4 Improving connectivity and service delivery in Colombian rural areas

This chapter assesses the main opportunities to improve transport and digital connectivity as well as access to quality education and healthcare in Colombian rural communities. It begins with a brief analysis of the status of transport infrastructure for rural areas in Colombia, with a focus on tertiary roads and mobility. It then expands the analysis on connectivity by identifying the main barriers and opportunities to improving broadband Internet access in rural communities. It ends by outlining the bottlenecks and opportunities to improving rural education and healthcare provision.

Assessment and recommendations

Assessment

Rural regions in Colombia have long faced a lag in connectivity and access to markets and public services, which has prevented greater well-being and productivity. Some regions lack connection to the primary road network, most municipal roads are unpaved (94%) and some in-land rural areas are only reachable by river transport, which still has an incipient infrastructure. The accessibility gap is also evident in education and healthcare, where rural regions register issues in access and quality. A severe broadband connectivity gap in access and quality adds to this historic rural deficiency in access to transport and services (e.g., only 28.8% of rural households have broadband access, fixed and/or mobile, vs. 70% in urban areas). Access to electricity and water has had an important progress, but the urban-rural gap is still high.

The Colombian government has put in place long-term plans to close gaps in rural connectivity and access to services. Transport infrastructure has been a major priority in the last decade, with important projects on primary roads. This has been complemented by recent efforts to provide broadband connectivity in rural areas (e.g. *Zonas Digitales* and *Centros Digitales* programmes). Basic educational and health outcomes have also improved (e.g. reduction of illiteracy and almost universal healthcare access) and the government has recently issued national policies with a particular focus on rural services, including education, healthcare, electricity or water among others.

Current national plans to improve rural connectivity and accessibility are in the right direction but need to be accelerated, with sufficient financial and human capacity and a more comprehensive approach. The implementation of these plans needs particular focus on empowering local networks, adapting national strategies to rural needs and leveraging experimentation and alternative local approaches (e.g. alternative structures to provide mobility, community networks for broadband connectivity, mobile or virtual education and healthcare provision). Co-ordination with local governments needs to be improved, particularly in rural information (e.g. road and broadband infrastructure) and transparency in administrative procedures. Moreover, some current programmes need to be carefully reviewed to improve their impact. For example, programmes of free public broadband access have faced major continuity challenges and lacked territorial prioritisation. Importantly these programmes are not a substitute to connect businesses and people directly through fixed and mobile broadband subscriptions.

Recommendations

Rural transport Infrastructure

- ***Prioritise road transport projects and multimodal transport solutions to connect remote rural regions***. To this end the government of Colombia should:
  - Accelerate and prioritise investment in primary roads projects that connect remote rural regions, including Amazonas, Chocó, Guainía and Vichada.
  - Strengthen the *Colombia Rural* programme with greater financial and institutional capacity to adopt a proactive approach to reach subnational governments that do not apply to the co-finance scheme.
  - Accelerate the implementation of multimodal transport projects, mainly the rail network and fuvial transport. To this end, the government should diversify infrastructure funding to implement the existing multimodal transport plan, for example through aggregation of funding sources from different levels of government and the private sector and value capture mechanisms.

- ***Accelerate efforts to improve the information on the inventory and quality of tertiary roads in the country***. To this end, the government could formalise alternative georeferencing solutions and evaluate the possibility to leverage other ongoing efforts for an improved rural information system.
- ***Enhance local co-operation to expand and improve tertiary roads by mobilising local communities and inter-municipal partnerships for road investment and maintenance***. To this end the government of Colombia should*:*
  - Promote partnership models between the government and local communities to support the creation and involvement of local micro-enterprises for road maintenance.
  - Support inter-municipal partnerships for co-investment in the expansion and maintenance of tertiary roads.
  - Expand the Work for Taxes scheme to increase private sector participation in the improvement of tertiary roads.

Broadband connectivity

- ***Foster communication infrastructure deployment by involving local governments in rural digital transformation***. To this end, Colombia should:
  - Provide legal certainty and reduce the burden of installation procedures and costs associated with broadband deployment at the local level. The Ministry of Information and Communication Technologies (MinTIC) currently employs advisors at the departmental level who support infrastructure deployment and who are able to provide support for the infrastructure deployment policies in municipalities. In addition, technical advisory work to support municipal authorities may also be established by the National Spectrum Agency (ANE) and the Commission for Communications Regulation (CRC).
  - Increase transparency on potential locations for communication infrastructure deployment and on existing communication assets.
  - Develop a campaign to educate local governments and their decision makers and population on the importance and advantages of connectivity and reduce potential concerns.
- ***Amplify the impact of current policies to provide rural areas with greater connectivity***. To this end, Colombia should:
  - Undertake further analysis on how the Azteca fibre optic backbone could connect more businesses and homes while creating an environment where private companies could leverage the existence of the backbone.
  - Ensure that contractors of the *Zonas Digitales* and *Centros Digitales* programmes are fulfilling their obligations and objectives, in particular the commitments acquired with the programmes that are funded by the *Fondo Único de TIC*.
  - Improve the maintenance and overall continuity of the *Zonas Digitales* and *Centros Digitales* initiatives and the medium- to long-term viability of these programmes.
  - Strengthen comprehensive policies (e.g. National Rural Connectivity Plan) to expand high-quality broadband access to complement programmes of points of public broadband access. This should acknowledge that *Zonas Digitales* and *Centros Digitales* programmes do not substitute connecting underserved people and businesses directly through fixed and mobile connections.
- ***Leverage mobile services to narrow the rural-urban connectivity divide***. To this end, Colombia should:

- Monitor and ensure that operators are adhering to their coverage obligations resulting from the 700 MHz auction.
- Take into account coverage and competition considerations simultaneously, when planning the design of the upcoming 3.5 GHz auction. Coverage obligations can further contribute to broader coverage of rural and remote areas. It should be ensured that the extent of the coverage obligation is not an impediment for certain actors to bid in the auction. Competition considerations should be taken into account, given the dominance of provider Claro in the mobile communication services market.
- Auction the 3.5 GHz spectrum as soon as possible and forego delays.
- Provide a timely, transparent process and clear rules for spectrum license renewals. Given the importance of connectivity for the country and the positive spill-over effects to all sectors of the economy, ensure that licence fees are not set at overly excessive prices, i.e. that they do not maximise fiscal revenues but rather increase overall welfare in the country.

- ***Ensure that taxation and sectoral fees do not hamper the adoption of communication services in rural areas***, as these taxes and fees may be passed on to customers. This is especially problematic since the communication sector creates many positive spill-over effects throughout the economy. To this end, Colombia should:
  - Identify means to reduce the taxes and fees paid by communication operators, for example their contributions to the *Fondo Único de TIC*, to reduce prices of communication services and devices for consumers.
  - Ensure that the use of the resources of the *Fondo Único de TIC* is monitored, the projects evaluated and set up in a way that maximises welfare and extends high-quality connectivity in sustainable ways.
- ***Complement measures to extend connectivity through bottom-up approaches and innovative regulation***. To this end, Colombia should:
  - Create an enabling environment for the development of community-led initiatives. Colombia could consider facilitating the creation of community networks by:
    - Facilitating interconnection with already deployed networks.
    - Allowing for the deployment and operation of community networks by non-profit entities through lower licensing costs and lower bureaucratic burdens around compliance with administrative requirements to maintain the networks.
    - Considering the use of the *Fondo Único de TIC* for community-led initiatives if their creation caters to more sustainable access to connectivity than other projects financed by the fund.
    - Implementing the measures set out in the Spectrum Management Master Plan to provide community-led initiatives with the necessary spectrum without delay.
  - Recognise small Internet service providers (ISPs) as important players in extending connectivity in rural areas, especially with respect to the last mile. Measures to promote a favourable environment for small ISPs include the facilitation of access and interconnection with other networks and lower bureaucratic burdens.
  - Consider ways to enable more companies to experiment with projects in the regulatory sandbox that may further the deployment and usage of communication services in rural areas. This may involve the reduction of the administrative burden for community-led initiatives and potential regulatory sandboxes.

Education and health

- ***Co-ordinate the implementation between the National Rural Health Policy and the National Rural Education Policy along with other development actions in rural communities***, including infrastructure projects in sanitation and broadband coverage.
- ***Reinforce flexibility of education and healthcare systems by better adapting them to rural needs and involving local actors in decision-making***. To this end, the government should:
  - *Education*: Better adapt education policies to particularities of local needs, while promoting minimum quality, by:
    - Developing core curriculum national guidelines to ensure minimum level in some basic competencies (e.g. mathematics and reading) that help recover learning losses from COVID-19, while leaving subnational flexibility in the rest of the curriculum. This flexibility should be accompanied by a careful evaluation from national and regional authorities to identify schools that need support to manage curricula autonomously.
    - Better integrating local communities – including Indigenous and Afro-Colombian – in educational decision-making by encouraging initiatives such as "learning communities", which gather small groups of students, teachers and families.
    - Fostering alternative and flexible schools with adapted processes to address rural dropout, for example by focusing on children with gap years in education. Chile's Súmate Foundation initiative could be a useful example for Colombia.
    - Adding greater flexibility in school food programmes (PAE) to support local producers, for example by integrating local culture and culinary products into menus.
  - *Health*: Scale up flexible healthcare alternatives to empower the rural population around health, by:
    - Further supporting mobile healthcare units in rural departments to improve staff's professionalisation and reach remote communities with more frequency.
    - Leveraging alternative healthcare practices (e.g. Indigenous approaches) in rural communities and supporting their complementarity with conventional healthcare provision.
    - Encouraging the adaptation of payment methods to the specific risk profiles of rural citizens by providing healthcare providers with incentives to offer differentiated care to patients with different risk factors.
- ***Upscale the quality of healthcare and education provision by fostering digital services, upskilling rural professionals and improving attraction policies***. To this end, the government should:
  - *Education*: Improve digital skills of rural teachers through specific courses and collaborative networks, while improving teacher attraction policies in rural areas, by:
    - Improving rural teachers' access to training with targeted courses on digital skills and new teaching methodologies, while ensuring accessibility to training supply (e.g. transport costs). Volunteer committees on teacher cross-training can support this.
    - Encouraging attraction and retention policies for rural teachers through career incentives (e.g. faster progression in the career system), financial and non-financial compensations for long travel times or further accommodation support.
  - *Health*: Promote the adoption of telemedicine and the digital skills of healthcare professionals in rural areas by:

  - Leveraging mobile service to complement the provision of telemedicine services through fixed connections in rural areas.
  - Fostering collaboration with universities and schools to improve healthcare professionals' skills in the use of digital equipment.

- ***Facilitate complete trajectories by better connecting upper secondary education with labour market needs***. To this end, the government should:
  - Encourage the expansion and diversification of rural education in line with rural economic activities.
  - Better connect the educational offer for youth and adults wishing to complete their studies with the needs and priorities of the territories and with the innovation ecosystem (e.g. universities or companies). For this, the government can strengthen the Tutorial Learning System.
  - Involve education institutions (including the National Training Service [SENA]) in the rural policy-making process by partnering with local governments to co-build development plans and adapt the educational offer to future economic and social needs. The example of the Academy for Smart Specialisation of Karlstad University in Sweden could guide the government of Colombia.
- ***Ensure lasting health outcomes through policy co-ordination with a focus on primary healthcare***. To this end, the government should:
  - Adopt a comprehensive and inter-sectoral approach to improve primary health and prevention services in rural areas. This can involve strengthening the co-ordination capacity of early childhood development services.
  - Unify healthcare service support programmes to avoid entry barriers and administrative burdens (e.g. users travelling several times to claim their benefits for different healthcare programmes) leading to unnecessary travel for rural citizens.
  - Reorganise primary care around multidisciplinary teams to simplify procedures and achieve economies of scale. The case of Multi-professional Health Houses in France can be a guide for Colombia.

Introduction

Colombia has made significant progress over time to extend connectivity and improve the accessibility of rural communities to education and healthcare. In recent years, increased investments in transport infrastructure, mainly primary roads, along with ambitious plans of multimodal transport and greater recognition of the need to expand digital connectivity in rural communities is a sign of the development process in the country. New approaches to bringing education and healthcare to rural communities have also contributed to a steady improvement of services in rural communities.

However, closing the accessibility gap in rural areas still faces some challenges. Geography is the first factor that hampers more rapid progress in infrastructure and service delivery. The costs needed to provide good quality services in places with smaller and more dispersed populations are higher, given the smaller economies of scale. Apart from geographical barriers, violence, weaker institutional capacity at the local level and greater difficulties in attracting service professionals are still factors to be solved in Colombian rural areas.

For a long time, the lack of connectivity in Colombian rural regions has underpinned a structural development gap with urban areas and fed a feeling of abandonment. Today, the Colombian government has the opportunity to start mitigating this historical gap by accelerating projects of transport infrastructure and ensuring quality access to broadband. Digital connectivity in a geographically fragmented country such as Colombia can open multiple opportunities to join international markets, strengthen the network of producers and consumers, access information, adopt new technologies and access public services. If complemented with training and education, jointly closing the transport and digital gap can represent a significant improvement in the well-being of rural inhabitants.

This chapter assesses the main opportunities to improve transport and digital connectivity as well as access to quality education and healthcare in Colombian rural communities. It begins with a brief analysis of the status of transport infrastructure for rural areas in Colombia, with a focus on tertiary roads and mobility. It then expands the analysis on connectivity by identifying the main barriers and opportunities to improving digital accessibility in rural communities. The chapter ends with a focus on the bottlenecks and opportunities to improving rural education and healthcare provision.

Improving transport and broadband infrastructure in Colombian rural regions

Transport and broadband infrastructure are a necessary driver for productivity growth and well-being in OECD rural regions. It improves accessibility to local, national and international foreign markets, facilitates public service delivery and reduces transportation and marketing costs. In countries where rural economies are increasingly diversifying, like Colombia, better broadband infrastructure would also be an engine to stimulate off-farm economies and improve territorial interdependencies and cohesion (Pinstrup-Andersen and Shimokawa, 2006[1]).

Given that the Colombian government has already examined the challenges of road infrastructure and defined some initial strategic actions and long-term plans to improve it (Government of Colombia, 2016[2]; 2019[3]), this section puts greater emphasis on the actions required to improve an equally important type of connectivity: access to broadband infrastructure.

Keep closing rural accessibility gaps with transport infrastructure

Colombia is the third largest country in Latin American and almost double the size of OECD countries like France. Colombia's road network is divided into primary, secondary and tertiary roads. Each of these networks are under the responsibility of a different level of government and cover different parts of the territory (Ministry of Transport, 2019[4]):

- **Primary roads**. By 2018, the Primary Network represents 8% of the national road network, divided into the Concession Network (5%), under the responsibility of the National Infrastructure Agency (ANI), and the Non-Concession Network (3%), under the responsibility of the National Roads Institute (INVÍAS).
- **Secondary roads** account for 22% of the national road network and fall under the competency of regional governments, which rely on this network to connect different municipalities inside the region and link them to primary roads.
- **Tertiary roads** represent 70% (approximately 142 284 km) of Colombia's road network. Most of this network is managed and under the responsibility of the municipal government (71%), while some shares are managed by the national (19%) and regional (10%) governments. There are also private and rural roads, with other types of paths found particularly in remote and mountainous municipalities.

The country faces an important lag in transport infrastructure development when compared with other countries of similar income levels in Latin American and certainly in comparison with OECD countries. Colombia's road density (530 km per million inhabitants) is below countries of a similar level of development in Latin America such as Brazil (1 066 km) and Mexico (1 188 km). Likewise, Colombia's transport infrastructure is identified as one of the main factors hampering Colombia's international competitiveness, ranking 104 among 141 countries in terms of road quality infrastructure within the World Economic Forum Global Competitiveness Index (WEF, 2019[5]), below countries like Argentina and Mexico.

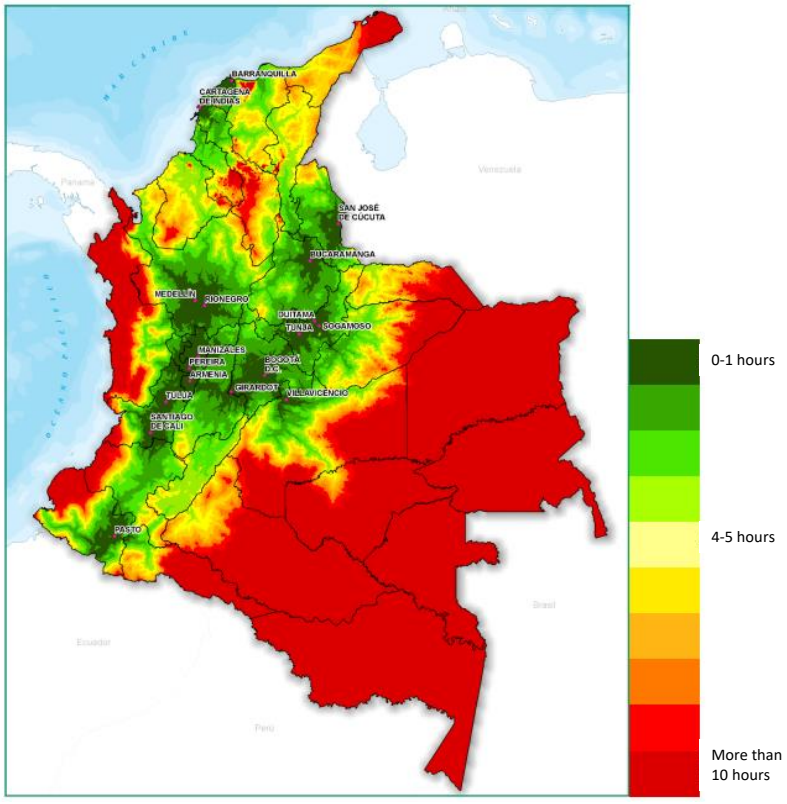
Communities in rural regions in the east, west and north of Colombia face long commutes, sometimes up to 10 hours, to reach 1 of the 12 cities in the country (Figure 4.1). The primary road network is concentrated in the Andean and Atlantic regions, facilitating the connection between the country's main production centres and its key ports, while there is less connectivity from west to east. Some municipalities are not even reachable by land (e.g. in Chocó).

