DIGITAL TRANSFORMATION

Infrastructure Sharing in Latin America and the Caribbean

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Abstract

Access to digital infrastructure is key to socioeconomic development. Nevertheless, more than 60 percent of the population of Latin America and the Caribbean lack access to quality digital infrastructure. One of the instruments with the greatest potential to reduce the cost of deployments and thus make private sector investment is infrastructure sharing viable, both among telecommunications operators and with operators of other infrastructure (electricity, roads, gas, among others). This document analyzes the benefits derived from sharing as well as the regulatory and legal implications, and presents potential models to implement this strategy in the region.

Palabras clave: infrastructure, digital, broadband, digital divide, public policies, telecommunications

List of Acronyms

A4AI	Alliance for Affordable Internet
ADETEL	Dominican Association of Telecable Companies Inc.
ADSL	Asymmetric digital subscriber line
ANATEL	National Telecommunications Agency of Brazil
ANDE	National Electricity Administration of Paraguay
ARCONEL	Electricity Regulation and Control Agency of Ecuador
ARCOTEL	Telecommunications Regulation and Control Agency of Ecuador
ARPU	Average revenue per user
BDI	Broadband Development Index
BEREC	Body of European Regulators for Electronic Communications
BTS	Base transceiver stations
CAPEX	Capital expenditures
CDEEE	Dominican Corporation of State Electric Companies
CELEC	Electrical Corporation of Ecuador
CEPM	Punta Cana–Macao Energy Consortium
CNE	National Energy Commission of Honduras/Dominican Republic
CNEL	National Electricity Corporation of Ecuador
CONATEL	National Telecommunications Council of Ecuador
CONATEL	National Telecommunications Commission of Honduras/Paraguay
COPACO	Paraguayan Communications Company
DWDM	Dense Wavelength Division Multiplexing
EC	European Commission
EDEESTE	East Electricity Distribution Company of the Dominican Republic
EDENORTE	North Electricity Distribution Company of the Dominican Republic
ENEE	National Electric Power Company of Honduras
ETED	Dominican Electricity Transmission Company
EU	European Union
FCC	Federal Communications Commission
FTTC	Fiber to the curb
FTTP	Fiber to the premises
FTTx	Fiber to the curb/home/premises
GIS	Geographic information system

GSMA	Global System for Mobile Communications Association
HFC	Hybrid fiber-coaxial
ICT	Information and communication technology
IDB	Inter-American Development Bank
IFT	Instituto Federal de Telecomunicaciones of Mexico
INDOTEL	Dominican Institute of Telecommunications
IoT	Internet of Things
IRU	Indefeasible right of use
ISPs	Internet service providers
IT	Information technology
ITU	International Telecommunication Union
JMCIA	Japan Mobile Communications Infrastructure Association
JV	Joint venture
LAC	Latin America and the Caribbean
LMST	Framework Law of the Telecommunications Sector (Honduras)
LRIC	Long-run incremental cost
LTE	Long-term evolution
MBC	Mid-Atlantic Broadband Cooperative
Mbps	Megabits per second
MDB	Multilateral development bank
MNOs	Mobile network operators
MPLS	Multiprotocol Label Switching
MVNOs	Mobile Virtual Network Operators
NRA	National regulatory agency
OBA	Basic access offer
OECD	Organisation for Economic Co-operation and Development
OFAPs	Optimal Fiber Aggregation Points
OPEX	Operating expenditures
OPGW	Optical ground wire
ORN	Olleh Rwanda Networks
OSIPTEL	Supervisory Board of Private Investment in Telecommunications in Peru
PGMC	General competition plan of Brazil
PIA	Physical Infrastructure Access
PON	Passive Optical Network
PPP	Public-private partnership
RAN	Radio Access Network
RNFO	National Fiber Optic Network (Paraguay)
ROW	Rights-of-way
SENI	National Interconnected Electric System
SMP	Significant market power
SNOA	Wholesale negotiation platform of Brazil
Towerco	Tower companies
TSOs	Transmission system operators
TVWS	TV White Space
UN	United Nations

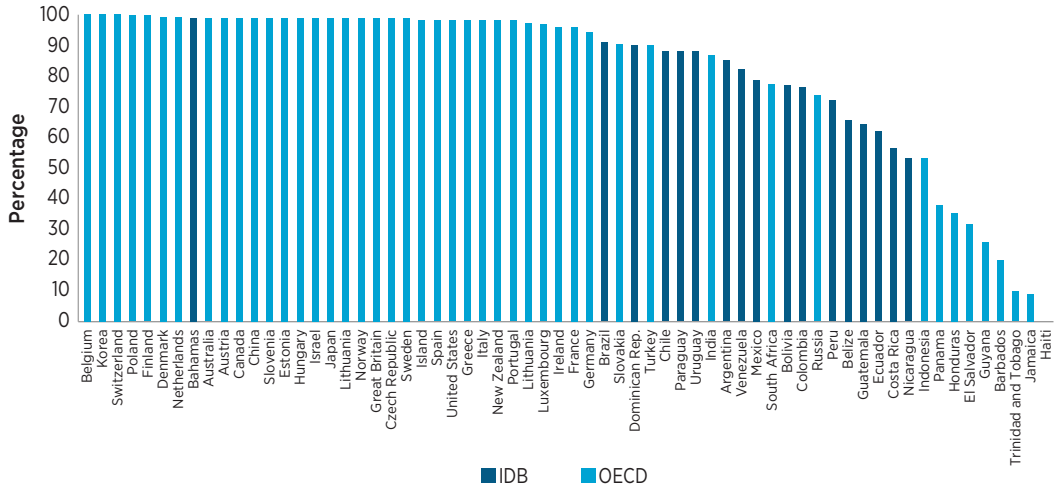
Executive Summary

In Latin America and the Caribbean, access to digital infrastructure is limited. Service in urban areas such as Buenos Aires, Montevideo, or Panama City has the best characteristics, but in rural areas with more difficult access coverage is considerably limited. As an example, the percentage of the population covered by mobile broadband (4G) networks in Inter-American Development Bank (IDB) member countries compared to Organisation for Economic Co-operation and Development (OECD) countries is shown in Figure 1.

One of the main reasons for this limited coverage is the low financial profitability for private operators in the most remote and less populated areas. This problem is not unique to the region—it occurs in the vast majority of countries—but in Latin America and the Caribbean effective mechanisms have not yet been implemented to achieve universal service.

FIGURE 1

POPULATION WITH BROADBAND MOBILE NETWORKS (IDB vs. OECD member countries)

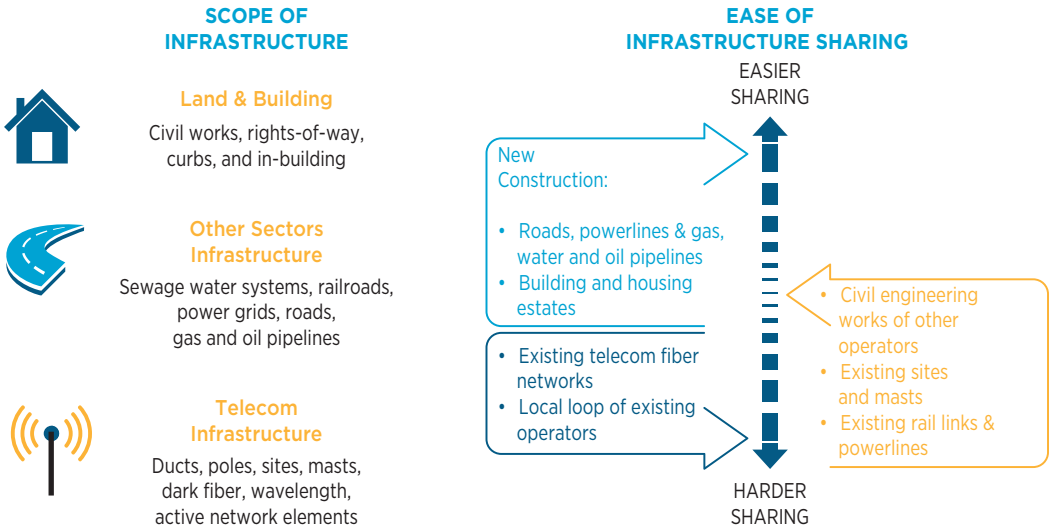


Source: GSMA (2018).

One of the instruments with the most potential to reduce the cost of deployments and thus make private sector investment viable is infrastructure sharing. Sharing, as seen in Figure 2, can occur at different levels and require different processes, but in essence it is a mechanism capable of reducing the cost of investment associated with providing coverage to a particular household or population thanks to the concurrent use of an infrastructure element.

FIGURE 2

SHARING LEVELS AND PROCESSES



Source: Authors' elaboration based on various publications.

