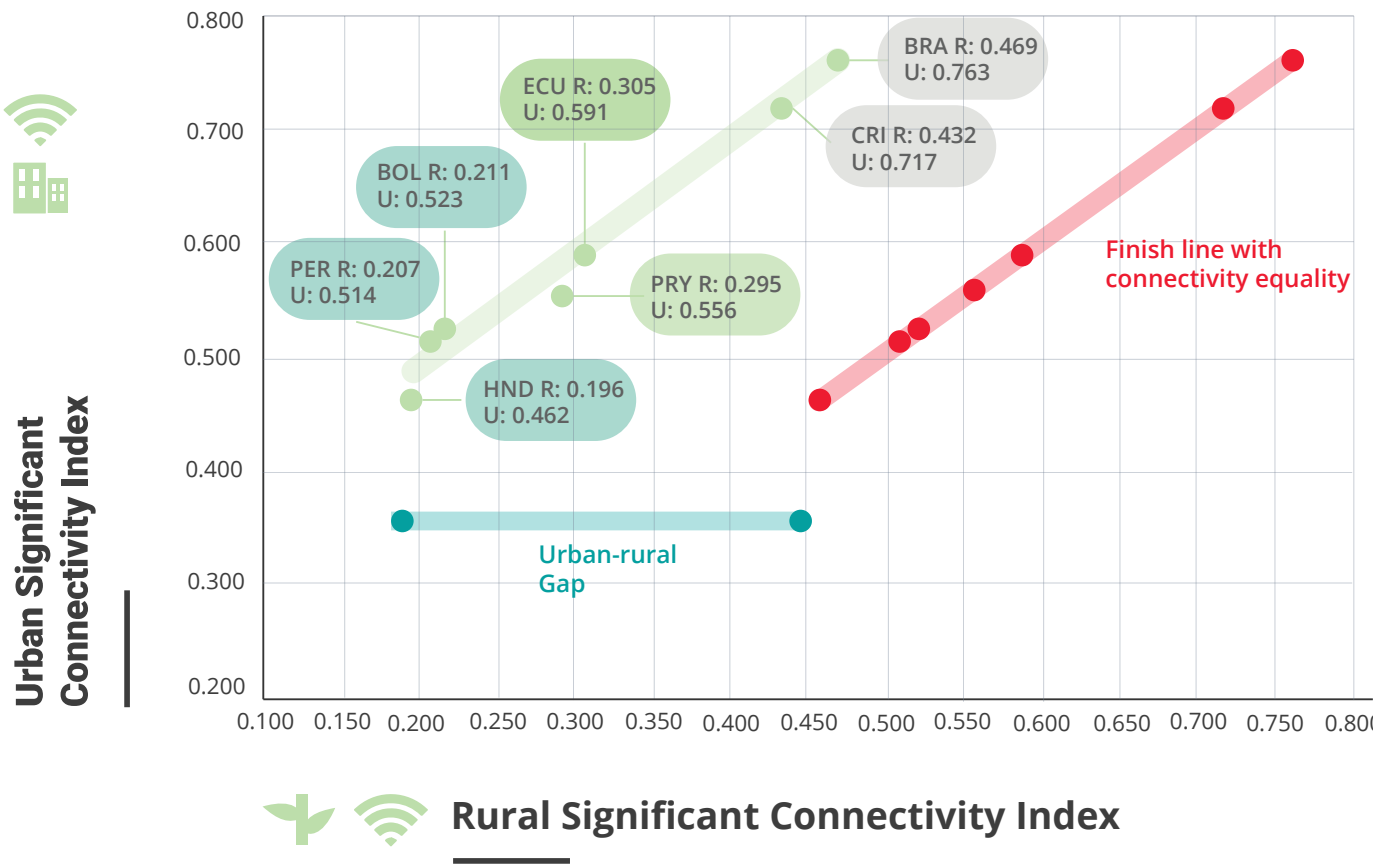
Source: IICA, BID, Microsoft; 2020.

Levels of significant rural and urban connectivity are highly correlated (Table 1 and Graph 1), that is, when connectivity is low or high at the urban level, it is also the same at the rural level, but even so, the differences between countries are notable. **On average for the seven countries, the percentage of significant connectivity is twice as high in urban areas as in rural areas, with gaps ranging from 2.5 times in Bolivia and Peru to 1.6 - 1.7 times in Brazil and Costa Rica.**

The data reveal that an alarming number of rural dwellers do not have access to quality connectivity, according to the standards of significant connectivity. **The average percentage of people without access to significant connectivity is 63%, but if Brazil is excluded because of its higher relative population weight, the average rises to 75%. As we will can observe below, this would mean that more than 77 million rural inhabitants in Latin America and the Caribbean (24 countries) do not have access to quality connectivity services.**

Graph 1 reflects the long road ahead for countries to at least equal the significant connectivity of rural populations to the same levels as urban dwellers. Even so, it would not be enough because an average of 29% of the urban population, or 46% if Brazil is excluded, does not have access to quality services. Over time, and as a result of the implementation of effective and differentiated policies, we will see a cluster of countries in the upper right-hand corner of Graph 1 as an indication that all countries, both in rural and urban areas, will have reached levels close to 100% penetration of connectivity services with minimum quality standards. The aim is to reduce existing gaps by eliminating territorial and interpersonal imbalances in order to effectively take advantage of the opportunities offered by development in general and, in particular, by the production and exchange of material goods and digital services.

GRAPH 1. RURAL, URBAN AND GENERAL SIGNIFICANT CONNECTIVITY INDEXES (ICSR, ICSU AND ICG) AND URBAN-RURAL GAP (THE MINIMUM SCORE IS 0 AND THE MAXIMUM IS 1). SELECTED COUNTRIES, YEAR 2017



Source: IICA, BID, Microsoft; 2020.

2.4 Analysis of Results according to Dimensions of the Significant Rural Connectivity Index

A look at the pillars or dimensions of significant rural connectivity (Table 2) reveals that the most significant lags in connectivity are due to the low frequency of internet use with an average of only 10% of the rural population (or 21% if Brazil is excluded) using the internet daily. Internet use is particularly low in Honduras, Peru and Bolivia. Next in importance is the low broadband penetration with an average of 16.6% of the rural population accessing this service. The countries with the lowest access are Bolivia, Peru, Paraguay and Honduras. The use of equipment (mainly smart phones) and access to 4G technologies show more favorable rates, with average penetration levels in rural populations of 71% and 37%, respectively (48% and 15%, respectively, if Brazil is excluded from the average). Brazil's influence on average access to 4G technologies is noteworthy, concealing the fact that, for the rest of the countries, about 85% of the rural population does not have access to adequate internet speed.

TABLE 2. PARTIAL INDICATORS OF THE RURAL SIGNIFICANT CONNECTIVITY INDEX. SELECTED COUNTRIES, 2017

Countries	Daily internet use	Equipment	Broad-band	4G Technology	ICSr
Brazil	0,730	0,460	0,500	0,185	0,469
Bolivia	0,149	0,464	0,030	0,200	0,211
Costa Rica	0,600	0,621	0,249	0,256	0,432
Ecuador	0,296	0,406	0,409	0,108	0,305
Honduras	0,055	0,447	0,110	0,170	0,196
Paraguay	0,400	0,539	0,080	0,160	0,295
Peru	0,134	0,513	0,068	0,114	0,207
Weighted average	0,100	0,712	0,166	0,366	0,366
Weighted average excluding Brazil	0,212	0,475	0,165	0,145	0,249

Source: IICA, BID, Microsoft; 2020.

The results according to dimensions of the index of significant rural connectivity suggest that the challenges of addressing the problem of connectivity in this area differ from country to country. Some countries register high levels of daily Internet use (Brazil and Costa Rica), but have lower levels of 4G Rural coverage. Similarly, the availability of equipment, in general, is relatively high (mainly mobile equipment) but access to fixed broadband differs significantly between countries, from 3% penetration in Bolivia to 50% in Brazil. The data are evidence of the complexity of the problem, which requires the design of specific instruments and approaches that focus on the most limiting factors.

An analysis of the linkages between the indicators that make up the Significant Rural Connectivity Index allowed for determining its main drivers. The combination of several methods, such as the correlation matrix, ordinary least squares (OLS) between pairs of variables, and the principal component analysis (see Annex I), allows for concluding, in general terms, that:

1. **daily internet use** in rural areas of the seven countries is strongly associated with greater broadband availability rather than the availability of 4G technologies

2. **lower** broadband penetration in rural territories is closely tied to **greater** availability of mobile devices, or vice versa; and

3. the **higher** the broadband penetration, the **greater** the use of personal computers.

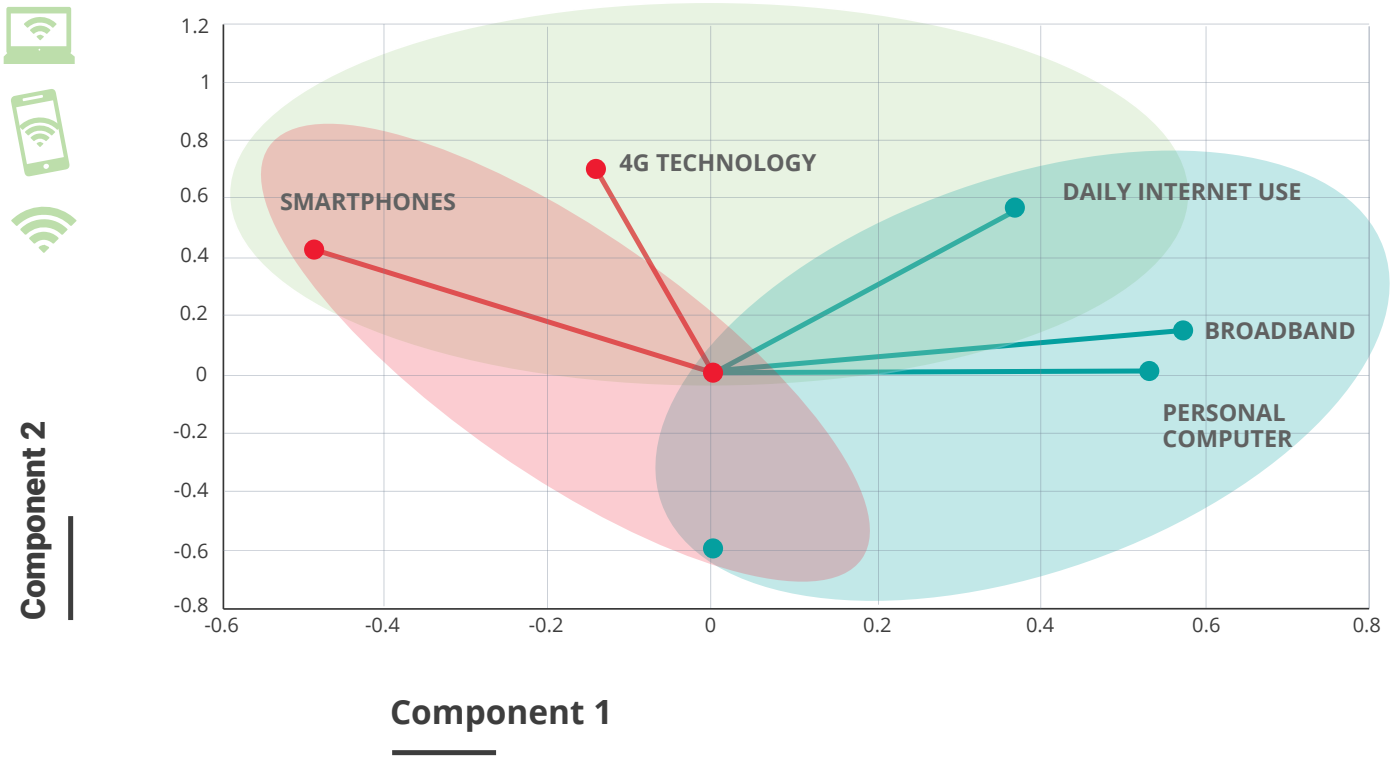
Based on the principal component analysis (see Annex I), two courses of action for improving rural connectivity were identified, which are expressed by two groups of variables that explain 88% of the variability in the data for the seven countries included in the sample (Graph 2).

The first component, which explains 53% of the data variability, shows that increased daily internet use occurs due toa greater availability of and access to broadband, as well as a higher percentage of rural dwellers who own a personal computer (as is the case in Brazil and Costa Rica). Conversely, lower internet use is associated with low broadband penetration and a low percentage of rural dwellers who own a personal computer (as is the case in Bolivia, Honduras and Peru).

These variables, in turn, are negatively associated with the variable of access to smartphones. In other words, rural dwellers who do not own a personal computer or who lack access to broadband, access the internet using smartphones.

The second component, which represents 35% of the data variability, shows that daily internet use increases as a result of greater availability of 4G technologies and increased access to smartphones. The opposite also holds true; that is, daily internet use declinesalongside decreased availability of 4G technologies and more limited access to mobile phones. There is little association between this componentof linkages between variables and the first component, given that smartphones and 4G technologies represent an alternative to the lack of or limited broadband penetration and low level of access to personal computers (Graph 2 and Annex I).

GRAPH 2. CORRELATION BETWEEN THE INDICATORS OF THE SIGNIFICANT RURAL CONNECTIVITY INDEX



Source: Prepared by the author based on the principal component method (Annex I). IICA, BID, Microsoft; 2020.

2.5 Extrapolation of results to other Latin American and Caribbean countries

This study was conducted for seven countries in Latin America and the Caribbean due to the absence of data disaggregated by rural and urban areas for the rest of the countries. However, it is possible to assume that there is a high correlation or linkage between the index of significant rural connectivity estimated in this study and other indices available in the literature.

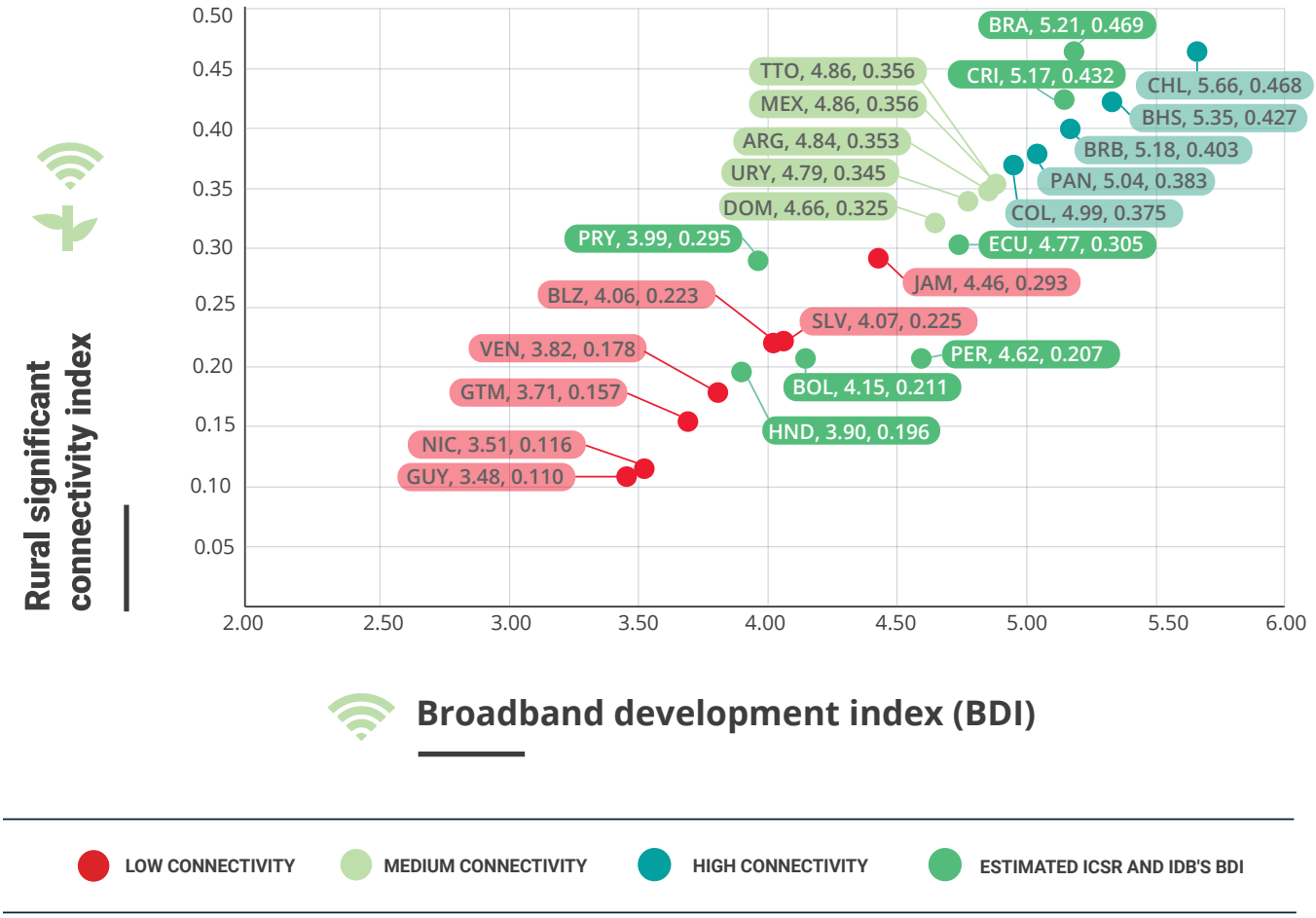
For example, the correlation between the Rural Significant Connectivity Index and the Broadband Development Index published by the IDB is 82%. This means that, based on this high correlation between the indices, this measurement can be extrapolated to the rest of the countries of Latin America and the Caribbean.

The high correlation between these two indices should not be surprising because the indicators included in the infrastructure dimension of the BDI index are similar or directly linked to indicators used to calculate the SIRI, such as 4G coverage, households with personal computers, households with access to the internet, access to broadband, and internet speed. Other indicators used in the construction of the Broadband Development Index are indirectly linked because they clearly have an effect on significant connectivity. For example, the degree of progress made by countries in implementing public policies and defining regulations that promote information and communication technologies, spending on research and development, and broadband development will clearly have a significant impact on levels of connectivity at both the urban and rural levels. On the other hand, the development and use of applications and digital training, as well as the level of penetration of digital technologies in businesses, communities, governments and schools, will undoubtedly have significant effects on quality rural connectivity.

Graph 3 shows in blue the high and significant correlation between the IDB's Broadband Development Index and the Rural Significant Connectivity Index for the seven countries included in this study. Based on a simple extrapolation of the results to the rest of the countries of Latin America and the Caribbean (17 countries), a logarithmic adjustment formula was used. Suriname and Haiti were excluded from the analysis because they presented extreme values, so the graph shows the results for 24 countries in the region, which in 2017 accounted for 116 million rural dwellers out of a total of 124 million for Latin America and the Caribbean. In other words, this extrapolated sample is representative of 93% of the region's rural population[10].

10 https://databank.worldbank.org/source/world-development-indicators

GRAPH 3. CORRELATION BETWEEN THE RURAL SIGNIFICANT CONNECTIVITY INDEX (RSCI) AND THE IDB'S BROADBAND DEVELOPMENT INDEX (BDI), 2018 VERSION



Source: IICA, BID, Microsoft; 2020.

This extrapolation of the results enables the identification of at least three clusters of countries, marked in the graph in red, yellow and green:

CLUSTER WITH LOW SIGNIFICANT RURAL CONNECTIVITY: Jamaica, El Salvador, Belize, Bolivia, Peru, Honduras, Venezuela, Guatemala, Nicaragua and Guyana. This group of 10 (out of 24) countries accounts for 28% of the rural population in the sample of 24 countries or 32.5 million people. The index for this group of countries ranges from 29% (Jamaica) to 11% (Guyana), which means that between 71 and 89% of the rural population in these countries does not have access to connectivity services of sufficient quality. Note that the connectivity indices for Bolivia, Peru and Honduras are actual estimates from this study, while the indices for the rest of the countries are extrapolations according to the methodology explained above.

MEDIUM-LEVEL CLUSTER WITH SIGNIFICANT RURAL CONNECTIVITY: Trinidad and Tobago, Mexico, Argentina, Uruguay, Dominican Republic, Ecuador and Paraguay. This group of seven countries represents 35% of the rural population of the sample of countries or the equivalent of 40 million people. The index of rural Significant Connectivity for this group varies from 35.6 (Trinidad and Tobago) to 29.5 (Paraguay), which means that between 64 and 71 percent of the rural population in this group of countries does not have access to connectivity services with minimum quality standards.

HIGH LEVEL CLUSTER OF SIGNIFICANT RURAL CONNECTIVITY: Brazil, Chile, Costa Rica, Bahamas, Barbados, Panama and Colombia. Finally, this group of seven countries represents 37% of the rural population in the sample of 24 countries, or the equivalent of 43 million people. The index of rural Significant Connectivity for this group varies from 46.9 (Brazil) to 37.5 (Colombia), which means that between 53 and 62% of this population group does not have access to significant connectivity services.

2.6 Opportunities, Challenges and Decision-making Issues

In summary, approximately **77 million rural dwellers in 24 countries do not have access to connectivity with the minimum quality standards required according to the concept of Significant Connectivity shared in this study.** Much research remains to be done in order to deepen the analysis and extend it to more countries in the region, taking into account that differentiation by urban and rural areas is strategic and necessary. It will undoubtedly help to undertake public and private actions, at the level of rural communities and organizations, multilateral credit agencies and international support and investment institutions, local governments, academia, among many other actors. Having complete, open and available information and data in an appropriate and timely manner is key to the comprehensive management of this challenge. Direct coordination and the generation of agreements with national statistics offices, universities, research institutes and observatories is therefore essential for the recovery of better data on the rural digital divide.

Improving connectivity and closing the digital gaps between people and between rural and urban territories should hold great appeal and be a priority for policy design if their benefits are recognized and evidenced. Improved digital services and connectivity will save time and money, make production processes and public and private services more efficient, generate employment, improve productivity

and the quality of products and services, and promote inclusive education and expand the possibilities for knowledge and participation in global culture[11], which are key factors in achieving sustainable development of the region's agricultural and food systems[12].

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 (see ECLAC/FAO/IICA, 2019). In addition to the gaps described in detail in the report, there is the gap that may form the basis for others: 71% of the population has access to significant connectivity services, while in rural populations the percentage drops to 36.8%, a gap of 34 percentage points. Correcting these gaps in the immediate future is a major challenge, given that the recession caused by the COVID-19 pandemic is, as will be noted later on in this document, the largest in the history of Latin America and the Caribbean.

11 https://publications.iadb.org/publications/spanish/document/Informe_anual_del_%C3%8Dndice_de_Desarrollo_de_la_Banda_Ancha_en_Am%C3%A9rica_Latina_y_el_Caribe_es.pdf

12 agrirural.org

AFP Pablo Porciuncula

3 The state of connectivity in Latin America and the Caribbean and the re-dimensioning of the problem of access limits in rural areas

Currently, the world is undergoing a transformation of great magnitude in the field of information and communications driven by a technological revolution without precedent. In this scenario, digitization raises endless possibilities for economic, social, cultural, environmental, health, scientificand educational development as well as resilience to climate change, so much so that the spectrum of human activities is affected by the profound changes taking place.

Furthermore, available technologies represent not only more advanced tools and instruments, but they also radically modify the very activities they are used to carry out. In short, it is not merely about the existence of new artifacts, but that these objects possess the ability to modify productive processes, process data at a large-scale, drive the creation of knowledge-sharing, foster previously unknown forms of artificial intelligence and democratize access to resources and services, among other changes.

3.1 Latin America and the Caribbean advance in developing a digital ecosystem, but have tasks pending

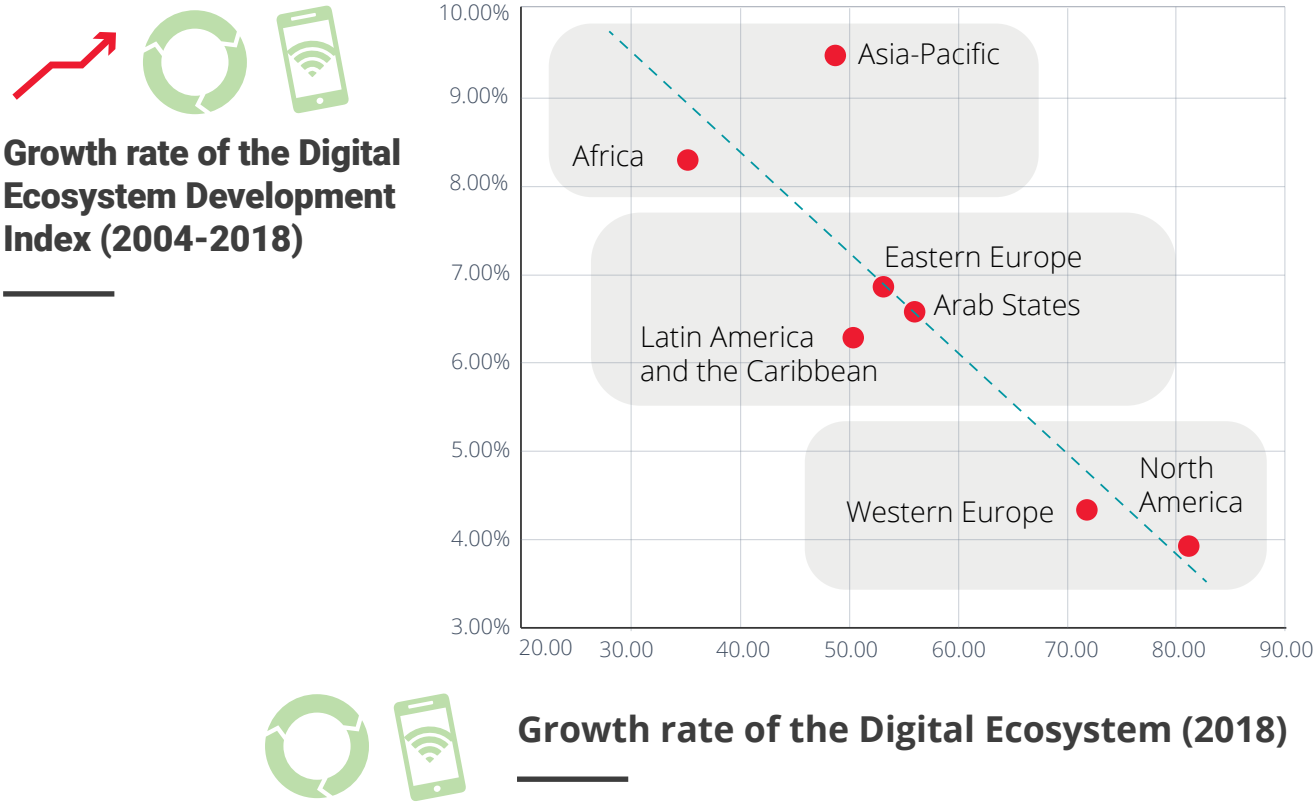
According to the CAF Digital Ecosystem Observatory (2020), Latin America and the Caribbean are currently at an intermediate level of development compared with other regions in the world in terms of development of a digital ecosystem: "with an index of 49.92[13] (on a scale of 0 to 100), the region is in a more advanced position compared to Africa (35.05) and Asia and the Pacific (49.16). However, despite

13 For more information on the calculation of the index, see: CAF Digital Ecosystem Observatory (2020)

significant advances in the development of its digital ecosystem over the last fifteen years, Latin America and the Caribbean still show a lag behind Western Europe (with an index of 71.06), North America (80.85), Eastern Europe (52.90) and Arab States (55.54)." (CAF, 2020: 13)

In addition to the lag in the development of the digital ecosystem compared to other more developed regions, it has an annual index growth rate inferior to other regions. "In fact, Latin America and the Caribbean belong to an emerging group of countries whose digitization presents a moderate annual growth rate" (CAF, 2020:13). During the period 2004-2018 (see Graph 4), the region registered an annual rate of 6.21%, behind that of Eastern Europe (6.89%), Africa (8.27%), and Asia and the Pacific (8.27%). According to this index, Latin America and the Caribbean could register a more accelerated rate as a function of its level of digital ecosystem development, so this growth rate is still below its potential.