An important challenge for transport connectivity in Colombia is the extension and quality of tertiary roads. There are regions like Amazonas, Chocó, Guainía or Guaviare which are larger than 45 000 km square but have less than 1 500 km of tertiary roads (Government of Colombia, 2016[2]). In terms of quality, only 6% of the tertiary roads with available information are paved and 25% are classified in a good state. A seminal issue is the acute lack of information about this network. As of 2022, there was no certainty on the number of existing tertiary roads, their state and the average daily traffic.

Moreover, there is a high dependence on road transport in the country, which makes transport inefficient and expensive. High reliance on one type of transport infrastructure – roads in Colombia – leads to congestion in connective passenger and freight transport and explains the low quality of infrastructure. Historically, most of the investment has focused on road infrastructure (Figure 4.2). Most of the cargo is transported by road (81% in 2018), with a small share by rail (15.7%), river (1.7%) or air (0.1%) (Ramírez-Giraldo et al., 2021[6]). Mining industry energy products are mainly transported by rail (coal) or boat (93% of the load on Magdalena River corresponds to petroleum derivatives).

Figure 4.1. Distance to reach any of the 18 largest cities in Colombia

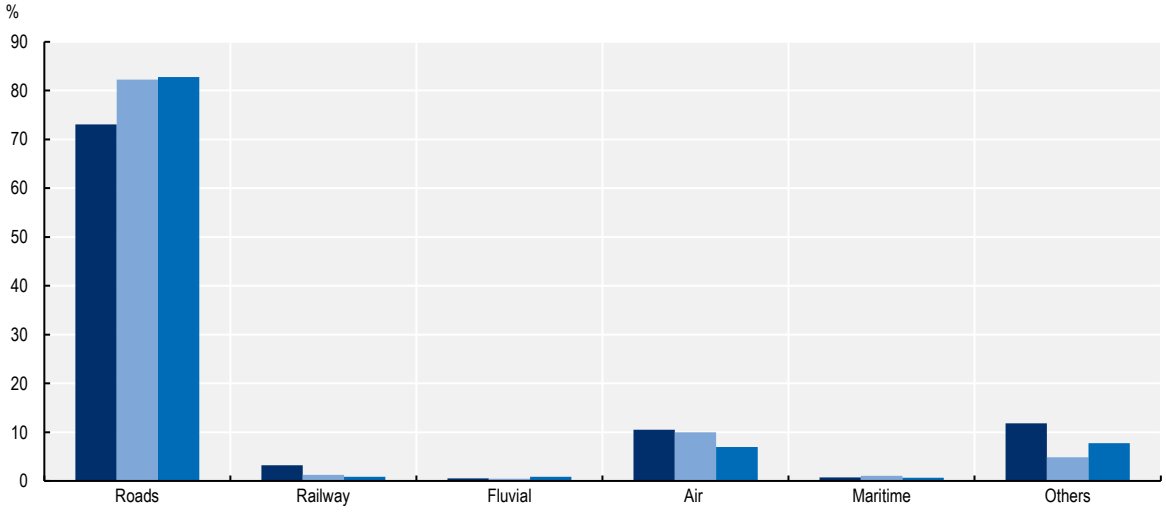
Commuting time over land



Source: Ministry of Agriculture and Rural Development (2019[7]), *Politica Agropecuaria y de Desarrollo Rural 2018-2022*, https://sioc.minagricultura.gov.co/Documentos/20190326_politica_agro_2018-2022.pdf.

Figure 4.2. Distribution of public investment in transport infrastructure in Colombia

Share by mode of transport over total investment



Source: Ramírez-Giraldo, M. et al. (2021[6]), "La inversión en infraestructura de transporte y la economía colombiana", https://doi.org/10.32468/espe.99.

Government policies aiming to improve transport infrastructure

Since 2015, Colombia established an ambitious plan to improve transport infrastructure and connectivity through multimodal transportation projects, commonly referred to as the Intermodal Transport Master Plan (PMTI). This initiative encompassed 101 road, 52 highway, 5 railway, 8 fluvial, 31 airport and various dredging projects. These policy objectives translated into an increase in public transport investment. While investment in transport infrastructure was 1.06% of gross domestic product (GDP) during the 2006-10 period, this percentage reached 1.54% during the 2011-13 period and 3.10% for the 2014-16 period.

The more ambitious plans have mainly focused on primary road infrastructure, under the name of fourth-generation (4G) and five-generation (5G) roads. This plan has relied on the active involvement of the private sector, based on the modern regulatory framework for public-private partnerships (PPPs). Colombia's regulatory framework for infrastructure ranks as one of the most competitive in the world across different rankings (EIU, 2017[8]; World Bank, 2018[9]). In 2021, the government established the Investment Plan for the reactivation of the economy, on the path to COVID-19 recovery, which added new transport goals and projects, e.g. finishing 28 road projects already underway and starting another 22 road corridors for national and territorial integration. Resources for this plan will be added to those already provided for in the National Development Plan (PND), which represents the largest public investment in transport (total budget of COP 9.6 billion in 2021) in the last decade (Ramírez-Giraldo et al., 2021[6]). Some of these 4G and 5G road projects will be important to connect and unlock rural regions such as Chocó.

In terms of secondary and tertiary roads, the national government had tried to compensate for the low investment by regional and municipal governments with direct investments through various strategies. These include the 2009-10 Program for the Improvement and Routine Maintenance of Tertiary Roads (PROVITER, with a forgivable loan for 538 municipalities), the 2011 Paths to Prosperity plan to repair secondary and tertiary roads, particularly the ones affected by the climate, and direct agreements between National Roads Institute (INVÍAS) and municipalities to improve road quality.

As part of the commitments in the peace agreement, in 2016, the national government issued a national policy for tertiary roads to establish a support management scheme for territorial entities. This policy targets five main actions: i) update the inventory of tertiary roads; ii) set a methodology to guide municipalities in the prioritisation of road investment; iii) issue technical and environmental norms for the construction of tertiary roads with better methods and materials that involve local offers; iv) adopt a co-financing model that allows favouring municipalities with the greatest needs; and v) promote efficiency and transparency in the contracting processes of tertiary roads, seeking better risk management.

In 2019, the Ministry of Transport through INVÍAS launched the Rural Colombia programme to co-finance improvement works and road maintenance in the secondary and tertiary networks. This project works under voluntary application from municipalities and regions through a virtual platform that aims at reducing the administrative burden in the submission process. The programme has a special fund targeting the municipalities most affected by the armed conflict, and included in the Development Programs with a Territorial Approach (PDET).

There is scope to improve road quality and tertiary roads to connect rural areas

Keeping up the investments ratio in infrastructure

Overall, recent investment efforts are on track to close the historic gap in infrastructure in the country but the level of investment will need to keep up. The investment in recent years (3% of GDP in 2019-21) doubles the average trends during the last decade (1.9% in 2010-20) but is still below average investments rates across other middle-income countries in East Asia and the Pacific or South Asia (5.7% and 2.25% respectively). Furthermore, according to different authors, this ratio of investment would still be below the

one needed to converge to transport infrastructure levels of countries with a similar stage of development, ranging between 4% and 6% of GDP (Bonifaz et al., 2020[10]; Cavallo, Powell and Serebrisky, 2020[11])

While projects on primary roads seem to be on track, the challenge to expand and improve secondary and tertiary roads remains. Programmes that gather resources from different sources and co-ordinate investments towards a single target of improving municipal roads can achieve economies of scale and accelerate the projects. The programme *Colombia Rural* is a good start for this. It could pull in resources from the General System of Royalties, the Work for Taxes (*Obras por impuestos*) scheme and subnational and private resources. This programme needs, however, a more proactive approach that not only relies on voluntary applications for co-finance but also actively reaches poor municipalities beyond the ones classified as PDET.

Moreover, the Work for Taxes scheme created in 2016 could be further expanded to cover tertiary roads in all of the poorest rural municipalities. This mechanism allows the private sector and taxpayers – with a minimum level of income – to reduce the amount of income tax by investing directly up to 50% of this tax in the construction of infrastructure works in the 344 municipalities classified as Zones Most Affected by the Armed Conflict (ZOMAC) (almost 30% of municipalities in the country). This means a company, which tends to be in extractive industries operating in the region, can directly invest and build the infrastructure project, which helps mitigate underinvestment by municipal governments and create social acceptance of its economic activity.

Greater focus on road quality, especially for regional and municipal roads

Moreover, the important investment in road network expansion has not been reflected in road quality. During the last 2 decades, there have been no significant advances in the percentage of paved roads in the primary road network, whose share of paved roads remain around 75-80% since 2000 (INVIAS, 2021[12]; Ramírez-Giraldo et al., 2021[6]). In fact, the quality of road infrastructure (3.4 points according to 2019 World Economic Forum [WEF] index) remains below the average of Latin American countries (3.6). The most worrying case corresponds to secondary and tertiary roads. Approximately only 6% of tertiary roads in the country are paved (Government of Colombia, 2016[2]).

A pressing need to improve information on road transport

Information on the number of tertiary roads is a seminal challenge for Colombia. This is partially explained because municipalities and regional governments do not provide complete information on the roads under their responsibility or they do so using different standards and methods. There are no clear protocols for updating the information or a centralised database for these roads. This issue is partially due to a lack of financial and staff capacity at the local level to undertake these tasks but also still incipient support to provide technical assistance.

The government could formalise short-term solutions, such as alternative estimation exercises to map the tertiary road network. A project to use satellite imagery and artificial intelligence (AI) has led the National Planning Department (DNP) and the Ministry of Transport to identify the baseline of the country's tertiary roads. The project has managed to estimate 87% of the national territory. This information can be used as a baseline for municipalities and is estimated to save between 40% and 60% in the cost of municipal road inventories (DNP, 2022[13]). This project can be further improved if it is linked to the *Catastro Multipropósito* to ensure inter-operability of the information.

Boosting local capacity and involvement of local communities to improve transport infrastructure

The regional governments' and municipalities' management of secondary, tertiary and rural road networks is done without technical criteria or planning (Government of Colombia, 2019[3]). This issue leads to low quality construction projects – unpaved roads – that become temporary solutions due to their vulnerability to climate effects. Furthermore, the lack of clarity in terms of the prior consultation process to start a project is an additional challenge that also affects other infrastructure projects in the country. As discussed in Chapter 5, by 2022, the regulation on prior consultation had not been enacted, which creates uncertainty for both transport projects and communities (see Chapter 5 for some recommendations in this regard).

In 2019, the government established a special commission to identify, among others, strategies to address the historic gap in transport infrastructure (Government of Colombia, 2019[3]). Some of the recommendations from this commission highlighted the need to strengthen regional transport secretaries and improve their rules of government, as well as direct the existing maintenance co-operatives to tertiary and rural roads with municipal funding. Moreover, boosting a sense of belonging in communities could help ensure projects are carried out to a minimum quality standard and maintenance is undertaken. For example, routine maintenance must find partnership models between the government and the communities that live near the roads, promoting participation schemes such as road maintenance micro-enterprises (such is the case of Provías Rural in Peru) (Government of Colombia, 2019[3]).

Additionally, promoting urban-rural co-operation in transport projects could support rural municipalities in the development of road infrastructure. This would be particularly useful for rural areas close to small- or medium-sized cities. To this end, some OECD countries have used partnerships, where the government of the urban municipality takes on the maintenance of the roads and receives compensation from surrounding rural governments (e.g. Poland) (OECD, forthcoming[14]). The Colombian government could also set up co-operation partnerships around transport in national and regional development plans as a priority strategy for some regions. Incentives like co-funding urban-rural transport projects with national resources could also trigger inter-municipal co-operation in the country.

Accelerating intermodality to increase mobility options for rural communities

There is a pressing need to accelerate the development of other modes of transport to free up space on roads and also improve the mobility of people and freight.

Development or improvement of the railway network in Colombia should also be a priority action for the government of Colombia, to increase competitiveness and opportunities for rural economies in the country. In 2018, the railway network had 603 km in operation, of which 66% is used for the transportation of coal while the remaining 2 885 km of railway lines are inactive (Ramírez-Giraldo et al., 2021[6]). The national government has already set up the strategies to develop cargo and passenger railways in the country, a Railway Master Plan (2020), which could reduce up to 26% of logistics costs.

Fluvial transport is also an important focus. INVÍAS is implementing the Colombia Fluvial programme, which seeks to connect the most remote areas of the country, through the construction of fluvial infrastructure (docks, access platforms and ferries) and the maintenance of fluvial corridors (dredging, signposting, logging and cleaning). The first objective of this programme will be carried out through 45 projects. The DNP is also updating the River Master Plan issued in 2015.

Financing is an important aspect to accelerate the deployment of an alternative mode of transport, railway and fluvial, as well as support the development of tertiary roads. To reach full implementation of the multimodal transport plan, the government needs to diversify infrastructure funding. It currently comes from two sources: i) public contributions from the General Budget of the Nation (PGN), royalty resources or transfers, or local taxes in the case of territorial entities; and ii) direct charges to users or beneficiaries of

the infrastructure, mainly through tolls (often used to pay back PPP projects) (Government of Colombia, 2019[3]).

According to the 2019 special commission on infrastructure, options for funding diversification include sales of state assets and the use of resources from the residual value of assets in infrastructure, or land value capture instruments. This last instrument is of particular relevance for municipal roads, in the framework of updating land information systems (*Catastro Multipropósito*, see Chapter 5) and the expectation that it leads to increased local property taxes. Another option suggested by this commission is allowing aggregation of payment sources from different levels of government and the private sector. Currently, there are resources available for infrastructure from royalties and the programme Work for Taxes (*Obras por impuestos*), which can be combined with land value capture instruments to increase the scale of investment. This type of aggregation of resources for priority infrastructure investment could be done through place-based interventions for rural regions, for example with a similar approach to PDET.

All these projects at the national level are of high importance to improve accessibility across the country and more importantly connect remote rural communities. These plans, especially the investment in fifth-generation (5G) highways, the implementation of the railway plan and the improvement of the navigability of Magdalena River need to be continued. This should require long-term investments and political commitment from future governments to implement and finalise these projects.

Improving rural mobility with innovative transport options

Beyond investing in rural infrastructure, rural communities can also adopt innovative ways of mobility to increase commuting despite physical transport bottlenecks. Even with roads in place, some communities do not have public transport systems or access to private vehicles to benefit from the roads. Limited transport options in peripheral, rural and remote areas hinder effective access to services and markets.

A number of OECD countries are developing novel ways to provide economically viable, affordable, inclusive and sustainable mobility where private and conventional public transport struggle to provide appropriate connections (Box 4.1). Innovative mobility is not necessarily based on new technological approaches. It could be a new mobility offer (e.g. a new carsharing programme), a process change that increases the uptake of an existing solution (e.g. introduction of an online booking system) or a social or institutional process that results in the identification or application of a new mobility approach (e.g. collective walking and cycling “school buses”) (ITF, 2021[15]).

Box 4.1. Options of innovative rural mobility across OECD countries

Flexible and innovative mobility services that are adapted to unique local circumstances are the best way of ensuring critical links to core public transport networks. Despite increased interest from policy makers, new mobility approaches are rarely implemented on a large scale and lack integration with the wider transport network, due to the funding, legal and institutional environment. Yet, adopting innovative ways of mobility relies mostly on a political decision, one in which local governments have space to experiment.

Some of the innovative rural mobility modes identified across OECD countries include:

- **Shared mobility**. The local shared mobility offer is an important building block to complement the existing core transport network. Different approaches exist and their utility depends on population density characteristics in each rural community. They include rural demand-responsive transport, community or volunteer transport, ridesharing, carsharing and autonomous buses.

- **Active mobility**. Cycling in rural areas is valuable as a standalone mode of transport or to bridge the last mile(s) in order to access both branch services and the core transport network. This mode of transport also includes pedibuses, cyclobuses, collective walking and cycling "school buses".
- **Integration of mobility services**. Co-ordination between core bus lines and local branch networks, including regular bus services, flexible last-mile services and other shared and active transport options are crucial to improve travel experiences and accessibility in rural areas. Co-ordination mechanisms used in OECD rural areas include:
  - *Rural mobility hubs*: a location for switching modes of transport, designed to improve inter-modality and integrate private transport modes and feeder services to direct bus and rail lines.
  - *Mobility as a service*: a digital system that integrates different transport, information and payment services into a smooth customer interface.