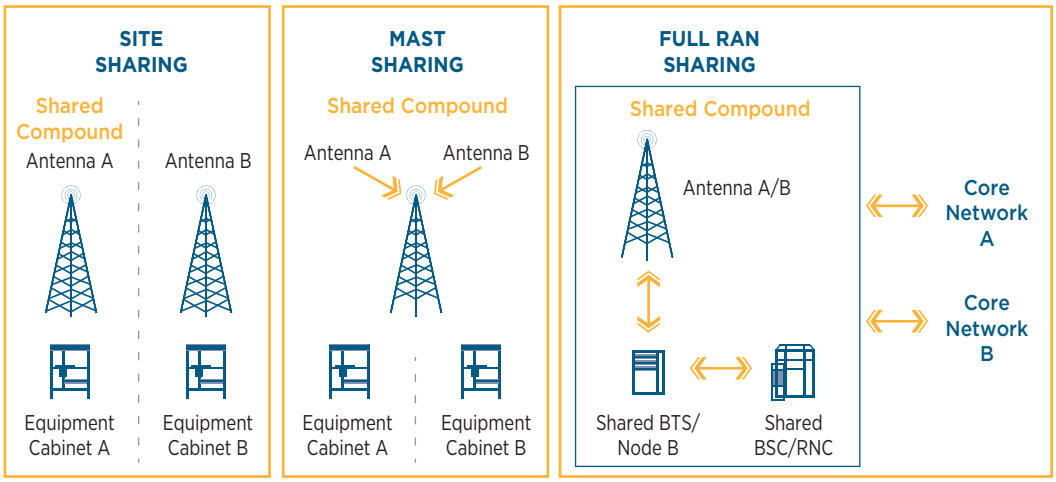
This document analyzes the benefits derived from sharing, the regulatory and legal implications, and proposed models to implement effective infrastructure sharing in the region. As an example, the different sharing models for a mobile communications tower are shown in Figure 3.

In the Latin American and Caribbean region, infrastructure sharing is limited. This causes the deployment costs for operators to be higher than in other regions where sharing is more widespread, making it even more difficult to offer service in rural or hard-to-reach areas.

Only eight countries in the region have some type of infrastructure sharing. This is partly due to the existence of uncompetitive markets and the lack of incentives for sharing.

FIGURE 3

SHARING MODELS



Source: GSMA (n.d.).

This document presents the possible limitations to sharing that have historically made it difficult to implement it successfully. There is an analysis on sharing with the electricity sector and opportunities in four countries of the region (Honduras, Ecuador, Paraguay, and the Dominican Republic) are analyzed. A review of the existing laws and policies for the active and passive sharing of infrastructure in the region is presented in Table 1.[1]

Public policy and the regulatory framework can play a fundamental role in extending infrastructure sharing through the generation of incentives, frameworks for sharing, and initiatives for the publication of information on existing infrastructures. At the end of this document, a series of technical, regulatory, and policy recommendations that can promote infrastructure sharing are presented, accompanied by an annex that contains an example of legislation that can serve as a basis for its implementation.

[1] Active sharing refers to elements of the active layer such as router equipment and antennas, while passive sharing refers to the use of passive elements such as poles, ducts, or pipes.

TABLE 1

TYPES OF SHARING IN SELECTED LATIN AMERICAN COUNTRIES VS. THE UNITED STATES

Country	Passive Sharing	Active Sharing
Argentina	O	O
Brazil	O	O
Canada	O	O
Chile	O	X
Colombia	O	O
Costa Rica	O	X
Ecuador	O	X
Mexico	O	X
Peru	X	X
Paraguay	X	X
US	X	X

Source: Authors' elaboration based on various publications.

CHAPTER 1

Introduction to Infrastructure Sharing

Although basic mobile telephony is now available to the majority of the population of Latin America and the Caribbean (LAC), fixed and mobile broadband remain largely out of reach for many. Today approximately 30 percent[2] of people in LAC still do not have any internet access, and approximately 48 percent[3] do not have access to mobile internet.

Fiber-optic network expansion and wireless network upgrades have primarily concentrated on areas of higher income and more densely populated areas. Yet, for those with lower income in these locations, broadband access costs can be unaffordable.

A number of barriers constrains the supply and demand of broadband services. On the supply side, insufficient backbone infrastructure and uncompetitive wholesale markets related to the services provided over the backbone infrastructure to retail internet service providers (ISPs) represent one of the major obstacles preventing broadband investments in the downstream, retail access markets in developing countries. Rural and geographically isolated areas are most affected.

In contrast, in urban and other densely populated areas where rapid increase of demand for broadband services is accompanied by higher quality requirements (such as connection speeds), operators have no choice but to connect households, businesses, and public institutions using future-proof fiber-optic access networks. High quality requirements coming from the urban areas of the country are applying additional pressure on the national backbones.

[2] https://www.internetworldstats.com/stats10.htm#spanish.
[3] https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/03/GSMA_MobileEconomy2020_LATAM_Eng.pdf.

Cross-sector infrastructure sharing is a public policy measure which aims to tackle such bottlenecks and most, if not all, developed countries along with many emerging countries have taken advantage of it. Infrastructure sharing is commonly understood as an agreement between two or more market players to share various parts of their infrastructure for the provision of services. This has been identified as an effective way to lower the cost of network deployment and to achieve better connectivity. Infrastructure sharing can also play an essential role in protecting the environment, reducing resource consumption, increasing energy efficiency, and achieving sustainable growth (APEC, 2011).

Sharing can take place within a particular sector, such as between telecom network providers, or amongst different sectors, such as between telecoms and other utilities (i.e., electricity grids, gas, or transport networks). Depending on the type, infrastructure sharing is usually categorized as either passive or active. Passive infrastructure sharing refers to the sharing of non-electronic infrastructure, such as sites, towers, poles, ducts, equipment rooms, and so forth, as well as civil engineering components. On the other hand, active infrastructure sharing refers to electronic elements of the core network that are shared, such as switches, antennas, management systems, or spectrum (ITU, n.d.).

Given the above, cross-sector infrastructure sharing represents one of the major components of any national policy effort which aims to support broadband investments, making possible the economic and social benefits of affordable pervasive broadband. Sharing of fiber-optic networks, especially across rural areas in developing countries, can increase connectivity and penetration by providing more cost-effective backbones needed for the provision of low-cost broadband access services to the end user. In mobile networks, tower sharing and network sharing are already popular in both developed and in some emerging markets. Generally, infrastructure sharing generates a number of economic and social benefits:

i. It reduces the cost of network deployment and operational costs, as well as potentially speeding the time to market, with positive impacts on service coverage, costs and prices, and operator profitability. Cross-sector infrastructure sharing of broadband networks with other major infrastructure sectors such as water, electricity, railways, and roads can allow the deployment of fiber at even lower cost. Sharing of land, rights-of-way, in-building cables, as well as curbs that provide access between the street and the sidewalk, also provide cost reductions and speed of deployment efficiencies.
ii. It creates positive environmental benefits by reducing network duplication and thereby the physical impact of necessary infrastructure.
iii. It increases competition, which reduces prices, improves service provision, and creates incentives for operators to extend their networks to previously unserved and underserved areas.
iv. It reduces the barriers derived from obtaining construction and operation permits and from payment of fees (tariffs) for the use of rights-of-way, construction, and deployment since several operators share those permits and fees.

Indirectly, infrastructure sharing supports better economic and social growth through its potential to improve the standard of living of the population, as well as its integration with economic activities.

Considering these benefits, regulators and competition authorities of developing countries are increasingly encouraging infrastructure sharing between operators. In emerging markets, infrastructure sharing remains more limited, although as this report shows, is at times more innovative, having developed successful models. The analyzed experiences provide valuable lessons for sharing policies and strategies in the future.

1.1 Strategic Importance of Infrastructure Sharing

It is widely recognized that the availability of broadband connectivity is an important determinant of the economic and social development of a region or country. The United Nations (UN) recognizes that the global and open nature of the internet is a driving force in accelerating progress towards development in its various forms.[4] Likewise, the Inter-American Development Bank (IDB) recognizes the impact of digital infrastructure on the Sustainable Development Goals.[5] Access to high-speed broadband can help foster economic growth, facilitate social cohesion, and improve citizen well-being. It is therefore not surprising that the increase in the penetration of broadband has become one of the key policy aims for many national and international policy organizations. For example, the European Union (EU) has recognized and underlined the importance of widely available and competitively priced broadband and adopted a Digital Agenda for Europe in 2012 (EC, 2010) that was updated in 2016 to mirror the strategic objectives of the European 2025 Gigabit Society (EC, 2016a). According to the EU, "very high-capacity Internet connectivity is essential to unleash the next wave of competitiveness and innovation and to allow Europe's businesses and citizens to harvest the full benefits of the Digital Single Market" (EC, 2016b). To that end, it outlined three main strategic objectives for 2025:[6]

- Gigabit connectivity for all of the main socioeconomic drivers;
- Uninterrupted 5G coverage for all urban areas and major terrestrial transport paths; and
- Access to connectivity offering at least 100 Megabits per second (Mbps) for all European households.