GRAPH 4. DIGITAL ECOSYSTEM DEVELOPMENT INDEX (2018) VS. GROWTH RATE (2004-18)



Source: Telecom Advisory Services Analysis, cited by CAF, 2020.

3.2 The problem of connectivity access

When it comes to Latin America and the Caribbean (henceforth LAC), the presence of new information and communication technologies takes on particular characteristics since the region is the most disparate worldwide. Because of this, it is supremely important to address existing gaps when confronting the challenge and opportunities that digitization brings.

Gaps in accessibility deepen inequality in terms of knowledge links, exercising citizenship to the fullest, and possibilities of economic integration. The CAF report posits that disconnection curtails access to information that is in the public interest, the completion of online transactions and procedures, and also overrides possibilities of consuming and producing content.

In the region, 32% of the Latin American population (244 million of its inhabitants) does not have access to Internet services (CAF, 2020). This figure fails to reveal another regional problem: the sizeable imbalance between and within the countries, where economies coexist with levels of household internet penetration less than 40% (see Table 3).

Were we to consider factors related to the quality of service, the gap is even wider. Per ECLAC statistics (2018), of the two countries best placed in terms of connectivity within the region (Chile and Uruguay), only 15% of its connections had speeds greater than 15 Mbps. At the other end of the spectrum, we could mention Bolivia's case, a country with one of the region's lowest connectivity percentages[14].

14 Bolivia recently began installing its own connection to the global fiber optic network that covers almost 20,500 kilometers. This will enable the country to reduce the cost of internet access (which is currently the most expensive in South America) and to extend coverage to other regions and lower income sectors. See complete information, 09/04/20 DiarioInfobae https://www.infobae.com/america/agencias/2020/09/05/bolivia-inaugura-su-propia-conexion-a-red-de-fibra-optica/

TABLE 3. INTERNET PENETRATION IN HOUSEHOLDS IN LATIN AMERICA AND THE CARIBBEAN (2018-2020) (*)

	2018	2019	2020
Argentina	77.78%	81.42%	85.24%
Barbados	84.03%	86.37%	88.77%
Bolivia	48.22%	53.04%	58.34%
Brazil	74.22%	81.64%	89.80%
Chile	82.33%	82.33%	82.33%
Colombia	66.68%	71.40%	76.47%
Costa Rica	74.09%	76.88%	79.79%
Dominican Republic	74.82%	82.31%	90.54%
Ecuador	60.67%	64.27%	68.09%
El Salvador	37.20%	40.92%	45.02%
Guatemala	71.50%	78.65%	86.52%
Honduras	34.06%	36.60%	39.33%
Jamaica	60.58%	66.64%	73.30%
Mexico	65.77%	67.75%	69.79%
Panama	62.01%	66.45%	71.20%
Paraguay	64.99%	69.16%	73.60%
Peru	52.54%	56.65%	61.08%
Trinidad & Tobago	81.58%	86.06%	90.79%
Uruguay	70.21%	72.20%	74.24%
Venezuela	79.20%	87.12%	95.83%
Latin America (weighted average)	68.66%	73.52%	78.78%
OECD (weighted average)	83.93%	86.07%	88.33%

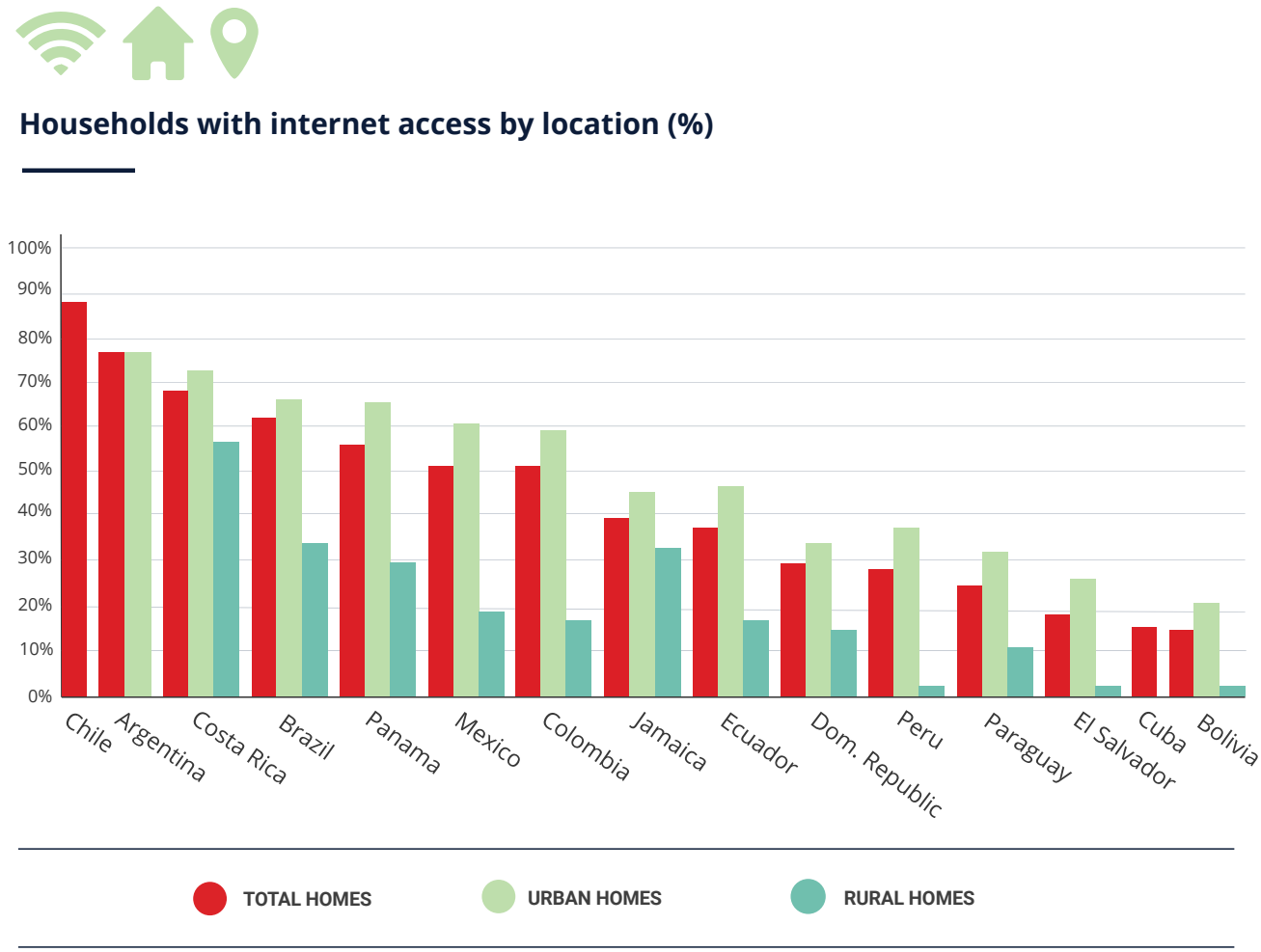
Note: the latest data provided by ITU correspond to 2017 and 2018 according to the country. Data for 2019 and 2020 have been extrapolated based on the growth rate of the last year of information provided by ITU.

(*) Publication note: the values shown in the table were calculated based on official information submitted by each country.

Source: International Telecommunications Union; Telecom Advisory Services analysis.

The gap widens within the interior of the region's countries, between urban and rural, also between men and women, youth, senior adults, the indigenous population and other disadvantaged groups represented by the lowest income quintiles. According to data and estimations provided by ECLAC (2019), 19% of the population in LAC live in rural areas with less than 2,000 inhabitants, a percentage which is systematically decreasing since the 1960s due to the continuous urbanization process. As per the ECLAC, FAO, IICA (2019) report, if the region wishes to fulfill the 2030 Sustainable Development Goals, it must deepen its structural transformation of rural territories, boosting and redirecting them in the economic, social and environmental realms; to do this, the region must overcome multiple socioeconomic gaps relating to the urban areas, one of these being access to infrastructure and basic services. On average, the differences in internet access among LAC urban and rural populations reach 28 percentage points. According to ECLAC, FAO, IICA (2019), many rural areas in LAC do not have internet coverage, since the population spread makes it unprofitable for private companies.

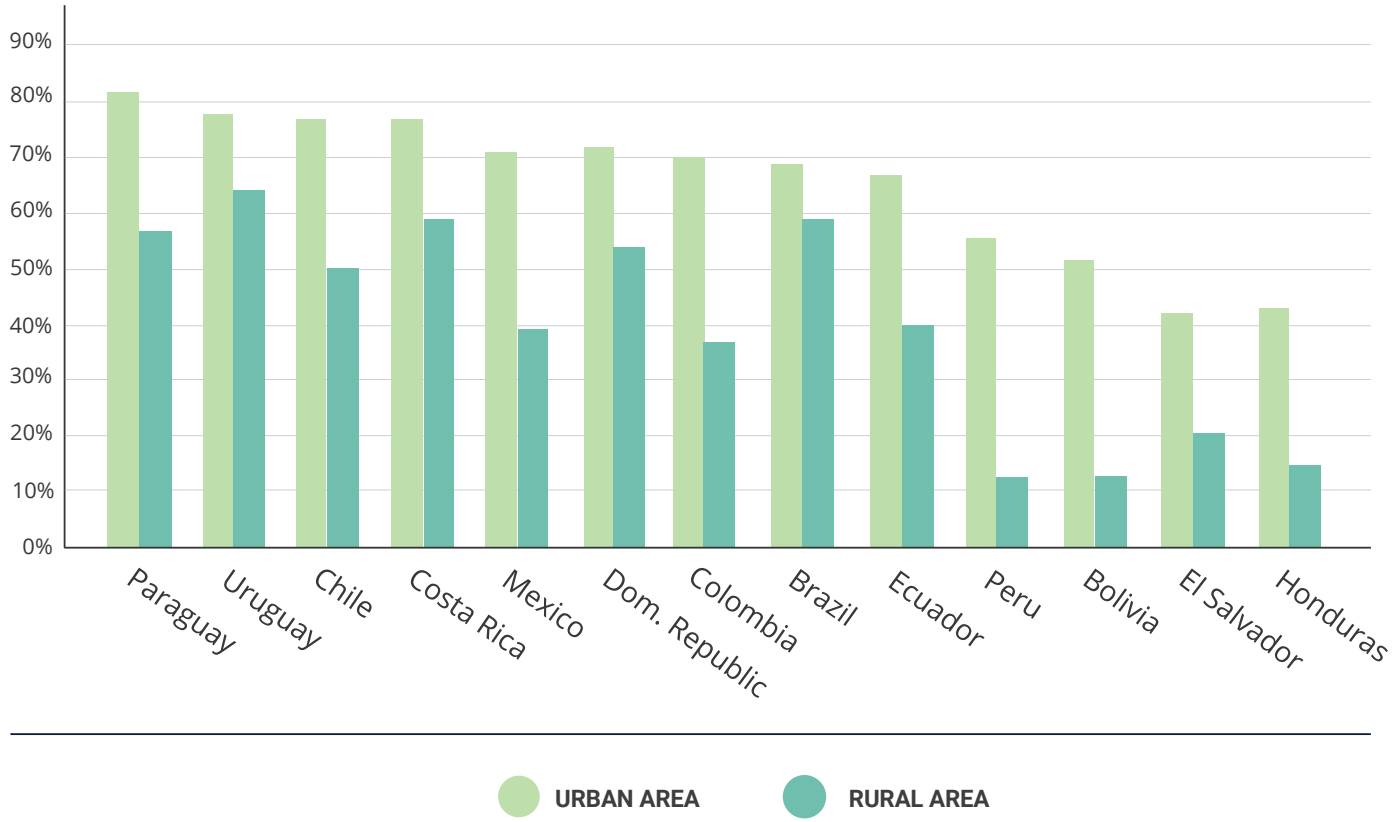
GRAPH 5. HOUSEHOLDS WITH INTERNET ACCESS PER LOCATION. SELECTED COUNTRIES, 2019.



Source: IICA (2019) prepared based on ITU and ICTs 2019

In terms of population, the information available for thirteen of the region's countries also points to significant differences in internet access depending on location, ranging from 15 percentage points (Brazil, Uruguay, Costa Rica) to more than 40 points (Bolivia, Peru), to the detriment of rural inhabitants.

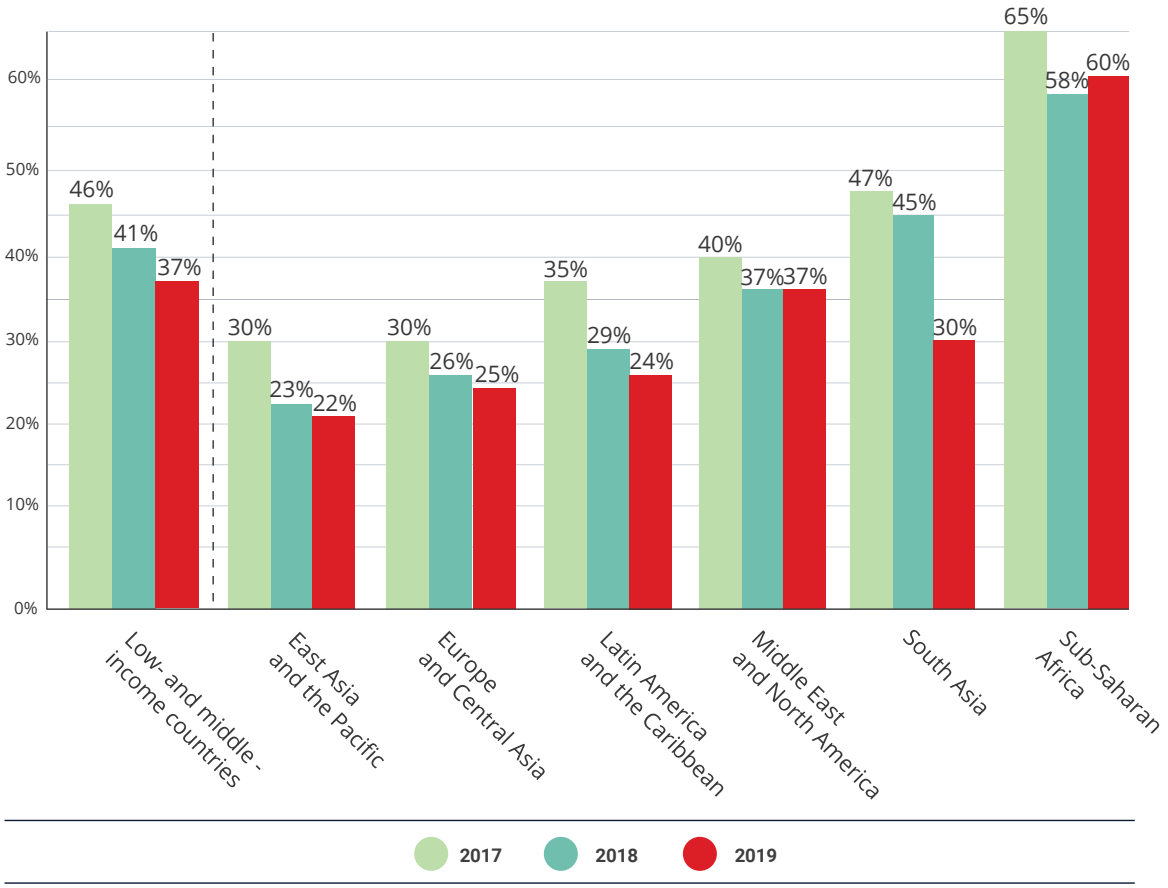
GRAPH 6. INTERNET USER POPULATION PER LOCATION AS A PERCENTAGE OF TOTAL POPULATION. 2017.



Source: CAF (2020) based on ECLAC data.

Concerning mobile internet, despite the advance, network coverage continues to be limited (FAO-ECLAC, 2020). In 2018, the urban-rural gap in mobile internet use was 29% for LAC, which is below the average for low- and medium-income countries (40%) but above low- and medium-income countries in east and central Asia and Europe [GSMA 2020].

GRAPH 7. RURAL-URBAN GAP IN THE USE OF MOBILE INTERNET IN LOW - AND MIDDLE - INCOME COUNTRIES BY REGION. 2017-2019



The "rural gap" refers to how much less a rural inhabitant tends to use mobile internet in relation to an urban dweller calculated as 1-(adoption of mobile internet in rural areas/adoption of mobile internet in urban areas).

The data was obtained from the GSMA Intelligence Consumer Survey and Gallup World Poll (for countries not included in the first one). There are differences between the two questions used for the analysis. The GSMA Intelligence Consumer Survey refers to persons who have used the Internet on a mobile phone at least once in the last three months. The Gallup World Poll refers to persons who have access to Internet in any form, whether by mobile phone, computer or any other instrument. Therefore, the questions are not completely comparable. However, the data of the countries covered by both surveys have a high degree of correlation (0.8) and the 28 countries covered by the GSMA Intelligence Consumer Survey represent 75% of the adult population of low and medium-income countries.

Source: GSMA. 2020. The State of Mobile Internet Connectivity 2020. Translation of the graph is the author's.

LAC's advance in the area of connectivity has allowed the gap to lessen in relation to OECD countries (according to the Broadband Development Index, IDB, 2019, which measures the current state of broadband in the region). However, there continue to be significant differences in two of the four pillars that make up the index, "Infrastructure" and "Public Policies". With regard to infrastructure, according to CAF data, LAC investment in telecommunications infrastructure per capita PP (purchasing power) accumulated over five years is USD 462.80, almost half the investment of OECD countries (USD 852.18).

At the level of telecommunications infrastructure, it is necessary to increase the backbone as well as the "middle mile" infrastructure which allows the backbone to be connected to the backhaul. According to the report "Broadband Policies for LAC: A manual for the digital economy" prepared by OECD and IDB in 2016, "one of the reasons behind the lack of access to broadband is the absence of transport infrastructure in the backbone or of infrastructure that connects these backbones to the access switches or the base station (backhaul network or return). This is the case in rural areas, including rural areas in the LAC region, where there are less incentives to invest and widen the national backbone."

The barriers relating to digital inclusion present various difficulties. The GSM Association (GSMA), which represents mobile operators worldwide and is the nucleus of over 400 companies dedicated to mobile telecommunications, has identified four main barriers:

- **ECONOMICS OF INFRASTRUCTURE:** expansion of mobile internet coverage in rural areas
- **AFFORDABILITY:** reduction in the total cost of mobile internet ownership
- **DIGITAL APTITUDE:** increase in the adoption and use of the internet through digital literacy
- **LOCAL CONTENT:** promotion of relevant content to attract people to use the Internet.

It is in this context that the specific needs and challenges that require most important attention in the rural areas are raised, especially considering the significant challenges for future development.

This document focuses on the first of these barriers and highlights the current situation and the obstacles to addressing the coverage gap in Latin America and the Caribbean.

3.3 Connectivity as a priority during the COVID-19 crisis

The CAF report (2020) indicates that if LAC is to achieve the same levels of digitalization as the OECD, the region will require 160 billion dollars in, which is 60% more than the investment that had been estimated originally. It also estimates that if Latin America were able to bridge the digital divide with the OECD, this would impact productivity and would potentially enable growth of more than 3% annually. However, one must also take into account the stagnation in growth

due to the pandemic, given that, according to new World Bank projections in July 2020, Latin America's economy will contract by 7.2%. These projections suggest that growth will fall short of estimates made by ECLAC in 2019, which forecast 700 billion dollars of additional growth up to 2030 and the creation of more than 400,000 jobs annually.

The current situation surrounding COVID-19 further exacerbates the marginalization of almost one third of the Latin American population in terms of internet availability (both coverage and connectivity speed). It also demonstrates the inability of existing devices to cope with the new reality, as well as the limitations in the required skills to use these devices in different activities. A vast number of citizens are excluded from services and activities (education, health care, financial services, the ability to conduct electronic transactions, access to transactions with state entities, among others).

In this context, the recent CAF study on the digitalization of LAC amidst the pandemic— "*El estado de la digitalización de América Latina frente a la pandemia del COVID- 19*" (2020)—issues a warning about the differing conditions among countries in the face of the pandemic. For example, the countries that are at the forefront of e-government adoption are those that had been working on these developments previously: Chile, Uruguay, Mexico, Brazil and Argentina. The digitalization of education has introduced special plans, such as, *Seguimos Educando* (Argentina), *Aprender Digital* (Colombia), *Educar Ecuador* (Ecuador), and *Plan Ceibal* (Uruguay), among others.

The ability to access internet in homes is therefore a critical tool in tackling the health and economic crisis, as it allows individuals to continue activities that are restricted due to social distancing measures and instead facilitates access, through the use of technology, to telecommuting, education, health care and rural extension services, among other activities and services.

Connectivity will determine the ability of rural areas in the hemisphere to acquire state-of-the-art knowledge, as is the case with the global initiative spearheaded by Precision Agriculture for Development.[15] The initiative has used 2G and more advanced technology; big data; machine learning, while drawing on the principles of behavioral economics, to send personalized messages through the mobile network to enable small farmers to mitigate the impact of COVID-19, which has restricted the delivery of face-to-face rural extension services, and to continue improving productivity and output (for example, by providing technical advice on pests, crops, best practices and animal health, to name just a few). In Latin

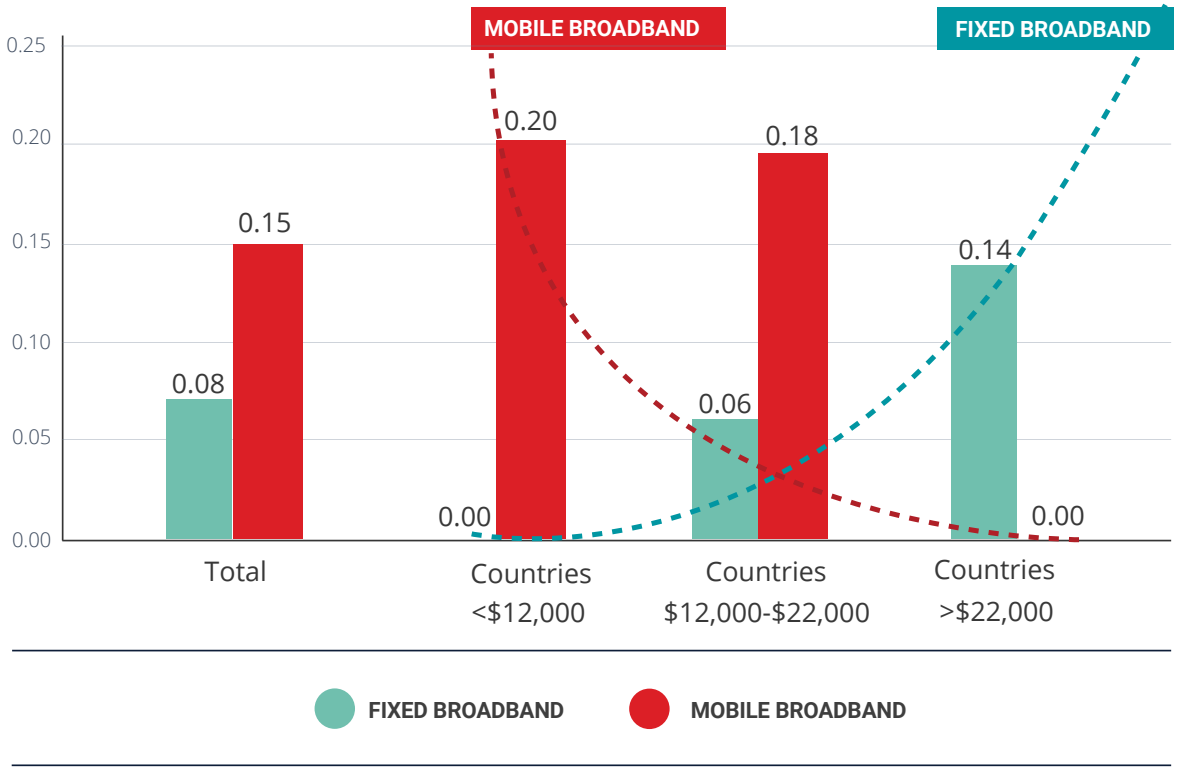
15 This is an initiative by Michael Kremer (2019 Nobel Prize winner for Economics), which was implemented in Asia and Africa, and which will be introduced in Northeast Brazil, through a cooperation agreement between Brazil's Ministry of Agriculture, Livestock and Food Supply (MAPA), PAD and IICA, to develop digital solutions for agriculture.