Unfortunately, the rise of new mobility solutions, including shared and active mobility forms and multimodal integration, currently happens within the context of long-standing deficits in rural transport provision.

Source: ITF (2021[15]), *Innovations for Better Rural Mobility*, https://www.itf-oecd.org/sites/default/files/docs/innovation-rural-mobility.pdf.

Rural areas in Colombia are diverse in terms of income and settlement pattern structure, which allows for exploring different options for mobility. Some close to large cities (e.g. around Bogotá, Cali or Medellin) could adopt innovative options of shared mobility (e.g. carsharing or community transport) to palliate the increasing cost of delivering public transport. Others can formalise unconventional active mobility solutions, like the pedibus or boat bus for the case of some regions in the pacific. The pedibus is a form of school transport for children who, supervised by adults, walk to school in much the same way a school bus would drive them (e.g. rural areas in France or the Netherlands). A vélobus or cyclobus is a 10-seater bicycle used in several villages.

Colombia has already passed a law to recognise different types of transport modes for children to reach schools (see the section on education below). This effort of formalising alternative mobility options should also be extended to general commuting in the communities. As the population is sparse and economies of scale low, there is not currently the same political or institutional prioritisation or motivation to solve mobility issues for rural areas as there is for urban areas. Thus, innovative mobility initiatives in rural areas are fragmented and communities are more likely to have to push for change, compared to urban areas where there is already a strong desire for new outcomes and an appetite for new solutions, including among policy makers (ITF, 2021[15]).

Therefore, Colombia could find a guide in rural policy mobility frameworks across OECD countries and regions to set planning instruments for alternative and cost-efficient mobility structures for rural areas (e.g. cyclobus). Some of them include comprehensive rural mobility policies at the subnational level (Flanders, Belgium), obligations to produce the rural equivalent of Sustainable Urban Mobility Plans (e.g. Slovenia) and organisational frameworks that provide national and regional coverage, assigning minimum service levels (Catalonia, Spain)

Today, physical connectivity is not enough to allow people to fully benefit from economic opportunities and help them reach new markets. The increasing digitalisation trend is shifting the way people and firms reach new markets with local products and acquire inputs, access education and training as well as other government services.

Unleashing the potential of connectivity to close digital divides in rural areas

High-quality fixed and mobile communication networks are crucial for the further digital transformation of Colombia. This has been recognised by Law 2108 of 2021, which considers access to broadband connectivity as an essential and universal public service. Connectivity in rural areas has spill-over effects across all sectors of the economy and allows people to access healthcare, education and other government services (e.g. justice) as well as participate in democracy. High-quality connectivity in rural areas can help mitigate the penalty of distance in some communities in terms of transport costs and prepare rural economies for technological change (e.g. drones, autonomous machines) to increase their resilience and efficiency.

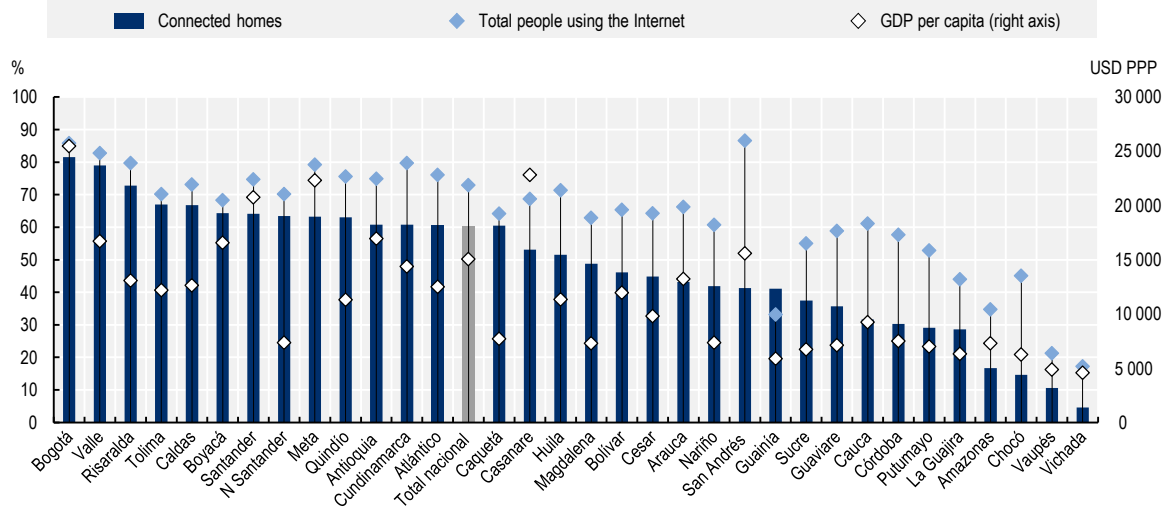
A lack of access to connectivity in an increasingly data-driven economy and society increases not only digital divides but also social and economic divides. Connectivity gaps in rural areas may undermine policy objectives in areas such as social assistance or education and reduce regional attractiveness, for example for young people and the private sector. Overall, this gap contributes to a decrease in quality of life in the country and increases regional inequalities (OECD, 2018[16]).

The state of connectivity in rural areas in Colombia

According to the official territorial classification of Colombia in 2021, only 28.8% of households located in rural areas have broadband access (fixed and/or mobile), in contrast with 70.0% in urban areas (DANE, 2022[17]). Moreover, in Colombia, departments with lower income per capita tend to have lower subscription rates (Figure 4.3), which are mainly those with a higher degree of rurality (Chapter 2). One of the reasons for this trend is that the prices of communication services represent a greater hurdle for lower-income households. As noted in Chapter 2 of this review, income in rural areas is generally lower compared to urban areas.

Figure 4.3. Poorer and more rural Colombian departments have a lower share of connected households and are making less use of the Internet

Share of households with fixed and/or mobile broadband access (“connected homes”) and share of people using the Internet (left axis, 2021) and USD PPP GDP per capita (2020) in Colombian departments (right axis)

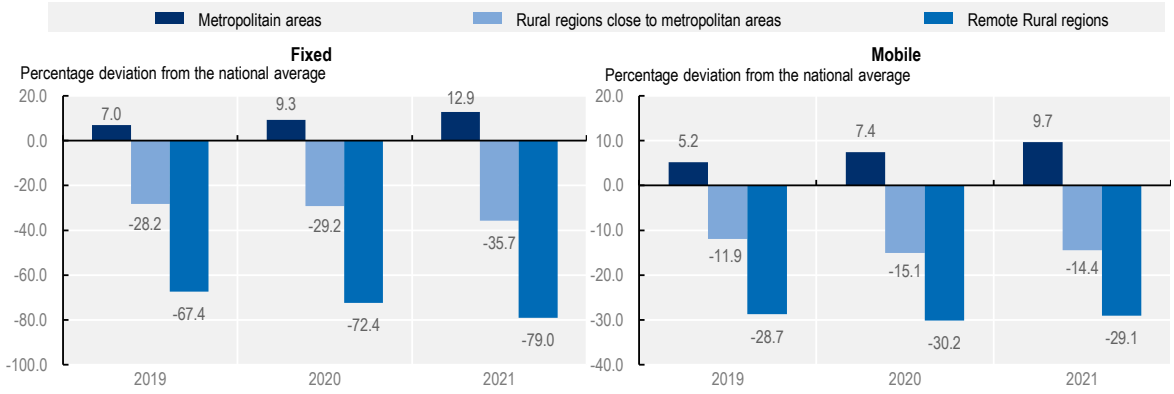


Note: “Connected homes” data were collected for the National Quality of Life Survey (*Encuesta Nacional de Calidad de Vida*, ECV), OECD.
Source: DANE (2022[17]), *Encuesta Nacional de Calidad de Vida (ECV) 2021*, https://www.dane.gov.co/files/investigaciones/condiciones_vida/calidad_vida/2020/Boletin_Tecnico_ECV_2020.pdf (accessed on 26 October 2021).

Apart from the low share of subscriptions in rural areas, the quality of service in rural areas in terms of speed also lags significantly behind metropolitan areas. Therefore, even with access to broadband, many of the possible services available online might not be fully and easily accessible and the opportunities to tap the potential of connectivity necessarily remain unused (Figure 4.4). Network speeds matter as businesses need fast and reliable connection speeds to process payments and orders, participate in online commerce and stay competitive in an increasingly digital economy (OECD, 2018[16]). Furthermore, speeds are important for the use of key information and communication technology (ICT) tools, such as cloud computing and many other data-intensive activities and demanding applications across sectors for example industry automation. This is especially the case when it comes to such an important sector as agriculture in Colombian rural areas, which is currently undergoing far-reaching productivity shifts worldwide due to technological developments such as the Internet of Things (IoT). High speed is also crucial to allow effective access to virtual education and healthcare, for example to leverage the potential of augmented reality or medical imaging, and allow remote working.

Figure 4.4. Colombian rural areas significantly lag behind speeds experienced in cities

Speeds experienced in metropolitan regions, regions near a metropolitan area and regions far from a metropolitan area; fixed (left) and mobile (right)



Note: Territorial classification follows the OECD regional classification (see Chapter 2), which looks at the degree of rurality in small regions (Territorial Level 3, TL3). The graphs present the information according to the following grouping: metropolitan regions (large metro region+ metro region), regions near a metropolitan area (non-metropolitan region near a metropolitan region) and regions (non-metropolitan region with access to a small/medium city + non-metropolitan region remote).
Source: Ookla (n.d.[18]), *Speedtest*, https://www.ookla.com/ookla-for-good/open-data.

Amplifying the impact of measures taken and existing networks to provide rural areas with connectivity

The Colombian government has recognised the rural-urban connectivity divide and has taken measures to narrow it. To this end, three major initiatives have been implemented: i) the creation of a national fibre backbone that has connected an important number of Colombian municipalities; ii) the Universal Sustainable Access Project (*Proyecto de Acceso Universal Sostenible*) that supports public broadband access, called *Zonas Digitales* (Digital Zones); and iii) the project *Acceso Universal para Zonas Rurales that installed Centros Digitales* (Digital Centers) to connect people in rural areas with no personal broadband access.

The National Optical Fibre Project (*Proyecto Nacional de Fibra Óptica*) deployed a fibre optic backbone (Azteca Network) through a governmental contribution agreement, with the aim to connect most Colombian municipalities. This backbone provides an important foundation for connecting consumers and businesses.

In particular, the rollout to remote municipalities can help close the important digital gap between urban and rural areas in Colombia. Through this initiative, the number of connected municipalities grew from about 287 in 2010 to around 1 073 municipalities in March 2022 (Government of Colombia, 2022[19]).

Nevertheless, this Azteca fibre optic network only reaches the centre of municipalities, with no coverage in the surroundings, and also needs to be extended to last-mile municipalities. Currently, some of the existing operators do not connect to or use the fibre backbone, partially due to quality-of-service (QoS) requirements or because they possess their own infrastructure in the respective area. Additionally, the cost of connecting to the Azteca network may be very high and subject to individual negotiations, which may represent a barrier, especially for community-led initiatives (Government of Colombia, 2022[19]). The Commission for Communications Regulation (*Comisión de Regulación de Comunicaciones*, CRC) has been working on solving the regulatory QoS issue. For example, where last-mile deployments of fixed network infrastructure are not feasible due to geographic challenges in certain rural areas, fixed wireless solutions could be envisaged. In addition, consultations could be facilitated between Azteca and ISPs[1] of all sizes in Colombia in a view to setting interconnection fees in a way that results in better use of the fibre backbone, and this in particular in rural areas of Colombia in particular.

Another major initiative by the Colombian government is the Universal Sustainable Access Project which amounts to more than COP 27 billion (USD 7.3 million)[2] and aims at installing solutions for public broadband access called *Zonas Digitales.* In these zones, anyone is allowed free broadband access from a smartphone, tablet or laptop 24 hours a day. *Zonas Digitales* have the capacity to serve at least 10 users simultaneously at a required minimum speed of 9 Mbps. Overall, the project was planned to provide connectivity through 1 300 *Zonas Digitales*, benefitting 378 municipalities, distributed in 20 departments[3] of the country (MinTIC, 2019[20]; 2019[21]; 2021[22]).

However, such a plan to extend the *Zonas Digitales* has faced major challenges. In 2022, only 9 of these first 1 300 *Zonas Digitales* are up and running as to the termination of the contract's express terms.[4] In the first phase of the plan, only 10 of the departments that benefitted from the *Zonas Digitales* (i.e. 50%) have beenbelow the national average of connected homes.[5] The five departments with the lowest share of connected homes (Amazonas, Chocó, Guainía, Vaupés, Vichada) have not been included in the initiative. As a consequence, the Executing and Connecting Plan, Phase 2 (*Plan Ejecutando y Conectando, Phase 2*), also initiated in June 2020, put forward the installation of 250 additional Digital Zones in 97 municipalities of 14 Colombian departments and the Capital District. These 250 additional zones are currently up and running (Government of Colombia, 2022[19]).[6] In addition, the *Plan Ejecutando y Conectando, Phase 2* included the reconnection of 145 *Zonas Digitales* from the Universal Sustainable Access Project.

The National Rural Connectivity Plan (*Plan Nacional de Conectividad Rural*) aims to extend connectivity provided through public access solutions (MinTIC, 2019[23]). In line with this plan, the project for Universal Access to Rural Areas (*Acceso Universal para Zonas Rurales*) aims at providing connectivity through 14 750 so-called Digital Centers (*Centros Digitales*) throughout all Colombian departments until 2031, for a value of around COP 2 138 billion (USD 578.6 million). The project was awarded to operators Comcel and UT Centros Poblados in December 2020 and was divided into two regions (A and B). The project aims at allowing economies of scale to reduce the costs of installation, operation and maintenance of connectivity for rural areas.

In *Centros Digitales*, connectivity will be provided through WiFi solutions, thereby avoiding time restrictions for the use of the service and significantly reducing logistical and operational costs. Ninety-eight percent of *Centros Digitales* to be installed are comprised of official rural educational institutions located mainly in areas classified as populated centres, The remaining 2% will be installed in "special cases", i.e. in independent premises of ethnic communities, military units, healthcare posts, Territorial Training and Reincorporation Spaces (ETCR) and National Natural Parks (PNN), among others.

Each *Centro Digital* has two Internet access points: one is located inside the educational institution benefitting the educational and academic community and the other outside, to be used by the inhabitants of the surrounding area. As of January 2022, only 10.2% of the planned Digital Centers (1 515) are up and running. Extrapolating the current speed of deployment, there is not much leeway for delays to have all 14 750 planned centres up and running by 2031.

While the *Zonas Digitales* and *Centros Digitales* are increasingly providing broadband access to the unconnected communities, these programmes have to ensure that contractors are complying with their obligations and objectives. This is especially the case in light of programme funding, the majority of which is enabled through the Single Information and Communication Technology Fund (*Fondo Único de Tecnologías de la Información y las Comunicaciones*, or *Fondo Único de TIC*) by communication operators (see below).

Furthermore, the focus should also be put on how continuity of *Zonas Digitales* and *Centros Digitales* initiatives can be ensured, and this across legislative periods. In the predecessor programme Live Digital Plan (*Plan Vive Digital*), so-called Live Digital Points (*Puntos Vive Digital*), were deployed between 2010 and 2018. It seems that this programme suffered particularly from maintenance issues. Some of the installed free Internet access points have been used less often than intended due to the unreliability of the service. In addition, many of the access points have not been kept up and running after the regional authorities had to take care of the upkeep of the service in 2018 due to lack of government funding at the national level. In July 2019, only 56 of the 949 installed *Puntos Vive Digital* (5.9%) were up and running (Government of Colombia, 2022[19]; Ancestra, 2019[24]).

Finally, it has to be acknowledged that these programmes are not able to substitute direct household or business fixed or mobile subscriptions for the population that is currently not connected. As Figure 4.3 shows, there is a relationship between the share of connected households and the share of broadband usage. Home connections are indispensable to drive connectivity in a sustainable way. These measures should be further improved and comprehensive policies (e.g. National Rural Connectivity Plan) should be strengthened to expand high-quality broadband access to complement public broadband access point programmes.

Community networks and local ISPs as additional drivers of rural connectivity

Community networks

The promotion of community networks may be considered to foster rural connectivity and complement national efforts. Community networks are bottom-up approaches that build on local knowledge and initiatives (i.e. grass-roots movements) and can play a complementary role with respect to national service providers to bridge connectivity divides, particularly in remote areas or those with difficult access (APC, 2020[25]; OECD, 2021[26]). Locally-led efforts can benefit from greater knowledge of local geographic, economic and social conditions as well as direct co-operation with local communities and governments.

Nevertheless, to date, there are almost no successful community-led initiatives in Colombia (Government of Colombia, 2022[19]). In Colombia, Article 8 of Law 1978 (ICT Modernization Law) provides for the possibility to exempt some spectrum bands from payment with the purpose of extending coverage in rural areas, which could facilitate the creation of these types of networks. Moreover, an important step in the right direction has been made by the National Spectrum Agency (*Agencia Nacional del Espectro*, ANE). The ANE, in its five-year Spectrum Management Master Plan published in February 2022, acknowledges “non-traditional spectrum management models” and is considering, among other things, spectrum sharing and its secondary use to promote community-led initiatives (ANE, 2022[27]).