Research indicates that an increase in broadband penetration is not necessarily homogeneously distributed. Significant differences exist not only among countries and

[4] United Nations Resolution A/HRC/32/L.20 (https://undocs.org/en/A/HRC/32/L.20).
[5] https://publications.iadb.org/en/node/18961.
[6] For information on the EU's program Broadband Europe, see https://ec.europa.eu/digital-single-market/en/broadband-europe.

between wealthier and poorer regions, but also within countries, especially between their rural and urban areas. The European Commission (EC) is therefore emphasizing efforts to overcome this and other challenges, particularly the need to minimize infrastructure deployment costs. This is where infrastructure sharing, an integral part of the EC's initiative, plays a vital role. Beyond the EU, cross-sector infrastructure sharing is becoming a standard for good broadband policy and is widely applied in the United States, New Zealand, Australia, and many other developed countries.

It should be noted that infrastructure sharing within the telecom sector has already been taking place for a number of years. Indeed, the increase in the number of network-sharing agreements has been especially notable to increase the coverage of 3G and 4G networks. The deployment of 5G technology could lead to a second big wave in the number of sharing agreements.

In general, the benefits of infrastructure sharing, whether telecom infrastructure only or across sectors, can be summarized as follows:

i. **Cost savings.** One of the most important benefits of infrastructure sharing is that it helps to significantly cut broadband network deployment and expansion costs. It is widely agreed that civil engineering works constitute the dominant part of overall network deployment costs, regardless of the technology used, with estimates as high as 80 percent for certain technologies (EC, 2013a). Thus, according to the EC (EC, 2013a), with proper infrastructure-sharing policies in place, for example, improved access to physical infrastructure of other sectors, more cooperation in civil engineering works, streamlined permit procedures for rolling out broadband networks, and more buildings ready for high-speed broadband, it is possible for an operator (a lessee) to save between 20 and 30 percent of network deployment costs.

   As shown in Table 1.1, other studies also illustrate potentially significant cost savings. Cost savings will largely depend on the existing/owned infrastructure. If the infrastructure is already in place, its owners (e.g., telecoms or utilities) could partly cover depreciation and/or maintenance costs by sharing such infrastructure. If the infrastructure is yet to be built, cooperation in civil engineering works may bring their initial investments down, and the installation of extra capacities to be leased could guarantee additional revenues in the future.

   It is important to note that cost savings do not necessarily mean smaller investments or larger profits. In an environment with clear strategic objectives, it instead refers to more strategically tailored investments, where some (i.e., infrastructure owners) can focus their resources on core networks and others (e.g., ISPs) can concentrate on access technologies.

ii. **Network expansion/better connectivity.** Considering the amount of money needed to develop an end-to-end fiber network, it is difficult to expect that any one investor could commit to covering a substantial part of any country (Faggiano et al., 2017).

TABLE 1.1

COST SAVINGS FROM INFRASTRUCTURE SHARING

Study	% savings	Summary
Analysys Mason, "The Costs of Deploying Fiber-Based Next-Generation Broadband Infrastructure" (2008)	16–24	Potential cost savings from the reuse of infrastructure owned by utilities depend on the areas covered (urban vs. national) and technologies chosen (FTTC vs. FTTP).
Analysys Mason, "PIA Versus Self-Build Fiber in the Final Third: Digging into the Financials" (2012)	29–58	Cost savings that may be achieved by using passive infrastructure sharing in the UK depend on areas covered and additional works to be done. Savings could range from 29% in relatively densely populated areas using a combination of infrastructure sharing and traditional trenching to 58% in sparsely populated areas using the cheaper slot-cutting trenching approach.
OFCOM/CSMG, "Economics of Shared Infrastructure Access" (2010)	57–67	Sharing infrastructure networks such as reusing existing ducts where possible could result in up to 57% cost savings in urban and 67% in suburban areas.
EC, "Impact Assessment" (2013)	75	The initial cost of network deployment in Western Europe using existing ducts ranges €20–25 per meter compared to an average of €80–100 per meter for deployments that require digging.
BEREC, "Report on Infrastructure Sharing" (2018)	16–35	Cost savings depend on the type of sharing: passive sharing cost savings are 16–35% of capital expenditures (CAPEX) and 16–35% of operating expenditures (OPEX); active sharing (excluding spectrum) cost savings are 33–35% of CAPEX and 25–33% of OPEX.

Source: Authors' elaboration based on various publications.

Sharing the existing infrastructure or the costs of deploying new networks may significantly improve the business case for the less-covered rural areas, where demand for internet services and purchasing power are lower and the per capita cost of broadband network deployment is higher.

iii. **Additional revenues.** Infrastructure sharing also benefits the host infrastructure providers through additional rental revenues. Depending on the business model and services provided, it can become an important revenue diversification source. Sharing only physical infrastructure would guarantee relatively lower revenues (at lower risk and additional expenditure) when compared to active infrastructure sharing or engagement in the provision of end-user services.

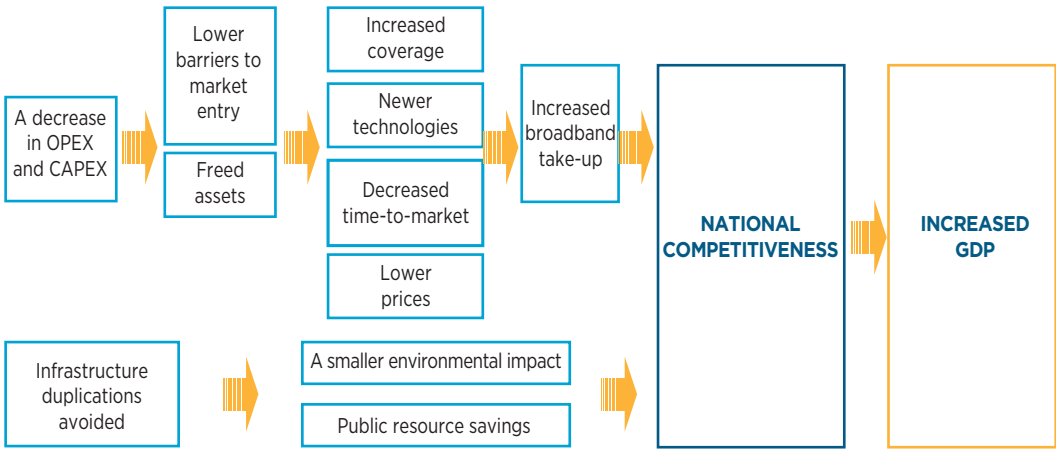
iv. **Competition and time-to-market.** Infrastructure sharing reduces barriers to entry for new market players. Upstream markets are often controlled by incumbent operators, thus entering this market requires substantial initial investments. Therefore, by providing the possibility of accessing more economically viable existing networks, infrastructure sharing offers a more rapid and cost-effective way to enter the market. As communication technologies become increasingly complex, larger investments are needed in order to bring the latest technologies to end users. Infrastructure sharing, whether active or passive, allows operators to upgrade their networks more quickly and at lower cost. Sharing is especially attractive in less profitable regions, since it minimizes the investment requirements (Andrews, Bradonjic, and Saniee, 2017).

v. **Affordability.** Infrastructure deployment and maintenance costs are transferred to the end users. Naturally, the cost of a network related to construction, operations, and maintenance is only one component within the whole cost structure of the final retail broadband price. The overall retail price of services depends on many factors, such as other cost elements, demand for the service, pricing policies, and regulatory or competitive pressures. However, the possibility of reducing the cost of the network already offers some flexibility in adjusting retail prices and generates a virtuous circle: lower retail prices lead to higher demand, resulting in increased usage and therefore higher profitability, which means additional resources for network expansion or further price competition. Recent examples from New Zealand show that almost 90 percent of wholesale price reductions have been passed on to end users (Glimp, 2017).

vi. **New business models.** Infrastructure sharing has brought about new business models where transport and backhaul infrastructure is separated from the access network. Even though the passive infrastructure "tower operator" model has been in use for many years, nowadays other business models are common where these tower operators provide all the transport and backhaul services to telecommunications services operators for shared use. In the case of active infrastructure, it is becoming more common for an operator to lease capacity from other operator, reducing the deployment costs of the former and generating an additional revenue stream for the latter. Likewise, wholesale-only service operators are becoming more common, like the Red Compartida (Shared Network) in Mexico, where the wholesale operator deploys all the passive and active infrastructure and sells capacity on its network to other operators. These models translate to a significant reduction of costs for the telecommunications services operators and promote the coverage of underserved or unserved regions that, without infrastructure sharing, are not profitable.