America, IICA has forged a partnership with PAD (an organization co-founded by 2019 Nobel Prize Winner for Economics, Michael Kremer), enabling family farmers in the countries in which the initiative is being implemented to incorporate digital agricultural services for technical support and rural extension. This is a key element in allowing one of the most marginalized links in the agriculture sector to obtain better yields and to increase income, thus contributing to their productive and social inclusion, as well as to economic development and environmental protection.

The situation resulting from COVID-19 has brought to the fore the importance of addressing the digital divide in LAC, as well as on accelerating infrastructural investments and support services. Thus, there is an increasing need to define common agendas to promote collaboration agreements between governments, the private sector and civil society to improve the digital ecosystem. As such, various organizations and entities (IICA, ECLAC, IDP, CAF, DPL Consulting Services, Telecom Advisory Services and Microsoft, among others, have indicated in recent months that the watershed moment brought on by the COVID-19 pandemic has also created a favorable environment to adopt initiatives that contribute to reducing the existing digital divide in Latin America and the Caribbean. This situation causes us to reflect on the critical importance that connectivity has acquired at this time and the need to overcome the obstacles that are impeding internet connection in rural areas. Promoting connectivity is therefore imperative and a matter of priority to enable production, social and community life in rural areas to take place.

In so far as the impact of connectivity on GDP is concerned, an ITU study (2018) revealed that at the global level, a 1% increase in fixed broadband penetration would result in a 0.08% increase in GDP, whereas a 1% increase in mobile broadband penetration would lead to a 0.15% increase in GDP. Therefore, the economic impact of fixed broadband demonstrates a return-to-scale effect, as the economic impact of fixed broadband is greater in more developed countries than in lesser developed countries; whereas the economic impact of mobile broadband demonstrates a saturation effect, producing a greater impact in less developed countries than in more developed countries.

GRAPH 8. ECONOMIC IMPACT OF BROADBAND WORLDWIDE, 2010- 2017



Note: Values expressed as impact on GDP of 1 per cent increase in broadband penetration.

Source: ITU (2018). The economic contribution of the broadband, digitization and ICT regulation.

With respect to digitalization, it determined that a 1% increase in the development index of the digital ecosystem leads to a 0.13% growth in per capita GDP, with the digital ecosystem producing a greater impact in more advanced economies than in developing countries. It also concluded that the digital ecosystem has an economic impact on productivity (both on labor and on total factor productivity). A 1% increase in the digitalization index results in a 0.26% increase in labor productivity and a 0.23% increase in total factor productivity. The study also provided evidence of the importance of the regulatory and institutional component in driving the growth of the digital ecosystem.

A recent ECLAC report (2020) analyzed the extent to which digital technologies have become essential to the functioning of the economy and society during the crisis ensuing from the Coronavirus pandemic (COVID-19). It also issued a warning about the risks of growing inequality in situations in which internet access is limited, while pointing out the severe disparities that are affecting those who cannot function remotely. Estimates for Latin America

indicate that more than 80% of those working in the service industry; professionals and technical specialists; as well as those in education, finance and insurance, have the ability to telecommute. These sectors represent less than 20% of the total employed population. On the other hand, the possibility of telecommuting for those working in the wholesale and retail sectors is less than 15% and in agriculture, it is only 1%.

However, as the Director General of IICA, Manuel Otero, pointed out, agriculture "has been the only sector in many countries that has continued operating without interruption during the pandemic. Despite the drop in global trade and the difficulties caused by the virus, it had the capacity to increase exports and reaffirmed its strategic role. In this context, the new technical cooperation agenda promotes "the facilitation of producers' access to the trade chain and the push towards bioeconomy, and the intelligent industrialization of our societies based on the use of biological resources. This has the potential to convert rural territories into an immense green factory of food, bioenergy, biomaterials and probiotics".[16]

The data on the limits of remote work in the agriculture sector show that addressing the rural-urban gap is a task that remains pending in Latin America. The barriers to digital inclusion intensify the situation with respect to the disconnection of communities, with the risk that they remain marginalized and in a critical condition in the face of a growing digital gap.

The advent of connectivity in rural areas bodes well for opening up to new development opportunities and for relocation of the population. Among some of the possible advantages, it contributes to the revaluation of the area, the generation of income and value added. The reduction of urban-rural gaps in Latin America and the Caribbean is also a requirement to comply with the 2030 Agenda. In the region, the rural population's access to connectivity and accessibility (roads, internet, telecommunications) and basic services (drinking water, sanitation and electricity) is still limited (Saravia-Matus and Aguirre 2019). According to ECLAC, FAO, IICA (2019) these limitations hinder the ability to fulfill SDG 6 (Clean water and sanitation) and 9 (Industry, innovation and infrastructure) and even SDG 1 (Eradication of poverty). As presented at the **Conference of Ministers of Agriculture of the Americas 2019** organized by IICA,[17] information and communication technologies (ICTs), the universalization of connectivity and the broader dissemination of digital technologies constitute a fundamental pillar for the future of agricultural production.[18]

16 https://elpais.com/elpais/2020/09/04/planeta_futuro/1599234583_838734.html
https://www.youtube.com/watch?v=4_AuL2QDemw&feature=em-lbrm

17 http://jia2019.iica.int/

18 First forum "Opportunities for rural inclusion in the digital era"

As shown in the article "Harnessing digital tools for climate and agriculture" published by IICA,[19] "digital tools (DT) could help to reach more than 170 million small-scale farmers around the world, improving their decisions based on better knowledge and information (...) DT in agriculture are still under the penetration levels observed in other sectors, which reveal a great opportunity but also specific limits for scalability. However, more decisive public support for DT in agriculture will not happen until policy and decision-makers clearly understand their potential."

Likewise, IICA's 2018-2022 **Medium-term Plan (MTP)** propounds the need to replace the current vision that constrains rural territories as zones that generate poverty and internal migration, with a new focus, so they are appreciated as having a high level of potential for progress, based on using new technologies and increasing their connectivity. The MTP also suggests that the reduced connectivity of rural areas is one of the disadvantages that underpins the causes behind the relatively lower level of well-being and the persistence of poverty that exists in rural areas. However, it is pertinent "to recognize that territories are a continuum, with needs for infrastructure, social protection policies, and gender equality, under the same natural environment and with the same rights, whether they are urban or rural" (ECLAC, FAO, IICA, 2009: 37); this condition of interdependence can drive the urgency of reducing persistent gaps and at the same time demand the adoption of an integrated vision of urban and rural spaces, rather than a dichotomous one.

Addressing the digital gap becomes important since one of the main challenges to advance the recuperation process after the pandemic is to rely on innovative capacities and human capital to drive activities and increase value added. The Vice President of Sales, Marketing and Operations of Microsoft Latin America, Mariana Castro, in a recent conversation with the Director General of IICA, Manuel Otero, highlighted the essential nature of incorporating and understanding the use of technology to reimagine the world of production and reinvent activities of the future.[20]

In this same conversation, Natasha Santos, Vice President of Bayer AG, emphasized the great potential that technologies have in the rural context and urged us to "recognize that digital transformation is about people and the technologies are astonishing because of what people can do when they are connected".

19 https://blog.iica.int/blog/aprovechamiento-las-herramientas-digitales-para-clima-agricultura

20 Available at: https://www.iica.int/es/prensa/noticias/dialogo-bayer-microsoft-e-iica-la-inclusion-digital-de-las-mujeres-y-los-jovenes

AFP Marvin Recinos

4 Characteristics of the digital divide in rural areas: key problems identified

4.1 The scarcity of data to characterize the rural connectivity situation

In recent years, the Latin American and Caribbean countries have increasingly factored variables into their censuses and other statistical surveys relating to access to ICT and the utilization and incorporation of such technologies. However, half of the countries currently possess specific data on connectivity in rural areas (Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Honduras, Mexico, Paraguay, Peru, the Dominican Republic and Uruguay) and the infrastructure for other basic services, such as overhead power lines, sanitary sewers and water supply systems, that could facilitate the deployment of infrastructure for connectivity.

On the other hand, there are many sources of up-to-date information about the issue at the global level.[21] Unfortunately, in most cases the information available on connectivity does not distinguish between urban and rural areas, as no such provision is made when the statistics are compiled. Specific information about national telecommunications infrastructures is also in short supply across the

21 The International Telecommunications Union (ITU) produces statistics on the state of ICTs across the globe that it publishes on the ITU-D ICT Statistics platform (https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx).The World Bank Open Data platform (https://data.worldbank.org/) incorporates aggregate indicators on connectivity.The GSMA conducts studies on mobile connectivity and produces important indicators (https://www.mobileconnectivityindex.com/). At the regional level, the Inter-American Development Bank's DigiLAC (https://digilac.iadb.org/es/inicio) and Digital Infrastructure and Connectivity Network (RICDigital) programs are a source of up-to-date, quality information and provide a space for important stakeholders in this field to coordinate public policies. Finally, ECLAC has developed the CEPALSTAT platform, which condenses information from the countries about connectivity (https://www.iadb.org/en/financial-markets/connectivity).

region.The ITU now maintains the *Interactive Transmission Map*[22], a compilation of information about the main connectivity infrastructure (underwater cables, IXPs[23], transmission networks, etc.). While this is an important source, the countries need to update the data on the state of national infrastructure and provide fuller information, including specific facts and figures for rural areas.

The members of the Organisation of Eastern Caribbean States (OECS) are currently mapping connectivity within their region. When the study is published in 2021, it will include specific information on rural areas.The Caribbean countries are also implementing the GIGA project, a joint UNICEF-ITU cooperation initiative aimed at providing connectivity in both urban and rural schools in the OECS countries.

The localized information on the state of rural connectivity includes regional indicators prepared by ECLAC that measure Internet access among Latin American rural households, specifically for the 13 countries that produce official statistics:Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Honduras, Mexico, Paraguay, Peru, the Dominican Republic and Uruguay.Although this is a relevant indicator, section 2 of this study describes the limitations of these measurements in gauging the situation in rural areas. Consequently, progress was achieved in developing a Significant Connectivity Index for countries of the region. The scope of this tool and the methodology being used to construct it are also described in that section.

Finally, four IICA-sponsored studies were carried out to determine the situation in Brazil. Conducted by researchers at the University of Sao Paulo (USP) working with the Ministry of Agriculture, Livestock and Supply[24], they cover the year 2018.The information is disaggregated and the studies describe in detail the connectivity situation in the rural areas of Brazil.A number of issues are highlighted, including the inequalities in the interior of the country, and the fact that the lack of access to the 4G mobile network is linked to low per capita GDP and lower population density, except in a few states, such as Mato Grosso and Mato Grosso do Sul. The studies also show that there is extensive 2G and 3G coverage nationwide, while the 4G service is concentrated in the south and center of the country where precision agriculture is carried out.The work analyzed the coverage and state of connectivity in Brazil by region, and examined the infrastructure capacity and the quality of

22 ITU Interactive Transmission Map. Available at: https://www.itu.int/itu-d/tnd-map-public/

23 Internet exchange points.

24 Inter-American Institute for Cooperation on Agriculture, Ministry of Agriculture, Livestock and Food of Brazil. Análise da Conectividade no Meio Rural: Acesso à Informação, ATER e fixação do jovem no campo. Piracicaba-SP-Brasil. August 1, 2019.

Internet access in the rural milieu.Part of the research's brief was to consider the relationships between Internet access and the adoption of technological innovations such as precision agriculture, agro-meteorological monitoring methods and the automation of productive processes, which are essential to making agricultural production socioeconomically and environmentally sustainable, and to encourage young people to remain in the countryside.

Studies of this magnitude provide substantive input for the design of policies and development initiatives. Regrettably, very little work of this kind has been done in other countries of the region and more input is needed. While such studies have always been important for assessments and planning processes, in the current pandemic —and given the need to redefine productive activities— they are absolutely essential.

4.2 Limitations of the incentives (universal access funds) used to promote connectivity in remote territories

Universal access funds (UAF) are instruments first created 25 years ago to promote digital inclusion and address market exclusions in the different countries. They are financed by means of taxes applied to telecommunications operators, usually ranging from 1.5-3.0 per cent of their profits.

Nearly all the Latin American countries have universal access funds. Connectivity projects financed with these resources targeted at groups that do not enjoy access to technology have created universal access points, public spaces with connectivity and free Wi-Fi access points. Cases in point are the projects implemented by the National Telecommunications Fund (FONATEL) in Costa Rica, the Information Technology and Communications Fund (FONTIC) in Colombia, the National Telecommunications Program (PRONATEL) in Peru, and the Telecommunications Development Fund operated by SUBTEL in Chile.[25]

25 It should be noted that in the case of Chile the fund's resources are allocated in the national budget.

However, the meetings held and evaluations carried out under this study highlighted the existence of a series of limitations as far as UAF are concerned:

- Many UAF were created 25 years ago and are linked to a specific technology, e.g., telephony or electricity.This has limited their use for the development of new technologies such as broadband or fiber optic services.Brazil is a case in point, where funds were originally allocated by law for telephony development and a legislative amendment is required to channel funds into other technologies.

- In most cases, the regulation of the funds is complex, and this translates into obstacles for implementation.

- Most UAF are allocated (under different models) to the major telecommunications firms.Small operators, cooperatives, community networks and other local projects usually do not have access to these resources.

- In other regions, there are good practices for including members of the public —especially people who form part of the target groups of connectivity projects—in decision-making and the management of UAF (Canada is one such example). Practices of this kind have yet to be implemented in the LAC region, however.

- No UAF impact assessments were found focusing on the transformations achieved and capabilities created under initiatives implemented in unfavorable contexts.

- The ITU's most recent evaluation of the state of UAF in Latin America dates from the year 2010.

- In the meetings held (ASIET, ANATEL),[26] all the stakeholders took the view that the management and governance of UAF needed to be reviewed to ensure that these funds increase digital inclusion, especially in places where there is no Internet access, i.e., the most remote and isolated areas.

- Another major constraint is the fact that plans for the use of UAF do not dovetail with digital agendas or national connectivity plans. This disconnect limits impact, due to the absence of a focal point for channeling efforts.

4.3 Socioeconomic difficulties and disincentives for investment

The GSMA estimates that around 490 million people will be using mobile phones in Latin America by 2025, a big increase compared with the number that were using the technology in the region in 2012, when the figure was put at 352 million.[27] The same entity also suggests that the future growth of new subscribers will be mainly limited to Brazil, Mexico and Argentina (in that order), which between them will account for two-thirds of the estimated increase. These countries have the largest number and proportion of urban dwellers.

The GSMA also notes that the present ninety per cent coverage in Latin America has been achieved thanks to competition among networks and operator investment. Nonetheless, a gap in coverage remains, with ten per cent of the Latin American population (64 million people) having no access to mobile broadband networks. The GSMA suggests that what is required to connect the remaining population is a combination of infrastructure, partnering with stakeholders from local ecosystems, and government support.

Raúl Echeverría, former president of the Internet Society, is of a similar opinion. He states that for connectivity to become a reality, "key stakeholders such as providers, the operators of community telecommunications networks and local technical communities, and —in addition to government agencies— organizations like IICA, should encourage agriculture and communications ministries,

26 ASIET is the acronym of the Inter-American Association of Telecommunications Enterprises. ANATEL is the regulator of the telecommunications sector in Brazil. Meeting with NiloPasquali and Eduardo Jacomassi, ANATEL.

27 https://www.gsma.com/latinamerica/wp-content/uploads/2019/09/Latin-Americas-evolving-digital-landscape.pdf

among others, to engage more with the issue. It also has to be borne in mind that the situation in the countries varies; in some, there are rural organizations, in others, indigenous communities. Small towns that depend on rural tourism, among others." Such diversity calls for different strategies, and different solutions as well.

For mobile operators, the current business model has proven effective in expanding coverage to current levels and connecting remote areas. The latter, where the majority of the unconnected live, is a bigger challenge because of the huge geographical distances involved, the difficult economic situation in the region, the high cost of investment required and the limited return on such investment. In many countries, the rural population (which is the most unconnected) lives in the areas with the highest poverty indicators, where a combination of different negative factors reinforces the circle of exclusion: the lack of infrastructure, potential users' low buying power, mobile operators' reluctance to invest in such places given the meagre financial returns, and the absence of public policies and incentives to turn the situation around.

The issue of the infrastructure deficit was highlighted by representatives of DIGICEL, a mobile operator in Haiti. While the firm has expanded 2G coverage in the West Indian nation, the severe limitations in infrastructure and resources (such as the lack of electricity) are a major obstacle to further expansion.

Another barrier in Latin America is the cost of mobile and fixed broadband services. According to data from ECLAC (2020), the cost for the population in the lowest income quintile is equal to 12-14 per cent of their income. These costs are six times the reference threshold of two per cent of income that the Broadband Commission for Sustainable Development recommends in order to classify as an affordable Internet service. The problem of higher consumer prices in rural areas is well known, as is the fact that fixed and mobile Internet affordability varies greatly from country to country in the region.

Julián Casas buenas, of the Asociación Colnodo, works in local connectivity projects. He notes that "it has been pointed out in many forums in Colombia that the quality of the service is very limited; the resale of multiple accesses is a common practice, even though there is high demand. The costs are much higher than in urban areas and the Internet service to which we are able to connect does not permit videoconferencing or access tostreaming."

In contrast, Alex Jucius, Director General of the Asociacao Neotv (Brazil), an umbrella group of small national firms, argues that the massive take-up of its members' services is due precisely to the low costs to users. As these companies enjoy special tax status, they can offer cheaper plans to the lowest income groups costing R 50-70 (USD 10-13) per month.

Finally, to the problem of insufficient infrastructure must be added installation issues, given the inaccessibility of some areas due to the terrain or social conflicts and violence.

Lillian Chamorro, an electrical engineer with the Asociación Colnodo (Colombia), cautions that: "The problem of violence has a major bearing on the construction of infrastructure, that is why electricity transmission lines and networks are in very poor condition. There is no way of constructing telecommunications infrastructure. The costs of installing and maintaining networks and equipment are very high, and there is no support infrastructure. Hence, local solutions, or those provided by the communities themselves, are an excellent option." These constraints, in one form or another, are to be found in many other countries of the region.

4.4 The large number of sectors involved and the need for coordination to close the connectivity gap

Closing the connectivity gap calls for the intervention of a number of sectors and stakeholders. The States themselves are key players, as they can help improve the situation by drafting public policies designed to promote increased connectivity, establishing standards and producing public information for decision-making.

A body of specific telecommunications laws exists in the region, along with a series of regulations governing development plans on the subject; a few address the question of conditions in rural areas. The situation created by COVID-19 has also led to amendments or the creation of ad hoc regulations to address connectivity problems.

The Table "Connectivity plans, regulatory frameworks, rural connectivity policies and specific measures in response to COVID-19," which is attached in Annex II, details the situation in each country up to and including the year 2020.

The analysis of telecommunications programs and laws shows that a little over half of the Latin American and Caribbean countries (19 out of a total of 33) have specific legislation aimed at reducing the digital divide. Less than forty per cent of the countries in the region have implemented programs and strategies to address the differences between urban and

rural areas or the problem of rural connectivity. Recently, it was found that 14 countries (less than half of the nations in the region) had introduced regulations in the wake of the COVID-19 pandemic, mostly to regulate access to content and the cost of services.

Several attempts to address the digital divide in rural areas as part of telecommunications development plans are worthy of mention. The first is the **Rural Connectivity Plan in Colombia**, whose purpose is to "help improve the quality of life of Colombians in rural areas through the deployment of the infrastructure needed to guarantee Internet access in municipal seats of government and the terms of use for the connectivity service provided through public access solutions in population centers with more than 100 inhabitants in priority municipal districts" (PDET).

In **Brazil**, the goal of the **Rural Connectivity Project** is to propose: "telecommunications solutions that make it possible to connect people and "things" in rural areas, meeting the strategic demands of small, medium- and large-scale producers throughout the national territory. Beginning in 2012, a public policy was promoted that committed the government to providing connectivity to towns with over 600 inhabitants (a number based on the size of both the country and the population)." Edmundo Matarazzo, director of Abranet, a company that offers solutions to Internet providers in Brazil, suggests that in the case of agriculture: "Seventy-two per cent of the five million farms of up to 100 ha. (family agriculture) do not have adequate connectivity. As many as half of these unconnected farms are in the North/Northeast of the country." In Brazil, Internet access varies greatly between large and small farms. The Rural Connectivity Project was designed to address the problems of unequal connectivity in different parts of the country.

The ***Programa de Banda Ancha Rural*** **(Rural Broadband Program)** in the Dominican Republic aims to "reduce urban-rural and interregional disparities in access to services and economic opportunities by promoting well-organized and inclusive territorial development." The mission of the figure of the Rural Mobile Infrastructure Operator (OIMR) in Peru is to "deliver high-speed Internet to Peruvians living in the remotest areas of the country and develop their digital skills." On the other hand, Chile's Digital Agenda, with the *Impulsar el Desarrollo Rural en Red* projects, aims to contribute to "... the inclusive development of the country, and close gender, socioeconomic vulnerability and urban–rural development gaps," and roll out broadband on a large scale, with efforts targeted at indigenous, rural and vulnerable organizations.


ONGAWA, Ingeniería para el Desarrollo Humano

In Argentina, the goal of the ***Agenda Digital 2030*** **(Digital Agenda 2030)**, through initiatives such as the *Plan Federal de Internet, Conectar Igualdad, Plan País Digital* and the lines of action aimed at improving infrastructure throughout the country, is to create "a data-based Argentina" that incorporates the digital inclusion of rural territories and their production systems. Gustavo López, Vice President of telecommunications regulator ENACOM (Argentina), points out that the current policy subsidizes the operation of local cooperatives in areas with up to 30,000 inhabitants, with the State financing the installation of infrastructure. As part of national policy, ARSAT (the Argentine State telecommunications enterprise) will cover the cost of installing a 35,000 km optic fiber network to permit connectivity in remote areas.

In 2017, the **Caribbean Community** (CARICOM) adopted the **Integrated Work Plan for the Single ICT Space**, "to address connectivity issues for all its Member States, including environmental assessments, harmonized regulations, spectrum regulation and capacity-building programs for the government and communities, among others".

In summary, some of the programs that have been mentioned have as a common denominator the development of alternatives to foster connectivity through different mechanisms, most notably by generating public access points, reaching rural areas through local stakeholders and driving investments geared towards installing infrastructure.

In recent years, central governments in the region have increasingly sought to delegate more responsibility to local governments and decentralize services and projects. The field of telecommunications and efforts to reduce the digital divide have been no exception. Cases in point are projects such as E-localidades in the Dominican Republic and the *Modernización de Gobiernos Locales en Panamá* (Modernization of Local Governments) project in Panama.

Since 2000, much emphasis has been placed on strategies focused on public Internet access points. These consist of setting up spaces with computers with Internet access that can be used for free, or for digital skills development programs. Projects such as the Smart Community Centers (CECI) in Costa Rica, the INFOPLAZAS Community Information Centers in Panama, INFOCENTROS in Ecuador, and the National Telecenters Network in Colombia are clear examples of initiatives of this kind.

According to the entities that represent mobile operators, many issues need to be addressed to close the connectivity gap working through the entities of the mobile ecosystem. The main ones include the States' role in creating incentives that make services in the least commercially attractive areas more profitable. In this regard, they need to simplify access to infrastructure, offer financial incentives, reduce local red tape for the installation of infrastructure, provide an enabling environment for infrastructure sharing, and increase spectrum availability.[28]

A meeting with executives of TIGO (Colombia) revealed that in 2020 the firm began work in rural areas with a view to expanding its operations. This development was prompted by the State's decision to assign spectrum in the 700 MHz band, on the condition that the company invest in infrastructure to provide connectivity in more remote territories. It has enabled rice farmers to engage in precision agriculture and also encouraged coffee growers and processors to adopt new technology.

In a further development in Colombia, the government recently chose Speedcast International for a project to provide high-speed Internet to 250 places in rural areas. The initiative, covering the area from Guajira to Amazonas, will offer near-instant Internet access (even in regions where fiber, cable and LTE services are unavailable). Ricardo Egas, Country Manager of Speedcast Colombia, pointed out that: "In the absence of fiber and cable, satellite broadband is key to effectively delivering much-needed connectivity to the most remote areas of Colombia. With our expertise and network of trusted partners, we are committed to enriching the country's digital economy and look forward to seeing it realize its full potential over the next year-and-a-half".[29]

28 A detailed account is to be found in the GSMA document "Closing the coverage gap. Digital inclusion in Latin America https://www.gsma.com/latinamerica/wp-content/uploads/2016/05/report-closing_coverage_gap-4-ES.pdf

29 https://www.developingtelecoms.com/telecom-technology/satellite-communications-networks/9975-speedcast-extends-colombian-rural-high-speed-internet-with-hughes.html

An important point to bear in mind is the fact that Internet access in more isolated areas where fewer people live is today being provided by small local firms, because large businesses are reluctant to make the major investment required given the meagre returns in those locations. Hence, in territories where the cost of the last mile —the final leg of the connection between the distributor and the end-user— is higher, the service is being provided by small businesses, including cooperatives. In addition to Brazil, Mexico, Peru, and Colombia, many other countries in the region are sure to be adopting similar strategies.

Brazil has 12,000 firms of this kind (just over two per municipal district) that have grown thanks to a tax regime created especially for them. They offer mobile phone services at prices below the market average, targeting low-income sectors. Alex Jucius, director of the Neotv Association, which represents 160 of these firms, says the aim is "to connect people who cannot afford the services provided by big companies." The operation of these firms is not recorded in official statistics. Genaro Cruz, the GSMA's Senior Market Engagement and Advocacy Manager, points to Peru's experience as a model for reviewing the work of "rural operators in collaboration with other operators to work on models that are interconnected and have scaled services," as it is difficult to scale up local alternatives of this kind. Further information about the role that these small businesses play can be found in section 5.2 "Endogenous alternatives of communities."