Institutional framework conditions are often necessary to support bottom-up initiatives that seek to expand connectivity in rural and/or remote areas. Other countries of the region have already promoted framework

conditions to facilitate the expansion of these networks. For example, in Mexico, the rise of community networks has been facilitated by changes brought by the 2013 telecommunication reform and implemented with the 2014 sector law (*Ley Federal de Telecomunicaciones y Radiodifusión*, LFTR). The licensing regime changed to a simple class-licensing regime (except for resource scarcity restraints, i.e. spectrum), where spectrum licences are granted for a determined use (commercial, public, social use). In Mexico, social use spectrum licences include community and Indigenous networks with non-profit purposes (OECD, 2017[28]). In Brazil, the communication regulator (Anatel) explicitly recognised community networks as an option for Internet access in Brazil (Anatel, 2020[29]; OECD, 2021[26]).

It is important to not only allow for the possibility of these initiatives but also to create a benevolent space for their development. Colombia could consider facilitating the creation of community networks by:

- Promoting interconnection with already deployed fibre optics and other networks.
- Allowing for the deployment and operation of community networks by non-profit entities through lower licensing costs and lower bureaucratic burdens around compliance with administrative requirements to maintain the networks.
- Considering the use of the *Fondo Único de TIC* for community-led initiatives, if their creation caters to more sustainable access to connectivity than other projects financed by the fund.
- Implementing the measures set out in the Spectrum Management Master Plan to provide community-led initiatives with the necessary spectrum without delay.

Small ISPs

Colombia possesses a rich landscape of ISPs that can help extend connectivity in areas where bigger ISPs do not see a positive business case or do not have sufficient onsite expertise. The number of these small ISPs ranges between 400 and 500 and their networks can be found in almost all municipalities throughout the country (Government of Colombia, 2022[19]). Often, these small ISPs play an important role in last-mile connectivity, i.e. in enabling the connection to the premises. Increasingly recognising small ISPs statistically will lead to a more coherent picture of communication services in Colombia.

Colombia may consider boosting the potential of these small ISPs by including them when designing its policy and regulation. This may include an easy and cost-efficient interconnection with other networks as well as lower bureaucratic burdens. Resolution 175 of 2021 was a start in the right direction, as it provides for the reporting of revenues and access numbers by small ISPs. In addition, Law 2108 of 2021 enables small ISPs in certain cases to be exempted from the annual contribution to the CRC and the *Fondo Único de TIC* (Congreso de Colombia, 2021[30]).

Getting local governments involved in boosting rural digital transformation

Local governments have an important role to play in lowering barriers to communication infrastructure deployment. Important barriers exist on the local government level and slow down the deployment of communication infrastructure, making it more costly (Government of Colombia, 2022[19]). Those barriers include:

- Lack of clarity regarding land use restrictions, prohibiting infrastructure deployment in public spaces, in areas of cultural, heritage or conservation interest and height limits.
- Additional procedures, for example approval procedures, defined locally for the deployment of networks, which may represent excessive burdens and can delay or impede network rollout and the deployment of communication infrastructure.

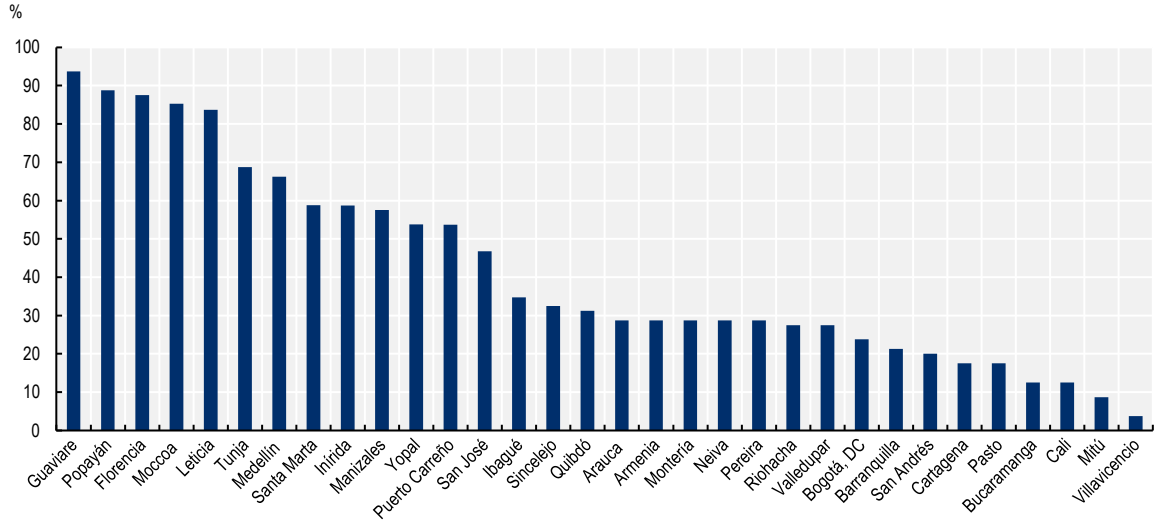
While some of these restrictions of municipalities on infrastructure deployment may be justified and reasonable, deployment barriers at the local level need to be reduced to a maximum extent and rights of way should be streamlined. One effective way to do so would be the provision of legal certainty to those

involved in the deployment of infrastructure and reducing the burden of installation procedures and costs associated with such deployment. MinTIC currently employs advisors at the departmental level who support infrastructure deployment and are able to provide support for the infrastructure deployment policies in municipalities. In addition, technical advisory work to support municipal authorities may also be established by the ANE and the CRC.

A laudable development is the creation of the favourability index for the deployment of telecommunication infrastructure in the country's capital cities (*Índice de favorabilidad al despliegue de infraestructura de telecomunicaciones en las capitales del país*) by the CRC to compare the ease of communication infrastructure deployment in the country's cities. The index provides an overview of which capital cities in Colombia are the easiest to deploy infrastructure in and serves as a starting point for local authorities to identify the cities that would require support in the expansion and improvement of service coverage. Furthermore, corresponding to the legal mandate in Article 309 of Law 1955 of 2019, the CRC has been promoting the accreditation of municipalities with respect to the absence of barriers to deployment. Among others, the index is also showing the number of accreditations or requests of accreditations of municipalities in the respective department. The index for capital cities and the accreditation process for municipalities put the different capital cities and municipalities in competition as they increase transparency on areas with the lowest barriers to infrastructure deployment in Colombia. The index indicates, among others, that 34.3% of capital cities in Colombia have a rating that is above 50% of deployment favourability.[7] More than 65% of the capital cities have regulations that promote the deployment of infrastructure. Nine capital cities have been identified by the CRC to have a deployment favourability rating below 25% (Figure 4.5) (CRC, 2022[31]).

Figure 4.5. Only 65% of capital cities can be said to promote broadband infrastructure deployment

CRC favourability index for the deployment of telecommunication infrastructure in the country's capital cities, February 2022



Source: CRC (2022[31]), *Índice*, https://www.crcom.gov.co/es/micrositios/indice (accessed on 28 January 2022).

Further mechanisms to ease infrastructure deployment can be drawn from other good practices across OECD countries. Spain, for example, established a mechanism to better co-ordinate different levels of government responsible for urban planning and broadband infrastructures. The country's General Telecommunications Law allows for an evaluation of a municipality's management instruments for infrastructure deployment. Municipalities need to obtain a binding report from the Spanish Ministry of Energy, Tourism and Digital Agenda. The ministry must examine the management instruments and whether they comply with measures of the General Telecommunications Law.

Many OECD countries aim at extending and improving access through measures to streamline rights of way. Administrative processes may be burdensome and the processing times for deployment applications submitted to municipalities may delay network expansion. Approval procedures often require approval from several different public authorities. Streamlining these procedures and rights of way, e.g. in the United States (US) (Box 4.2) can help reduce the cost and speed up the process of network deployment.

Box 4.2. Streamlining of rights of way in the US

An example of an interesting regulatory action to simplify rights of way is the Federal Communications Commission (FCC) Order, *Accelerating Wireless and Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment,* adopted on 26 September 2018 in the US. The decision clarifies the FCC's views regarding the amount that municipalities may reasonably charge for small cell deployment given the practicalities of 5G deployment and the importance of 5G to the US. In particular, the FCC declared that pursuant to Section 253 of the Communications Act, fees should be a "reasonable approximation of the municipalities' costs". In offering guidelines for determining this value, the FCC cited the rules of 20 states that limit upfront pole fees to USD 500 for use of an existing pole, USD 1 000 for the installation of a new pole and recurring fees of USD 270.

Source: FCC (2018[32]), *FCC Facilitates Wireless Infrastructure Deployment for 5G*, https://www.fcc.gov/document/fcc-facilitates-wireless-infrastructure-deployment-5g (accessed on 9 October 2018); OECD (2019[33]), "The road to 5G networks: Experience to date and future developments", https://doi.org/10.1787/2f880843-en.

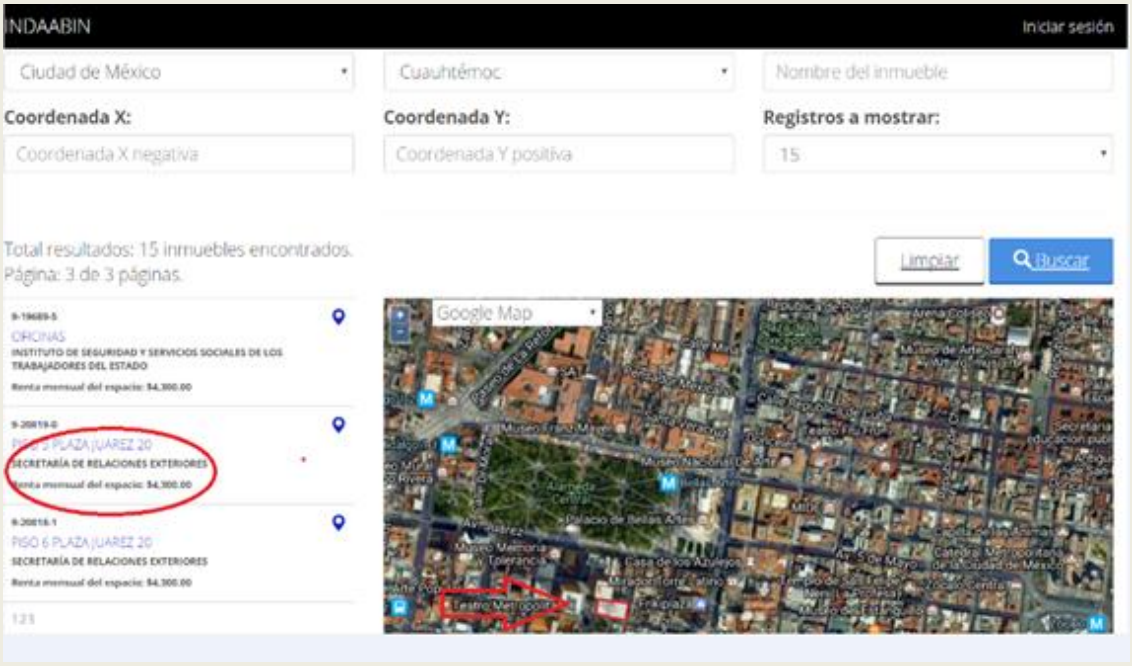
A further measure to facilitate infrastructure deployment in Colombia is to increase transparency on potential locations for communication infrastructure deployment and also where existing communication assets are already deployed. The determination of locations and existing infrastructure are critical time factors in rolling out broadband infrastructure. For example, Colombia could consider establishing a one-stop online portal that georeferences publicly owned buildings available for lease to allow concessionaires to deploy communication infrastructure. This system can follow the example of Mexico's National Information System of Telecommunications Infrastructure, which provides an inventory of public assets with the aim of revealing the availability and status of this infrastructure in order to increase efficiency in deploying telecommunication networks (Box 4.3).

Box 4.3. Mexico's projects within its passive infrastructure programme

In Mexico, the Secretariat of Infrastructure, Communications and Transportation (*Secretaría de Comunicaciones y Transportes*, SCT) issued an interagency agreement that allows for close to 110 000 state-owned structures to be used and shared, by concessionaires (licensees), permission-holders and infrastructure developers, as passive infrastructure for telecommunication networks under non-discriminatory, equal-access and non-exclusive conditions. Information pertaining to the relevant

properties, including georeferenced location as well as physical, economic, technical, safety and operational conditions and the market value, are published on an online platform called ARES, operated and managed by Institute for National Assets (*Instituto de Administración y Avalúos de Bienes Nacionales*, INDAABIN). Interested parties can use the platform as a search engine and indicate their interest in a particular building and INDAABIN will serve as a one-stop portal for all requests. Apart from the 110 000 federal buildings, other interested public institutions, for instance at the municipal level, can become a member of the portal and present their properties that fulfil the necessary technical conditions.[8]

Figure 4.6. Online platform ARES on infrastructure for telecommunication networks



This initiative is part of the SCT's efforts to synchronise the involvement of local and state authorities through a passive infrastructure programme containing parallel projects with the intention of lowering the costs for infrastructure deployment and increasing coverage across the country.

Source: OECD (2017[28]), *OECD Telecommunication and Broadcasting Review of Mexico 2017*, https://doi.org/10.1787/9789264278011-en.

While the CRC and MinTIC issued a set of guidelines ("Code of good practice") for municipalities aiming at increasing co-ordination in urban planning regulations for infrastructure deployment, these guidelines seem to have only had limited impact due to their non-binding nature stemming from constitutional and legal barriers. The CRC and MinTIC may therefore consider developing a campaign to educate local governments and their decision makers and population on the importance and advantages of connectivity and reduce potential concerns. While the Colombian government has endorsed the importance and advantages of broadband connectivity, the digital mindset and spirit need also to take root in the municipal groundwork of the country. If concerns with respect to communication infrastructure stem from health considerations, as for example with respect to electromagnetic fields (EMF), this campaign might even involve the Ministry of Health and Social Protection (MinSalud).

Leveraging mobile broadband services and fixed wireless access to narrow the rural-urban connectivity divide

Mobile broadband services complement fixed broadband services in extending access to connectivity in rural areas. In some low-density areas, mobile networks may be the only network available, as achieving last-mile connectivity with mobile networks tends to be less cost-intense since digging trenches, for example, is not required to reach each individual house or each individual user (reached using mobile spectrum).

Mobile coverage in Colombia is for this reason much more extensive than fixed, relative to OECD countries (OECD, 2021[34]). Furthermore, fixed wireless access (FWA) can help mitigate the "last-mile" challenges in rural and remote areas by using spectrum to reach the end-user. While the large majority of OECD countries currently conceive mobile and fixed communication services as complementary rather than substitutes, FWA is a technology evolving to provide higher broadband speeds and, in some circumstances, may help bridge connectivity gaps in rural areas (OECD, 2021[26]). Nevertheless, it has to be stressed that mobile coverage still requires extensive fibre deployment. Especially with respect to a wide 5G deployment it is indispensable to deploy fibre deeper into mobile backbone networks and to lay fibre to mobile cells in order to offload mobile traffic into fixed networks.

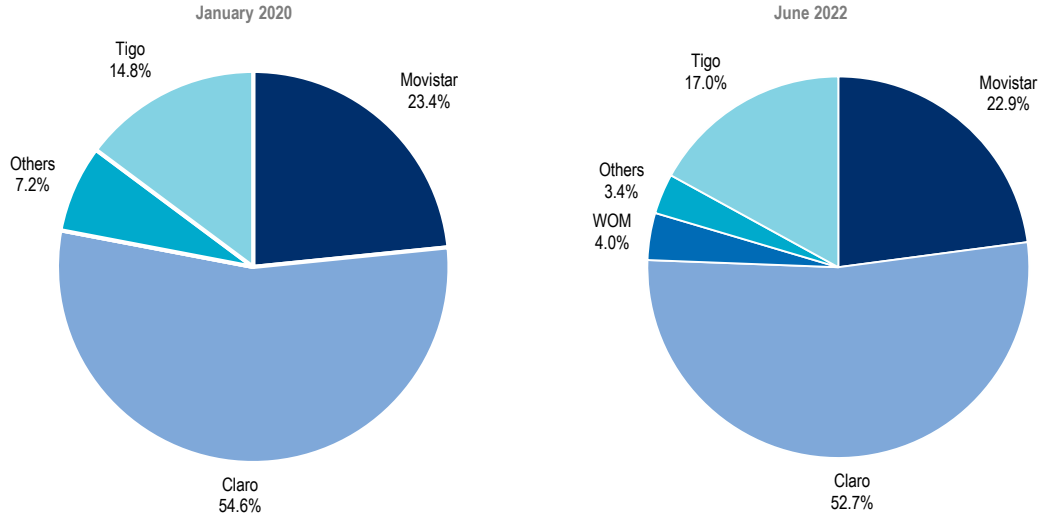
Mobile subscriptions have constantly increased in Colombia. As of December 2021, Colombia counted 73.6 subscriptions per 100 inhabitants, compared to 48.2 as of December 2016, which amounts to an increase of more than 50%. Nevertheless, Colombia lags behind the OECD average of 124.5 subscriptions per 100 inhabitants as of December 2021 (OECD, 2022[35]).