FIGURE 1.1

BENEFITS OF INFRASTRUCTURE SHARING



Source: Authors' elaboration based on various publications.

vii. **Public benefits, environmental impact.** Sharing infrastructure can reduce public infrastructure expenditure by avoiding unnecessary network duplications and multiple civil works; it also reduces unnecessary visual pollution. Infrastructure sharing also has a positive environmental impact by reducing the carbon footprint through savings in materials, energy, and emissions (Deloitte and APC, 2015). Various studies (Andrae and Griffa, 2010) suggest that up to 36 percent of fiber networks' annual carbon footprint can be reduced by using existing infrastructure for fiber network deployment.

In the same sense, infrastructure sharing can mitigate the reluctance of some communities that obstruct the deployment of infrastructure arguing, from lack of knowledge, potential health dangers from (non-ionizing) radiation. Nonetheless, awareness campaigns are necessary to transmit to the population that, after countless studies around the world, it has been impossible to prove that this type of radiation produces harmful health effects, when the radiation is within the operating parameters agreed upon and approved internationally.

1.2 Infrastructure-Sharing Opportunities

Over the past four decades, telecommunication markets around the world have been steadily liberalized and deregulated. Today some level of competition prevails in most countries, mainly in the provision of value-added network access for traditional ISPs, but also increasingly in basic telecommunication infrastructure (i.e., the physical elements

of the network). At the same time, many traditional telecom operators, which previously provided unmanaged data services and voice minutes, are now also providing broadband access and content services, as are many of the mobile operators. These changes, combined with booming demand for the internet, have led to the emergence of infrastructure sharing as an important element in strategies for rapid and cost-effective deployment and operation of competitive services.

Infrastructure sharing in the telecommunications sector primarily occurs in three ways:

i. Where one or more operators use the resources of other operators, such as their mobile towers, fiber cables, or ducts;
ii. Where a group of operators agrees to share the ownership and/or use of the resource. In some cases, this resource may be owned fully or partially by government, or by an independent (non-telecom) third party; or
iii. Where an operator uses the resources of other, non-telecom infrastructures, such as power lines, roads, or even buildings, which can be leveraged for the deployment of fiber and/or radio equipment. From the point of view of the network operator, these are often called "passive infrastructure," "alternative infrastructure," or in some cases "linear infrastructure."

A typical example of a cross-sectoral sharing strategy is the joint venture between an electricity company and a telecom operator in Ireland, which aims to deploy a national fiber network directly to houses by using the existing electricity infrastructure.[7] Other examples of sharing in developed economies include:

- Cities such as Paris, London, and New York, which have deployed fiber using the existing underground sewer system.
- In Europe over the last 10 years, all the major mobile operators have entered network-sharing agreements, in particular to run and operate shared 3G and 4G networks.[8]
- Australia's National Broadband Network Company Limited was created to build and operate a new national broadband network which allows wholesale and retail service providers to deliver broadband services.
- In the United States, the Mid-Atlantic Broadband Cooperative (MBC) brought a fiber network to a rural and previously underserved part of Virginia. The project was funded partly by the government and provides dark fiber to operators on an open access basis. In return for rights-of-way, the MBC provided a total of twelve fiber strands for public sector use (Cohen and Southwood, 2008).

[7] https://www.vodafone.com/news-and-media/vodafone-group-releases/news/esb-vodafone-ireland.
[8] http://www.itu.int/itunews/manager/display.asp?lang=en&year=2008&issue=02&ipage=sharingInfrastructure-mobile.

Infrastructure sharing is limited in LAC. In emerging markets, practices of infrastructure sharing are not common when compared to developed economies. Considering that these countries generally have smaller markets than most developed countries and have larger proportions of their populations that still remain unconnected, these countries stand to benefit more than developed countries from increased infrastructure sharing. Lack of awareness of the opportunities, immature markets, or lack of a competitive environment are among the common reasons for more limited infrastructure sharing—factors which are addressed in more detail later in this report. As discussed later, only eight countries in LAC have seen some kind of infrastructure sharing. This causes the deployment costs for operators to be higher than in other regions where sharing is more widespread, making it even more difficult to provide service in rural or hard-to-reach areas.

Several common technical and commercial infrastructure-sharing models have emerged, within the telecom sector as well as across different sectors. These include:

- **Telecom operator consortia** where a group of operators share the costs and ownership of a common asset, such as a fiber cable. This model is most common in undersea cables but is also found in terrestrial cable deployments. The model may include partial government ownership and mechanisms to support open access for smaller operators.
- **Specialized wholesale telecom operators including dark-fiber operators,** whose customers are in effect sharing the costs and use of the infrastructure provided by the wholesaler. Normally these wholesale operators do not sell services to the end user, but where local loop unbundling of the access network has taken place the original owner of the local loop acts as wholesale provider to other retail operators, while often competing with them. Shared wholesale wireless networks are now also increasingly being deployed. These range from a variety of municipal networks to some national Long-Term Evolution (LTE) services such as Red Compartida in Mexico and Olleh Rwanda Networks (ORN) in Rwanda, and to national, regional, and global hotspot providers which lease their networks of Wi-Fi hotspots to other operators for their wireless roaming services.
- **National power utilities** are probably the most common form of shared cross-sectoral or "alternative" infrastructure due to the electric power utilities' own fiber needs for administering the supply of power over the grid. Where excess fibers are available on existing high-tension grids, this can provide ready infrastructure for the deployment of telecom networks. Using the power grid's poles and pylons also provides a secure platform for rapid and low-cost fiber cable deployment.[9]
- **Roads, rail lines, and pipelines carrying fuel, water, and sewage** can all be effective hosts for ducts for telecom operators wanting to extend their fiber networks. When

[9] High-tension power grids in particular are by their nature unlikely to be vandalized or subject to cable theft due to the inherent danger.

ducts and fiber are planned into any new infrastructure, this can dramatically cut the cost of the deployment of networks by taking advantage of the construction works. Most of the cost lies in the civil works to lay the cable. This model extends to new building construction, such as in all new residential developments and commercial/public construction, which are increasingly subject to conduit installation requirements. Planning for provision of ducts in other major civil works, such as ports, airports, and bridges, is also an important opportunity for reducing costs of fiber deployment.

- **Mobile networks** have historically been proactive in use of sharing opportunities: from simple site sharing and tower sharing to full Radio Access Network (RAN) sharing, mobile operators have in parallel developed commercial options such as Mobile Virtual Network Operators (MVNOs), joint ventures, or tower companies to manage risks and benefits.

While sharing infrastructure can substantially reduce both the cost of equipment and the cost of civil works to deploy networks, the use of existing alternative/passive infrastructure also solves one of the primary problems faced by operators wishing to deploy networks: limited access to rights-of-way. Purchasing or leasing land and obtaining permits to dig are often among the most time-consuming and expensive components of new telecom network deployment. This can make it particularly difficult for new entrants to the market to compete with existing, usually state-owned, operators, which often have easier access to public land and state-supported rights-of-way, especially when they first deployed their networks.

Thus, support for infrastructure sharing is considered an integral part of improving the market environment, fostering greater competition in the sector, and supporting the model to increase coverage in unserved regions (dispersed and rural) that otherwise are not profitable.

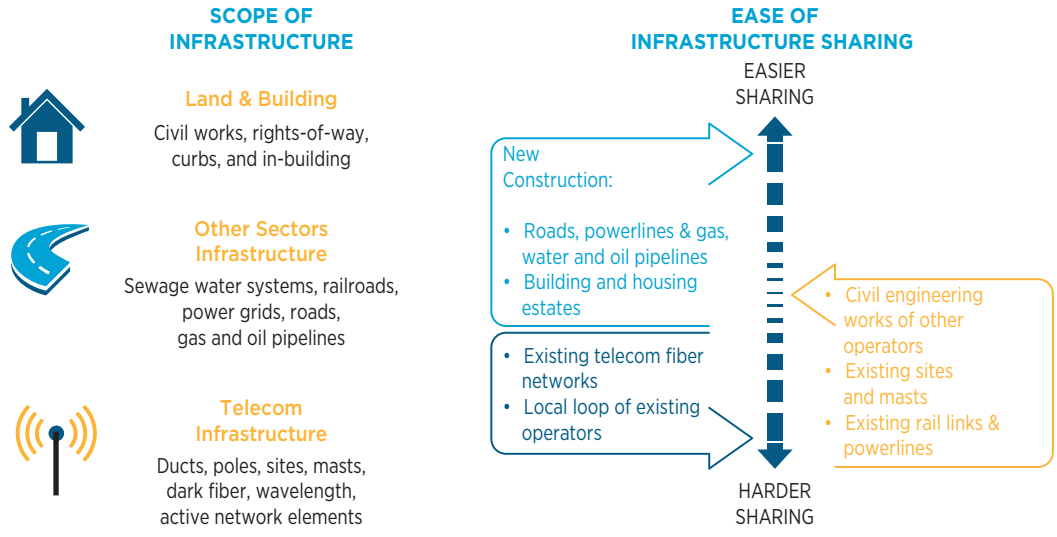
National geospatial record tracking and management systems and intra-governmental coordination also need to be in place to realize the full potential of infrastructure sharing across various sectors. By ensuring effective planning, buildouts can be synchronized and carried out more efficiently while minimizing the risk of cable cuts to other fiber operators.