4.5 The aggregation of gaps in rural areas: women's access to connectivity

Women make up 48.5 per cent of the rural population in LAC. In 2015, the number was put at around 62 million (UN, 2015). It is estimated that 17 million are economically active and 4.5 million of them are farmers (though their work is underreported, since it is considered part of their domestic duties). **According to the Gender Equality Observatory for LAC (ECLAC, 2018), rural women produce fifty-one per cent of the region's food and make up forty-three per cent of the agricultural workforce.** Furthermore, forty per cent of them do not have an income of their own, only ten per cent have access to credit, and five per cent have access to technical assistance programs. These figures highlight the situation of inequality with which they have to contend, with rural men owning more of the land and resources, and receiving more of the income generated. As noted in the IICA document on Women and Equity (2020), it is important to emphasize that women do not enjoy the same access to credit or financing. Insurance should be available to them, and it is the insurance entities themselves that should create specific types of coverage for rural women producers and traders.[30]

30 Access to credit is only one of the disadvantages that women in rural areas have to contend with in carrying out their productive activities. https://urgente24.com/actualidad/argentina/las-empresas-conducidas-por-mujeres-le-dan-menos-financiamiento-que-las-que

As stated in the Conceptual Framework for Gender Analysis in Agriculture (IICA):[31] "sectoral planning still fails to take sufficient account of the fact that women are responsible for a significant proportion of agricultural production and the sustainability of production units, be they peasant, small, medium-sized or large operations. That they are players in the development of agriculture and rural societies, and that these processes have effects on them".

In the book "Warriors" (IICA, 2018), Mara Marinaki[32] addresses the issue of the gender gap with which rural women have to contend, noting that these women are not a homogenous group. Their contributions, needs and interests differ, depending on their origins, age and the composition of their families, etc. While these characteristics apply to all population groups, most of the contributors to the book take the view that rural women are affected by social and economic dynamics that place them at a disadvantage in comparison to their urban counterparts, and especially compared to rural men. Thus, land ownership, the production activities in which they engage, their income, their limited access to financing, and the educational, social protection and health services available to them, are just some of the issues that place them in a subordinate, more precarious position. In short, they have fewer prospects of achieving autonomy and accessing opportunities than their male counterparts (ECLAC-FAO-IICA 2019, 40).

Reversing these trends calls for specific programs to address the situation of rural women. One such initiative is the Rural Development and Family Farming Program promoted by IICA Uruguay, which, as Clara Villalba (IICA Specialist in Rural and Territorial Development) explains, is carrying out a series of actions to improve the status of rural women. This process consists of several

31 http://americalatinagenera.org/newsite/images/doc_393_muj12.pdf

32 Ambassador, Principal Adviser on Gender and on the Implementation of United Nations Security Council Resolution 1325 on Women, Peace and Security; European External Access Service (EEAS), Brussels, Belgium.

stages which, in no strict order, are: advocacy, recognition of women's work, empowerment, and the achievement of autonomy. The target group par excellence, although not the only one, are rural women and the territorial agents that work with them.[33]

The gender gap, which has its roots in historical and cultural phenomena, imposes severe limitations on the rights of women, and also restricts women's productivity. In this regard, Melinda Gates[34] asserts that rural women must be "at the center of the efforts," since meeting the future food needs of a world whose population will continue to grow and which is threatened by climate change calls for the participation of women in agriculture. Dana Bolden[35] said something similar: that the participation of women in agricultural activities was essential to mitigate hunger and "to ensure that the lives of all the inhabitants of the earth are sustainable in terms of health, productivity and nutrition".

In addition to the aforementioned limitations, the gap between men and women in the region includes the differences in access to technology. For that reason, **one important conclusion** of the IICA-organized series of virtual forums "Rural women and equity during the COVID-19 pandemic"[36] was that "Improvements in access to land, water and connectivity are urgently needed to close gender gaps that affect food security in the Americas".

33 https://www.elobservador.com.uy/nota/equidad-de-genero-y-visibilizacion-de-las-mujeres-rurales-en-uruguay-20191252146 43.

34 Co-chair, Bill and Melinda Gates Foundation.

35 Senior Vice President, External Affairs and Chief Sustainability Officer, Corteva Agriscience.

36 https://iica.int/es/prensa/eventos/foro-hemisferico-mujeres-rurales-y-equidad-ante-la-pandemia-covid-19#!#transmision

Furthermore, during the hemispheric forum on the same subject organized by IICA, Beatriz Paredes[37] emphasized the need to focus on the differences that exist among rural women by adopting public policies that are effective in the current context. She believes it is essential to address issues such as financial constraints, flexible credit terms in a difficult economic scenario, support for the supply chain, the implementation of sanitary protocols, the protection of social security and healthcare, by providing solutions for the different roles that women play in rural life.

It is important to consider the work, living conditions and cultural issues of rural women, and how Internet access can impact them.

The GSMA's "Mobile Gender Gap Report 2019" presents some important data on the situation regarding Internet access.[38] It is a global study, but the references to Latin America and the Caribbean provide useful information for the region.[39]

In 2018, the *mobile ownership rate* for women was 86 per cent, with the gender gap[40] falling from two per cent in 2017 to one per cent the following year. The region ranks near the middle in relation to other continents. Some 31 million women in the region are unconnected (i.e., they do not own a mobile phone). Women's mobile ownership in Europe has reached ninety per cent, while in Sub-Saharan Africa the figure is only sixty-nine per cent. **Bearing in mind that today access to knowledge, culture and information about basic aspects of civic life depends on access to technology, this figure is significant.** According to the aforementioned study, mobile penetration is lower among people living in rural areas, in part because of structural elements of inequality, inasmuch as there are fewer devices in those areas and no access to antennas that provide mobile and Internet services.

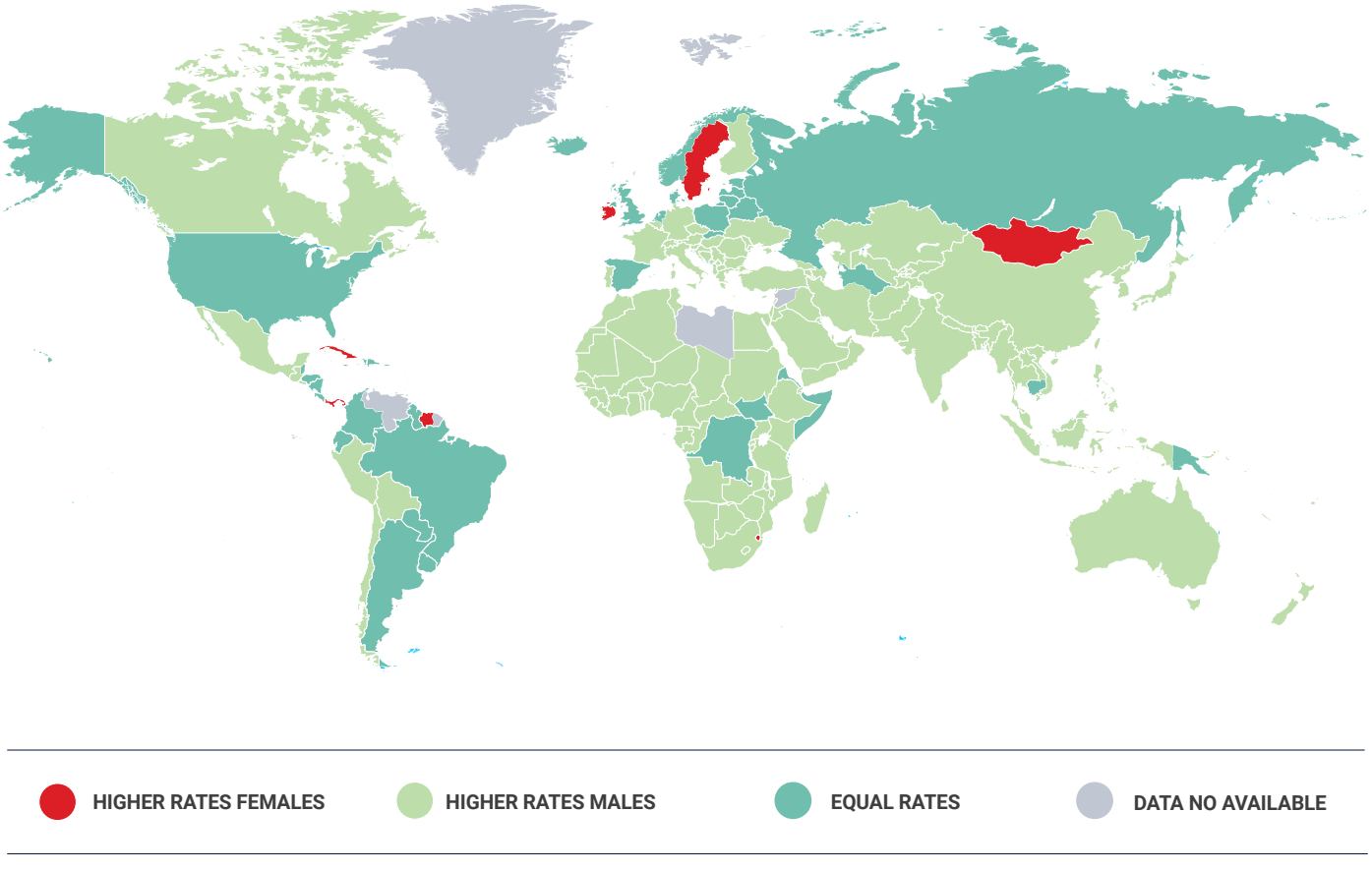
37 Mexican Senator and Chair of the Senate Science and Technology Commission; member of the Foreign Affairs, Agriculture, Livestock and Fisheries, Rural Development, Education and Immigration committees; and of the Bicameral National Security Committee. https://blog.iica.int/en/blog/mujeres-rurales-en-tiempos-covid-19

38 https://www.youtube.com/watch?v=96FxCy_UCts&feature=youtu.be

39 The data was obtained from consumer surveys carried out in 2018 of 20,000 people in medium- and low-income countries.

40 According to the GSMA, the gender gap indicates the magnitude of difference between women and men with respect to women's lower likelihood of owning a mobile phone.

FIGURE1. PROPORTION OF INTERNET USERS, BY GENDER, 2019*

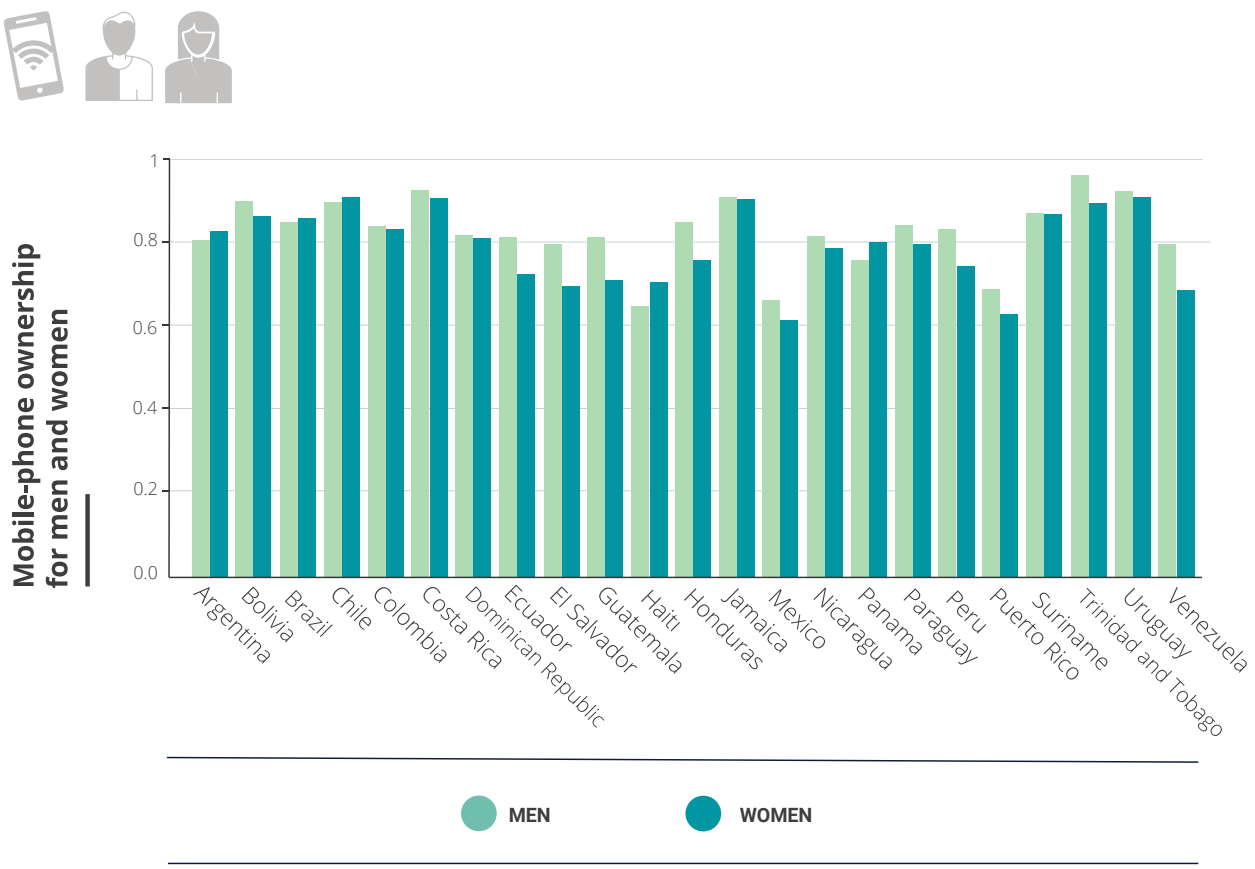


Fuente: https://digitalpolicylaw.com/brecha-digital-de-genero-se-agrava-a-17-en-el-mundo-advierte-la-uit/

According to the GSMA analysis (2019), at the global level, even when women have access to mobile data, they use fewer services and spend seventeen per cent less on them than men (GSMA, 2019, 3). The report also points out that mobile phone access is closely linked to the countries' per capita GDP, and, in those with the lowest income levels, the gender gap is widest.

In a joint study developed by IICA, the University of Oxford, IDB and IFAD, Rotondi et al. (2020) provide a series of measurements for the gender gap in rural women's access to mobile phones. Based on data retrieved from the Gallup World Poll, in 23 Latin American countries there are differences between men and women with respect to mobile phone ownership. **These significant differences between countries are illustrated by Figure 2.**

FIGURE 2. MOBILE-PHONE OWNERSHIP FOR MEN AND WOMEN, ESTIMATE FROM LATEST GALLUP SURVEY YEAR AVAILABLE



With respect to *mobile Internet use*, the GSMA (2019) notes that women are at a greater disadvantage. In Latin America, the gender gap is double the average (two per cent),[41] with only sixty-six per cent of the women surveyed having access to the service. The number of unconnected women in the region is two-and-a-half times higher than the figure for the mobile phone gender gap, with the number put at 76 million.

As mobile subscriber growth slows, there is a risk that the population groups that have not benefited from the expansion in coverage will remain unconnected. The majority of the unconnected population are women who, among other things, live in rural areas, are illiterate or semi-illiterate, and are over 45 years of age. Campaigns aimed at increasing access should take account of the demographic profile of the target population in order to achieve greater success. In addition to these limitations, the study identifies other barriers to mobile ownership and mobile Internet access. In the first case, the barriers highlighted by women in the region are affordability, personal safety, and literacy and digital skills (for the

41 The gender gap indicates the magnitude of difference between women and men with respect to women's lower likelihood of owning a mobile phone.

survey, this last aspect was included under the headings "DO NOT KNOW HOW TO USE A MOBILE" and "READING AND WRITING DIFFICULTIES"). In the case of Internet access, the most important issue is personal safety, followed by literacy and affordability. In low- and medium-income countries, women are less likely to know how to use the Internet on a mobile phone, despite the fact that usage has increased in recent years.

> **"... A combination of low literacy levels, lack of digital literacy and lack of time and support to learn how to use mobile internet aggregated to be among the top barriers in almost every country surveyed. This is consistent with findings from the International Telecommunication Union (ITU), which identified consistently lower levels of digital skills among women across a sample of developed and developing markets, and that women's lower digital skills correlated with gender inequalities overall..." (GSMA, 2019, 29).**

In addition to the availability of mobile services and Internet access, the study looked at the use of other apps available on mobile phones. In this case, women also make less use of the options available, most likely for the same reasons identified as limitations above—less educational capital and fears about safety and personal data. For example, while forty-one per cent of men in Guatemala use more than 10 apps, only twenty-four per cent of the women surveyed do so.

In the case of Colombia, it emerged from a meeting with executives of mobile operator TIGO that more rural women are now using mobile devices to take foundation courses on subjects related to soft skills, healthcare, childcare, etc. The firm's representatives affirmed that certain cultural norms have an impact on mobile use. When homes have only one device, it is used mainly by the men, with women having to wait their turn (even if they had purchased the phone). On the other hand, the chief economist of BITT (Barbados), a firm that provides digital money services, pointed out that, despite being more literate, women's access to technologies was limited. If this situation were corrected, it would lead to improvements not only for them, but also for the rest of society and the economy. In the same vein, in an IICA meeting (2020) with rural women from the five regions of Latin America and the Caribbean, the participants stressed the need to improve digital access, which is essential in the context of the pandemic for many reasons. Some stated that broadband should be made available in rural areas in order to rein in the widening of the digital gap in this context. They also pointed out the practical uses of the technology, including the need to support the virtual education of their children, which is limited because they have no Internet access.

Finally, a study by Dr. Valentina Rotondi, of Oxford University's Leverhulme Center for Demographic Science, demonstrates the economic and social implications and offers evidence of mobile phones' potential as a vehicle for sustainable development. Based on a set of statistical data and the calculation of correlations, the research led by Rotondi shows the positive effects of mobile phone use by rural women in Africa as a driver of empowerment. It confirms that access to mobile devices helps to reduce maternal and infant mortality, improve healthcare in general and address issues related to sexual rights and reproductive practices. The researcher also provides information about the gaps in access and in the use of mobiles by men and women.

In a recent study produced for Latin America (IICA, the University of Oxford, IDB and IFAD), Rotondi et al. (2020) warn that inequities in education, income and employment (among others) found in the offline universe are associated with digital inequities. The latter, the authors affirm, perpetuate and even exacerbate gender inequities. The aforementioned study focuses on the use of social networks (mainly Facebook) by women in the region, which is a useful predictor of the digital gender gap. Women in Latin America use these networks more than their peers in Asia and Africa. However, there are major disparities among countries, which highlight the digital gender gap. While in Brazil, Argentina, Venezuela, Colombia, Suriname, Uruguay and Paraguay women use Facebook at least as much as men (and in some cases, more) the situation is quite different in some Mesoamerican countries (Mexico, Nicaragua and Guatemala).

Closing the gender gap would not only generate income for mobile operators and Internet providers but also improve access to cultural goods, health, education and cultural services, and other areas of life in general, all which would improve wellbeing. The study contains a series of recommendations for different stakeholders that suggest interesting lines of action for programs or specific actions targeted at women that take cultural, as well as structural, elements into account.

Several recent research projects like the one mentioned above have focused on the living conditions of rural women and the challenges posed by future technological transformations. As Julia Klöckner[42] points out, Germany has undertaken a study of 30,000 rural women across the country in order to garner information about their practices and innovation activities, and place in agriculture and society (IICA, 2018). Similarly, in 2107 Corteva Agroscience conducted the study "Global Women in Agriculture" in order to gain a grasp of the work of women in agriculture in 17 countries on all five continents. These research projects are designed to generate data that can be used to draft policies aimed at addressing the gender gap that continues to exist in the rural milieu.

42 Minister of Food and Agriculture, Federal Republic of Germany.

The meetings with stakeholders and the research cited show that there is fertile ground for forging policies and promoting mobile usage and Internet access as a means of delivering benefits for rural women in particular, and the wider community in general. As Katie Taylor[43] (2018) points out, action to tackle the deep digital divide is urgently needed. "The full inclusion of women and girls must eliminate these gaps quickly and practically if we are to achieve dramatic growth in rural development over the next ten years" (IICA, 2018, 112).

4.6 Aggregation of gaps in rural areas:Internet access in the home and at school

The development of the information society and information and communications technologies makes it imperative that people acquire digital skills in order to achieve full inclusion in contemporary society. To that end, over the last three decades, policies have been implemented across the globe aimed at enabling educational systems in general, and continuing adult education in particular, to respond to the challenges posed by ICT, so that the use of these tools yields benefits for productive growth, social inclusion and local development.

In recent years, the deployment of digitalization has also profoundly transformed societies and the world of work, increasing the need to acquire new skills and expertise to enable individuals to participate actively under the changing conditions. Furthermore, the crisis caused by the outbreak of COVID-19 has highlighted the stark contrast between those who have access to information and communications resources and those left on the sidelines. This situation has served as a catalyst for the discussion concerning the need to align the countries' digital agendas with ICT training policies.

Recently, ECLAC (2020) drew attention to the fact that forty-six per cent of 5 to 12-year-old children in the region live in households with no Internet access, effectively disqualifying them from making use of distance learning solutions while their schools are closed during the COVID-19 pandemic. This means that more than 32 million children in 13 LAC countries are being denied the opportunity to study online.

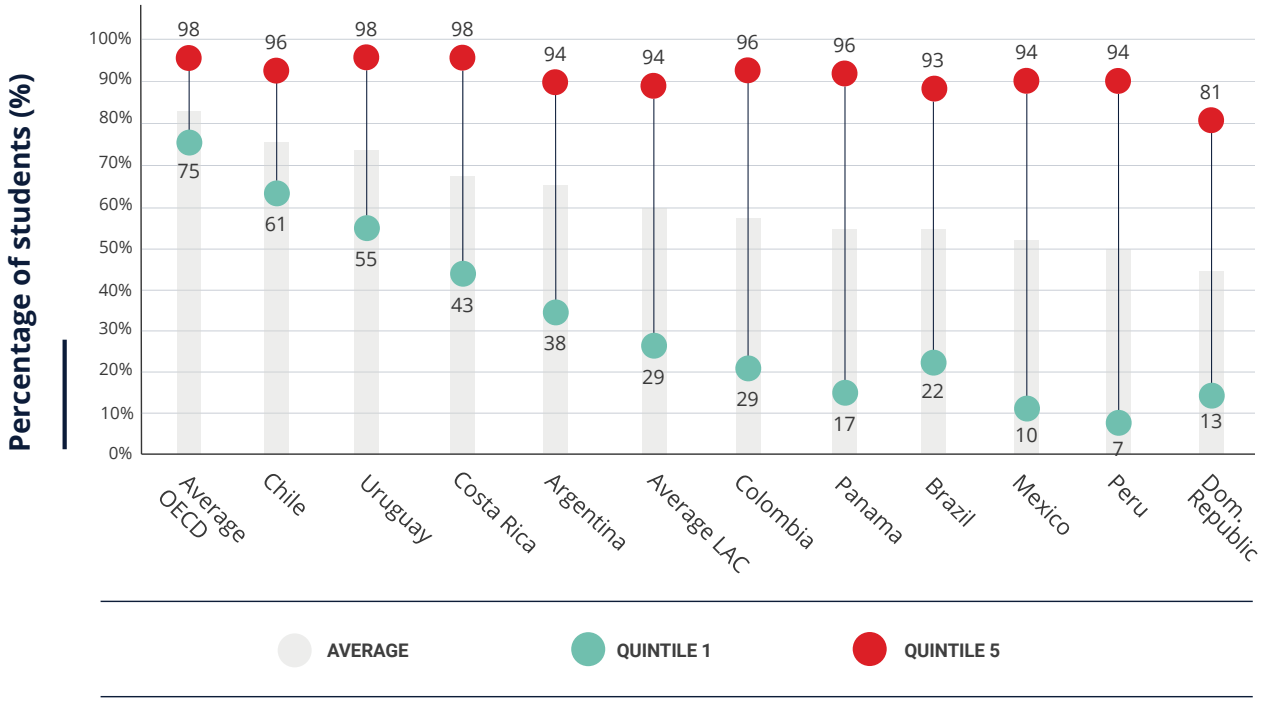
43 Executive Director of the Pan American Development Foundation (PADF).

Despite the fact that educational systems implemented a wide range of policies on the issue, digital gaps remain an obstacle when governments wish to incorporate the new technologies into education in LAC. There is no shortage of data to demonstrate the limitations that deny some population groups access to ICT and, as a result, to the benefits of digitalization.

Firstly, the socioeconomic context is an important determining factor in Latin American students' access to technology. A recent OECD study (2020) suggests that around eighteen per cent of 15-year-old Latin Americans from economically disadvantaged backgrounds have no Internet access either at home or at school, in contrast to the average of less than two per cent in OECD countries. However, it is important to highlight the great heterogeneity between countries, as some of them have developed major programs, such as the Ceibal Plan in Uruguay, which provides the school-age population with broad internet access and technological devices.

Nonetheless, approximately 24% of youth from less socioeconomically advantaged groups lack access to computers (PC, laptop or tablet) at home or at school. By contrast, students from more socioeconomically advantaged groups in the Latin American countries enjoy a level of access to such devices similar to their peers in the OECD countries. In fact, in both the Latin American and OECD countries, less than one percent of more economically advantaged students do not have access to a computer. In short, socioeconomic factors are responsible for a significant gap, which calls for the implementation of policies in the countries of the region designed to bring about effective inclusion by affording young people digital access.

GRAPH 9. ACCESS TO A COMPUTER IN THE HOME FOR DOING HOMEWORK, BY SOCIOECONOMIC LEVEL, PISA 2018



Source: Prepared by the authors based on PISA, OECD (2018). Note: Countries listed from highest to lowest according to average access in the home. Vulnerable households are those in the bottom quintile (q1) of the distribution of the PISA index of economic, social and cultural status. "Advantaged households" refers to households in the top quintile (q5).