Experience in other OECD countries, such as Mexico, has shown that increased competition may lead to lower prices and in turn to higher demand for communication services (OECD, 2017[28]). The entry of mobile operator WOM may bring additional competition to the Colombian mobile market. WOM started to market its mobile services in Colombia in April 2021, after its participation in the 2019 spectrum auction, the takeover of mobile operator Avantel and a CRC ruling ordering other operators to sign interconnection agreements with WOM. As of June 2022, WOM reports 1 514 388 mobile internet connections, representing a 3.99% market share by mobile data subscriptions, after a bit more than one year of operation (Figure 4.7). In comparison, Avantel, which started operations in Q3 2014, reached less than half of this share (1.6%) almost two years after its market entry (by Q2 2016). Looking at market shares by mobile data revenues, Claro holds 59.6%, while Telefónica Colombia (branded as Movistar) holds 17.6%, Tigo 18.1%, and WOM 3.1% as of June 2022 (Figure 4.8). While the CRC declared the dominance of Claro in the national market for mobile communication services (CRC, 2021[36]), this decision has largely been without measures to decrease market concentration.

An important way to spur competition is through efficient spectrum management. Spectrum enables mobile communication services and is an essential input for mobile networks. It is a scarce resource and its availability to operators is managed by governments and regulatory authorities. The spectrum in the 700 MHz band is, among others, very well suited to increase connectivity in rural and remote areas. The allocation of this spectrum, therefore, has been an important step to extend connectivity in Colombia. The auction for the 700 MHz band has been held at the end of 2019, and Colombia has awarded spectrum to 3 bidders raising COP 5 trillion (USD 1.524 billion). The spectrum granted in the auction was linked to coverage obligations expanding mobile communication services in 3 658 localities in rural areas of the country's 32 departments, including the San Andrés archipelago (Government of Colombia, 2019[37]).

Figure 4.7. While WOM managed to enter the mobile market, 2 players still hold more than 75% of the market share in terms of subscriptions

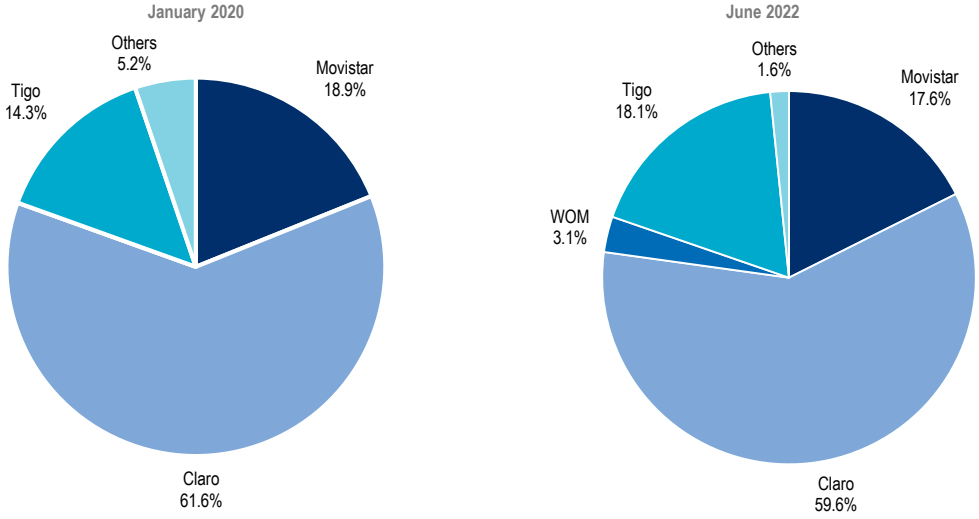
Market shares by mobile data subscriptions in January 2020 and June 2022



Source: CRC (n.d.[38]), *Cifras de los servicios de telecomunicaciones*, https://www.postdata.gov.co/dashboard/cifras-de-los-servicios-de-telecomunicaciones.

Figure 4.8. In terms of revenues, Claro has a market share of nearly 60%

Market shares by mobile data revenues in January 2020 and June 2022



Source: CRC (n.d.[38]), *Cifras de los servicios de telecomunicaciones*, https://www.postdata.gov.co/dashboard/cifras-de-los-servicios-de-telecomunicaciones.

In addition, the assignment of licenses for the use of the spectrum in the 700 MHz band was linked to the technological modernisation of mobile communication networks. While the auction design indeed aimed to increase the social benefit of the auction, it has to be closely followed if the conditions of granting the licenses are to be fulfilled. As of April 2022, Comcel (Claro) had to install their infrastructure in 560 locations, WOM had to deploy their mobile networks in 674 locations and Tigo in 551, amounting to a

total of 1 785 locations. Table 4.1 shows the coverage obligations to be fulfilled by the operators which obtained spectrum in the auction. In terms of actual deployment, operators have not fully met their obligations for the first year which ended in March 2021 (Table 4.2). Colombia should ensure that operators are fulfilling their coverage obligations resulting from the 700 MHz auction.

Table 4.1. In the 5 years following the 700 MHz auction, mobile services are to be expanded to 3 658 rural localities

Number of rural localities as defined in the auction to be provisioned with communication services by operator

Operator	Year 1	Year 2	Year 3	Year 4	Year 5
Tigo		551	540	273	272
Comcel (Claro)	280	280	280	228	228
Partners Telecom Colombia (WOM)	674				
Total locations	**954**	**831**	**820**	**553**	**500**

Source: Information provided by the Government of Colombia (2022[19]), "Answers to OECD questionnaire on rural policy development".

Table 4.2. Operators are lagging in their coverage obligations

State of deployment of Year 1 and 2 obligations resulting from the 700 MHz auction (March 2021); number of rural localities that have been planned, executed, are in process or to be started

Operator	Planned	Executed	In process	To start process
Tigo	551	359	121	71
Comcel (Claro)	560	329	100	131
Partners Telecom Colombia (WOM)	674	648	19	7
Total locations	**1 785**	**1 336**	**240**	**209**

Source: Information provided by the Government of Colombia (2022[19]), "Answers to OECD questionnaire on rural policy development".

The auction was held in view of the ICT Modernisation Law, which modified the use of spectrum to maximise social welfare. By law, social welfare is understood mainly as "the reduction of the digital divide, universal access, the expansion of coverage, the deployment and use of networks and infrastructures and the improvement in the quality of the provision of services to users […]". As such, the objective selection mechanisms carried out by MinTIC for granting licenses for the use of spectrum should encourage investment in infrastructure and maximise social welfare. At the same time, the possibility of establishing coverage obligations as a form of payment for the permission to use spectrum was established. The ICT Modernisation Law furthermore modified the duration of permits for the use of the spectrum, increasing from 10 to 20 years. Operators can request a renewal of the permit for up to the same period of 20 years, generating a new payment to MinTIC.

When planning the auction design of the upcoming auction of the 3.5 GHz band intended to foster 5G commercial services in the country, two key policy issues should be taken into account simultaneously: coverage and competition. Coverage obligations – as used in the 2019 auction – are common across OECD countries and can further contribute to broader coverage of the population in rural and remote areas. When designing the auction, it should be ensured, however, that the extent of the coverage obligation is not an impediment for certain actors to bid in the auction.

Furthermore, it is good practice for the auction to establish a transparent mechanism to allocate spectrum in an efficient way while avoiding the auction being used to maximise public revenues from that auction. It

is further recommended that the conditions for the renewal of the licence are known well in advance and that the renewal follows a transparent process.

It is also advisable that the upcoming auction does not suffer from significant delays in order to enable the best use of available spectrum resources. This also holds true in light of the growing mobile broadband market and the increase of mobile applications in markets.

On 19 October 2021, MinTIC, assisted by the National Spectrum Agency (ANE), renewed the spectrum use licenses in the 1 900 MHz band for Claro and Telefónica Colombia in Resolutions No. 02802 and 02803. In accordance to these resolutions, operators Claro and Telefónica Colombia will continue to provide their mobile communication services in these spectrum bands. In turn, they will have obligations to update their technology to improve the coverage and quality of their services. Revenues will be directed to the *Fondo Único de TIC*. The resolutions have been subject to appeal for reconsideration by the operators (MinTIC, 2021[39]). To resolve the appeals, MinTIC reassessed the renewable fees based on the parameters established by the ANE together with the Comptroller General of the Republic (*Contraloría General de la República*). The reassessment detected risks generated by the high price for the spectrum determined by MinTIC and showed that proposed renewal fees in Colombia were above international benchmarks. The license renewal fees to be paid for the respective spectrum use licenses by Claro and Telefónica Colombia were subsequently reduced by 19% (dpl news, 2022[40]).

In general, it is good practice to set rules for license renewals well in advance to give operators enough time and legal certainty to enable them to plan their network investments. In addition, license renewals should be transparent, which can be achieved by publishing the methodology for the valuation of the related spectrum. However, the ministry is not obliged to disclose the methodology in public consultations used to determine spectrum valuation for license renewal in Colombia. For the most recent renewals, MinTIC thus only provided a methodological guide explaining the different approaches that can be used for spectrum valuation to allow operators to develop their own analysis. Finally, licence fees should not be set at overly excessive prices, i.e. so that they do not maximise fiscal revenues but rather increase overall welfare in the country, given the positive spill-over effects of connectivity to other sectors of the economy.

Boosting rural connectivity through innovative regulation

Effective and innovative regulation is essential to keep up with the fast-paced technology developments of the communication sector and to extend connectivity. The Colombian communication regulator CRC therefore plays a critical role in facilitating and enabling broadband deployment in both urban and rural areas. The CRC has initiated modifications to the ability to share infrastructure with other service providers such as electricity providers. This regulation aims to reduce the cost of infrastructure deployment. In the first phase, the regulation focused on electricity infrastructure. In the second, the measure will add the potential use of other infrastructures, such as hydrocarbon infrastructure.

The CRC also initiated a regulatory sandbox programme in order to create flexibility for the implementation of projects that may generate social benefits. Regulatory sandboxes are a structured form of regulatory flexibility that enables selected firms to test innovative products or services with minimal regulatory requirements (Attrey, Lesher and Lomax, 2020[41]). While there has been a comparatively high number of proposals (23), only 3 of the proposed projects have finally been accepted by the CRC. To date, the projects selected to be part of the regulatory sandbox are at the stage prior to the start of experimentation. Two projects stand out with respect to expanding connectivity in rural areas:

- Telefónica Colombia started to use the opportunity to carry out a 4G Internet project in rural areas using Open RAN technology. However, the company stopped the project following an internal decision. Open RAN technology may increase the flexibility and efficiency of the network.[9]
- The mobile operator Millicom, operating under Tigo Colombia, collaborates with Parallel Wireless to help deploy 4G services in more rural parts of the country using Open-RAN-compliant architecture. Plans initially called for 362 sites, with service provided through Tigo Colombia. The

first phase of deployment, which employs 7.2 (an O-RAN Alliance split option) radios, is expected to be completed by March 2022 (Fierce Wireless, 2021[42]). However, the Tigo O-Ran project is not part of the sandbox environment.

While its programme has been one of the first regulatory sandbox initiatives in Latin America, the CRC may consider ways to enable more companies to experiment with projects that may further the deployment and usage of communication services in rural areas. This is especially the case with respect to community-led initiatives. With the aim of extending connectivity in rural areas. This may involve the reduction of the administrative burden for community-led initiatives and potential regulatory sandboxes.

Ensuring that taxation and sectoral fees do not hamper the adoption of communication services in rural areas

Currently, multiple taxes are imposed on the communication sector and on the consumption of communication services.[10] Communication service providers have to pay a special periodic fee to finance the *Fondo Único de TIC,* which is used to execute investment projects that have the purpose of expanding broadband Internet connectivity and is administered by MinTIC. MinTIC determines the value of the periodic fee, which may not be higher than the amount of the periodical consideration set on the date of entry into force of said law (25 July 2019). In June 2020, MinTIC issued Resolution No. 0903, which provides that, as of 1 July 2020, the periodic fee for the *Fondo Único de TIC* is reduced from 2.2% to 1.9% on gross income. While the contributions to the *Fondo Único de TIC* have been decreased – which is a laudable development – they continue to be significant and means should be identified to reduce them as contributions could exceed MinTIC's needs. In addition, *Fondo Único de TIC* resources must be channelled to where they best benefit society. For example, initiatives financed by the fund, such as *Zonas Digitales* and *Centros Digitales* (see above), are laudable but do not represent a suitable substitute for people being connected in their homes or with their own high-quality connection.

Finally, general taxes, both on the national and municipal levels, add to sector-specific fees. At the national level, corporate tax amounts to a total of 35%. In addition, any financial transaction is taxed with 0.004% of its amount. At the municipal level, an industry and commerce tax is levied and amounts to 0.2-0.7% for industry activities and 0.2-1% for commercial and service activities. Several other municipal taxes add to this, such as a property tax or specific taxes depending on each municipality.[11]

All these taxes and fees impact the prices of communication services and reduce the resources available for the communication sector. Thus, they may hamper a broad adoption of communication services, in particular among low-income groups, and may have detrimental effects on innovation and investment. This is especially problematic since the communication sector creates many positive spill-over effects throughout the economy.

Consumers additionally have to bear the burden of relatively high prices for terminal devices. For handsets, the Colombian government introduced a value added tax (VAT) exemption for entry-level handsets in order to increase the adoption of ICT services. Currently, this exemption holds for handsets that cost up to COP 836 088 (approximately USD 223).[12] This measure seems to have increased the demand for smartphones in Colombia.

The former investments in transport and broadband infrastructure are a key pillar for rural development in Colombia but, in isolation, they do not ensure greater well-being for rural communities. Improving broadband connectivity needs to come with policies to increase digital skills and education. Moreover, increased quality healthcare and education provision can help ensure that spill-over effects from infrastructure and broadband network expansion can translate into greater regional attractiveness for people and companies and greater well-being for rural communities. Overall, the next two sections review the main education and healthcare policy initiatives for Colombian rural areas and present some recommendations for improving access, quality and governance.

Improving education in rural areas of Colombia

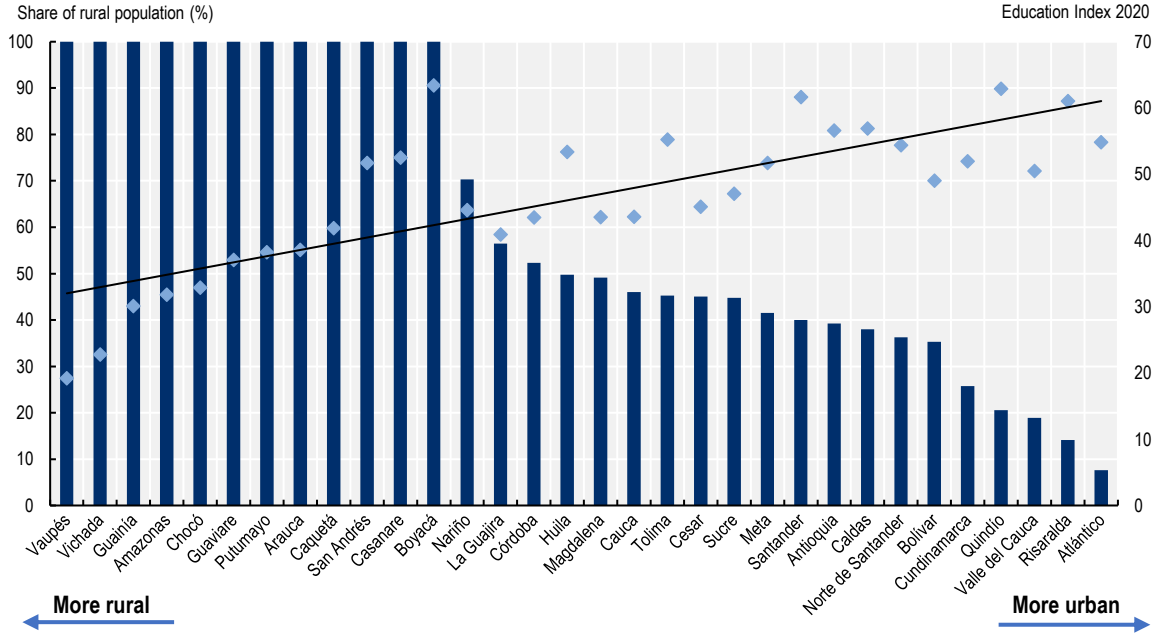
Human capital is a critical factor influencing regional growth and development throughout all types of OECD rural regions (OECD, 2017[28]). A learning society that is able to absorb as well as create knowledge is at the core of local development and competitiveness as it becomes an engine of innovation and resilience.

The state of rural education in Colombia

National policies in recent years have aimed to reduce urban-rural disparities in education and to improve access and quality of education in rural areas. These efforts have also resulted in the approval by the National Congress of the largest budget in Colombian history for the education sector in 2021. Budget priorities include access to education and improving education infrastructure. However, educational gaps between rural and urban areas are still significant, due to limited educational infrastructure and accessibility in rural areas. The impact of these challenges on students' learning – exacerbated by the COVID-19 pandemic – affects their educational trajectories and future perspectives, particularly with reduced access to higher education.