Infrastructure sharing is usually driven by two different factors:

i. Economic interest, which encourages operators to collaborate and/or to use alternative infrastructure due to the potential cost savings and accelerated time to market.
ii. Regulatory requirements, where regulators seek to address imbalances in the market resulting from the power of dominant operators, and/or to require more efficient use of public resources such as land and radio spectrum, and/or to require or compensate the operators of alternative infrastructure to help ensure they make provisions to share among telecommunications operators.

FIGURE 1.2

SCOPE AND EASE OF INFRASTRUCTURE SHARING



Source: Authors' elaboration based on various publications.

In developed economies, regulators have been increasingly supporting and incentivizing such sharing agreements, such as the U.S. Federal Communications Commission (FCC) passing a regulation on pole sharing as early as 1978 (OFCOM/CSMG, 2010). In Europe, the EC has recommended the adoption of legislation that relies on sharing to help accelerate investment in next-generation fixed networks (EC, 2013b). In Brazil, tower sharing is required when the towers are placed less than 500 meters from each other.[10]

Governments consider the wider benefits that infrastructure sharing provides with the technical and commercial models available. Operational and cost benefits determine the commercial structure that operators put in place. Meanwhile, potential economies of scale and scope that can increase the quality, coverage, and sustainability of the services, as well as mitigating environmental impacts, are some of the concerns to regulators and governments.

The economic benefits that infrastructure sharing can generate through the extension of broadband also often drive direct government involvement. For example, through a national broadband plan internet access is recognized as a fundamental accelerator of economic growth, leading to increases in productivity, potentially enhancing education impacts and improving healthcare outcomes, among many others.

[10] Law 11934/2009, Brazil (https://www.anatel.gov.br/legislacao/leis/426-lei-11934).

1.3 Demand Forecast and Benefits from Sharing

In an increasingly digitalized society, it is no longer enough for users just to be connected; they must have a quality connection that allows access to content almost immediately and at the most affordable price possible. The trends in services for different types of users require quality digital connectivity, which involves investments in both CAPEX and OPEX and the permanent revision of business models.

Indeed, according to estimates by the Global System for Mobile Communications Association (GSMA), the growth of mobile data during the 2015–2020 period was estimated to reach 53 percent per year worldwide and 21 percent in Latin America.[11]

In the case of virtually all telecommunications services, in addition to facing saturation due to the increasing traffic volume, increased market competition is introducing significant reductions in average revenue per user (ARPU), which can eventually lead to a concern about the sustainability of the investment levels necessary to maintain the quality of service. According to Cullen International, it is estimated that it is necessary to maintain a level of infrastructure investment of approximately 20 percent of annual revenues.[12]

The increasing demand of internet access has enabled not just innovation in devices and applications, but also the emergence of new modalities of service provision and business models. According to Analysys Mason, there are several factors that explain the behavior of end users, as can be seen in Table 1.2.

1.3.1 Penetration

This section will highlight key aspects related to broadband such as penetration and affordability of fixed and mobile broadband services.

As shown in Figure 1.3, the penetration of broadband lines, especially fixed lines, shows a gap between the Inter-American Development Bank (IDB) region and that of the Organisation for Economic Co-operation and Development (OECD).

The average of the IDB borrowing countries is lower for both cases, fixed and mobile broadband. Most IDB countries are below the average penetration rate.

1.3.2 Affordability

Focusing the analysis on the affordability of these services, the comparison between LAC and OECD is reflected in Figure 1.4.

The Broadband Development Index (BDI) includes the affordability of mobile and fixed broadband as indicators and measures them as the percentage of average per capita income for fixed or mobile service rates respectively. In 2016, the International Telecommunication

[11] https://www.gsmaintelligence.com/.
[12] https://www.cullen-international.com/studies.html.

TABLE 1.2

TRENDS IN THE BEHAVIOR OF END USERS OF DIGITAL INFRASTRUCTURE

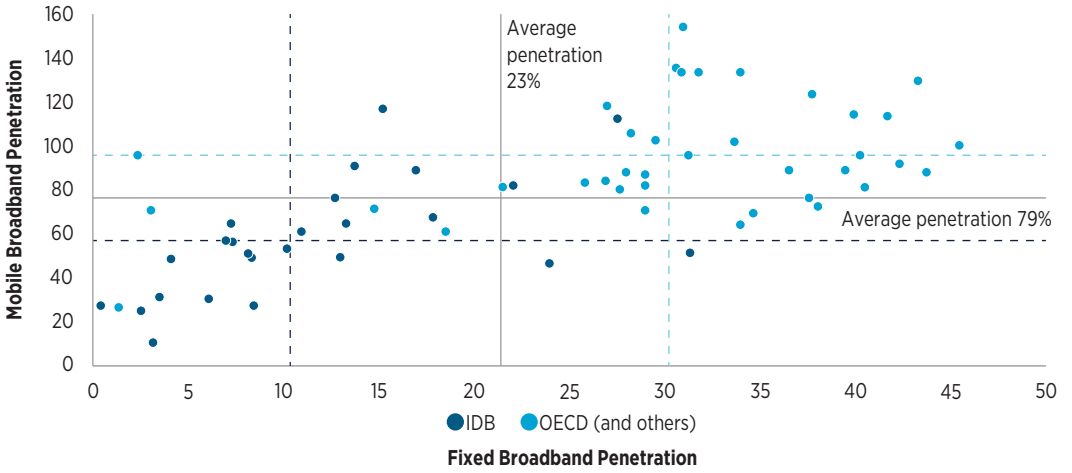
Factors	Description
Evolution of mono-media communications to multi-media communications	Technological evolution and convergence have enabled the emergence of applications capable of managing different data flows (e.g., voice, audio, video, messages) as users choose
Evolution of one-on-one communications to group communications	The simplicity to form closed user groups according to relationships and affinities gives a greater degree of flexibility, efficiency, and richness of interaction to users than in individual communications
Emergence, accelerated expansion, and consolidation of online service platforms of global scale	The emergence of such platforms (e.g., Facebook, Google, Microsoft) benefits from economies of scale, and they manage to transcend geographical boundaries and "classical fragmentation" by country in the communications industry
Interaction and integration between mobile applications	Communications on devices—primarily smartphones—provide a rich user experience through "multi-task" interaction and integration between applications
Focus on obtaining user engagement, not just revenue	Relevance of user engagement (make them loyal users, get them to connect more frequently, generate regular consumption), over the volume of consumption. The struggle is to attract a greater share of users' attention and time, not just generate direct income.
User empowerment	Increase in the perception of freedom of choice (e.g., device, supplier, application) by the consumer, based on multiple criteria (e.g., location, communication recipient, sensitivity to spending)
Evolution of conversations and private content to areas of exposure and public sharing of information	There are new models that sacrifice the privacy of user data, promoting an active sharing of information (messages, audios, videos) or inviting users to register private information that may later be used for advertising or similar exploitation. This is a strong contrast to the privacy standards of traditional communication platforms.

Source: Analysys Mason (2020).

Union (ITU) established 5 percent as the target threshold above which broadband is not considered affordable for the user, with a value below 3 percent recommended to favor adoption. The United Nations Broadband Commission, in its new goals for 2025, has reduced the threshold of affordability of broadband services from less than 5 percent to less than 2 percent of gross national income per capita per month. The region is still very far behind the OECD countries, which are in most cases below the thresholds that are established by ITU.

FIGURE 1.3

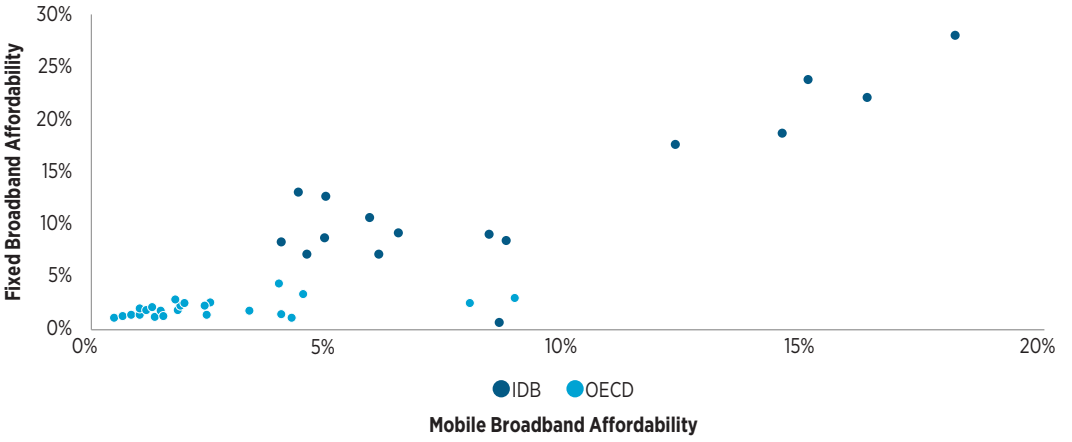
BROADBAND PENETRATION RATE



Source: ITU (2018).