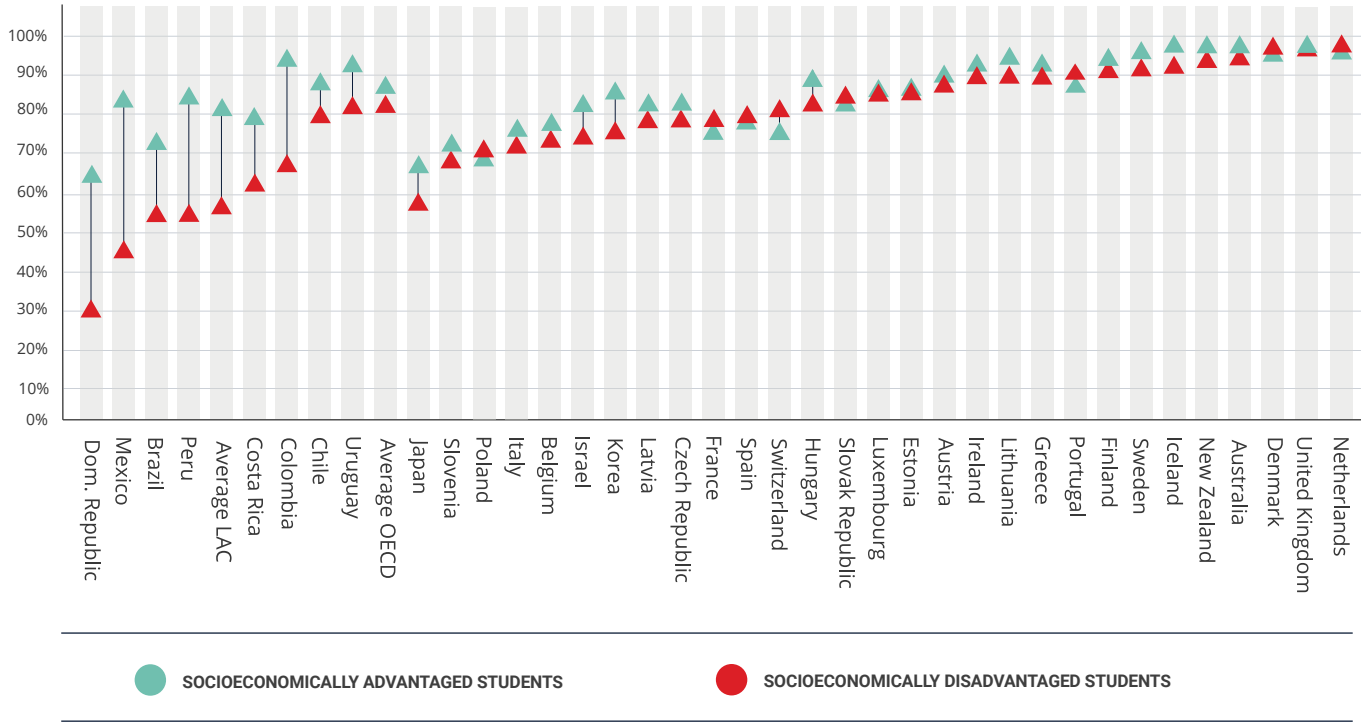
Source: IDB (2020), based on PISA, OECD (2018)

The IDB analysis (2020) based on the information gathered by the 2018 PISA assessment suggests that in Latin America forty-five per cent of the households among the most vulnerable groups have Internet access, while the figure for more advantaged homes is ninety-eight per cent. A similar trend is highlighted by the data of the TERCE study focusing on primary education, which also confirms that Internet access in the home is influenced by the socioeconomic context and the geographical area.

Secondly, the gaps in access to devices by socioeconomic status are not being reduced as a result of the availability of access to ICT in schools. In fact, the OECD (2020) warns that, although Latin American schools provide certain access to ICT, this has yet to narrow the gap in Internet access between disadvantaged and more advantaged students. The average gap in access between the two groups is more than 30 percentage points higher in the Latin American countries for which data is available than the average for the OECD countries.

GRAPH 10. GAP IN ACCESS TO ICT IN SCHOOLS, ACCORDING TO STUDENTS' SOCIOECONOMIC STATUS

Percentage of 15-year-old students with access to a PC / laptop / tablet at school



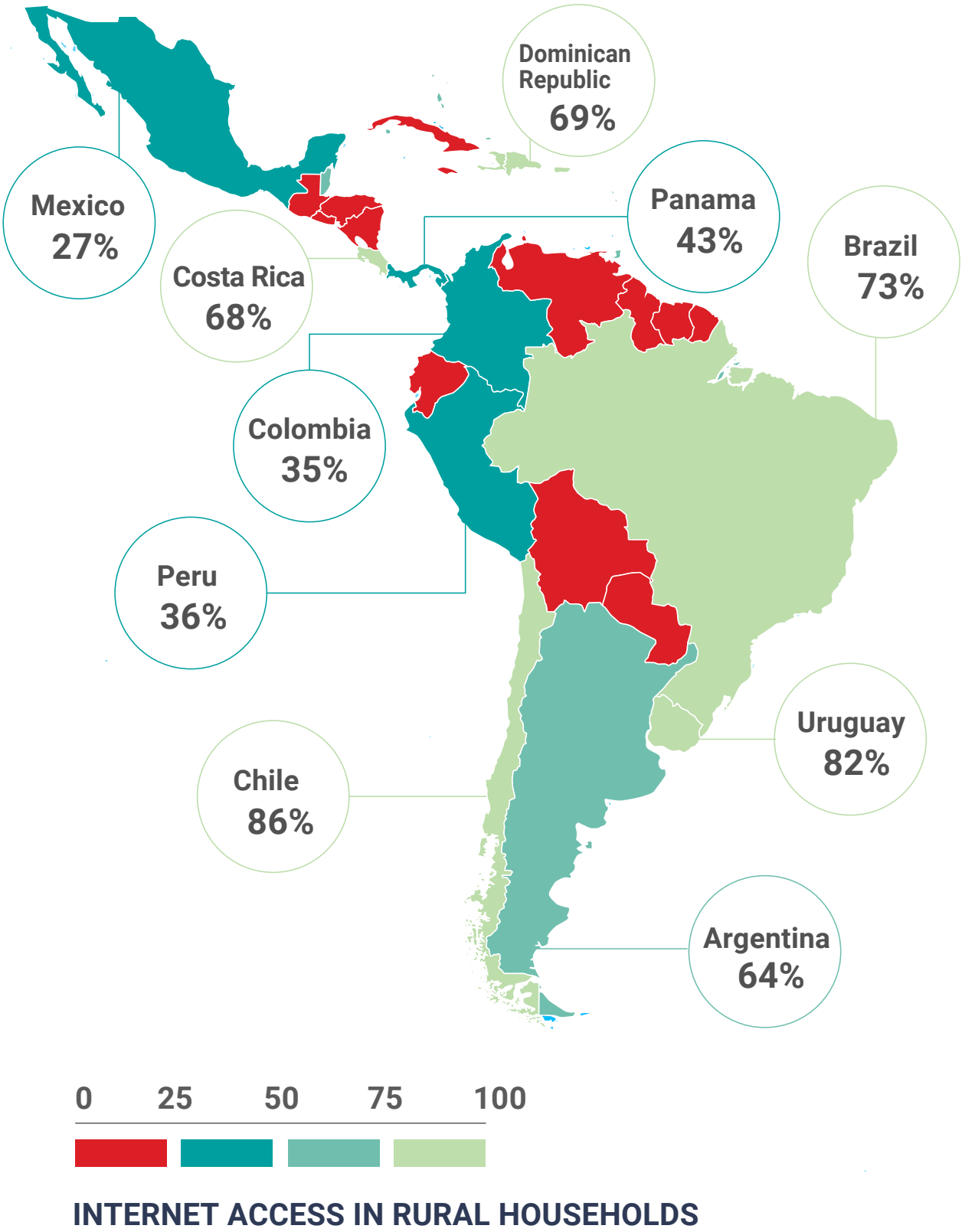
Note: Students in rural schools are students whose school is situated in "a town, village or rural area with less than 3000 inhabitants," while students in urban schools are students whose schools are located in a city with more than 100,000 inhabitants.

Source: IDB (2020). OECD calculations based on OECD (2015[23]), PISA 2015 database, http://www.oecd.org/pisa/

Thirdly, the connectivity gap between urban and rural areas is widespread in the countries of the region and even bigger than the gaps already mentioned. The gap between students according to location (in urban and rural spaces) is 35 percentage points greater in the Latin American countries than the average for the OECD nations.

The following figure, based on information from PISA 2018, shows the situation regarding rural students' access to Internet at home in 10 countries of the region.

FIGURE 3. STUDENTS IN RURAL AREAS WITH INTERNET ACCESS AT HOME, PISA 2018



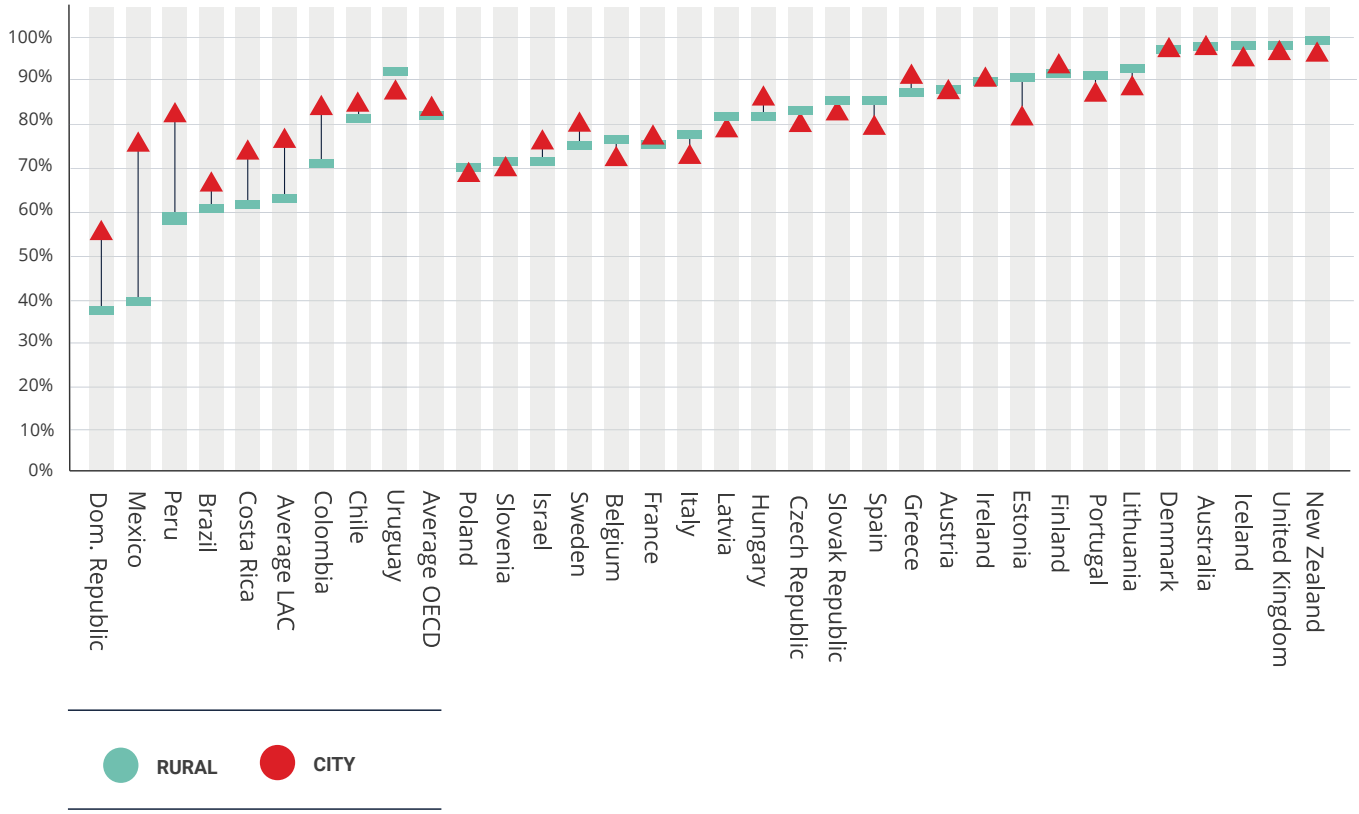
Source: prepared by authors based on PISA, OECD (2018).
Note: To disaggregate the data between urban and rural schools, a single definition is used to make it possible to compare countries. Schools located in hamlets, villages and small towns (population of less than 3000) are considered rural.

Source: IDB (2020)

In rural areas, the presence of devices and connectivity in schools enables students who have no access at home to take advantage of alternative spaces. It is important to note that schools are institutions that, given their territorial distribution and close links with the population, could potentially be used to help mitigate existing gaps. Graph 10 shows the gaps in Internet access in schools in eight LAC countries (both the gaps between urban and rural schools and in relation to the OECD countries). Note that in the LAC countries there is a big gap between urban and rural access (except in the cases of Chile and Uruguay).

GRAPH 11. GAP IN ACCESS TO ICT IN SCHOOLS BETWEEN RURAL AND URBAN AREAS

Percentage of 15-year-old students with access to a PC/ laptop / tablet at school



Note: Students in rural schools are students whose school is situated in "a town, village or rural area with less than 3000 inhabitants" while students in urban schools are students whose schools are located in a city with more than 100,000 inhabitants.

Source: IDB (2020). OECD calculations based on OECD (2015[23]), PISA 2015 database, http://www.oecd.org/pisa/

The gap is greater if connectivity is included. The average connectedness of schools in rural areas is thirty-four per cent, while nearly all schools in urban areas are connected.

In the Dominican Republic, Mexico and Peru, one in four students in rural areas have no Internet access, while the figure for advantaged students in those three countries is less than eight per cent.

With respect to access to devices, in Brazil, national statistics reveal stark differences between rural and urban areas: only forty-three per cent of schools in rural areas have computers, compared with ninety-seven per cent in urban areas (CGI, 2019; cited in OECD 2020).

According to this same document, more than forty-one per cent of rural students in Peru only have access to a computer at school. In Colombia, the figure is twenty per cent of rural students, and in Mexico, twenty-seven per cent. Other countries in the LAC region, such as Uruguay and, to a lesser degree, Chile, seem to have closed the gap between urban and rural areas, as most rural students have access to Internet and computers, both at home and at school.

It should be noted that the data cited thus far refers only to mobile phone and Internet access among students in LAC countries in urban and rural areas. Questions such as the adaptation of digitalization policies, the devices and digital skills available, and the teaching programs used to incorporate ICT, are beyond the scope of this report. These issues are also of key importance when forging public policies designed to respond to the demands and opportunities of digitalization.

The challenges posed by the COVID-19 situation call for a rescaling of the efforts to tackle the problem of the connectivity gap. **Developments in recent months have demonstrated that lack of connectivity increases inequalities and has resulted in many children and young people in the region seeing their right to education compromised, as they have no way of accessing Internet to learn.** This situation is even worse in places where the conditions are the most challenging, such as remote rural areas. An example of this can be seen in a video broadcast on Peruvian TV showing adults and children hiking 15 km to reach Kantati Ururi, in the Department of Puno. With no Internet access, they climb to the top of a hill to pick up a radio signal and listen to the content broadcast by the Ministry of Education following the closing of all schools.[44]

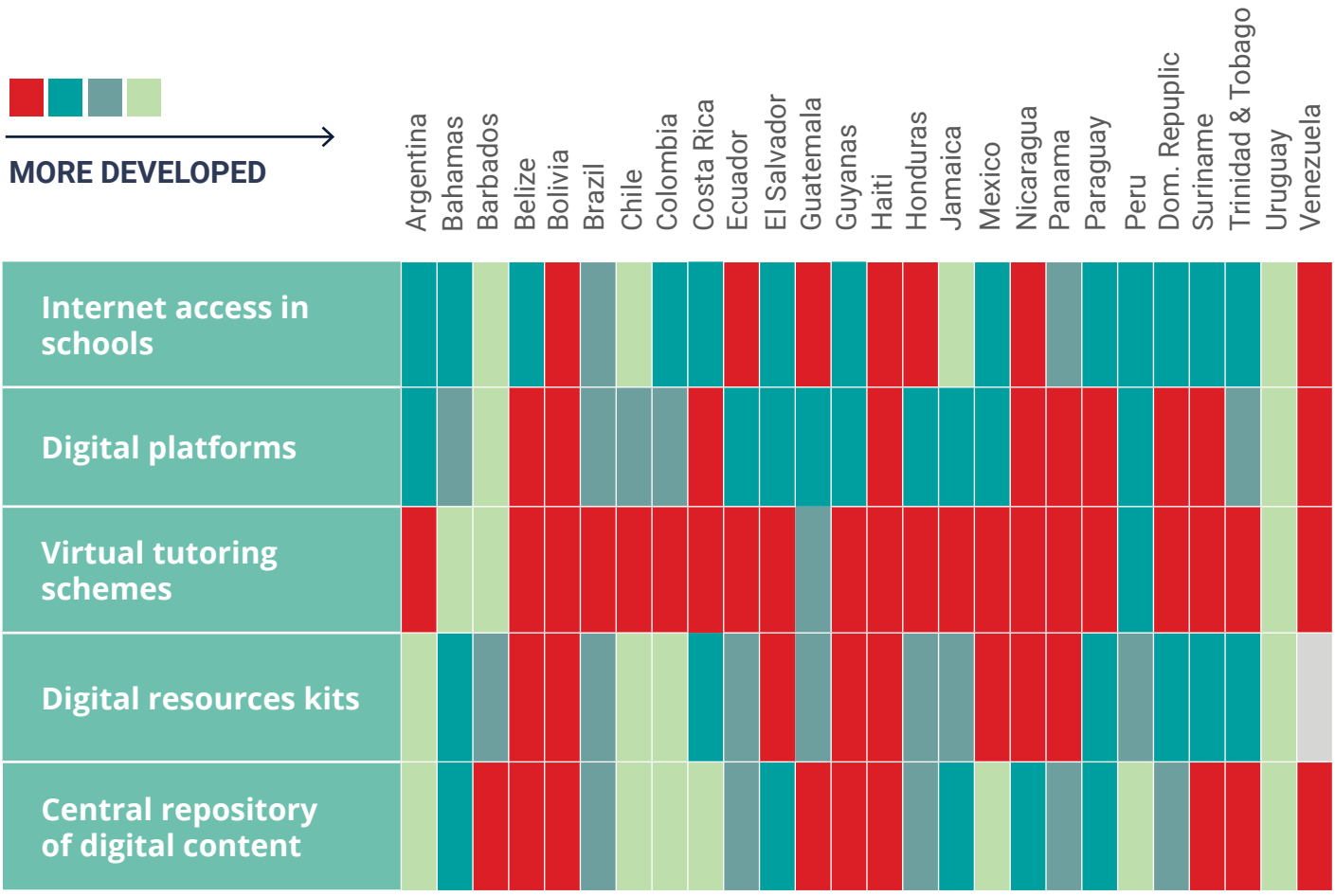
The IDB (2020) estimates that ninety-five per cent of enrolled students are no longer attending classes in person at any level following the closing of educational establishments because of the health risks posed by the virus.

44 https://www.youtube.com/watch?v=nszWPmq47dU&feature=youtu.be

In response, a number of different options have been implemented in the region, with solutions combining distance learning, the use of other digital media (social networks and platforms), and teaching via TV, radio and printed materials.

The IDB's Education Division has been working for more than two years with the Latin American and Caribbean countries on the Education Management and Information Systems (SIGED) project. The survey carried out by SIGED (2020) in the current scenario revealed that most countries in the region lack the basic digital infrastructure required to provide online educational services to all students.

FIGURE 4. BASIC DIGITAL CONDITIONS IN SIGED



Source: SIGED and data compiled by the IDB Education Division.

The above table highlights the broad disparities in the resources available to the different countries in the region for dealing with the suspension of classes. Of the 26 countries analyzed, only four have higher levels of Internet access in schools, seven have designed central repositories of more developed digital content, and four have plans for more advanced digital resource kits. Note that only Uruguay has focused on developing digitalization for educational purposes more widely (with these efforts dating, in fact, from before the pandemic), while the situation is quite the opposite in a group of the most disadvantaged countries.

According to SIGED, in Latin America only thirty-three per cent of schools have sufficient bandwidth, less than half of the average reported in the OECD countries (sixty-eight per cent). Less than twenty per cent of schools in socioeconomically disadvantaged contexts in Argentina, Colombia, Panama, Brazil, Peru and Mexico have sufficient bandwidth or Internet speed. It should be noted that, at present, bandwidth or Internet speed is just as important as Internet access to guarantee virtual learning (this document also argues for the key importance of the quality of Internet access; see section 4. "The Rural Significant Connectivity Index (RSCI) for Latin America and the Caribbean).

According to the information available, in eight of the ten Latin American countries analyzed, less than fifteen per cent of rural schools have sufficient bandwidth or Internet speed. The situation is identical with regard to Internet access in rural households, which is considerably lower than in urban areas.

AFP Marvin Recinos

5 Current strategies and solutions to reduce the coverage gap in rural areas

The survey identified three current models for reducing the coverage gap in rural areas not reached by large providers:

- **PUBLIC-PRIVATE PARTNERSHIPS**
- **ENDOGENOUS ALTERNATIVES OF THE COMMUNITIES**
- **PUBLIC SECTOR PARTNERSHIPS AND INTERNATIONAL COOPERATION**

5.1 Public-Private Partnerships

Firstly, the construction of public-private partnerships to generate projects to reduce the digital gap is identified as a model that is present in the countries of Latin America and the Caribbean. This model has initially gained momentum in urban areas, in countries such as Guatemala, Panama, El Salvador, Colombia, Ecuador and Argentina. A number of initiatives along these lines are focused on projects developed with private telephone and Internet operators in each country.

Among the projects specifically geared toward rural areas, mention may be made of those established within the framework of the Microsoft Airband Initiative that operates through the use of empty spaces in TV frequencies. **FarmBeats** (Microsoft) is an initiative developed by Bill Gates that has started a recent exploration in Argentina through linkages with agricultural companies, INTA and universities

to provide Internet connectivity from the wave frequencies used by TV that may be extended to farmers' homes and Internet of Things (IoT) base stations in the countryside. The project develops a model of data collection and centralization at the farm level. The communication of the node with the server uses the technology of TV White Spaces. This alternative was tested in the USA and there are pilot projects in Africa and Asia with FarmBeats in intensive crops.

In 2017 Microsoft Colombia joined forces with Lavazza, an Italian coffee roasting company, the Ministry of ICTs and the National Agency of the Spectrum to support 100 families of coffee growers in the municipalities of Lejanías, Mesetas and San Juan de Arama, in the department of Meta, in the implementation of a sustainable system of coffee production based on the appropriation of ICTs by the coffee growers of the area. Luciano Braverman, Education Director for Microsoft Latin America, notes that, based on the rural connectivity generated by TVWS, the quality of the products of these communities has increased by 52%, they have adapted to international standards and these families have been able to utilize educational, cultural, health and quality of life content that they could not access before. As a result, 38% of the program has been adopted in each of the municipalities where it is developed, while 25 out of 30 coffee growers and 20 out of 30 teachers are in training.

In collaboration with IICA, Microsoft is developing a digital educational alliance, with the aim of using the Microsoft technology platform to meet innovation needs in the agricultural and ecosystem segment within agriculture. Within this framework, CIMAG, the Center for the Interpretation of Tomorrow's Agriculture was launched. It is an interactive space for experimentation using artificial intelligence and for teaching about agriculture where, through virtual reality, it is possible to create models of climate behavior and crop yields, dialogue with chatbots to learn about better production practices, simulate production units, make decisions about fertilizers, land use, products that should be planted and waste management.

The Internet for All (IPT) proposal in Peru promotes the digital inclusion of people living in remote areas; it is worth mentioning that this project is developed in partnership between Facebook in Latin America, Telefónica Peru, the IDB and CAF (Latin American Development Bank) and foresees the expansion of mobile internet networks to some 30,000 rural locations in the country and to reach more than 6 million people. In El Salvador there is also a history of alliances between universities and IICAN, Red Clara and Fundación Conexión to promote rural connectivity and digital agriculture. This project provides TV connectivity in the white spaces for schools. Its representatives indicate that the project is scalable to the entire country due to its small territorial dimensions.

TV white spaces can expand connectivity in unattended and remote rural areas. Unlicensed access to unused TV channel frequencies (TV White Spaces or TVWS), can enable rapid deployment of low-cost, long-range connectivity. TVWS is an option to provide direct connectivity to end-user devices or provide a backhaul link for Wi-Fi access points, supporting distance education, teleworking, rural clinics and telemedicine, among other applications.

5.2 Endogenous Alternatives of Communities

There is a consensus among those interviewed that the arrival of connectivity in the most remote places is due to the solutions proposed by small local operators, community networks and the activity of technological poles. These are endogenous alternatives that emerge in the communities and options from where connectivity is provided by very small-scale local business initiatives that are not reflected in the statistics. In this sense, Lillian Chamorro, electrical engineer of the Colnodo Association (Colombia), remarks that: "endogenous or community-based solutions are a very good alternative" for those places beyond the reach of connection.

Actors who propose the model of endogenous solutions indicate that often connectivity strategies have not been designed in conjunction with the inhabitants of these places in accordance with their conditions and needs, due to three concurrent factors: the centralism that prevails in the region at the time of decision-making; the extrapolation of urban solutions to the rural environment; and a perspective that views connectivity as a technical issue rather than a topic related to development and a problem of a social nature. Some actors also warn about the diversity of situations in rural areas.

In this regard, Raúl Echeverría states that "rural means very different things: rural development is very different in each place; all the activities that are far from the main metropolises, small towns and villages, and we are speaking of many people, even though they may be characteristically dispersed and have lower purchasing power".

Community networks that reach out to more distant places are an alternative in the region for those cases where support from operators is needed to achieve a greater level of outreach. Among these are start-ups operating in remote locations that generally use a micro radio base and a return or backhaul network solution that connects to the mobile operators' core network.