Overall, regions with a higher degree of rurality in Colombia register lower educational outcomes (Figure 4.9). The eight regions with lower education performance, measured with the DNP's education index, are all considered rural. However, some rural regions reveal good performance in education, which is the case of Boyacá, in the centre of the country, with the highest index of the 32 departments (63.4). Nevertheless, the regions that register the lowest mathematics and reading scores in the national secondary test, Saber 11, are all rural (Amazonas, Vaupés, Vichada) (DNP, 2021[43]).

Figure 4.9. Education performance by degree of rurality at departmental level in Colombia



Note: The "education index" includes the net coverage of secondary and transitional education (ratio between the number of students enrolled in an educational level who have the theoretical age to attend and the total population corresponding to the same age in 2020) and the *Saber 11* score (average score of the department in the generic competencies module [mathematics and language] of the *Saber 11* tests in 2020). Classification of degree of rurality is according to the OECD regional classification.

Source: DNP (2021[43]), *Resultados Medición Desempeño Municipal 2020*, Dirección de Descentralización y Desarrollo Regional, based on data from the Colombian Ministry of National Education (*Sistema Integrado de Matrícula*) and the Colombian Institute for the Evaluation of Education (ICFES).

The lag in education in rural regions is evident in various outcomes:

- **Accessibility**. Overall, most children and young people who do not have access to education in Colombia come from rural areas and remote regions (70%), using the National Administrative Department of Statistics (DANE) rural classification (Parra, 2021[44]).

  Already from the earliest age, poor access to education in rural areas leads to inequalities in children's preparation before reaching primary school: 40% of children aged 0-5 years in urban areas are enrolled in early childhood development services – provided by the *Instituto Colombiano de Bienestar Familiar* (ICBF) – compared to only 22% in rural areas (World Bank, 2021[45]). The difference is significant considering that 92% of children who receive services in rural areas do so from the ICBF because of the lower supply of private services. Beyond long distances and difficult geographical access, barriers explaining the lower outcomes in education are related to difficulties in physical access, excessive administrative documentation and lack of clarity to access the services. This poses difficulties in the provision of education in an efficient manner.
- **Attainment**. In Colombia's rural areas, the population has 3 fewer years of education than the urban population and only 5.1% of the population over 17 years of age has a higher education degree (DNP, 2015[46]). Education gaps are particularly high for the adult population (25-65 year-olds), whose gap with adults in urban areas is over 4 years. The urban-rural gap in literacy rates of the rural adult population is much higher (7.8 percentage points below the urban rate) than for young people (15-24) (1.5 percentage points) (Table 4.3).

  The country, however, has progressed in reducing educational inequalities in primary school coverage. The percentage of children aged 6-12 who receive an education is practically equal between rural and urban areas (96.2 and 96.6 respectively), while the gap widens among the 13-17 year-olds (81.8% in rural areas compared to 90.7% in urban areas) and 18-23 year-olds (17.6% in rural areas compared to 38.9% in urban areas).
- **Dropout in upper secondary and tertiary education** is higher in rural areas, where 45% of youth aged 18-22 leave school without completing upper secondary education, compared to only 27% in urban areas. Repetition and early dropout rates are particularly high in rural areas among the poorest segments of the population and within some ethnic groups.

Table 4.3. Education indicators by type of areas in Colombia, 2019

Years of education				
	All population	25-65 year-olds	Male (25-65)	Female (25-65)
Rural	5.3	6.1	5.7	6.5
Urban	8.4	10.3	10.1	10.4
Literacy (% of population)				
	15-24 year-olds	25-65 year-olds	+65 year-olds	
Rural	97.7	89.9	67.5	
Urban	99.2	97.7	88.2	
Gross enrolment rates (% of population attending any educational level)				
	3-5 year-olds	6-12 year-olds	13-17 year-olds	18-23 year-olds
Rural	78.5	96.2	81.8	17.6
Urban	88.9	96.6	90.7	38.9

Source: CEDLAS/World Bank (2021[47]), *Socio-Economic Database for Latin America and the Caribbean*, https://www.cedlas.econo.unlp.edu.ar/wp/en/estadisticas/sedlac/estadisticas/#1496165425791-920f2d43-f84a (accessed on 24 March 2022).

Infrastructure and security are the main issues undermining education in Colombian rural communities

Infrastructural barriers contribute to lower access to education in rural areas. These include a high deficit of road infrastructure as well as limited electricity, digital tools and Internet networks. Educational institutions in Colombia have around 2.3 million active terminals, of which 61% are concentrated in urban areas and 39% in rural areas (Ministry of National Education/MinTIC/CONPES, 2020[48]). The ratio of students to terminals is lower in rural departments and electricity and connectivity problems in rural departments limit the use of the existing terminals. In rural departments such as Chocó, La Guajira and Vaupés, more than 50% of schools do not have electricity. Also, only 8.1% of all rural schools in the country have broadband connectivity, compared to 43.3% in urban areas. In addition, for after-school homework, many children do not have access to the Internet at home or in libraries.

Moreover, the absence of transport services forces many students and teachers to walk long hours to get to school, sometimes in difficult weather conditions and dangerous roads (Arias Gaviria, 2017[49]). In some cases, they have to spend part of the day working in the fields, helping in the family garden or harvesting crops.

Finally, rural education in Colombia has been affected in the past and present by the armed conflict, which is largely rural in nature. In addition to the constant threats and assassinations of rectors and teachers, between 1990 and 2020, there have been 331 cases of violent takeovers or attacks on educational institutions, and rural schools have been an epicentre of forced recruitment throughout the conflict (Rutas del conflicto, 2020[50]).

Lack of staff supply and preparation negatively impacts the quality of rural education

Several rural schools operate under the modality of single-teacher organisation in a multigrade classroom with age heterogeneity. This significantly reduces the academic offer for children in rural departments such as Guainía, Vaupés or Vichada, where they complete just half the learning-adjusted schooling of an average child in Bogotá (World Bank, 2021[45]).

Additionally, educators in rural areas have lower levels of education, with less specialisation, master's or doctoral education (Ministry of National Education, 2020[51]). The frequent geographical isolation of teachers in rural areas limits their possibilities for training and professional development, and thus the quality of their performance.

The COVID-19 pandemic had a stronger negative impact on rural students

Despite the challenge posed by the pandemic for both teachers and students, education systems in OECD countries, including Colombia, managed to adapt to the consequences of the pandemic (e.g. school closures, recourse to distance learning, use of digital and technological tools, etc.). As we will see later, the capacity for innovation and collaborative networking in Colombia has demonstrated the country is capable of providing education beyond formal pre-pandemic education.

However, between March 2020 and February 2021, schools in Colombia had been closed for 115 days, which is 41 days more than the world average (74) and 8 days more than the average for Latin American (107) (UNICEF, 2021[52]). This closure of schools particularly affected rural areas, where the challenges for teachers and students in terms of technology capability and access to digital technologies with a reliable Internet connection were stronger, with less infrastructure, less access to connectivity or electricity, and therefore less likely to access remote learning.

One of the consequences of the COVID-19 pandemic is also the impact on student learning and performance. Data from the ICFES on the Saber 5 tests show that the share of students at or below the minimum reading level in Grade 5 is particularly higher in rural areas, especially since the COVID-19 pandemic (60% before the pandemic and 72% with distance education in 2021) (World Bank, 2021[45]).

Policies and initiatives aiming to improve rural education

At the national level, many efforts are being made to reduce urban-rural disparities in education and to improve access and quality of rural education – including in terms of digitalisation – since the COVID-19 pandemic. However, there are still many challenges and some of the policies are weak.

Efforts have been made to strengthen the rural angle of education policies

The national government has implemented various educational programmes to improve access to education and support greater coverage in rural areas. Since 1999, the Rural Education Project (PER) of the Ministry of National Education seeks to mitigate the problems affecting educational coverage and quality in rural areas by helping to bridge the gap between rural and urban education. The objective of the programme is to increase access to quality education in the rural sector from pre-school to high school, promote retention in the education system and improve the relevance of education for rural communities and their school populations in order to improve their quality of life (Ministry of National Education, 2021[53]).

As part of the requirements of the Integral Rural Reform (IRR) of the 2016 peace agreement, the government approved the Special Plan for Rural Education (PEER) in 2020. This plan seeks mainly to provide comprehensive care for early childhood, guarantee the coverage, quality and relevance of education and eradicate illiteracy in rural areas. As part of this plan, the programme *Escuela Nueva* offers complete primary education to children between 7 and 12 years in rural areas by integrating curricular strategies and fostering teacher education, administrative management and community participation. In higher education, the Generation E Programme supports the enrolment and support of young university students. In 2021, 31 000 of the 249 000 young beneficiaries of the programme were from rural areas.

Colombia has also implemented the "Todos a aprender" programme, which seeks to contribute to the comprehensive development and learning of children from early education and throughout primary school by strengthening the pedagogical practices of teachers – particularly in the areas of language and mathematics – and the pedagogical leadership of teachers' managers. About 33% of students who benefitted are from rural areas and 73% of the schools that participate are rural (around 10 736 out of the 14 512 schools benefitted). The programme also aims to provide teaching materials, including books for students and guides for teachers (Ministry of National Education, 2021[54]).

Moreover, the government developed a rural school transport law in 2020 to guarantee children in remote areas with adequate school transport. The law allows the mayors of the most remote municipalities to contract a non-motorised school transport service (e.g. canoes, donkeys, horses or bicycles) when necessary, as currently many of these transports are used without contracting and therefore without safety conditions.

Other initiatives with positive results for rural education come from civil society and universities, such as learning communities (Box 4.4). The Utopía project by La Salle University seeks to generate educational and productive opportunities for young people from rural and low-income sectors who have been affected by violence, poor education and social exclusion. The project seeks to turn them into agricultural engineering professionals and entrepreneurs who are able to reinvent agriculture and achieve sustainable agricultural reconversion through participatory research and the transfer of new technologies (Universidad de La Salle, 2020[55]).

Box 4.4. Learning communities in Colombian rural areas

Learning communities is an initiative implemented since 2014 through the foundation Entrepreneurs for Education (*Empresarios para la Educació*, ExE), a business alliance that supports innovation, quality and efficiency in the Colombian educational system.

Schools as learning communities are based on the dialogic conception of learning and allow local educational communities – through small groups of students, teachers and families – to identify the main challenges and priorities for each school and propose a plan for action. By 2019, 60 rural schools from Antioquia, Atlántico, Caquetá, Cundinamarca, Putumayo, Santander and Valle del Cauca – including single-teacher, multigrade and age-heterogeneous schools – have been involved in this initiative.

The project's implementation follows a five-phase process:

1. The awareness phase is where all teachers take part in intensive training where the basic outlines of the project are explained, as well as scientific research contributions that demonstrate successful implementations.
2. The decision-making process, in which the entire educational community decides whether to transform the educational centre into a learning community.
3. The "dreaming" phase, in which the community brainstorms on developing a common objective and a collective purpose for school development. Building on the principle of "egalitarian dialogue", the dream (e.g. "a computer for each child", "improving maths" or "a friendly school without conflicts") is a pathway to include all the voices, desires and aspirations in transforming the school.
4. The educational community establishes the priorities for each school and looks for successful strategies to address those challenges.
5. Finally, the plan for action is proposed to move ahead with the transformation.

Some schools as a learning community, such as Monteloro School in Valle del Cauca, have significantly improved the results of their Saber tests in Grade 5 since its implementation. While national scores in the language test did not show considerable changes in 2016-17, the results of the students from Monteloro School showed an improvement. In 2016, 39% of the students scored in the satisfactory level range, while in 2017, after another year of learning community project implementation, this student body percentage increased to 72%. Students also improved their reading and language abilities following their participation in the dialogic literary gatherings which took place weekly in the classrooms. This initiative allowed children to read, discuss literary works and link profound themes of humankind with their own lives.

As a result of its impact, European institutions – from the European Commission to the European Parliament or the European Council, among others – have recommended the learning communities as a model to prevent school dropout.

Source: ExE (2022[56]), *Fundación Empresarios por la Educación*, https://fundacionexe.org.co/ (accessed on 24 March 2022); Soler, M. et al. (2019[57]), "Transforming rural education in Colombia through family participation", https://doi.org/10.4119/jsse-3251.

Further successful measures have been taken since the COVID-19 pandemic

Since the COVID-19 crisis, many measures have been taken to promote distance learning or the use of digital tools in schools and homes. During the pandemic, the Ministry of National Education adopted initiatives such as *Colombia Aprende*, *Colombia Aprende Móvil* or *Aprende Digital*, which provided a wide variety of free educational resources to the educational community through online platforms or portals for mobile phones. In a co-ordinated effort, the Colombian Ministry of Information, Technology and Communications (MinTIC) ordered mobile phone operators to provide zero-rate conditions for the education community. Other initiatives such as *Mi señal* aimed to support the work at home of students and teachers in rural areas through radio solutions (Vincent-Lancrin, Cobo Romaní and Reimers, 2022[58]). Besides, to help families during school closures, initiatives such as *Mis Manos te Enseñan* – in response to the closure of early childhood development services – provided parents with an educational package that included basic materials (e.g. paper, paint, chalk and crayons).

Civil society and non-governmental organisations' initiatives have also been crucial to help rural areas face the COVID-19 consequences in rural areas. Organisations such as *Empresarios por la Educación*, *Alianza ERA (Educación Rural Antioquia)* and universities have worked closely with the Ministry of National Education to promote innovative processes. Some of them encouraged the use of low-cost devices, including mobile phones, as tools to facilitate the exchange of learning materials as well as to facilitate interaction between students, parents and teachers in rural areas (Vincent-Lancrin, Cobo Romaní and Reimers, 2022[58]). In addition, the World Bank has developed *Monitor Escolar*, a data technology platform that is highly adaptable to local needs and conditions. It allows for the real-time data collection on school conditions for implementing health protocols and combining in-person and distance learning, student vulnerabilities and dropout risk, conditions for home-based learning and the effectiveness of remedial education programmes (World Bank, 2021[59]).

Education policies in rural areas have important scope for improvement

Despite the efforts described in the current section, education policies and initiatives have relevant areas for improvement:

- The rural focus of education strategies and policies is still limited, partly due to the centralisation of decision-making, the lack of flexibility of education policies, the need for greater involvement of local actors in the design and implementation of policies, and the weak adaptation to local contexts and specificities.
- Clearer communication and co-ordination for educational strategies are lacking for the effective implementation of innovative practices and solutions. More broadly, education policies lack co-ordination with other sectoral policies, including infrastructure plans.
- Rural education needs improved upskilling policies, especially since the strengthened use of digital tools with the COVID-19 pandemic. Indeed, measures undertaken during the pandemic to ensure access to education have been more difficult to implement in rural areas given the lack of broadband connectivity and digital skills in rural areas. For example, digital delivery platforms developed by the Department of Education of the city of Bogotá are more difficult to achieve in rural areas. This sheds light on the significant wider urban-rural digitalisation gaps.
- The high dropout rates and lower population with a higher education degree in rural areas call for policies aiming to better link the academic offer of secondary and post-secondary education with the labour market needs of rural areas.
- In general, the monitoring of educational policies should be reinforced and revaluated in some cases. For example, some entities, such as the National Training Service (SENA), measure the success of their programmes by their coverage (e.g. number of students) rather than a more holistic evaluation (e.g. number of students managing to complete a course/cycle or programme).

Some actions can be taken to tackle these challenges, to identify innovative and flexible ways to improve accessibility, quality and policy making of education at all levels in rural areas, as well as to learn from diversity across stakeholders, levels of government and other OECD countries.

Reinforce flexibility in the education system to adapt to rural needs

Recent efforts to better integrate rural communities in the design of curricula and the implementation of educational policies still do not fully consider rural identity and the diversity and particularities (geographical, traditional, historical, cultural, environmental) of the different Colombian regions. National policies should ensure that educational tools and pedagogical experiences in rural areas – including self-study modules or differentiated learning guides – respond to these particularities. Beyond the construction and design of curricula, local educational communities should have the possibility to evaluate their effectiveness and make adjustments according to the results. To achieve this, it is necessary to promote mechanisms for collaboration and dialogue between the different actors (see below).

Law 715 of 2001 establishes minimum curricular content for the departments. However, given the lower mathematics and reading scores in rural areas, prioritised core curriculum guidelines from the national level should better target these basic competencies, boost educational outcomes, help recover learning losses from the COVID-19 pandemic[13] and still leave flexibility in the rest of the curriculum. National authorities will nevertheless have to take into account that the potential for curricular autonomy of rural departments is limited by a number of factors, including the capacity of schools and teachers to adapt to new content and the insufficient leadership of certain school communities (Radinger et al., 2018[60]). Some OECD and non-OECD countries such as Chile or Viet Nam are currently implementing a prioritised core curriculum to recover learning losses from the COVID-19 pandemic.

Targeted policies with flexible approaches can help address rural dropout. For example, the development of alternative and flexible schools with adapted processes can focus on those children with gap years in education. An inspiring initiative can be Chile's Súmate Foundation, which promotes basic and secondary schools for children and young people with two or more years behind in school. The initiative focuses on the development of socio-emotional and cognitive skills through active methodologies that promote the development of competencies as well as the construction of educational trajectories and life projects.