FIGURE 1.4

AFFORDABILITY OF BROADBAND SERVICES



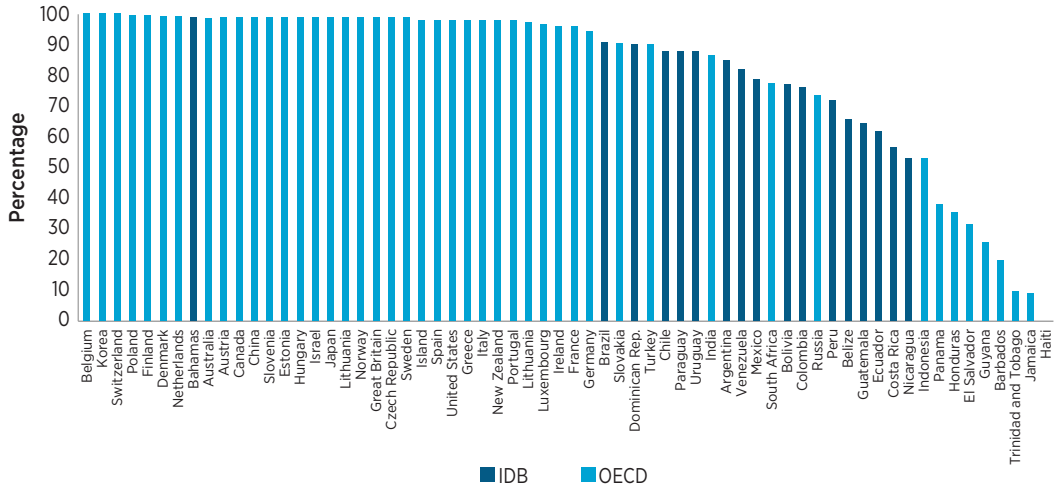
Source: ITU (2018).

1.3.3 Coverage

The current status of the countries under analysis is as shown in Figure 1.5. As can be seen, most IDB member countries are lagging behind European countries.

FIGURE 1.5

4G COVERAGE



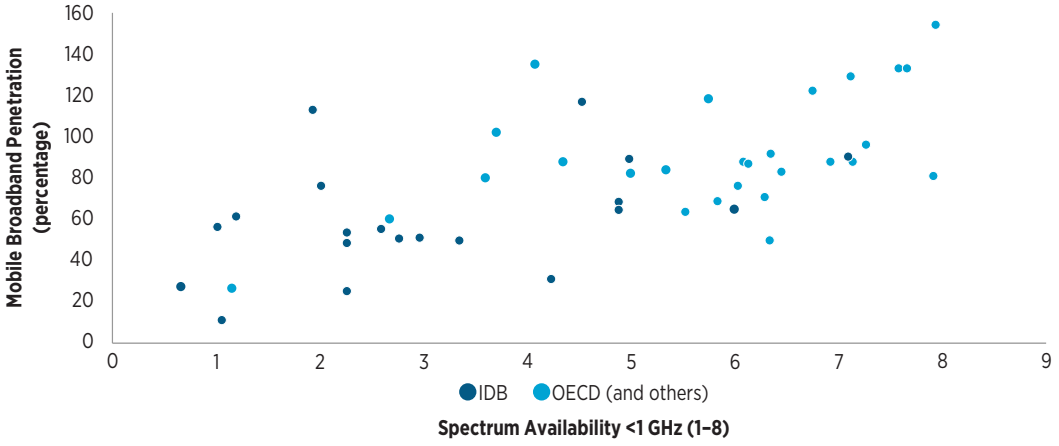
Source: GSMA (2018).

1.3.4 Spectrum

The shortage of and problems with bidding for new spectrum bands limit the ability of operators to expand their networks, increasing deployment costs and limiting the use of new technologies. Figure 1.6 shows the relationship between spectrum availability

FIGURE 1.6

SPECTRUM AVAILABILITY AND MOBILE BROADBAND DEVELOPMENT



Source: García Zaballos and Iglesias Rodríguez (2019).

and penetration of mobile broadband services in countries where the spectrum is below 1GHz.

Figure 1.6 shows a correlation between both indicators, which reveals the importance of promoting plans and mechanisms that allow efficient spectrum management. Some challenges in spectrum management were identified in the region:

- Identify and tender new spectrum bands for the development of 5G.
- Analyze the spectrum for the deployment of Internet of Things (IoT) networks.
- Expand the spectrum in low bands available for mobile communications (700, 800 MHz).

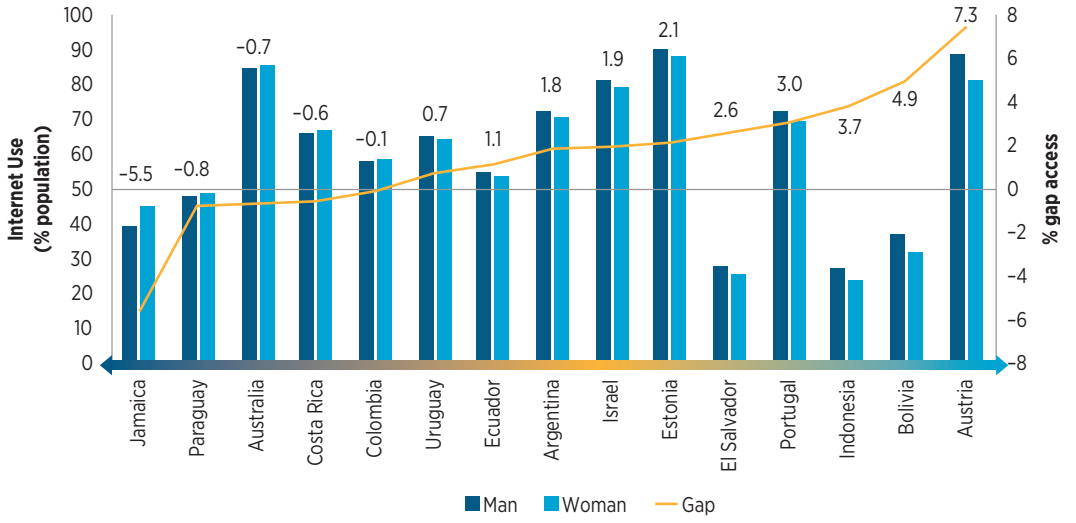
1.3.5 Gender Equality

To complete the analysis of relevant indicators, the existing gender differences in the use of internet and broadband are described. Figure 1.7 shows the differences for some countries in the use of the internet.

The position of the countries of the region around the possible gender gap in internet access reflects similar behavior to developed countries with very high levels of internet access equality. The gap between the access of men and women to the internet does not exceed 10 percent in any case.

FIGURE 1.7

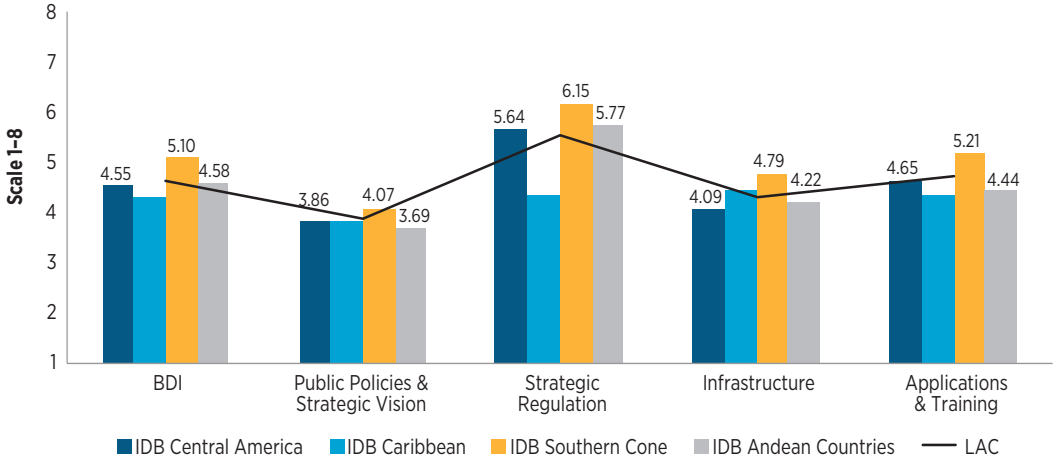
GENDER EQUALITY IN INTERNET ACCESS



Source: ITU (2018).

FIGURE 1.8

COMPARISON OF INDICATORS BETWEEN LAC CLUSTERS



Source: García Zaballos and Iglesias Rodríguez (2019).

1.3.6 Comparison between the LAC Regions

Figure 1.8 shows the sub-indexes of the pillars for the four main clusters under study. To complete the information, the linear graph is added indicating the value reached by the 26 LAC countries grouped in each dimension.