The options offered by smaller-scale companies, in addition to bringing connections to places that are difficult to reach, in many cases drive rural connection policies associated with the development of agriculture with the participation of its inhabitants.

In Mexico, there are precedents of this type that allow for the remote connection of isolated communities through the activity of Rhizomatica (a non-profit organization).[45] The cost of these networks is less than the installation of the conventional network. This is a proposal within the reach of local communities, whose scalability possibilities need to be analyzed.

In Argentina, a project of the organization NonoLibre- and El Valle (Córdoba) aims to install wireless network infrastructure in communities in the Traslasierra valley, where there is little or no access to the Internet. The project foresees the installation of a solar station and the deployment of a meshed network of more than 30 nodes using LibreRouters and home routers. The project aims to complete the link between the National University of Córdoba and the villages of Traslasierra Valley and to interconnect the community networks of the Paravachasca and Traslasierra valleys.

An alternative model for an endogenous solution is that designed by Rhizomática together with the IDB, who are carrying out a strategy for the connectivity of indigenous territories based on the principle of autonomy and human rights. In the interview, Eric Huerta, who has developed the indigenous diploma in rural connectivity and works with community networks in Oaxaca (Mexico), emphasizes that "the problem is that there are no technological policies that strengthen the communities of peasant or family agriculture, which is the most important because of its relation with the conservation of ecosystems. The technology programs promoted by Latin American states are designed for large industries".

Dialogue with rural women and youth within the framework of this study allowed for gaining insight on the perspective of these stakeholders regarding the rural digital divide.

One of the conclusions of the youth forum organized by IICA in June 2020[46] was that the networks mentioned in this section are mostly associated with perspectives that encourage the agricultural practices of these communities. As part of the conclusions of this forum, the participants pointed out that in times of pandemic, their proposal is to strengthen family agriculture and eco-agriculture and that, to that end, the technologies must meet their needs for information to innovate and communicate efficiently, as well as to open up new markets and forms of marketing.

45 This initiative connected a community of 500 inhabitants in San Juan Yaeé (Mexico) www.rhizomatica.org

46 https://www.iica.int/en/press/news/rural-youth-americas-share-requirements-becoming-involved-building-new-post-covid-19

When considering the youth perspective, Yeisully Tapias, Director of the Association of Rural Youth in Latin America, says that proposals for access to technology "should focus more on building solutions with youth. Ensure that technologies arrive but that young people can define what they really need (...) It is urgent that rurality not be assimilated with agricultural production. Rural youth do much more than agriculture. Young rural people who go to study abroad want to return to the countryside, but what happens if they return and the conditions do not exist to empower these young professionals to contribute to the development of rurality? We must not only take advantage of these capacities in the area of production and marketing, but we must also advocate for the allocation of resources to transform agricultural production, build collection and marketing centers, and so on. Thus, those who studied marketing and sales can develop their capacities, or those who studied photography can produce content. But this is not possible without connectivity.


AFP Nano Calvo, Science Photo Library

The COVID- 19 scenario also poses challenges for family agriculture. In IICA's series of web seminars: "Thinking about the world and food security in Latin America and the Caribbean after COVID-19," several speakers highlighted connectivity as a key issue:

The President of Cooperatives of the Americas, Graciela Fernández, and the former Minister of Agriculture and Foreign Affairs of Uruguay, Álvaro Ramos, **agreed** that "differentiated public policies, digitalization and connectivity for training, technical assistance and access to health information will strengthen the short circuits in which family agriculture is key to food supply." During the same activity, the former U.S. Undersecretary of Agriculture and Food Security, Elsa Murano, and the Director General of the Alliance of Bioversity International - International Center for Tropical Agriculture (CIAT), Juan Restrepo, agreed on the issue of

the coverage of ICTs, and stated that providing connectivity to rural areas and increasing investment in research and development will be fundamental to strengthening agricultural value chains after Covid-19. The women also proposed a similar approach to connectivity in the forums for rural women in Latin America and the Caribbean (IICA, 2020), where they emphasized the need for connectivity to support family and small-scale agriculture and for technologies to help them strengthen direct marketing between producers and consumers, by consolidating their offerings without requiring collection centers.

Regarding the scope of connectivity solutions, several of the people interviewed in this study mention, as stated in this section, that technological solutions must be adjusted according to uses, destinations and requirements; so they argue that each remote community should have a specific combination of technologies. In a similar vein, Maryleana Méndez, General Secretary of ASIET pointed out that "we must think of advanced solutions that are close to the population. All these processes must be on par with the development of skills associated with the vital forces of the district".

In short, the perspective that tends to associate the search for solutions with the development carried out by the communities themselves, presents an important agreement from the perspective of those who are developing endogenous solutions. Thus, they also claim that there is no single technological option and that these must be selected in relation to the different contexts. In this regard Raúl Echeverría warns: "I believe that technologies are there; we must draw up a menu of technologies as Altermundi and Rizhomática have done; there is technology such as satellite access that makes no sense in a neighborhood with multiple fibers, but does so in a remote place. You have to consider the different technologies, what are the benefits, in which cases some are better than others; sometimes they deal with frequencies and other times it can be wifi. Similarly, Maryleana Mendez points out that "there is an ecosystem (technological)- the solutions are complementary and necessary - depending on the investment, people involved and distances. For example, a satellite is used to undertake transport from tower to tower when I cannot carry microwaves or cellular connectivity lines. There are complementary technologies; in fact, there are options for everything".

In short, to the diversity of technologies and solutions must be added the multiplicity of actors who are involved in solving the problem of rural connectivity. According to CAF - now the Latin American Development Bank - in order to increase investments and make them more effective, the countries must adopt a comprehensive vision of rural development, with a public policy framework that takes into account the particularities of rural communities with an emphasis on the most dispersed and vulnerable populations, such as indigenous peoples.

5.3 Public Sector Partnerships and International Cooperation

The third model identified is the establishment of public partnerships and international cooperation for the reduction of digital divides. Two cases are presented that belong to the field of rural education and are of interest because of the connectivity solutions they are developing and their potential for reaching dispersed territories. The "Lights to Learn" program promoted by the Organization of Ibero-American States for Education, Science and Culture (OEI) and the "ICT-mediated Rural Secondary Schools" program of UNICEF Argentina.

"Luces para aprender" has been growing in 13 countries of Latin America (Argentina, Bolivia, Colombia, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, Peru, Panama and Uruguay since 2011. The project was presented with an award at the WISE 2017 Awards (Qatar),[47] integrating the nomination of the 6 projects selected worldwide for providing innovative solutions in education.[48] The objective of the project is to improve the quality and equity of education in rural schools in the region. It was carried out through the cooperation of the OEI with each of the Ministries of Education in the countries. The project is divided into five components: energy; information and communication technologies (ICTs); teacher training; community strengthening; and sustainability.

The arrival of connection to remote areas occurred via the electrification of schools carried out through isolated systems of renewable energies (photovoltaic solar energy), since the electrical distribution network does not reach most of the communities. Most of the countries designed a solar photovoltaic system (SSFV). This solution includes the installation of energy kits that provide lighting services and connection of various computer equipment. However, some countries adjusted this general proposal to offer a system adapted to local conditions. The ICT component has required customized solutions, as the technical alternatives to facilitate connectivity are dependent on the local context. Among the options used are terrestrial connectivity to the Internet, satellite connections and DSL connection.

The program was successful in reaching 55,000 'hard-to-reach' rural schools in Latin America, favoring, in particular, indigenous peoples, those of African descent, and the most vulnerable sectors.

In the case of Uruguay, all rural schools without electricity in the country had electrical panels installed, through a project in association with the country's electricity company, ANEP (National Education Administration) and the Ceibal plan. When the country advanced in technological expansion through Ceibal to all its schools, the electrical panels were moved to rural areas of the country

47 https://www.youtube.com/watch?v=4tMEEMFkgmM&feature=youtu.be

48 Institutional video "Bienvenidos", which presents the project "Luces para aprender" (OEI) https://www.youtube.com/watch?v=QXFzD8EhsqM&t=46s


AFP Marvin Recinos

without connection and this allowed for the development of other productive processes. The latter confirms the synergy generated by connectivity in rural areas, as well as its transformative potential. In this way, a project that initially reached schools impacts productive activity (such as a fishing enterprise of women and youth in the region)[49]and cultural activity (series of community cinema organized in schools).[50]

Within the framework of the "Program for Accelerating the Development of Education in the Amazon (PADEM)", the Brazilian government, with support from the IDB, has been promoting an online education initiative for rural communities since 2007. As a result of the project, 12 schools were built, and 500 existing schools were updated to develop a distance education model.

At present, the program benefits more than 50,000 young people from 6,000 rural communities (approximately 23% of high school students in the state of Amazonas outside of Manaus). Since its inception, more than 300,000 Brazilian students have participated in the initiative.

Students interact through a monitor with their teacher, who is hundreds of kilometers away in the city of Manaus, which is the capital of the state of Amazonas. The initiative has also been expanded to include the state of Pará, which neighbors the state of Amazonas. A digital system enables the teacher to respond to students in real time. An in-person teacher is also present in the classroom, to assist students with their assignments and support the activities carried out. Each class has no more than 40 students, who connect from several rural

49 Women and youth project in Laguna de Rocha (Uruguay) from the installation of the solar energy panels of "Luces para aprender". https://www.youtube.com/watch?time_continue=3&v=bFdNNt06JQU&feature=emb_logo

50 "Luces para aprender" in Uruguay https://www.youtube.com/watch?v=QXFzD8EhsqM&t=46s https://www.youtube.com/watch?time_continue=3&v=bFdNNt06JQU&feature=emb_logo

communities simultaneously. The teachers and specialists provide support from the Amazon Education Media Center, located in the Japiim district (south-central region of Manaus). The Center includes television studios, where a team of teachers conduct classes that are transmitted via satellite for the benefit of rural communities in the Amazon.

To provide students with access to the classes delivered from the Media Center, the state's Government has contracted a specialized satellite communication service in the rural communities that are involved in the project. In those communities, each classroom is equipped with a technology kit consisting of a two-way VSAT antenna, a satellite router-receiver, structured LAN cabling, a microcomputer, a webcam with a built-in microphone, a 37-inch LCD television, a laser printer and a switch. These technologies enable teachers and students to interact as if they were in the same physical space.

The program has been recognized by some of the world's leading educational organizations. In 2009, it received the Learning Impact Award from the IMS Learning Global Consortium, a WISE Award from the Government of Qatar, and an Arede Award in recognition of its innovative approach.

A proposal with similar characteristics is the project **"Rural Secondary Schools Mediated by ICT"**, which has been undertaken by UNICEF in Argentina since 2012 and is composed of eight secondary schools mediated by technology with 90 sites located in rural areas in 6 provinces of Argentina (Chaco, Salta, Jujuy, Misiones, Tucumán and Santiago del Estero). The project is the result of the cooperation of this organization with the Ministries of Education in each of the provinces.[51]

At present, there are more than 1,500 students in these schools, 100 teachers of the different subjects at the secondary level, 140 tutors and 14 indigenous teaching assistants who accompany the students at the locations. Of these, 46% belong to more than 10 communities of indigenous peoples. Since its inception, 500 young people have graduated. At the United Nations General Assembly in 2018, Generación Única chose Argentina's model of Rural Technology-Mediated Secondary Schools as one of five global solutions to guarantee access to education for millions of young people living in hard-to-reach areas.

Technology-mediated rural high schools include a central office located in an urban center, attended daily by teachers of different disciplines, and offices located in rural areas, attended by students daily. Teachers share classes from the capital by means of an educational platform that students access through computers. One or two teachers accompany the groups of students in the rural locations and have access to an internal school network with offline educational content, internet and cell phones. Since the schools are located in scattered areas, the connection is achieved via satellite.

51 Institutional video. Secondary schools mediated by ICT, UNICEF Argentina https://www.youtube.com/watch?time_continue=32&v=lc0FFXIjmzA&feature=emb_logo

Although these projects are relative in scope and have been applied to a particular sector (education), they are remarkable in that they provide a solution through the use of technological options that have proven to be optimal for addressing inaccessibility in unfavorable environments, either because of their geography and/or the absence of basic infrastructure. Indeed, proposals of this nature may be expanded. With respect to these alternatives, it should be noted that their scalability has yet to be explored, and they should also be incorporated as part of public policies to promote their continuity beyond the presence of cooperation agencies. Accordingly, it is essential to move ahead with agreement on public policies, and the various actors (private sector, cooperatives, etc) to resolve the current state of affairs. It is also necessary to generate governance models to promote the arrival of quality connectivity options in rural areas. In short, these projects demonstrate that it is possible to implement initiatives of this type for women and men linked to agricultural productivity, who are currently completely neglected.

Providing connectivity alternatives and closing the digital gap between rural and urban territories requires the promotion of public policies for this purpose. These investments generate returns in the areas of productivity, education and health. It is also worth noting that all sectors must support the implementation of public policies aimed at reducing existing gaps.

Mobile operators in Latin America are significantly increasing direct investment. According to the GSMA, they are expected to reach a cumulative total of US$116 billion between 2015 and 2020, with a large proportion of these resources going towards spectrum and license payments (a significant portion of capital spending is directed towards 4G deployment). Argentina, Brazil and Mexico are the countries that focalize most of the capital investment in the region due to their geographical size and population density. However, these investments have restrictions in terms of extending coverage to the most remote areas mainly because of their cost effectiveness. In the face of the scenario outlined, a series of connectivity options through mobile operators that adopt alternative methods appear, such as infrastructure sharing and partnerships with other actors in the digital ecosystem to further expand the reach.

Infrastructure sharing allows for more efficient network deployment and lower operating costs. This is an option that reduces infrastructure duplication (currently independent tower companies own and operate 42% of all towers in Latin America). The optimization in the use of the towers also brings about favorable effects in relation to environmental care. Infrastructure sharing is an option that comprises both the physical components of a cell site (e.g. installation of several antennas on one tower), and the possibility of access by radio access network, the central or core network.

In relation to partnerships with other actors in the digital ecosystem, the use of satellites and other antenna technologies that are facilitating the coverage of remote areas is currently being registered. For example, the Gilat Satellitte Networks Company provides services for telecommunication and rural access in Peru and Colombia and has partnered with various mobile operators such as Antel in Uruguay; O3b Networks provides services in Colombia and could be used to offer broadband internet to users in the Amazon and other remote areas. ENACOM and ARSAT in Argentina are working on alternatives to lower the cost of satellite access. Another form of collaboration is the formation of community networks, which are presented below as a model of an endogenous alternative for communities.

A document prepared by ECLAC, FAO and IICA (2019) reports on various projects currently being promoted to install a satellite network covering all the territories of the world. This is Amazon's Kuiper project, which proposes the creation of an interconnected network of 3,236 satellites to provide high-speed, low-latency connectivity to disconnected communities around the world. The PointView Tech project, driven by Facebook, foresees the launch in 2019 of the Athens satellite, located in low orbit, as a first step to subsequently installing an equivalent satellite network. The SpaceX's Starlink project aims to create a network of 11,000 satellites to cover the Earth. These projects, which would be operating as of 2022, will provide connectivity to the most remote locations on the planet, which currently do not have the resources or infrastructure necessary to access the network (EMOL 2019) and are expected to achieve a reduction in costs and improvements in the quality of service.

6 Conclusions

This report represents an effort to collect and produce information on the status of rural connectivity in LAC. At present, there is widespread agreement about the importance of Internet access, as has been demonstrated during the current crisis caused by COVID-19. However, almost a third of the total population in Latin America and the Caribbean currently lacks internet access, and there is a long road ahead to achieve equality of conditions.

The broad disparities between countries of the region, as well as within them, with respect to access to connectivity have been highlighted throughout these pages. Rural dwellers, women and lower socioeconomic populations are at a disadvantage in terms of access to the benefits afforded by new information and communication technologies. If these limitations are not effectively addressed, they can deepen existing inequalities. Disconnection, in turn, currently limits the possibility of accessing education, job opportunities and health services, among other benefits.

Further research is necessary in order to deepen the analyses generated in this document, which were based on available information and whose measurements and projections will need to be revised in light of new data produced. Moving forward, it will be crucial to acknowledge the strategic importance of producing official information that differentiates between urban and rural areas. There is no doubt that having access to robust information will facilitate public and private action-taking by rural communities and organizations, multilateral credit agencies, international support and investment institutions, as well as local governments, academia, and many other stakeholders.

Having access to complete and open information and data will play a key role in comprehensively managing this challenge. Furthermore, direct coordination and the establishment of agreements between national statistics offices, universities, research institutes and observatories are crucial in order to generate data on the rural digital divide.

A fundamental challenge for public policymaking is distinguishing between public and private goods which, in some cases, warrants the direct intervention of the State through efficient regulatory frameworks and public investment. However, in other cases, what is required are adequate incentives to encourage private investment as well as sufficient income levels to boost the demand for connectivity equipment and services.

This document has also described various partnership models and strategies that have achieved progress in bringing connectivity to dispersed and remote areas. These are noteworthy initiatives because they propose solutions for specific contexts and their proposals can be replicated, although it is necessary to explore ways in which they can be scaled up. In that regard, it is crucial to achieve progress in aligning public policies and efforts undertaken by various stakeholders (such as the private sector and cooperatives, among others) to resolve the current situation. It is also important to generate governance models to provide rural areas with quality connectivity options. The projects described demonstrate that it is possible to implement initiatives geared towards women and men who are involved in agricultural production and are currently neglected.

One interesting option is the idea of creating a digital cooperation ecosystem for the rural milieu with a view to fostering a culture of innovation and digital solutions for food production and agriculture. The links among different sectors (different types of agricultural producers, technological clusters, firms involved in agriculture 4.0, international agencies, state agencies, research institutes, etc.) can increase the demand for digitalization in rural areas. The development of a rural digital ecosystem is one way to promote connectivity and foster the development of ICT skills and their incorporation into production.

Improving connectivity and closing the digital gaps between people and between rural and urban territories should be a priority for policy design 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, generate employment, improve productivity and the quality of products and services, promote inclusive education and expand the

possibilities for knowledge and participation in global culture,[52] 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[53] 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 (ECLAC/FAO/IICA, 2019). In addition to the gaps described in detail in the report, there is the gap that may form the basis for others: 71% of the population has access to significant connectivity services, while in rural populations the percentage drops to 36.8%, a gap of 34 percentage points. Correcting these gaps in the immediate future is a major challenge, given that the recession caused by the COVID-19 pandemic is, as will be noted later on in this document, the largest in the history of Latin America and the Caribbean.

52 https://publications.iadb.org/publications/spanish/document/Informe_anual_del_%C3%8Dndice_de_Desarrollo_de_la_Banda_Ancha_en_Am%C3%A9rica_Latina_y_el_Caribe_es.pdf

53 agrirural.org

7 Recommendations

1 As was stated during the **Conference of Ministers of Agriculture of the Americas 2019**, information and communications technologies (ICT), universal connectivity and greater dissemination of digital technologies are important building blocks for the future of agricultural production.[54] Hence, public policies are required to specifically address the situation of the gap in rural connectivity in Latin America and the Caribbean.

2 Given the absence of official information on rural connectivity in most countries in the region, it is crucial that the States, when compiling statistical data, differentiate between the urban and rural sectors. Another priority is the need to gather information about small businesses and cooperatives that provide Internet access in rural areas. Countries need to possess this data in order to draft evidence-based public policies and monitor the achievement of regional and global goals related to disadvantaged territories and populations.

54 First forum "The opportunities for rural inclusion in the digital era".

3 In-depth information about the quality of connectivity in those territories is vital for the implementation of both public and private sector actions, and the efforts of rural communities and organizations, international centers, local governments and academic institutions that support the rural milieu, which are just some of the many other stakeholders. Having full, open information and data available as and when required is essential to tackle the challenge in an integrated manner. Hence, direct coordination and agreements with national statistics offices, universities, research institutes and observatories are also key to improving the quality of the data gathered on the rural digital divide.

4 Difficulties in financing infrastructure and the costs involved in connecting households and improving access to devices are barriers to digital inclusion that are more critical in rural areas. It is crucial to address the question of the affordability of both access and devices. Internet access in rural areas should cost the same as in urban areas (or even less).

5 Public policies are required that facilitate public investment in the construction of the relevant infrastructure, and in the development of regulatory instruments that provide an incentive for the private sector to invest in services in the most inaccessible areas, in order to close the gaps that currently exist. Subsidies, public/private partnerships, tax incentives and universal access funds, the instruments normally used, need to be redefined in order to expand coverage. The countries also need infrastructure maps (which do not exist at present) so they can determine whether the current gaps are due to market problems (the lack of profitability, which justifies public intervention), or to obstacles created by jurisdiction problems. The latter will require actions to address the question of regulatory issues and/or the competent authority. A key challenge for the design of public policy is the distinction between public and private goods which, in some cases, justifies direct State intervention with efficient regulatory frameworks for public investment; and, in others, calls for the promotion of private investment, as well as incentives for accessing connectivity equipment and services.

6 Given the heterogeneous nature of the rural connectivity situation across the region, and within countries, there are no universal solutions. Solutions and strategies must be tailored to the context, using the technology best suited to the different cases (optic fiber, satellites, etc.) and to the target populations, with a special focus on the gender perspective, emphasized in the report.

7 TV white spaces can be used to expand connectivity in remote, unconnected rural areas. Extensive use of TVWS technology is recommended as a secondary service, or as free use of the UHF band, for rural areas where it has been more difficult to guarantee Internet access. This technology makes use of the radio frequency spectrum (470 MHz to 698 MHz) that used to be assigned to television channels, but is now being freed up following the switch from analog to digital television. This alternative can provide high-speed Internet access in the most remote areas of Latin America and the Caribbean with a minimum of investment in infrastructure.

8 It is necessary to draw up specific rural connectivity policies tailored to each country and plans that take into account socioeconomic, geographical, and age- and gender-related criteria. Rural areas are not uniform and are made up of a wide range of activities in which connectivity is important (agriculture, health services, education, cultural promotion, etc.). The availability of Internet access for the work involved in any of these areas can produce synergies and positive spillover effects for the development of such communities (as observed in the cases of public partnerships with cooperation agencies that were discussed).

9 Given the scenario created by the COVID-19 crisis, the importance of agriculture and its growing links with digitalization cannot be overstressed, because of the latter's potential for generating scaled productive processes that maximize quality. In a discussion with the Director General of IICA, Manuel Otero, the Minister of Agriculture, Fisheries and Food of Spain, Luis Planas, said that "(...) agriculture is an indispensable sector for humanity, but it needs to aim for greater sustainability, broaden its digitalization and innovate both commercially and productively, all factors that will make it attractive to younger generations to dedicate themselves to the activity".[55] Future food needs, the anticipated economic reactivation and improvements in the work of people involved in agriculture call for the incorporation of digital processes into rural activities. For that to happen, Internet access is a prerequisite.

10 Reducing the gender gap in Internet access leads to improvements in productive activity, economic benefits and access to cultural goods and services that have a positive impact on the quality of life and development. The countries need to understand better the gaps that exist in rural women' access to mobile phones and how they use them. Placing ICT at women's fingertips produces benefits that help to empower them and their communities. To that end, studies on the rural gender gap are needed, along with specific policies for mitigating the disparities.

11 The governments of LAC have to strike the right balance between the expansion of access to digital devices, the improvement of quality, and the relevance of the investments in ICT made in Latin American and Caribbean schools, especially in those located in the most disadvantaged geographical areas, in order to mitigate the current disparities and promote effective digital inclusion.

12 Another priority is the need to develop specific content and fuel the demand for connectivity in rural areas as a means of encouraging expansion and the use of the new information and communications technologies. The development of learning platforms, the training of extension workers through information and communications technologies, and the dissemination of good practices for the development of agriculture through the incorporation of technologies can all stimulate the demand and drive growth in the use of ICT in rural activities, especially among the segments that are still lagging behind.