There is also scope to add greater flexibility in school food programmes to support local economies. The school plays a key role in feeding many rural children and youth with lunch, which for many is the most nutritionally complete meal of the day. The Colombian School Food Programme (PAE) could be more flexible and encourage rural schools, which have fixed providers, to integrate local culture and culinary products into menus (e.g. replace an industrially produced *pandebono* with a locally produced *arepa* or sugar-sweetened fruit drinks with fresh fruit). While these changes could demand greater administrative and monitoring capacity (e.g. on quality), if well managed, they could provide opportunities for local producers, including Indigenous communities.

Promote learning communities to solve pressing issues in rural education

Better integrating local communities in educational decision-making can help adapt the educational offer to the conditions of the community. Committees formed by teachers, parents and students could contribute to involving local actors in decision-making about school life, academic issues (including the design and evaluation of curricula), cultural activities, infrastructure and materials. This would help ensure that family members or people from the community participate and feel involved in the decisions. For example, beyond the Law on the Indigenous Education System, which involves communities in the implementation of educational schemes, the government could rely on learning communities to better integrate Indigenous and Afro-descendant communities into the educational community and involve them in decision-making.

Besides, given the improvements in the academic performance of many schools involved with learning communities, educational authorities should follow these schools' trajectories and evaluate if they manage to overcome early dropout.

Upskill rural teachers and improve attraction policies

Many efforts have already been made in this direction; however, as described in the previous section, rural areas have lower access to the Internet. Besides, according to the United Nations Educational, Scientific and Cultural Organization (UNESCO), infraestrcuture communications planning processes in rural areas do not incorporate the needs of the environment and the heterogeneity of local communities. In this context, education policies at the national level need to take into account these fragilities at the local level in order to adjust them to reality and accompany rural communities, including teachers, in this long process of adaptation. National authorities should consider the following actions:

- **Improving rural teachers' access to training courses, including ICT upskilling**. In parallel with efforts in extending broadband connectivity throughout rural areas, it is necessary to encourage ICT training for teachers in rural schools to optimise the current and future use of digital tools. Teacher training and support policies for the appropriation of digital technologies (e.g. *Computadores para Educar* training strategy) have not had a significant impact on the ICT appropriation of trained teachers, particularly in rural areas (Ministry of National Education/MinTIC/CONPES, 2020[48]). In addition, while rural teachers do not have any specific training processes, many also do not manage to participate in the generic training provided by the education secretariats at the departmental level, given that the territorial entities cannot assume the cost of transporting teachers and cannot leave classrooms without teachers (Bautista Macia, 2019[61]). Alternatively, national authorities should create specific training for them – virtually when possible – on the use of new educational materials (e.g. ICT and digital tools) but also curriculum updates or teaching methodologies.
- **Develop digital skills through volunteer committees**. Fostering collaboration between teachers has proven to have a positive impact on the use of ICT in classes and on the teaching of digital technologies to students (OECD, 2020[62]). Therefore, experience-sharing networks run by more experienced teachers could be encouraged, including committees of volunteer teachers at the department level to support teachers from rural communities with the most difficulties in their adaptation to digital and training processes. An inspiring case could be the Estonian Edulabs programme which offers an online platform where teachers help each other or consult each other on the use of technological resources.
- **Strengthen the support of alternative educational tools in rural areas**. Radio education promoted by initiatives such as *Enseña por Colombia*, with 10-minute episodes, could be further explored in rural areas, as a complementary tool or as a substitute for some school days to avoid long journeys to schools. For instance, the use of low-cost technologies in the creation of education platforms could include social media platforms like WhatsApp through which teachers and students could discuss the radio lessons.
- **Improve attraction and retention policies for rural teachers**. Beyond digitalisation, the difficult conditions of educational institutions in rural areas described in this section make them unattractive to teachers, who often request transfers closer to urban areas. Geographic mobility of teachers in rural areas could be enhanced with career incentives (e.g. faster progression of the career system for young teachers), clearer compensation for long travel times that go beyond financial compensation (e.g. flexible work hours, shorter time in classrooms, rotation systems for itinerant teachers) or further accommodation support. To help avoid transport problems, in the most extreme cases where teachers have to walk long hours to get to school and for whom the 2020 rural school transport law has not provided an alternative transport solution, teachers could also benefit from the existing school residences in rural areas.

Ensure complete trajectories by better connecting upper secondary education with labour market needs

It is essential to better connect the academic offer of secondary and post-secondary education with the labour market and productive structure of rural areas. For this reason, the expansion and diversification of the supply of rural education in key sectors such as agriculture, marketing, logistics, transport, conservation and waste disposal, sustainable tourism and construction are fundamental. Many rural departments do not have academic programmes related to their main productive sectors. This is the case, for example, of active training programmes and master or doctoral programmes related to the agricultural sector, which are limited in rural departments (of Colombia's 32 departments, the 12 departments with a 100% rural population account for only 90 of the 1 019 training programmes in the country) (Niño et al., 2020[63]).

In the same logic, there is also room to better connect the educational training of young people with the needs and priorities of the territories, from the protection and conservation of local natural resources to productive processes' innovations. One initiative along these lines is the Academy for Smart Specialisation of Karlstad University in Sweden, which prepares students for employment to drive industrial development in prioritised areas in the region of Värmland (OECD, 2021[64]). In the framework of a regional strategy in co-operation with the Governor's Office and municipalities, Colombian universities located in rural regions could become meeting places for researchers, companies, financiers and entrepreneurs in order to better link research innovation and education. These efforts can be part of an overall strategy that includes other related objectives such as sectoral specialisation, the support of rural entrepreneurship and the promotion of scholarships and internships.

These efforts should also concern adults with no or incomplete education who wish to complete their education or validate their studies. Flexible methods of education such as the Tutorial Learning System (SAT)[14] are a step in the right direction and should be reinforced by the national government to enable people of a relatively older age to easily access the labour market, especially in strategic sectors for the region. In addition, universities, polytechnic institutes and vocational education and training (VET) schools, in co-operation with public (e.g. national ministries, departmental institutions, employment agencies) and private (e.g. business support agencies) actors, should organise meetings between secondary education students and companies operating in the department in strategic sectors.

Finally, besides strengthening the co-operation with departmental education secretariats, national authorities should also strengthen their support to networks such as the Alliances for Rural Education and Development (ARED). This strategy from the Ministry of National Education – aiming to strengthen rural higher education through joined efforts between national, departmental and local authorities, higher education institutions, entrepreneurs, non-governmental organisations (NGOs), foundations, and international co-operation agencies, among others – should be better integrated into this objective of better connecting upper secondary education with labour market needs.

All these measures should be inside the comprehensive strategy for rural education to provide prospects and opportunities for the rural population and thus contribute to reducing educational dropout.

Improving healthcare in rural areas of Colombia

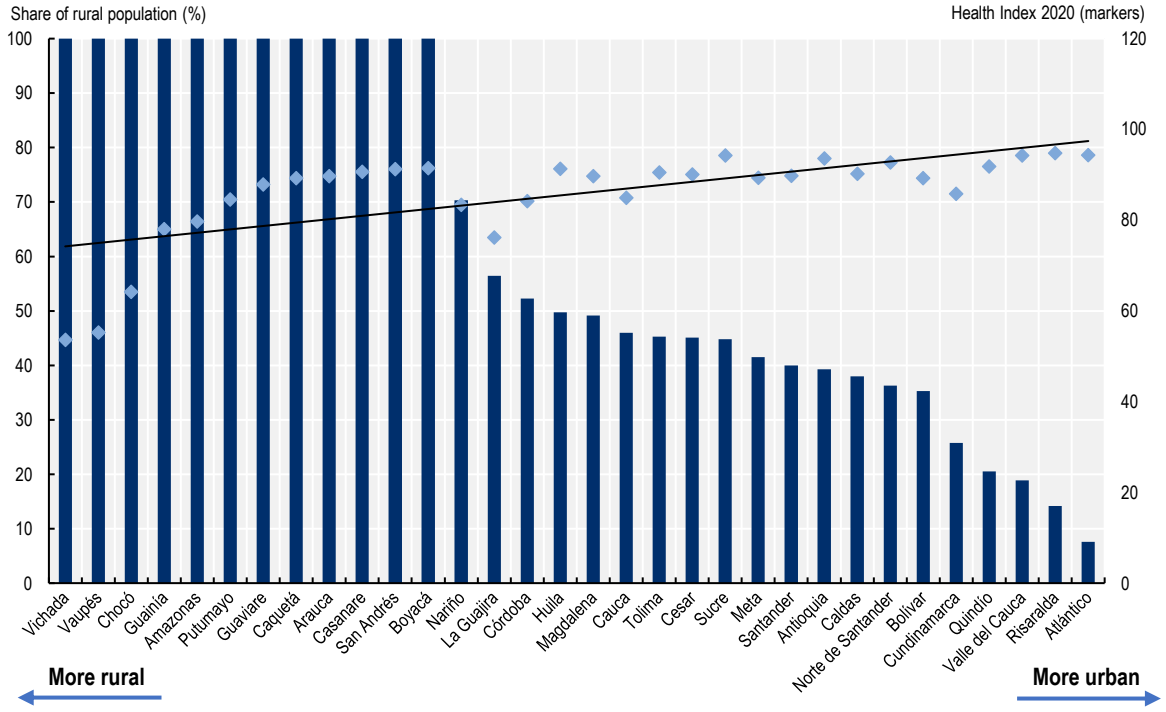
Rural health is a key component of a high-performing healthcare system. This is true not only because rural regions host around 30% of the OECD population but also because inequalities in provision are more likely to happen in rural places. Rural residents across OECD countries have on average shorter life spans and less healthy lifestyles. Implementing effective health policy in countries with a diverse and remote rural populations like Colombia relies not only on understanding the health issues facing rural populations but also on finding ways to increase scale and financial sustainability.

The state of healthcare in rural areas of Colombia

Over the years, Colombia has made rapid progress in extending healthcare coverage to almost all of the population and reducing infant mortality. In three decades, the country has gone from around 17% of the population with health insurance (in 1990) to almost 98% in 2020. Such progress is also reflected in a lower cost of healthcare services for the population: out-of-pocket spending dropped from 52% of total expenditure in 1993 to less than 15%. The country has reached vaccination coverage rates of 95% (including pentavalent and measles, mumps and Rrubella vaccines).

However, urban-rural disparities in health outcomes remain. Rural regions in Colombia still rank the lowest when it comes to health outcomes (Figure 4.10). In particular, Chocó, Vaupés and Vichada have the lowest rates of health performance, according to DNP's health index. Such low performance is explained by a still relatively low share of people affiliated with a healthcare system (72% average in the 3 regions vs. 94% country average in 2020) and a low share of children with complete vaccine schemes (76% average in the 3 regions vs. 95% country average in 2020). It is worth noting that the general social security system (with public and private participation) in Colombia has a greater scope, whereas entities such as regions have limited powers. Therefore, measures of health performance cannot be attached solely to the actions of regional governments.

Figure 4.10. Health performance by degree of rurality at departmental level in Colombia



Note: The "health index" includes the infant mortality rate (proportion of deaths recorded in relation to the number of individuals under one year of age in 2019), pentavalent vaccination coverage (percentage of the population under one year of age having received in 2019 the third dose of the pentavalent vaccine – diphtheria, pertussis, tetanus, hepatitis B and haemophilus influenzae type b) and healthcare coverage (proportion of the population that is affiliated to one of the health regimes in 2020).
Source: DNP (2021[43]), *Resultados Medición Desempeño Municipal 2020*, Dirección de Descentralización y Desarrollo Regional, based on data from the National Administrative Department of Statistics (DANE) and the Colombian Ministry of Health and Social Protection.

Issues in healthcare access start from the maternity care in rural areas, due to the low presence of specialised healthcare and high rates of procedures outside healthcare centres. Remote rural areas in Colombia register 86 maternal deaths per 100 000 live births per year, compared to 42 maternal deaths in

urban areas in 2019. Only 26% of women in rural areas have had access to mammograms, far below the rate in urban areas (52%). Reliance on alternative healthcare procures outside the official system is more common, due to poor access but also lack of information and traditions. For example, 25% of women in Chocó reported that their most recent birth took place outside a healthcare centre by 2019, compared to 1.6% at the national level (Ministry of Health and Social Protection, 2020[65]). Besides, in rural areas, traditions and multiculturality pose challenges to extending vaccination in rural communities. For example, low COVID-19 vaccination rates in some communities are explained by Indigenous communities' reticence towards the vaccine (Ministry of Health and Social Protection, 2022[66]).

Deficiencies in sanitary conditions are also factors affecting health outcomes in rural areas. Water coverage in rural areas (71.7% in 2019) is low when compared to the number in cities (96.3%) (CEDLAS/World Bank, 2021[47]), which has led to high mortality rates around otherwise preventable diseases, e.g. mortality rate due to Acute Diarrhoeal Disease in rural children under 5 years (8.14%) is 2.7 times higher than in urban areas (2.98%).

Access barriers in the rural areas of the country are associated with insufficient infrastructure and a lack of healthcare professionals. Rural areas in seven municipalities in the department of Cauca and three municipalities in Alto Guaviare (Putumayo) have no healthcare centres. Moreover, rural users have to wait twice as long as urban users for general appointments and five times as long – more than a month on average – to see a paediatrician (World Bank, 2021[45]). In addition, there are gaps in the skills of professionals, particularly digital skills, which were more evident during the COVID-19 crisis.

Policies aiming to improve healthcare services in rural areas

Efforts at the national level to improve access to healthcare services in rural areas are considerable. After the expansion of the subsidiary regime during the last decades, the national government is implementing a number of policies to improve access to healthcare and support greater coverage in rural areas. To this end, the National Rural Health Plan (NRHP), to be implemented during the period 2021-31, seeks several objectives:

- Close the urban-rural gap.
- Consolidate a special public health model for rural areas – with an emphasis on promotion and prevention.
- Reduce the gap in affiliation of the rural population and facilitate continuity in health insurance.
- Improve infrastructure and equipment.
- Strengthen integrated networks for the provision of healthcare services and the availability and skills of human talent in healthcare.

The national government is also working to consolidate the different healthcare models in rural areas. To this end, the government is improving the characterisation of the population, the territorial adaptation of Comprehensive Health Care Routes (RIAS) and developing integrated service provision networks to promote the use of telehealth, consultation care and home hospitalisation. The characterisation is being supported by major progress in information, including the recent database Sisbén IV, which provides information on the socio-economic conditions of households in Colombia (DNP, 2022[67]).

In order to strengthen local governance on healthcare, the Ministry of Health and Social Protection will issue guidelines and the roadmap for the implementation of the National Rural Health Plan (NRHP) to articulate the actors of the General System of Social Security in Health and provide the required technical assistance to the departments and municipalities.

Improving quality is also a central goal of the government. The NRHP seeks to strengthen the qualification and accreditation systems for providers and insurers as well as operationalise the special care models at the local level, with a comprehensive approach for the patient and a differential approach for rural areas.

However, one of the main challenges corresponds to the geographical, cultural and ethnic particularities, and service offers, among other aspects, which have caused the resident population in some territories to face barriers to access to healthcare services.

These health strategies go in the right direction to address the main health issues in rural communities. Implementing this national plan could put Colombia in a front-line position in addressing health issues with a rural focus. In fact, a recent review of eight countries (Australia, Canada, Croatia, Estonia, Italy, Spain, the UK and the US) identified a range of policies in place to ensure rural emergency and hospital care, but only one country (Italy) had a national policy on hospitals in rural or remote areas (Rechel, B. et al, 2016[68])

Health policies in rural areas have important scope for improvement

The implementation of the National Rural Health Plan (NRHP) of Colombia could be reinforced by ensuring sound policy co-ordination with a focus on primary healthcare, further promoting flexibility and adaptation to rural characteristics, and accelerating the adoption of telemedicine.

Ensuring lasting health outcomes through policy co-ordination with a focus on primary healthcare

Low population density and dispersion make it costly to provide quality healthcare to all rural populations and, even more so, to provide specialised healthcare to all rural populations. Therefore, co-operation within healthcare programmes with other policies and areas is essential to attain economies of scale and ensure better healthcare quality. To this end, the implementation of the NRHP needs to be co-ordinated with other development actions for rural well-being like education, particularly the Special Admissions Programme (PAES) and infrastructure projects in sanitation and broadband coverage. The PDETs can allow the articulation of health policies and adapt them to rural particularities. As mentioned in Chapter 3, this type of approach should be extended to all rural municipalities.

Given the difficulties in providing specialised healthcare services, the rural health policy should ensure a sound primary healthcare and prevention service. A co-ordinated approach to focus on primary care and prevention is one of the most effective actions across OECD countries to attain cost-effective service and reduces unnecessary hospital admissions. Strengthening primary healthcare also increases the resilience of community well-being as it helps respond well to a number of growing health needs (e.g. effective primary care as the backbone of healthy ageing policies), as health promotion and disease prevention services are critical to maintaining the healthy, high-functioning older populations.