There is a certain uniformity in the four key action points and in the four regions. The IDB Southern Cone cluster stands out in all the pillars. The Caribbean cluster has the worst position in the general index, but in terms of Public Policies & Strategic Vision and Infrastructure it obtains a better score than the Andean Countries cluster.

On the other hand, the Infrastructure pillar continues to appear as one of the pillars in which further development is required, along with the Public Policies & Strategic Vision pillar. On the contrary, Strategic Regulation stands out as having the best results in all cases.

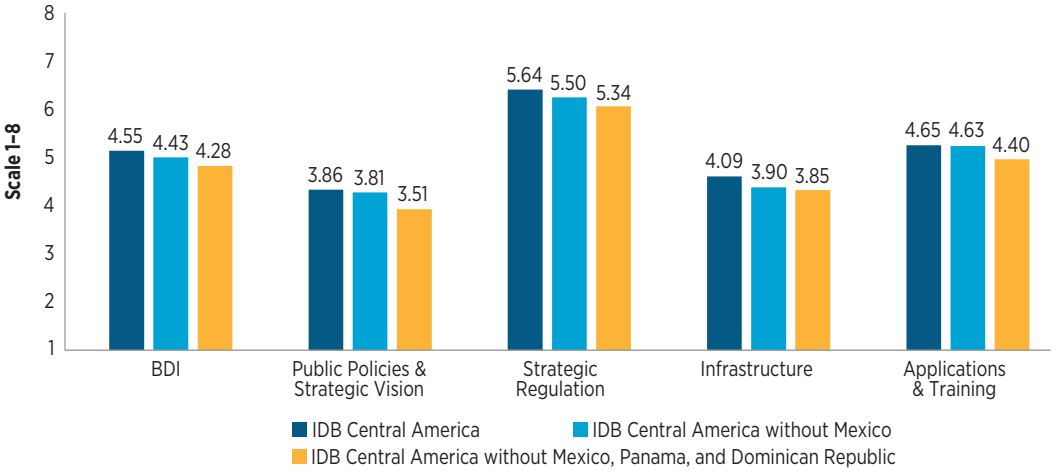
Figure 1.9 shows the variations referred to earlier when talking about the creation of two new sub-clusters in the Central American region. The reduction in the values for the region is observed when excluding Mexico, Panama, and the Dominican Republic.

The results show the weakness, especially in the Infrastructure pillar, of the Central American region formed by Guatemala, El Salvador, Honduras, Nicaragua, Belize, and Costa Rica (although this last country is undoubtedly the best performer, in general aspects, within the Index).

The object of study is also to define and analyze which pillar is strongest and which is the weakest—that is, the pillars that have the highest and lowest values within each

FIGURE 1.9

COMPARISON OF INDICATORS IN CENTRAL AMERICA

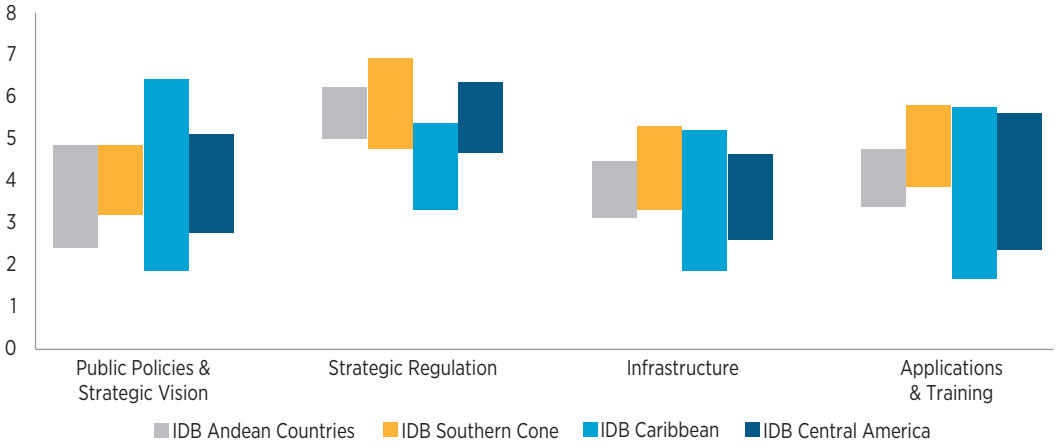


Source: García Zaballos and Iglesias Rodríguez (2019).

cluster. Figure 1.10 shows the range of values obtained by the countries that make up each cluster for each of the pillars. A big difference between the countries with the best score and the worst score was observed, except in the Public Policies & Strategic Vision pillar. This difference occurs mainly in the Caribbean and Central America regions.

FIGURE 1.10

SCORE RANGE IN LAC CLUSTERS



Source: García Zaballos and Iglesias Rodríguez (2019).

In the case of the Caribbean, this difference is based on the composition of the cluster, which includes both Barbados and Haiti: Barbados reaches very high values in most of the pillars as one of the top-ranking countries. On the contrary, Haiti is the most lagging country in the IDB region.

In Central America, the situation in Panama and Costa Rica contrasts with that of other countries such as Guatemala or Belize in terms of economic development and broadband development, which is reflected in the Index scores.

CHAPTER 2

Participation of Public Services Operators

The participation of utilities such as gas, transport, and electricity companies in infrastructure-sharing activities is usually driven by two factors: external pressures and internal drivers.

2.1 External Pressure: Government or Regulator

Countries that have clear strategic objectives for broadband development usually realize infrastructure sharing's potential in helping them to achieve their goals. They do so by formulating appropriate policies that encourage or mandate infrastructure sharing. Utilities are frequently covered under the scope of such policies, as typically they already have extensive passive infrastructure or privileged rights-of-way (ROW) for building new structures, which makes deployment much faster and may reduce installation costs significantly.

Furthermore, utilities, especially electricity companies, are not newcomers in deploying communication networks, which they need for internal operations. For example, transmission system operators (TSOs) use information and communication technology (ICT) for process monitoring, grid management, automatic emergency shutdown, maintenance and security systems, internal communications, data transfer and storage, billing, and corporate information technology (IT) networks. Since fiber optics are a prevalent data transport technology to electric power operators, telecom operators can share the existing electric utilities' fiber-optic infrastructure while optimizing their networks and saving the cost of deploying new ones. A number of utilities around the world are stepping in to fill the gaps left by telecom players (Macmillan Keck and Columbia Center on Sustainable

Investment, 2017). Electric utilities are therefore well positioned to play a complementary role in national fiber network development.

2.2 Internal Drivers: Cost and Revenue Optimization

Utilities, particularly the electricity sector, are facing the challenge of declining revenue as electricity consumption flattens due to increasing energy efficiency, more distributed generation, and less energy-intensive industries. The revenue diversification offered by infrastructure sharing thus becomes an attractive option. In mature markets, a utility could make up to 20 percent of its revenue from infrastructure sharing, depending on the chosen business model (Macmillan Keck and Columbia Center on Sustainable Investment, 2017).

The variety of services may range from dark fiber service provisioning to data transport in the wholesale market or the provision of final broadband services on a retail level. Retail business models are richer in revenue contribution but not necessarily in profits (Macmillan Keck and Columbia Center on Sustainable Investment, 2017), which is a possible reason why utilities prefer to be engaged as wholesale-only providers. For example, North power Limited, an electricity company operating in New Zealand, has implemented the active wholesale model for its Ultrafast Fiber and now has more than 45 service providers on its networks. Open Fiber in Italy owned by Enel Group seems to follow the same approach (Macmillan Keck and Columbia Center on Sustainable Investment, 2017).

Moreover, some experts (Godlovitch and Gantumur, 2018) think that wholesale-only business has great potential, as the availability of dark fiber will become even more critical for mobile operators when 5G technologies are deployed. The 5G systems use higher frequencies with a lower propagation range and therefore require a build-out of base stations, additional to the 3G/4G ones already in place, especially in densely populated areas. Since 5G base stations have a much higher capacity, they will require the deployment of additional fiber—90 percent more than today's networks (Godlovitch and Gantumur, 2018).

In sum, infrastructure sharing may result in a "win-win" situation, where society and government win by saving public funds and avoiding the unnecessary duplication of infrastructure. The utilities win by lowering the cost of installing infrastructure they will need anyway, and telecom operators win by optimizing their networks and concentrating their investments on "last mile" access, retail operations, and greater customer satisfaction, while limiting their upfront investments in fiber deployment.

Of course, what looks good on paper usually faces challenges in the real world. Utilities and telecom operators have different approaches to network planning, use different vendors, and manage their networks differently. Sharing their infrastructure requires delicate planning to ensure that their partnership is sustainable and acceptable to all parties (Paolini, 2010). Utilities often lack enough telecom capabilities in terms of human resources and expertise, not only in planning, design, construction, operations, and

maintenance but also in commercial activities. Simply put, utilities often lack personnel who understand how to monetize excess capacity, and they also often face their own specific challenges, such as safety requirements for installing fiber networks with minimum interruptions to their core business (Faggiano et al., 2017). Finally, utilities first have to comply with the requirements and regulations of their sector, for example, the approval of investment plans by the energy regulator in order to ensure that their primary service—electricity—remains affordable. These challenges often make utilities reluctant to engage in infrastructure-sharing activities.