55 https://www.google.com/url?q=https://iica.int/es/prensa/noticias/el-ministro-de-agricultura-de-espana-luis-planas-pide-agricultura-mas-digital&source=gmail&ust=1599595872993000&usg=AFQjCNFm6Tqxw4sYc3wvB1I7YfGQu7oGxg

Bibliography

- **Agencia de Gobierno Electrónico y Tecnologías de Información y Comunicación** (AGETIC). (2018). Estado TIC. Estado de las Tecnologías de Información y Comunicación en el Estado Plurinacional de Bolivia. Segunda Edición, La Paz. Bolivia. Disponible en: https://agetic.gob.bo/pdf/estadotic/AGETIC-Estado-TIC.pdf
- **Baca, C. Belli, L & otros.** (2019). Comunitarias en América Latina: Desafíos, Regulaciones y Soluciones. Internet Society. APC. Direito Rio. Redes por la Diversidad, Equidad y Sustentabilidad A.C Disponible en: https://www.internetsociety.org/wp-content/uploads/2018/12/2018-Community-Networks-in-LAC-EN.pdf
- **Banco Interamericano de Desarrollo** (2020) La educación en tiempos del coronavirus. Los sistemas educativos de América latina y el caribe ante COVID- 19. Documento para discusión N IDB- DP- 00768. https://publications.iadb.org/publications/spanish/document/La-educacion-en-tiempos-del-coronavirus-Los-sistemas-educativos-de-America-Latina-y-el-Caribe-ante-COVID-19.pdf
- **Banco Interamericano de Desarrollo**, CIMA (2020) COVID-19: ¿ESTAMOS PREPARADOS PARA EL APRENDIZAJE EN LÍNEA? Nota 20. https://publications.iadb.org/publications/spanish/document/Nota-CIMA--20-COVID-19-Estamos-preparados-para-el-aprendizaje-en-linea.pdf
- **Banco Interamericano de Desarrollo**. (2019). Internet para Todos: Disminuyendo la Brecha Digital en América Latina. Disponible en: https://www.iadb.org/es/mejorandovidas/internet-para-todos-disminuyendo-la-brecha-digital-en-america-latina
- **Banco de Desarrollo de América Latina.** (2018). Redes comunitarias como respuesta a la brecha de conectividad. Disponible en: https://www.caf.com/es/conocimiento/visiones/2018/10/redes-comunitarias-como-respuesta-a-la-brecha-de-conectividad/
- **Banco Interamericano de Desarrollo.** (2017). AgroTech: innovaciones que no sabías que eran de América Latina y el Caribe (en línea). Disponible en https://publications.iadb.org/publications/spanish/document/AgroTech-Innovaciones-que-no-sab%C3%ADas-que-eran-de-Am%C3%A9rica-Latina-y-el-Caribe.pdf.
- **Banco Mundial.** Junio 2020. Global EconomicProspects. Work Bank Group. Disponible en https://www.bancomundial.org/es/publication/global-economic-prospects
- **Brossard, F.** (2016). Hacia un modelo de inclusión digital rural. Nueva Sociedad. Disponible en https://nuso.org/articulo/hacia-un-modelo-de-inclusion-digital-rural/
- **Brossard, F.** (2016). La digitalización del campo en América Latina. ¿Para qué sirve internet en el mundo rural? Nueva Sociedad. Disponible en: https://nuso.org/articulo/la-digitalizacion-del-campo-en-america-latina/
- **Brunereau -Viña, L.** (2016). Conversando sobre inclusión digital en el sector rural. Ventana Informática. Núm. 35. Disponible en: http://revistasum.umanizales.edu.co/ojs/index.php/ventanainformatica/article/view/1852
- **Castellano, J.** (2012). Servicio universal de banda ancha en áreas rurales: análisis de impacto de los planes públicos en la reducción de la brecha digital en España. Conectados a la banda ancha: tecnología, políticas e impacto en América Latina y España. Santiago: CEPAL, 2012. LC/W.495. p. 51-69. Disponible en: https://repositorio.cepal.org/handle/11362/4022?locale-attribute=es
- **Caerio, Carolina.** (2019). El acceso que falta: el caso de las redes comunitarias. ASIET Telecomunicaciones de América Latina. Disponible en: https://asiet.lat/actualidad/opinion/el-acceso-que-falta-el-caso-de-las-redes-comunitarias/
- **CAF.** (2020, April 3). El estado de la digitalización de América Latina frente a la pandemia del

COVID-19. Caracas: CAF. Disponible en: https://scioteca.caf.com/handle/123456789/1540

- **CEPAL** (Comisión Económica para América Latina y el Caribe) (2020) Universalizar el acceso a las tecnologías digitales para enfrentar los efectos del COVID- 19. Disponible enhttps://www.cepal.org/es/publicaciones/45938-universalizar-acceso-tecnologias-digitales-enfrentar-efectos-covid-19
- **CEPAL** (2019). Tendencias recientes de la población de América Latina y el Caribe. Santiago de Chile, CELADE. https://dds.cepal.org/redesoc/publicacion?id=5036
- **CEPAL** (Comisión Económica para América Latina y el Caribe) (2018). Una mirada regional al acceso y tenencia de tecnologías de la información y comunicaciones – TIC, a partir de los censos. Disponible en https://www.cepal.org/es/enfoques/mirada-regional-al-acceso-tenencia-tecnologias-la-informacion-comunicaciones-tic-partir
- **Comisión Económica para América Latina y el Caribe (CEPAL)**. (2018). Monitoreo de la Agenda Digital para América Latina y el Caribe eLAC2018. Disponible en https://repositorio.cepal.org/bitstream/handle/11362/43444/1/S1800256_es.pdf
- **CEPAL, FAO, IICA** (2019). Perspectivas de la Agricultura y el Desarrollo Rural en las Américas: una mirada hacia América Latina y el Caribe 2019-2020. Disponible en https://repositorio.iica.int/bitstream/handle/11324/8214/BVE19040295e.pdf?sequence=1
- **Chamarro, M.** (2018). Brecha digital, factores que inciden en su aparición: acceso a internet en Paraguay. Población y Desarrollo. 2018; 24. Disponible en: http://scielo.iics.una.py/pdf/pdfce/v24n47/2076-054X-pdfce-24-47-00058.pdf
- **Digital Future Society.** (2019). Bridging digital divides: A framework for digital cooperation. Barcelona, Spain.
- **Eddine, D.** (2015). Brecha digital y perfiles de uso de las TIC en México: Un estudio exploratorio con microdatos. Culturales vol.3 no.1 Mexicali ene./jun. 2015 Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1870-11912015000100006
- **Escobar, D.** (2019). Mujeres rurales en el despliegue de redes celulares y de acceso a internet. GenderIT.org. Disponible en: https://www.genderit.org/es/articles/edicion-especial-mujeres-rurales-en-el-despliegue-de-redes-celulares-y-de-acceso-internet
- **Escuder, S.** (2019). Regionalización de la brecha digital. Desarrollo de la infraestructura de las TIC en Latinoamérica y Uruguay. Revista PAAKAT volumen 19. Disponible en: http://www.scielo.org.mx/scielo.php?pid=S2007-36072019000200007&script=sci_arttext
- **García Zaballos, A., & Iglesias Rodríguez, E.** (2017). Informe anual del Indice de Desarrollo de la Banda Ancha en América Latina y el Caribe. Monografía del BID https://publications.iadb.org/publications/spanish/document/Informe_anual_del_%C3%8Dndice_de_Desarrollo_de_la_Banda_Ancha_en_Am%C3%A9rica_Latina_y_el_Caribe_es.pdf
- **García Zaballos, A., & Iglesias Rodríguez, E.** (2017). Economía digital en América Latina y el Caribe: Situación actual y recomendaciones. Monografía del BID (Sector de Instituciones para el Desarrollo. División de Conectividad, Mercados y Finanzas); IDB-MG-570. Disponible en https://publications.iadb.org/bitstream/handle/11319/8701/Economia-digital-en-America-Latina-y-el-Caribe-situacion-actual-y-recomendaciones.PDF?sequence=1&isAllowed=y
- **García, A et al.** (2019). Promoción del desarrollo digital en Guatemala. Retos y Acciones. Banco Interamericano de Desarrollo. Disponible en: https://publications.iadb.org/publications/spanish/document/Promoci%C3%B3n_del_desarrollo_digital_en_Guatemala_Retos_y_acciones_es.pdf
- **GSMA** (2020). Connected Society. The state of mobile internet connectivity 2020. London, september. Disponible en: https://www.gsma.

com/r/wp-content/uploads/2020/09/GSMA-State-of-Mobile-Internet-Connectivity-Report-2020.pdf

- **GSMA** (2019). ConnectedWomen. La brecha de género móvil 2019. Londres. https://www.gsma.com/mobilefordevelopment/connected-women-la-brecha-de-genero-movil-2019/
- **GSMA** (2018). Cobertura Rural: hacia el cierre de la brecha digital. Disponible en https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/02/Enabling-Rural-Coverage-Spanish-February.pdf
- **GSMA.** (2016). Cerrar la brecha de cobertura. Inclusión digital en América Latina. Disponible en https://www.gsma.com/latinamerica/wp-content/uploads/2016/05/report-closing_coverage_gap-4-ES.pdf
- **Instituto Interamericano para la Cooperación para la Agricultura IICA** (2020) Mujeres rurales y equidad ante la pandemia COVID-19: recomendaciones para un nuevo punto de partida. Octubre 2020https://iica.int/es/prensa/eventos/foro-andina-mujeres-rurales-y-equidad-ante-la-pandemia-covid-19#!#transmision
- **Instituto Interamericano de Cooperação para Agricultura, Ministério da Agricultura, Pecuária e Abastecimento do Brasil** (2019). Análise da Conectividade no Meio Rural: Acesso à Informação, ATER e fixação do jovem no campo. Piracicaba-SP - Brasil. 01 de agosto de 2019.
- **Instituto Interamericano de Cooperación para la Agricultura.** (2019). IICA PLAY: Plataforma especializada en agricultura. En línea. Disponible en: https://www.iica.int/es/sobre-iica-play
- **Instituto Interamericano de Cooperación para la Agricultura.** (2019). BPA CHECK, La Tecnología al servicio de la inocuidad. En línea. Disponible en: https://www.iica.int/en/node/14547
- **Instituto Interamericano de Cooperación para la Agricultura.** (2018). Luchadoras: mujeres rurales en el mundo: 28 voces actualizadas. San José, CR. IICA.2018.
- **Instituto Interamericano de Cooperación para la Agricultura.** (2018). Plan de Mediano Plazo 2018-2022. San José, Costa Rica. Disponible en: http://repositorio.iica.int/bitstream/11324/7191/1/BVE18040249e.pdf.
- I**nstituto Nacional de Estadística e Informática (INEI)** (2018). Informe Técnico Estadísticas de las Tecnologías de Información y Comunicación en los Hogares. Disponible en: https://www.inei.gob.pe/media/MenuRecursivo/boletines/01-informe-tecnico-n02_tecnologias-de-informacion-ene-feb-mar2018.pdf
- **Instituto Nacional de Estadística y Censos (INDEC)**. (2018). Acceso y uso de tecnologías de la información y la comunicación. EPH. Informes Técnicos. Vol. 3, nº 86ISSN 2545-6636. Disponible en: https://www.indec.gob.ar/uploads/informesdeprensa/mautic_05_19CF6C49F37A.pdf
- **Informa Telecoms y Media Limited.** (2019). Modelos de inversión para reducir la brecha digital: Guía indispensable para gobiernos y hacedores de política pública en América Latina. Ovum.
- **International Telecommunications Union – ITU**. (2019). The ICT Development Index. Methodology, indicators and definitions. Presentation en Workshop.
- **International Telecommunications Union** (2018). The economic contribution of the broadband, digitization and ICT regulation. Disponible en https://www.itu.int/en/ITU-D/Regulatory-Market/Documents/FINAL_1d_18-00513_Broadband-and-Digital-Transformation-E.pdf
- **Joint Research Commission** – JRC-ISPRA (2019). GHSL Data Packages – Instruction for data access V 1.0. EuropeanCommission.
- **La buena noticia.** (2018). La brecha digital entre el medio rural y el urbano se reduce, pero aún queda mucho por hacer. Redacción, Nov 9, 2018. Disponible en: https://agroinformacion.com/la-brecha-digital-entre-el-medio-rural-y-el-urbano-se-reduce-pero-aun-queda-mucho-por-hacer/
- **Lewis, D. y Poelman, H.** (2014). A harmonized definition of cities and rural areas: the new degree of urbanization. Regional workingpaper. EuropeanCommission.

- **López, J.** (2017). ¿Hacia el final de la brecha digital en el medio rural? Revista Agropecuaria Agricultura. Editorial agrícola. Disponible en: http://www.revistaagricultura.com/economia/economia/hacia-el-final-de-la-brecha-digital-en-el-medio-rural_9473_39_11801_0_1_in.html
- **Lyrio, A.** (2018). Aspectos da Divisão Digital no Brasil. Grupo de Estudo da ANCIB Informática e Sociedade / Ação Cultural. Disponible en: http://enancib.ibict.br/index.php/enancib/venancib/paper/viewFile/1918/1059
- **Martínez, R.** (2018). La importancia de cerrar la brecha digital rural. Disponible en https://itmastersmag.com/noticias-analisis/la-importancia-cerrar-la-brecha-digital-rural/
- **McMahon, R.** (2019). Redes comunitarias para comunidades rurales de Naciones Originarias en Canadá. Asociación para el Progreso de las Comunicaciones. Disponible en: https://www.apc.org/es/news/redes-comunitarias-para-comunidades-rurales-de-naciones-originarias-en-canada
- **Micheli, J.** (2018). La brecha digital y la importancia de las tecnologías de la información y la comunicación en las economías regionales de México. Edición: Vol.9, Núm 2. Disponible en: https://rde.inegi.org.mx/index.php/2018/11/07/la-brecha-digital-la-importancia-las-tecnologias-la-informacion-la-comunicacion-en-las-economias-regionales-mexico/
- **Microsoft Airband Initiative**. (2019). Overview of Internet Service Provider technology considerations for rural broadband deployments. PreparedbyGarnet and Roberts. Microsoft.
- **Ministerio de Tecnologías de la Información y las Comunicaciones de Colombia.** (2019). Plan Nacional de Conectividad Rural. Disponible en: https://www.mintic.gov.co/portal/604/articles-125867_PDF.pdf
- **Ministerio de Agricultura, Ganadería y Pesca Argentina.** (2019). La Conectividad en el medio rural. Disponible en: https://www.indec.gob.ar/uploads/informesdeprensa/mautic_05_19CF6C49F37A.pdf
- **Morales, J.** (2017). La asimetría del poder de negociación entre los OIMR y OMR en Perú: ¿monopolio vs. monopsonio? TeleSemana.com Disponible en: https://www.telesemana.com/blog/2017/05/09/la-asimetria-del-poder-de-negociacion-entre-los-oimr-y-omr-en-peru-monopolio-vs-monopsonio/
- **Morales, J.** (2015). Un modelo para reducir la brecha digital en zonas rurales de El Salvador, creando conectividad a través de redes Mesh, implementadas desde una perspectiva de aprendizaje Edupunk. Universidad de Educación a Distancia, El Salvador. Disponible en: http://e-spacio.uned.es/fez/eserv/bibliuned:-masterComEdred-Jdmorales/Morales_Ayala_Julio_Damian_TFM.pdf
- **Moreira, J. et al.** (2017). Un breve análisis de la brecha digital de acceso en el Ecuador. Jornadas SARTECO.
- **Mooney, P.** (2019). La insostenible Agricultura 4.0 Digitalización y poder corporativo en la cadena alimentaria. Grupo ETC. Ciudad de México. México. Disponible en: https://www.etcgroup.org/sites/www.etcgroup.org/files/files/la_insostenible_agricultura_4.0_web26oct.pdf
- **Observatorio de Políticas Sociales y Desarrollo.** (2017). Brecha Digital: situación actual y los centros tecnológicos comunitarios (ctc) como política de mitigación. Boletín del Observatorio de Políticas Sociales y Desarrollo. Año 1, Número 5. Disponible en: http://www.opsd.gob.do/media/22309/boletin-5-brecha-digital.pdf
- **ONU Mujeres** (2015). Enlace disponible: http://www.unwomen.org/es/news/in-focus/rural-women-food-poverty.
- **OCDE** (2020), Making the Most of Technology for Learning and Training in Latin America, https://doi.org/10.1787/ce2b1a62-en. © 2020 OCDE, París.
- **OECD**. (2014). Estudio de la OCDE sobre políticas y regulación de telecomunicaciones en Colombia. OECD Publishing. Disponible en: https://read.oecd-ilibrary.org/science-and-technology/estudio-de-la-ocde-sobre-politicas-y-regulacion-de-telecomunicaciones-en-colombia_9789264209558-es#page3

- **OCDE/BID** (2016), Políticas de banda ancha para América Latina y el Caribe: un manual para la economía digital, OECD Publishing, Paris.
- **Oxford University& IICA** (2020). Thefirst- level digital gender divide in LAC countries. October 2020.
- **Paz, A. Montoya, M. Asensio, R.** (2013). ESCALANDO INNOVACIONES RURALES. IEP Instituto de Estudios Peruanos. Disponible en: http://biblioteca.clacso.edu.ar/Peru/iep/20170328042852/pdf_180.pdf
- **Peña, P.** (2013). Mujeres rurales jóvenes en América Latina: tan lejos y tan cerca de las TIC: políticas públicas y programas sobre manejo de nuevas tecnologías, inserción y brecha tecnológica. Disponible en: http://biblioteca.clacso.edu.ar/Peru/iep/20170329024841/pdf_1433.pdf
- **Prats, J y Gabarró, P** (2017). La gobernanza de las telecomunicaciones: hacia la economía digital. Banco Interamericano de Desarrollo. Disponible en https://publications.iadb.org/publications/spanish/document/La-gobernanza-de-las-telecomunicaciones-Hacia-la-econom%C3%ADa-digital.pdf
- **Programa Sociedad de la Información y el Conocimiento.** (2019). Informe Hacia la Sociedad de la Información y el Conocimiento 2019. Universidad de Costa Rica. Disponible en: http://www.prosic.ucr.ac.cr/informe-hacia-la-sociedad-de-la-informacion-y-el-conocimiento-2019
- **Rosales-Acevedo, G.** (2015). Análisis de la Penetración de las Tecnologías de la Información y Comunicación TICs y su Influencia en la Reducción de la Brecha Digital en el Valle de Aburrá, Caso Internet. Lámpakos, N° 13, pp. 62-71.
- **Saravia–Matus, S; Aguirre, P.** 2019. Lo rural y el desarrollo sostenible en ALC (en línea). Santiago, Chile, FAO. 20 p. Consultado 14 sep. 2019. Disponible en http://www.fao.org/3/ca4704es/ca4704es.pdf. (Serie 2030 - Alimentación, agricultura y desarrollo rural en América Latina y el Caribe, n.o 3).
- **Scheel, C.** (2007). Diagnóstico y Análisis de la brecha digital en Guatemala. Grupo de trabajo del WIT Monterrey. Disponible en: https://www.researchgate.net/publication/269632575_DIAGNOSTICO_Y_ANALISIS_DE_LA_BRECHA_DIGITAL_EN_GUATEMALA
- **Sukel, G.** (2019). Las personas mayores de América Latina en la era digital: superación de la brecha digital. Revista CEPAL N° 127. Disponible en: https://repositorio.cepal.org/bitstream/handle/11362/44580/RVE127_Sunkel.pdf?sequence=1&isAllowed=y
- **Sunkel, G; Trucco, G. y Espejo, A.** (2011) La integración de las tecnologías digitales en las escuelas de América Latina y el Caribe. Una mirada multidimensional. CEPAL, Santiago de Chile
- **Trendov, S. Varas, S. Zeng, M.** (2019). TECNOLOGÍAS DIGITALES EN LA AGRICULTURA Y LAS ZONAS RURALES. Organización de las naciones Unidas para la Alimentación y la Agricultura, Roma. Disponible en: http://www.fao.org/3/ca4887es/ca4887es.pdf
- **UNICEF** (2017) Guía para la implementación de Secundarias Rurales mediadas por TIC, Buenos Aires. https://www.unicef.org/argentina/media/2871/file/Gu%C3%ADa%20para%20la%20implementaci%C3%B3n%20de%20secundarias%20rurales%20mediadas%20por%20TIC.pdf
- **Unión Internacional de Telecomunicaciones.** (2019). The economic contribution of broadband, digitization and ICT regulation. Econometric modelling for the Americas. ITU Publications. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.BDT_AM-2019-PDF-E.pdf
- **Unión Internacional de Telecomunicaciones.** (2018). Estudio de caso: El ecosistema digital y la masificación de las Tecnologías de la Información y las Comunicaciones (TIC) en Nicaragua. ISBN 978-92-61-27073-5 Disponible en: https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.CS_NICARAGUA-2018-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones**. (2018). ICTs, LDCs and the SDGsAchieving universal and affordable Internet in the least developed countries. ISBN 978-92-61-25461-2. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/ldc/D-LDC-ICTLDC-2018-PDF-E.pdf
- **Unión Internacional de Telecomunicaciones**. (2018). THE STATE OF BROADBAND 2018: BROADBAND CATALYZING SUSTAINABLE DEVELOPMENT. Published in Switzerland Geneva. Disponible en: https://www.itu.int/dms_pub/

itu-s/opb/pol/S-POL-BROADBAND.19-2018-PDF-E.pdf

- **Unión Internacional de Telecomunicaciones**. (2018). Regional WSIS Stocktaking Report 2016 – 2018 ICT projects and WSIS action lines related activities in Americas. Disponible en: https://www.itu.int/dms_pub/itu-s/opb/pol/S-POL-WSIS.REP_REG_AM-2018-PDF-E.pdf
- **Unión Internacional de Telecomunicaciones.** (2018). Informe sobre Medición de la Sociedad de la Información. Resumen Analítico 2018. ITU Publicaciones. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/ind/D-IND-ICTOI-2018-SUM-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones.** (2017). Estudio de caso: El ecosistema digital y la masificación de las tecnologías de la información y las comunicaciones (TIC) en Ecuador. ISBN 978-92-61-28523-4. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.CS_ECUADOR-2019-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones.** (2017). Desafíos y oportunidades en materia de conectividad – Paraguay. Países en desarrollo sin litoral (PDSL) de América, diciembre 2017. ISBN 978-92-61-25753-8 Disponible en: https://www.itu.int/dms_pub/itu-d/opb/ldc/D-LDC-LLDC_AM.02-2018-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones.** (2017). Estudio de caso: El ecosistema digital y la masificación de las Tecnologías de la Información y la Comunicación (TIC) en el Estado Plurinacional de Bolivia. ISBN 978-92-61-23283-2. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.CS_BOLIVIA-2017-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones.** (2017). Cuestión 5/1 Telecomunicaciones/ TIC para las zonas rurales y distantes 2014-2017. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/stg/D-STG-SG01.05-2017-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones.** (2017). Estudio de caso: El ecosistema digital y la masificación de las Tecnologías de la Información y las Comunicaciones (TIC) en Panamá. ISBN 978-92-61-24723-2. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.CS_PANAMA-2017-PDF-S.pdf
- **Unión Internacional de Telecomunicaciones.** (2013). Estudio sobre los fondos del servicio universal y la integración digital universal. ITU 2013. Disponible en: https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.SERV_FUND-2013-PDF-S.pdf
- **Vitón, R; García, G; Soares, Y; Castillo, A; Soto, A.** 2017. AgroTech: Innovaciones que no sabías que eran de América Latina y el Caribe (en línea). Washington, D. C., Estados Unidos de América, BID. 92 p. Consultado 8 jul. 2019. Disponible en https:// publications.iadb.org/publications/spanish/document/AgroTech-Innovaciones-que-no-sabías-que-eran-de-América-Latinay-el-Caribe.pdf.
- **World Wide Web Foundation.** (2018). Universal service and Access funds: An Untapped Resource to Close the Gender Digital Divide. World Wide Web Foundation, CC BY 4.0. Disponible en: http://webfoundation.org/docs/2018/03/Using-USAFs-to-Close-the-Gender-Digital-Divide-in-Africa.pdf

ONLINE DATABASES CONSULTED

- **FAOSTATS:** http://www.fao.org/faostat/en/
- **CEPALSTATS:** https://cepalstat-prod.cepal.org/cepalstat/
- **ITU Statistics:** https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
- **OpenCell ID:** https://opencellid.org/stats.php
- World Bank Open Data: https://data.worldbank.org/
- **DigiLAC:** https://digilac.iadb.org/
- **UN Stats – Open SDG Data Hub:** http://www.sdg.org/datasets/
- **BID – Numbers for Development:** https://data.iadb.org/
- **Indicadores CET.LA:** https://cet.la/indicadores/
- **GSMA Intelligence:** https://www.mobileconnectivityindex.com/
- **UNDP Human Development Data:** http://hdr.undp.org/en/data#
- **Pew Research Centre:** https://www.pewresearch.org/global/dataset/
- **Demographic and Health Surveys Programme:** https://dhsprogram.com/Data/
- **Instituto Nacional de Estadísticas y Censos – Argentina:** https://www.indec.gob.ar/
- **División Estadística – Ministerio de Finanzas y Economía – Antigua y Barbuda:** http://www.ab.gov.ag/
- **Central Bureau of Statistics – Aruba:** http://www.cbs.aw/
- **Departamento de Estadísticas – Bahamas:** http://www.bahamas.gov.bs/statistics/
- **Servicio Estadístico de Barbados:** http://www.barstats.gov.bb/
- **Instituto Estadístico de Belice:** http://www.statisticsbelize.org.bz/
- **Departamento de Estadísticas – Bermuda:** https://www.gov.bm/department/statistics
- **Instituto Nacional de Estadística – Bolivia:** http://www.ine.gob.bo/
- **Agencia de Gobierno Electrónico y TICS – Bolivia:** https://www.agetic.gob.bo/#/
- **Instituto Brasilero de Geografía y Estadística:** https://www.ibge.gov.br/
- **Centro Regional de Estudios para el Desarrollo de la Sociedad de la Información CETIC – Brasil:** https://cetic.br/
- **Instituto Nacional de Estadística de Chile:** http://www.ine.cl/
- **Departamento de Estadísticas de Colombia:** http://www.dane.gov.co/
- **Instituto Nacional de Estadísticas y Censos – Costa Rica :** http://www.inec.go.cr/
- **Oficina de Estadística e Información – Cuba:** http://www.one.cu/
- **Oficina Nacional de Estadística – Rep. Dominicana:** http://www.one.gob.do/
- **Dirección de Estadística de El Salvador:** http://www.digestyc.gob.sv/
- **Instituto Nacional de Estadística de Guatemala:** http://www.ine.gob.gt/
- **Instituto de Estadística de Jamaica:** http://statinja.gov.jm/
- **Instituto Nacional de Información** – Nicaragua: http://www.inide.gob.ni/
- **Instituto Nacional de Estadística – Panamá:** http://www.contraloria.gob.pa/inec/
- **Ministerio de TICS – Paraguay:** http://www.mitic.gov.py
- **Instituto Nacional de Estadística e Informática – Perú:** http://www.inei.gob.pe/
- **Saint Lucia Statistics:** http://www.stats.gov.lc/
- **Oficina Central de Estadística – Trinidad y Tobago:** http://cso.gov.tt/
- **Instituto Nacional de Estadística – Uruguay:** http://www.ine.gub.uy/
- **Agencia de Gobierno. Electrónico, Sociedad, Información y Conocimiento- Uruguay**: https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/uruguay-gobierno-digital-d9
- **Instituto Nacional de Estadística – Venezuela** http://www.ine.gov.ve/

Annex I

THE VARIABLES IN THE FOLLOWING TABLES ARE AS FOLLOWS:

- **E:** Daily internet use
- **Ba:** Broadband
- **G4:** 4G technologies
- **Tel:** Smartphones
- **Comp:** Personal computers

Table xxx.Correlation coefficients
5% critical value (2-tailed) = 0.7545 for n = 7

E	Ba	G4	Tel	Comp	
1.0000	0.7079	0.4653	-0.0191	0.4902	E
	1.0000	-0.0150	-0.6794	0.6843	Ba
		1.0000	0.6271	-0.1828	G4
			1.0000	-0.5843	Tel
				1.0000	Comp