In Colombia, an action to improve outcomes of primary healthcare and prevention is to strengthen the comprehensive approach to enhancing the quality of life from an early age. In many rural communities, private childcare is not available, which leads to many children without proper healthcare in their early days, affecting human capital accumulation trajectories. Leveraging the National Policy for Integral Development of Early Childhood, and strengthening the co-ordination of the Family Welfare Institute (ICBF) early childhood development (ECD) services in rural areas could help improve children's health by ensuring better nutritional levels. The fragmentation of ECD service modalities in rural regions may be causing quality gaps in ICBF services that also affect the human capital accumulation of children over their lifecycle (World Bank, 2021[45]). Simplification of administrative procedures for accessing ECD services – such as reducing the number of documents required or integrating ICBF information systems – and strengthening monitoring of ECD service delivery should be promoted.

Adopting a horizontal approach that involves different actors with the goal to ensure prevention from childhood is the first building block to improve health outcomes in rural areas. The efforts to co-ordinate the universalisation of comprehensive early childhood care in key areas such as vaccination, nutrition and growth, or development controls with national strategies such as *Cero a Siempre*, should be approached

as an inter-sectoral policy for rural development. It can unite the efforts of the public and private sectors, civil society organisations and international co-operation in favour of early childhood in Colombia.

Co-ordination is also relevant among healthcare programmes in rural areas. Some public social programmes provided by the same agency, particularly those from the Department for Social Prosperity, still have separate and independent delivery chains (World Bank, 2021[45]). This can lead to entry barriers and administrative burdens for rural citizens who have less access to electronic and government-to-person (G2P) payments and need to travel several times to claim their benefits for different health programmes or get a specific document for registry. The government should unify health service support programmes to reduce administrative burden and time spent for rural residents.

Simplification of procedures and economies of scale can be achieved through an overall strategy to reorganise primary care around multidisciplinary teams. The NRHP already recognises the important role of Multidisciplinary Healthcare Teams (MHTs) in each region to define local priorities on health and identify action plans. These teams will be assigned to families for whom they will lead the primary care process, from the design to the implementation of primary care plans. The MHTs will have a variety of profiles (technicians, professionals and specialists) and will include new profiles such as community managers and agents, health promoters, community leaders or professionals from other disciplines such as health engineers, sociologists, agronomists, anthropologists, physical education professionals, among others. Such teams should be incentivised in all regions and could be further implemented with a focus on patient engagement in decision making. For example, Multi-professional Health Houses in France have been levers for improving access to care, particularly in rural areas where they contribute to reducing the isolation of certain territories (Box 4.5).

Box 4.5. Multi-professional health centres in France

In France, Multi-professional Health Houses (*Maisons de santé pluriprofessionnelles*, MSP) are multidisciplinary structures where doctors and medical auxiliaries work in a co-ordinated manner. The idea is to create a space dedicated to the co-ordination of care as close as possible to the population through the sharing of skills. They allow better management of professionals' time, mutualisation of operating costs, greater attractiveness of under-endowed areas and maintenance of local public services. The Health Houses, which are financed by public funds, sign a multi-year contract with the Regional Health Agency (*Agence Régionale de Santé*) setting out their objectives and resources before any financial aid is paid out by the agency.

The Health Houses have legal personalities and are made up of medical professionals, medical assistants and pharmacists (at least two general practitioners – or one on a temporary basis – and a medical assistant). These healthcare professionals must draw up a health project attesting to the co-ordination of their practice, which must be submitted to the Regional Health Agency.

In June 2021, France had approximately 1 889 Health Houses on its territory, mostly located in medically disadvantaged areas. These medical structures are highly appreciated by young practitioners looking for a job and by doctors seeking to boost their careers. In addition to the various existing aid schemes (subsidies, tax exemptions, etc.) to encourage their development, working within this type of structure offers undeniable advantages: pooling of resources leading to more efficient management, better time management resulting in a better quality of life, further teamwork reducing professional isolation, or pooling of skills improving care provision.

Source: DREES (2021[69]), "Médecins en maisons de santé pluriprofessionnelle : des revenus en hausse et des effets prometteurs pour l'accès aux soins", https://drees.solidarites-sante.gouv.fr/communique-de-presse/medecins-en-maisons-de-sante-pluriprofessionnelle-des-revenus-en-hausse-et-des.

Scaling up flexible care alternatives to empower rural population around health

The flexibility of the healthcare system can help involve rural communities as partenrs to improve health outcomes. Patient involvement is critical to a high-performing and people-centred health system. Studies have shown that patients who are more involved in their care show better outcomes and experiences (Hibbard and Greene, 2013[70]).

In Colombia, mobile alternatives such as mobile health units (MHUs) can contribute to boosting prevention in remote regions with specific needs, especially in terms of vaccination uptake. Promoted by public hospitals, MHUs have a role in prevention and promotion, in healthcare and in carrying out community actions (e.g. first aid training). These types of units require greater support in terms of the professionalisation of staff and financial capacity to reach remote communities with clearer frequency. They can be complemented by Community Health Committees or networks to enhance information on health-related issues inside the communities and serve as intermediaries with public and health authorities.

Moreover, there are alternative health practices in rural communities that could be aligned or institutionalised to improve health accessibility and ensure their quality. The multiculturalism of Colombian rural regions and the historic lag in some services has led to different forms of healthcare provision. Instead of outright banning, policy could leverage those practices and support their complementarity with conventional healthcare provision. This includes Indigenous health approaches. Moreover, traditional approaches like rural health promoters – rural women trained by the government to do prevention work – could be reintegrated into the health policy approach to help prevent diseases in rural communities (DNP, 2015[46]).

Supporting flexible healthcare alternatives in rural areas needs to be part of a comprehensive strategy that seeks to increase the availability and retention of human talent in healthcare. Therefore, the training and working conditions of the technical, technological and professionals working in the healthcare sector should be reinforced. The efforts and objectives of the Ministry of Health and Social Protection, which plans to strengthen the Compulsory Social Service or incentives aiming to increase the retention of healthcare professionals, are moving in the right direction.

Furthermore, greater adaptation in terms of the payment capacity of rural communities is needed to ensure quality service. The hospital-centric model of care delivery is ineffective in meeting the needs of the most vulnerable populations – including in rural areas – with chronic conditions requiring comprehensive care and better integration of health and social care. Current payment methods still do not account properly for the specific risk profiles of citizens, providing little incentive to healthcare providers to offer differentiated care to patients with different risk factors.

The country has piloted a model to specifically target rural regions with the greatest health needs (Law 1 122 of 2007). This model initially targeted Amazonas, Caquetá, Guainía, Guaviare, Putumayo, Vaupés and Vichada with exceptional treatment in the frame of the general system of social security on health to guarantee access to healthcare services or strengthen insurance. This approach could be extended to other rural departments such as Chocó, Guajira, Llanos Orientales or Norte de Santander, which should be included in a special model that strengthens health insurance for dispersed areas, thus guaranteeing access to healthcare services and protecting healthcare resources in order to improve the health status of their population.

Fostering the use of telemedicine in rural areas

Despite limited Internet access in rural areas, telemedicine is an opportunity to bring basic services such as healthcare closer to rural users. As seen before, mobile coverage is a growing trend in Colombian rural areas, which can be leveraged to extend healthcare services. For example, projects like the obstetric intensive care unit in 14 municipalities in northern Cauca, promoted by the Valle de Lili Foundation (Fundación Valle del Lili, 2022[71]) allow specialist doctors to assist general practitioners or other

specialised doctors telematically. This project complements local competencies in the management of obstetric emergencies with tele-assistance via WhatsApp and – when the infrastructure allows – in some hospitals in formal telemedicine processes.

To overcome the significant challenge of Internet access, some initiatives are turning to alternative technologies such as satellite technology. For example, in the department of Caldas, telemedicine services have begun to be implemented in rural areas via satellite technology in places without mobile phone and Internet signals. This project, which connects patients in remote areas with medical specialists, was made possible thanks to the co-operation with the University of Caldas, which provided the necessary tools for telemedicine and the support of the Governor's Office (Usma, 2020[72]). Collaboration with universities can be strengthened to foster healthcare professionals' skills in the use of digital equipment and to offer them support in incorporating these tools into their routine work activities.

Lack of electricity and drinking water is still a pressing issue in some rural areas

Other relevant services such as electricity or drinking water are a fundamental to reach basic levels of quality of life in Colombian rural communities. Colombia has made important progress to reach universal coverage in these services, with specific national policies on rural areas. However, as in other services, the urban-rural gap in accessing electricity and water remains important. Given the overall progress in these areas, this report only provides a short overview of these issues, without detailing specific sectoral recommendations.

Access to electricity

By 2021, about 10.9% of Colombian rural households lacked electricity service, far above the 0.1% of urban households lacking this service. Remote rural regions like Guainía, La Guajira or Vichada register less than 50% of households connected to electricity, which indicates a clear need to action (DANE, 2022[73]). Moreover, municipalities with electricity but unconnected to the grid often face an intermittent service (less than 24 hours a day), as in the best scenario, it is powered through decentralised fuel-based power plants.

The government's strategies to increase electricity coverage increasingly rely on the provision of renewable energy technologies, mainly solar panels and wind power parks. From 2018 to April 2021, about 32% of newly connected users received electricity through solar panels (Ministry of Mines and Energy, 2021[74]). To conduct such projects, the government has specific funds, including the Financial Support Fund for the Energization of Interconnected Rural Areas and the Financial Support Fund for the Energization of Non-Interconnected Areas, which are funded by the General System of Royalties. The Ministry of Mines and Energy has also promoted projects executed by network operators, incentivising operators through a percentage increase in the component of the tariff distribution paid by all users.

Universal electricity coverage in rural areas is a process that will take time, given its reliance on current funding and implementation times. At the current pace, the Mining and Energy Planning Unit has estimated that 96.4% of the remaining rural households without electricity would be covered only by 2035 (Ministry of Mines and Energy, 2021[74]). Therefore, Electricity coverage in rural regions should be accelerated to reach universalisation at an earlier date, as additional years to reach this goal exclude rural communities to benefit from the digital transformation. Speeding up this policy needs greater policy prioritisation within the national development agenda, stronger co-operation with network operators (e.g. using incentives in tariffs) and economies of scale with other projects (e.g. transportation or broadband infrastructure). Likewise, seizing technological progress on decentralised energy systems (e.g. cheaper and more efficient solar panels) is a strategy that other OECD countries are leveraging to offer energy solutions to remote rural areas.

Water

By 2021, about 47.5% of Colombian rural households were without access to tap water, far above the 2.5% of urban households lacking this service (DANE, 2022[73]).[15] The lack of access to water is more evident in remote rural regions. For example, rural areas in Amazonas, Guaviare or La Guajira had less than 12% of households with access to tap water (DANE, 2022[73]). In terms of quality, according to the Water Quality Risk Index for Human Consumption (IRCA), rural areas, on average, present a risk of water sanitation (IRCA of 29.9 in 2019) almost 3 times as high as in urban areas (11.3). Nevertheless, such a risk to water quality in rural areas has improved substantially since 2015, decreasing from high to medium.

Colombia has experienced important progress in water coverage in the last years, but it is estimated that the country will have to guarantee access to drinking water to at least 12 million additional people to reach universal access by 2030 (Ministry of Housing, City and Territory of Colombia, 2021[75]). The country has already elaborated particular water-related national policies for rural areas. These include Water to the Countryside programme ("Agua al Campo"), which provides institutional, financial and technical capacity building to operators (e.g. in project structuring) or Water to the Neighbourhood programme ("Agua al Barrio"), which provides aqueduct and sewage services to informal human settlements.

To achieve universal access to water by 2030, the country requires a greater focus on rural regions, where there is the greatest gap. To this end, the national government (2021[75]) has identified some necessary measures, such as improving information systems in the sector to identify households without access, strengthening the ongoing programmes focused on rural regions, ensuring a coordinated action among institutions that influence water policy (e.g. with the creation of the National Water Agency) or greater support to regional Enterprises of Public Services (e.g. with clear performance indicators or leveraging performance-based contracts) . Moreover, to increase the resilience of the water system in the face of the effects of climate change, the government needs to allocate specific resources to mitigating the risk of shortages and promote circular economy practices in the use of water (increase the treatment of wastewater and reuse of treated water for different activities).

Final considerations

Colombia has made significant progress over time to extend connectivity and improve access of rural communities to education, healthcare and other services (water and electricity). In recent years, increased investments in transport infrastructure, mainly primary roads, electricity and water infrastructure along with greater recognition of the need to expand broadband in rural communities are a sign of the development process in the country. Moreover, triggered by the IRR, the government has elaborated specific national plans with a rural focus to provide basic services to rural areas. New approaches to providing education and healthcare to rural communities have also contributed to a steady improvement on quality of live. This is particularly the case for primary health and education where the country has achieved high coverage rates. Other services such as water and electricity have experienced important progress, and efforts need to focus on accelerate the path for universal coverage.

However, closing the gap on access to services and transport and broadband infrastructure in rural areas still faces various challenges. The various IRR's national plans to deliver rural services and infrastructure are still in the initial stages and need coordination and continuous political and financial commitment. Factors including a difficult geography and dispersed settlements along with violence, lack of information and weaker local institutional capacity represent greater bottlenecks for investments and attraction of service professionals. Access to high-quality broadband can change the way rural population access services and markets, but its policy needs a comprehensive approach. Flexibility and adaptation of national policies to local needs together with greater transparency in administrative procedures, empowerment of local communities and experimentation in service delivery are key actions to enhance access to services and connectivity in rural areas, and thus attain higher levels well-being for rural population

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Notes

[1] ISPs are companies that provide end users with a broadband connection, allowing them access to the Internet and associated services.

[2] Using the OECD exchange rate of 2020 of COP/USD 3 694.854.

[3] These departments are Antioquia, Bolívar, Boyacá, Caldas, Casanare, Cauca, Cesar, Córdoba, Cundinamarca, Huila, Magdalena, Meta, Nariño, Norte de Santander, Quindío, Risaralda, Santander, Sucre, Tolima and Valle del Cauca.

[4] These nine *Zonas Digitales* are still running up to date because they were late in being approved and therefore getting started.

[5] These departments are Bolívar, Casanare, Cauca, Cesar, Córdoba, Huila, Magdalena, Meta, Nariño and Sucre.

[6] The departments below the national average of connected homes where the *Digital Zonas* are to be installed are Arauca, Bolívar, Caquetá, Cauca, Chocó, Córdoba, Guaviare, La Guainía, Putumayo, Vaupés, Vichada.

[7] These cities are: Popayán, Florencia, Inírida, Leticia, Manizales, Mocoa, Puerto Carreño, San José del Guaviare, Santa Marta, Tunja and Yopal.

[8] The webpage ARES is currently being updated by INDAABIN but will soon be available again.

[9] A monolithic base station in the past was made up of a remote radio unit (RU) that is connected to a baseband unit (BBU) through a “fronthaul” interface. The BBU is composed of a centralised unit (CU) and a distributed unit (DU). The BBU contains digital modules that process signals from the RU and provides a communication interface to the core network, via backhaul. The RU is made up of antennas that receive and transmit wireless signals from the air interface (i.e. spectrum). Therefore, the BBU has both hardware and software elements, while the RU is composed of hardware. The 3GPP Release 15 disaggregated the baseband unit into a CU and a DU, with a separate RU. A virtualised radio access network (RAN) introduces virtualised network functions for the CU and the DU in the baseband unit, thereby decoupling hardware and software. However, the interfaces between RAN elements in vRAN architecture may be vendor-specific and therefore may not interoperate. With Open RAN, the open, non-proprietary and interoperable interfaces allow operators to select different vendors according to their needs. The figure below compares a traditional “monolithic” RAN deployment with an open RAN deployment, with a disaggregated functional split RAN from 5G 3GPP Release 15 and open interfaces, coupled with commercially available, off-the-shelf hardware (COTS) (OECD, 2022[76]).

[10] Please see OECD (2019[77]) for a more in-depth discussion of the topic.

[11] Communication operators furthermore have to pay a regulatory fee of 0.15% of revenues to fund the CRC, as well as contributions to the superintendence (*superintendencias*) and annual spectrum fees.

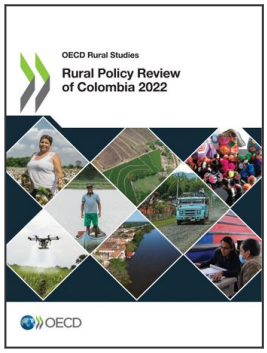
[12] Using the OECD exchange rate of 2021 of COP/USD 3 743.590. Paragraph 6 of Article 424 of the Colombian Tax Statute states that "smart mobile devices (tablets and mobile phones) whose value does not exceed twenty-two (22) Tax Value Units" are excluded from tax and therefore their sale or importation

does not cause sales tax. The equivalent of 22 Tax Value Units in 2022 is COP 836.088 (Government of Colombia, 2022[19]).

[13] Several OECD and non-OECD countries such as Chile or Viet Nam are currently implementing prioritised core curriculum to recover learning losses from the pandemic (World Bank, 2021[45]).

[14] The Tutorial Learning System (SAT) helps adults in rural areas of Colombia who have completed the full cycle of basic primary education to complete the baccalaureate through a methodology that integrates education with work and the processes of social and community organisation.

[15] This value is taken from the DANE Quality of Life Survey that is produced annually. This survey only measures traditional access to water (tap water through aqueduct) and does not take into account other alternative solutions that could be considered appropriate in rural areas, such as public standpipes.



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