Principal Components Analysis
n = 7

Eigenanalysis of the Correlation Matrix

Component	Eigenvalue	Proportion	Cumulative
1	2.6579	0.5316	0.5316
2	1.7529	0.3506	0.8822
3	0.3615	0.0723	0.9545
4	0.2116	0.0423	0.9968
5	0.0161	0.0032	1.0000

Eigenvectors (component loadings)

	PC1	PC2	PC3	PC4	PC5
E	0.368	0.566	-0.039	0.593	-0.437
Ba	0.575	0.150	-0.455	-0.041	0.662
G4	-0.142	0.694	-0.096	-0.685	-0.142
Tel	-0.481	0.419	0.352	0.354	0.586
Comp	0.531	0.011	0.812	-0.229	0.079

Model 40: OLS, using observations 1-7
Dependent variable: E

	Coefficient	Std. Error	t-ratio	p-value
Const	0.137042	0.116243	1.179	0.2915
Ba	0.971444	0.433509	2.241	0.0751

Mean dependent var	0.337714	S.D. dependent var	0.253424
Sum squared resid	0.192256	S.E. of regression	0.196090
R-squared	0.501076	Adjusted R-squared	0.401291
F(1, 5)	5.021570	P-value(F)	0.075131
Log-likelihood	2.649362	Akaike criterion	−1.298723
Schwarz criterion	−1.40690	Hannan-Quinn	−2.635804

Model 46: OLS, using observations 1-7
Dependent variable: E

	Coefficient	Std. Error	t-ratio	p-value
Const	−0.0564874	0.347988	−0.1623	0.8774
G4	2.31150	1.96650	1.175	0.2927

Mean dependent var	0.337714	S.D. dependent var	0.253424
Sum squared resid	0.301913	S.E. of regression	0.245729
R-squared	0.216505	Adjusted R-squared	0.059806
F(1, 5)	1.381660	P-value(F)	0.292738
Log-likelihood	1.069771	Akaike criterion	1.860457
Schwarz criterion	1.752278	Hannan-Quinn	0.523377

Model 45: OLS, using observations 1-7
Dependent variable: Ba

	Coefficient	Std. Error	t-ratio	p-value	
Const	0.774345	0.279922	2.766	0.0395	* *
G4	−0.717922	0.346766	−2.070	0.0932	*

Mean dependent var	0.206571	S.D. dependent var	0.184664
Sum squared resid	0.110164	S.E. of regression	0.148435
R-squared	0.461572	Adjusted R-squared	0.353886
F(1, 5)	4.286292	P-value(F)	0.093200
Log-likelihood	4.598352	Akaike criterion	−5.196703
Schwarz criterion	−5.304883	Hannan-Quinn	−6.533784

Model 47: OLS, using observations 1-7
Dependent variable: Ba

	Coefficient	Std. Error	t-ratio	p-value	
Const	−0.00158130	0.113792	−0.01390	0.9895	
G4	1.06862	0.509267	2.098	0.0899	*

Mean dependent var	0.206571	S.D. dependent var	0.184664
Sum squared resid	0.108796	S.E. of regression	0.147510
R-squared	0.468261	Adjusted R-squared	0.361913
F(1, 5)	4.403105	P-value(F)	0.089941
Log-likelihood	4.64210	Akaike criterion	−5.284208
Schwarz criterion	−5.392387	Hannan-Quinn	−6.621288

País	Plan/Programa	Leyes nacionales de telecomunicaciones y otra normativa (*)	Mención a políticas de conectividad rural	Medidas específicas COVID-19
Antigua and Barbuda – Barbados – Belize – Dominica – Grenada – Guyana – Jamaica – St. Kitts and Nevis – Saint Lucia – St. Vincent and the Grenadines – Suriname – Trinidad and Tobago -	Caribbean Telecommunications Union – Telecommunication plans and programs for the member countries (1989+)		No	
Argentina		Normativa de Telecomunicaciones de Argentina Ley 27078 (2014/ 2014)	No	
		Agenda Digital 2030 - Decreto 996/2018 (2018)	Yes	
	Resolución ENACOM 727/2020		No	
	Programa de Despliegue de Redes de Acceso a Servicios de Comunicaciones Móviles" (2018)		No	
	"Desarrollo de Infraestructura para Internet destinado a Villas y Asentamientos Inscriptos en el Registro Nacional de Barrios Populares en Proceso de Integración Urbana (RENABAP)" (2020)		No	
	Programa de Acceso a Servicios TIC a Poblaciones de Zonas Adversas y Desatendidas para el Despliegue de Redes" (2020)		No	
				Guarantees the provision of telecommunication services, freezes 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		Ley General de Telecomunicaciones (2011/ 2016)	No	
		Reglamento para el desarrollo Tecnologías de Información y Comunicación (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		Proyecto de Ley PL 4061/2019 Fines del Fondo de Universalización de los Servicios de Telecomunicaciones (2019)	Yes	
		Proyecto de Ley 172/2020 - Fines del Fondo de Universalización de los Servicios de Telecomunicaciones (2020)	Yes	
		Ley 9472 / 1997 - Ley de Telecomunicaciones (1997/ 2019)	No	
		Decreto 9854/2019 - Plan Nacional de Internet de las Cosas (2019)	No	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Brasil	Proyecto de conectividad rural del sistema Confederación Nacional de Agricultura / SENAR (2019)		Yes	
	Estrategia de Gobierno Digital 2020 -2022 (2020)		No	
	Estrategia Brasileña para la transformación digital E-Digital (2018)		No	
	Agencia Nacional de Telecomunicaciones			Continuity of services – Support for health and public safety services
Chile		Ley 18168 Ley General de Telecomunicaciones (1982)	No	
		Ley 21172 - Modifica Ley 18168 (2019)	No	
	Agenda Digital 2020 Chile Digital para tod@s (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		Proyecto Modernización del Sector TIC (2018)	No	
	Política de desarrollo espacial: condiciones habilitantes para el impulso de la competitividad nacional. CONPES 3983 /2020		No	
	Política nacional para impulsar la Innovación en las prácticas educativas a través de las Tecnologías digitales. CONPES 3988 / 2020		No	
	Política nacional para la transformación digital e inteligencia Artificial. CONPES 3975 / 2019		No	
	Política nacional de desarrollo, masificación y acceso a internet nacional, a través de la iniciativa de incentivos a la demanda de acceso a internet. (2019)		Yes	
	Política nacional de explotación de datos (Big Data). CONPES 3920/2018		No	
	Política para el desarrollo e impulso del comercio electrónico en Colombia. CONPES 3620 /2009		No	
	Plan TIC Colombia 2019-2022 (2019)		Yes	
	Plan Nacional de Conectividad Rural (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 – Santa Lucia St. Kitts y Nieves – San Vicente y las Granadinas		Eastern Caribbean Telecommunications Authority (ECTEL). Telecommunications Regulatory Fra-mework. (2000-2014)	No	
Costa Rica		Ley General de Telecomunicaciones (2008)	Yes	
	Política Nacional de Sociedad y Economía basadas en el conocimiento (2017)		No	
	Política Pública en Materia de Infraestructura de Telecomunicaciones (2015)		No	
	Plan Nacional de Desarrollo de las Telecomunicaciones (2015)		No	
	Estrategia de Transfor-mación Digital hacia la Costa Rica del Bicentenario 4.0 (2018)		No	
	Plan Nacional de Ciencia, Tecnología e Innovación 2015 - 2021 (2015)		No	
	IBD Índice de Brecha Digital 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		Ley Orgánica de Telecomunicaciones (2015)	Yes	
	Plan Nacional de Telecomunicaciones y Tecnologías de Información Ecuador 2016-2021 (2015)		Yes	
	Plan Nacional de Desarrollo de Banda Ancha (2013)		No	
	Plan Nacional de Alistamiento Digital - PLANADI (2018)		No	
				Discounts on mobile phone recharges, improvement of online transactions, reduction of costs in e-commerce platforms.
		Ley de Telecomunicaciones (2010)	No	
	Política Nacional de Innovación, Ciencia y Tecnología (2019)		No	
		Ley de desarrollo científico y Tecnológico (2013)	No	
El Salvador	Plan Nacional de Desarrollo Científico y Tecnológico (2010)		Yes	
	Estrategia de Gobierno Abierto 2018-2022 (2018)		No	
	Fondo de Inversión Nacional en Electrificación y Telefonía (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		Ley General de Telecomunicaciones de Guatemala (1996-2002)	No	
	Agenda Nacional Digital "Tecnología contribuyendo al desarrollo económico y social de Guatemala" 2016 - 2032 (2016)		Yes	
				#EnMarchaDigitalGt
Honduras		Ley Marco del Sector de Telecomunicaciones (1997)	No	
	Comisión Nacional de Telecomunicaciones (CONATEL) - Gobierno Electrónico		No	
		Ley en Alfabetización en Tecnologías de Información y Comunicación (2013/2018)	No	
	Plan Maestro del Gobierno Digital para la República de Honduras		No	
				Guarantees the continuity of services for all Hondurans. Basic connectivity package for the entire population.
Mexico		Ley Federal de Telecomunicaciones y Radiodifusión (2014)	No	
	Decreto de Datos Abiertos (2015)		No	
	Agenda Digital – México Digital		No	
	México Conectado (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		Ley N 200 "Ley General de Telecomunicaciones y Servicios Postales" (1995)	Yes	
	Fondo de inversión de telecomunicaciones - FITEL (2006)		Yes	
	Proyecto de Telecomunicaciones Rurales (2012)		Yes	
	Proyecto Pro Futuro (2018)		No	
Panama		Marco Legal de Telecomunicaciones (1991-2004)	No	
	Plan Nacional de Transmisión (1997)		No	
	Agenda Digital Estratégica del Estado Panameño (2019)		Yes	
	Proyecto Municipios Digitales (2014)		Yes	
Paraguay		Ley de Telecomunicaciones (1995/2004)	No	
	Transformación Digital Plan de Acción Agenda Digital Paraguay (2018)		No	
	Plan Nacional de Telecomunicaciones 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		Regulación de Banda Ancha (2012/2013)	Yes	
		Ley de Gobierno Digital (2018)		
	Sistema Nacional de Transformación Digital (2020)		No	
	Marco de confianza digital (2020)		No	
	Laboratorio de Gobierno y Transformación Digital del Estado en la Presidencia del Consejo de Ministros (2019)		No	
	Plataforma Digital Única del Estado Peruano, Gob.pe, y establece disposiciones adicionales para el desarrollo del Gobierno Digital (2018)		No	
	Lineamientos del Líder de Gobierno Digital de las entidades públicas (2018)		No	
	Comité de Gobierno Digital (2018)		No	
	Decreto Supremo N° 118-2018. Declara de interés nacional el desarrollo del Gobierno Digital, la innovación y la economía digital con enfoque territorial (2018)		Yes	
	Política Nacional de Modernización de la Gestión Pública al 2021 (2013)		No	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Peru	Decreto Supremo que modifica diversos artículos del Reglamento de la Ley N° 29904, Ley de Promoción de la Banda Ancha y Construcción de la Red Dorsal Nacional de Fibra Óptica (2013)		No	
	Decreto de Urgencia Nº 041-2019. Declaración de necesidad publica de 21 proyectos de banda ancha y fibra óptica (2019)		Yes	
	Política Nacional para el Desarrollo de la Ciencia, Tecnología e Innovación Tecnológica - CTI (2016)		No	
	Política Nacional de Transformación Digital, Encuesta Digital Nacional de Co-Diseño (2020)		No	
	Plan Nacional de Competitividad y Productividad 2019 – 2030 (2019)		No	
	Agenda Digital al Bicentenario (2020)		No	
	Programa Nacional de Telecomunicaciones (2018)		Yes	
	Estrategia Nacional de Inclusión Financiera (2015)		No	
	Digital Government in Peru, Working Closely with Citizens – OECD (2019)			
	Modelo Operador de Infraestructura Móvil Rural - 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 Para Todos (2016)		Yes	
	Estrategia Nacional de Agricultura Familiar 2015 - 2021 (2015)		No	
	Plataforma de Servicios Agrarios del Sector Agricultura y Riego - 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		Políticas TIC República Dominicana (2005)	Yes	
		Proyecto de Ley Estrategia Nacional de Desarrollo de la República Dominicana 2030 (2014)	Yes	
	Agenda Digital - Banda Ancha Rural (2014)		Yes	
	e-Localidades (2015)		No	
	TIC en el Sistema Educativo		No	

Country	Plan / Program	National telecommunication laws and other regulations (*)	Mentions rural connectivity policies	Specific measures in response to COVID-19
Uruguay		Política Digital Uruguay - Conjunto de leyes. (2008)	No	
	Agenda Digital de Uruguay (2019)		No	
	Plan de Gobierno Digital (2020)		No	
	Gobierno Digital y D9 (2017)		No	
	Estrategia Nacional de Desarrollo Uruguay 2050 (2018)		No	
	Mirador de Gobierno Abierto (2019)		No	
				Coronavirus UY application
Venezuela		Ley orgánica de Telecomunicaciones (2011)	No	
	Plan Nacional de Tecnologías de Información (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.

EXPERIENCES NATIONAL		
Bolivia	"Predicting Insect Pest Phenology" (PI2P) through the use of nano computers and nano sensors that facilitate decision-making by farmers by integrating climate, insect and crop models, and issuing early warnings when insects are detected in farming plots. AGRINAPSIS- application to access content of agricultural interest	2019
Costa Rica	Jale a la Feria, to connect consumers to agricultural markets	2020
	Computer system for the inspection, control and supervision of establishments that produce food of animal origin for human consumption	2019
	Digital platform that provides free access to soil data (IICA-UCR-INTA-ACCS)	2019
	AGROMENSAJES – Use of mobile SMS messages to disseminate fruit and vegetable prices	2014
	Costa Rican Agricultural Information System (INFOAGRO)	1997
Chile	BPA Check, designed to evaluate Good Agricultural Practices and improve safety systems (IICA-RESET)	2019
USA	Agricultural thesaurus and glossary (IICA-USDA) that provides controlled vocabulary, data solutions and open knowledge	2020
Guatemala	TOTOGEO, to inform the Q'eqchi' territory about the weather, prices, farming technology and other topics of interest in Spanish and in the Q'eqchi' language (Universidad Rafael Landívar, Universidad de San Carlos, Federación Guatemalteca de Educación Radiofónica, Federación de Cooperativas de las Verapaces and Asociación de Cardamomeros and FAS/USDA)	2016
Peru	Project Information System of the National System for Agricultural Innovation	2019

EXPERIENCES NATIONAL		
Jamaica	The Automated Coffee Leaf Rust (CLR) Detector (ACoRD), was developed to determine the prevalence of coffee leaf rust on Jamaican farms (IICA, Universidad de Colombia, University of Arizona, University of the West Indies, Weather Services and the Industrial Coffee Board)	2018
Jamaica-Saint Lucia	CARICROP. Use of digital technologies to support food production and market linkages, including the use of Blockchain	2019
Saint Lucia	Guru Marketing, to strengthen the relationship between buyers and farmers in Saint Lucia, starting out with the Massy Store chain (IICA-Guru Inc.)	2019
Suriname	Training in the use of digital technologies to model climate variability and foster evidence-based decision making for risk management, 3D models and the use of drones (IICA- FAO- "Anton de Kom" University of Suriname- MAAHF)	2019
Uruguay	Democratizing access to information in the Modelo market - Plan Senda(IICA-IDRC-IDB-CAMM)	2013

EXPERIENCES REGIONAL		
Central America	Application to determine the level of vulnerability of coffee farms to climate change (IICA-CATIE-EU)	2020
Central America, Dominican Republic and Mexico	Regional Agrifood Supply System for Food Security (SAAR), an application that provides decisionmakers with information on product surpluses or shortages in the countries, to support intraregional trade (IICA-EU)	2020

EXPERIENCES REGIONAL		
Hemispheric	AGROInfoCOVI19, an application that provides information, recommendations and preventive measures to strengthen the biosafety of the agrifood chain in countries of the Americas (IICA-EU)	2020
	PVS methodology for public institutions, which allows for assessing an organization's status in terms of ICT access, use and conditions	2011

CURRENT KNOWLEDGE AND INFORMATION PLATFORMS

MIOA Agricultural Market Information System (USDA-IICA): http://www.mioa.org/es/

Access Agriculture, which contains hundreds of videos that provide agricultural training in local languages www.accessagriculture.org

Alliance of Agricultural Information and Documentation Services of the Americas (SIDALC), which provides access to 349 databases of 178 agricultural institutions-www.sidalc.net

AgriPerfiles, which includes more than 13,500 professional profiles: http://agriperfiles.agri-d.net/ (Adopted by the National Council of Science and Technology, the National University of Costa Rica and Agrosavia Colombia)

IICA's Virtual Campus, which includes about 33 online courses: https://elearning.iica.int/

IICA-CATIE Integrated Library Management System, which provides access to more than 116 thousand resources: http://opac.biblioteca.iica.int/

IICA Repository, which provides access to more than 9,000 digital resources: https://repositorio.iica.int/

PUBLIC-PRIVATE PARTNERSHIPS	
Together with Microsoft, Bayer and Corteva, IICA is promoting Agriculture 4.0 through a number of initiatives, including the Interpretive Center for Tomorrow's Agriculture and IICA-Play, which provides access to more than 500 videos	2019
Together with the Ministry of Science, Technology and Telecommunications (MICITT) of Costa Rica, IICA inaugurated the FAB-LAB technology lab, which fosters innovation through solutions based on the Internet of Things, (including prototypes for water oxygenation and sensors for irrigation), while also improving the digital literacy of rural women entrepreneurs in Costa Rica.	2019
Digitalization of IICA's collections and books with the help of Google Scholar and Google Books.	2007-2009

NOTEWORTHY STUDIES	
Assessment of Rural Connectivity in Latin America and the Caribbean (LAC) – In collaboration with Microsoft	*Currently being prepared*
Experiences in the Use of Text Messaging Services (SMS) and Mobile Telecommunications in Agricultural Markets (IICA-MIOA)	2016
Virtual Consultation Process with FORAGRO 2019: Digital Agriculture and Inclusion – Priorities for the Agricultural Research, Development and Innovation (R+D+I) Agenda in Latin America and the Caribbean	2019
Agricultural Open Data in the Caribbean (IICA-CTA)	2015
Digitalization Processes in Agriculture and the Rural World	2019
Outlook for Agriculture and Rural Development in the Americas 2011-2012 (IICA-FAO-ECLAC): ICTs and Agriculture chapter	2011

POLITICAL FORUMS, SEMINARS OR EVENTS	
2019 Conference of Ministers of Agriculture of the Americas, during which ministers, secretaries and high-level authorities discussed digital inclusion in rural territories.	2019
In Colombia, IICA promoted the creation of the Digital Innovation Center for Agriculture and Rural Territories, which was approved during a seminar/workshop entitled "Agriculture 4.0: A Tool for Productivity and Rural Development". Among the participants were institutions (MADR, MinTIC, UPRA, AGROSAVIA, COLCIENCIAS, FINAGRO, SENA, CONSA), universities (Universidad Nacional de Colombia, Universidad La Salle, UNIMINUTO and Universidad de Córdoba-Spain), private companies that provide rural digitalization services (HISPASAT, INCLAM Group) and producers' organizations (FEDEGAN, ECOMUN).	2019
Latinity 2019, held at IICA Headquarters, brought together more than 500 Latin American women who are involved in technology, providing them with an opportunity to learn more about IICA, digital agriculture and various organizations and companies that offer applications, technologies and other resources to support women and their communities.	2019
The Retos seminar provided an opportunity to share the benefits of and innovations in the application of Blockchain to market agricultural products (IICA-Foodchain).	2019
Together with CENF0TEC University, the Ministry of Agriculture, SENASA, Microsoft and World Animal Protection, IICA organized the 2019 IICA Hackathon, aimed at developing information systems to respond to emergency situations faced by the agriculture sector in Costa Rica.	2019
In collaboration with the Ministry of Agriculture of Ecuador, SAP, SYNGENTA, CENFOTEC and ClubAgtech, IICA organized the 2020 IICA Virtual Hackathon to identify IT solutions to support the marketing of agricultural products.	2020
III Meeting on Information and Communication Technologies in Venezuela's Agriculture Sector, which provided an opportunity to share precision technologies, geographic information systems, drones and sensors for use in farming activities, which will allow for advancing towards "Agriculture 4.0".	2018

Annex IV | List of interviewees

#	Last name and first name	Organization	Position	Region / Country	Sector
1	Cleveland, Thomas	International Telecomunication Union (ITU)	Representative Caribbean Region	Caribbean	International organization
2	Corvalán Lucrecia	Mobile Operators (GSMA)	Senior Policy Officer LATAM	Latin America	Technical community
3	Cruz Genaro	Mobile Operators (GSMA)	Mobile for Development	Global	Technical community
4	Echeverría Raúl	LACNIC (responsible for Latin American nodes). Internet Society	Former Executive Director of LACNIC (up to 2020). Former President of Internet Society (up to 2020)	Latin America and the Caribbean	Technical community
5	Huertas Eric	Redes Comunitarias Latinoamérica	Director	Latin America and the Caribbean	Community
6	Ibarra Lito	ICANN, Red Clara, Fundación Conexión.	Director	Latin America and the Caribbean. El Salvador	Academic sector. Technical community
7	Jules, Didacus	Organization of the Eastern Caribbean States (OECS)	Secretario General	Caribbean	Organismo Intergubernamental
8	Khelladi Yacine	Alliance for Internet Affordability. Caribbean ICT Virtual Community (CIVIC)	LAC Coordinator A4IA. General Coordinator of CIVIC	Latin America and the Caribbean	International organization
9	Méndez Maryleana	Asociación Interamericana de Empresas de Telecomunicaciones (ASIET)	Secretary General	Latin America and the Caribbean	Technical Community
10	Rojas Fernando	Observatorio Latinoamericano de Banda Ancha	Executive Director	Central America	International organization
11	Ruiz Allan	Comisión Técnica Regional de las Telecomunicaciones (COMTELCA)	Executive Director	Central America	Technical Community
12	Tapias Yeisully	Red de Jóvenes Rurales	Regional Coordinator	Latin America. Colombia	Community
13	Arango Amparo	Indotel	Former Director of Indotel	Dominican Republic	Public Sector

#	Last name and first name	Organization	Position	Region / Country	Sector
14	Boute, Marteen/ Roy, Luigi	Digicel Haiti	CEO	Haiti	Private Sector
15	Cabrera Álvaro	Empresa Forestal	Agricultural engineer dedicated to the continuous improvement of forestry businesses	Uruguay	Private Sector
16	Casasbuenas Julian	Colnodo	Director General	Colombia	Community
17	Chamorro Liliam	Colnodo	Person responsible for rural connectivity issues	Colombia	Community
18	Foerster Steve	New World University	President	Dominica	Academic sector. Technical community
19	Juárez Amaya Máximo Alexander	UEGPS-PIADER	General Coordinator, responsible for the improvement of the Agricultural Statistical Information System and the Information Service for Rural Development	Peru	Public Sector
20	Jucius Alex	Associacao Neotv	Director General	Brazil	Community
21	Lombardini Adriana	Instituto Federal de Telecomunicaciones México. Lawyer specializing in telecommunication rights.	Former Commissioner	Mexico	Technical community
22	López, Gustavo	ENACOM	Vice-president	Argentina	Public Sector
23	Marius Michelle	ICT Pulse	Journalist	Jamaica	Community
24	Martínez Salvador/ Tellez Carlos	TIGO	Manager of the Micro- and Medium - Sized Business Segment	Colombia	Private Sector

#	Last name and first name	Organization	Position	Region / Country	Sector
25	Matarazzo Edmundo	ABRANET	Director	Brazil	Community
26	Pasquali Nilo / Jacomassi Eduardo	ANATEL	Planning and Regulations Superintendent	Brazil	Technical community
27	Pérez Wanda	LACNIC	Internet Governance Curator for the Caribbean	Dominican Republic	Public sector
28	Riaz Baldeo	Open Campus University	Researcher	Antigua and Barbuda	Technical community
29	Samuels Carlton	ICT Advisor - Jamaica	ICANN Member representing LAC	Jamaica	Community
30	Sankersingh Navin	Kikiri Connect	Founder – Specialist in Rural Development Solutions and Digital Connectivity	United Kingdom	Private sector
31	Saucedo Juan Pablo	CAINCO	Executive of the Diversification Observatory	Bolivia	Private sector
32	Sequera Maricarmen	TEDIC	Person responsible for projects related to connectivity	Paraguay	Community
33	Serrate Mendía Liliana	CAINCO. Santa Cruz Innova	Member of the Santa Cruz Industry, Trade, Services and Tourism Chamber	Bolivia	Private Sector
34	Valverde Dennis	Cámara de Empresas de Tecnologías de la Zona Norte – Costa Rica	President	Costa Rica	Private Sector
35	Williams Deirdre	Caribbean ICT Virtual Community (CIVIC)	CIVIC member	Saint Lucia	Technical community
36	Williams Irwin	Teleios	Senior Software Engineer	Jamaica	Private Sector

#	Last name and first name	Organization	Position	Region / Country	Sector
37	Kevoy Community Development Institute	Kevoy Community Development Institute	CSO to empower rural and urban individuals in the Caribbean	Jamaica	Technical community
38	Durkharan, Marla	BITT Global	Lead Economist	Barbados	Private Sector
39	Fernández Aroce-na, Juan Manuel	DIPROSE	Director General	Argentina	Public Sector

Focus groups and other IICA activities aimed at addressing this topic

ACTIVITY	REGION	PARTICIPANTS
IICA- Focus group (together with A4AI and CIVIC)	Caribbean	15 persons from 10 countries
Fusades	El Salvador	4 persons
Forum of Youth and Agriculture During COVID - IICA	Latin America	43 persons
IICA Women's Forum (5 conferences)	Latin America	37 persons

IICA – Inter-American Institute for Cooperation on Agriculture
Organism of the Inter-American System specialized in agricultural and rural development.

IDB – Inter-American Development Bank
Main source of financing for development in Latin America and the Caribbean.

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