CHAPTER 3

Existing Maps of Digital Infrastructure

Tables 3.1 and 3.2 show the amounts invested in telecom infrastructure by 12 countries in the region according to recent studies, disaggregated between fixed and mobile as well as between public and private.

The inventory of existing infrastructure that can be used for the deployment of new telecommunications networks is a fundamental step in enabling new forms of sharing. This section analyzes the state of the electrical infrastructure in four selected countries, the opportunities for sharing, and a brief diagnosis of the telecommunications sector.

3.1 Prioritization of Countries

In order to obtain conclusions applicable to the entire region, a prioritization of countries on which to carry out this analysis has been made. The following criteria were used for this prioritization:

- **Regionality:** One objective was to include a country from each of the regions into which the borrowing countries of the IDB are divided.
- **Degree of development of digital infrastructure:** Those countries with less infrastructure development have been prioritized. To measure this factor, the Infrastructure pillar of the Broadband Development Index (BDI) published periodically by the IDB was used.
- **Available information:** The degree of information available for each country was evaluated, including information published by regulators as well as other information available in previously conducted studies.

TABLE 3.1

ACCUMULATED TELECOM INVESTMENT IN THE 12 COUNTRIES STUDIED

	Investment (2008–2017, in millions of US$)				
Country	Fixed	Mobile	Public	Private	Total
Argentina	18,092	10,505	5,484	23,113	28,597
Bolivia	688	1,804	1,206	1,286	2,492
Chile	4,429	10,556	150	14,835	14,985
Colombia	8,496	11,682	3,778	16,400	20,178
Costa Rica	2,821	1,860	2,879	1,802	4,681
Ecuador	3,983	3,704	1,461	6,226	7,687
Guatemala	1,998	3,397	5	5,389	5,394
Honduras	1,934	1,520	15	3,439	3,454
Mexico	30,618	17,407	9,127	38,897	48,025
Panama	2,241	2,317	866	3,692	4,558
Peru	2,529	9,525	253	11,801	12,054
Suriname	190	181	71	301	371

Source: García Zaballos, Iglesias Rodríguez, and Adamowicz (2019).

TABLE 3.2

ACCUMULATED TELECOM INVESTMENT PER CAPITA IN THE 12 COUNTRIES STUDIED

	Investment (2008–2017, in millions of US$)				
Country	Fixed	Mobile	Public	Private	Total
Argentina	425	247	129	543	672
Bolivia	66	172	115	123	238
Chile	256	605	9	853	861
Colombia	180	248	80	348	428
Costa Rica	604	391	612	384	996
Ecuador	254	237	93	398	491
Guatemala	129	219	0,3	348	348
Honduras	224	177	2	398	400
Mexico	252	143	75	320	395
Panama	609	605	231	983	1,214
Peru	83	309	8	384	392
Suriname	355	334	131	558	689

Source: García Zaballos, Iglesias Rodríguez, and Adamowicz (2019).

- **IDB priority:** Each country's level of priority in the IDB's operational agenda in reference to digital infrastructure issues. This categorization was designated as low (1), medium (2), or high (3) based on a survey conducted with IDB specialists.

Based on these criteria, the results of the prioritization are as shown in Table 3.3.

TABLE 3.3

COUNTRY PRIORITIZATION

Country	Region	BDI-Infra	Information (1–3)	IDB Priority (1–3)	Score
Honduras	**Central America**	**3.16**	**3**	**3**	**5.41**
Guatemala	Central America	2.61	2	3	4.51
El Salvador	Central America	3.33	2	3	4.38
Ecuador	**Andean Countries**	**4.16**	**2**	**3**	**4.22**
Paraguay	**Southern Cone**	**3.34**	**2**	**2**	**3.37**
Dominican Republic	**Caribbean**	**4.06**	**2**	**2**	**3.24**
Bolivia	Andean Countries	4.07	2	2	3.24
Mexico	North America	4.43	2	2	3.17
Chile	Southern Cone	5.34	2	2	3.00
Guyana	Caribbean	2.78	1	2	2.48
Nicaragua	Central America	3.30	1	2	2.38
Jamaica	Caribbean	3.66	1	2	2.31
Panama	Central America	3.96	1	2	2.26
Peru	Andean Countries	4.25	1	2	2.20
Haiti	Caribbean	1.87	1	1	1.65
Suriname	Caribbean	3.00	1	1	1.44
Venezuela	Andean Countries	3.13	1	1	1.41
Belize	Central America	4.15	1	1	1.22
Colombia	Andean Countries	4.48	1	1	1.16
Uruguay	Southern Cone	4.52	1	1	1.15
Costa Rica	Central America	4.65	1	1	1.13
Brazil	Southern Cone	4.82	1	1	1.10
Argentina	Southern Cone	4.87	1	1	1.09
Barbados	Caribbean	4.93	1	1	1.08
Bahamas	Caribbean	5.01	1	1	1.06
Trinidad and Tobago	Caribbean	5.24	1	1	1.02

Based on this prioritization, and considering the selection of different regions, the countries of Honduras, Ecuador, Paraguay, and the Dominican Republic were selected for this study. The main findings for each of these countries are detailed in the following sections.

3.1.1 Honduras

3.1.1.1 Key Actors

In Honduras the main actors are:

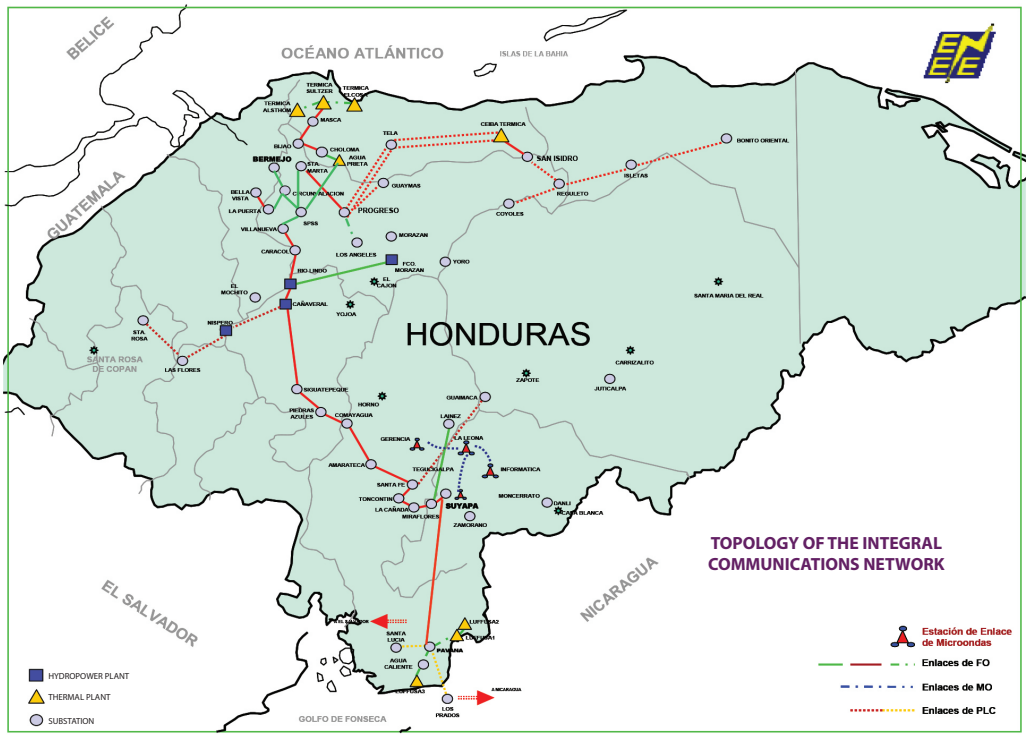
- **Electricity transmission and distribution network operators:**
  - *ENEE (transmission and distribution):* ENEE is the National Electric Power Company, established in 1957 as an autonomous body responsible for the production, marketing, transmission, and distribution of electric energy in Honduras. With its creation, the aim was to achieve national electrification, based on the use of the country's natural resources and taking advantage of the benefits of economies of scale.
  - The Cañaveral Hydroelectric Power Plant was its first large-scale project and included the construction of transmission lines and substations to distribute the energy generated in the plant to consumers. With this, what is now the Interconnected System of Electricity Transmission began at the national level, covering the main regions of the country.
  - Currently the company has about 4,725 employees, which indicates that the ENEE is a significant source of jobs in the country.
- **Telecommunications regulator:**
  - *CONATEL Honduras:* CONATEL is the National Telecommunications Commission, created in 1995 in Tegucigalpa when the Framework Law of the Telecommunications Sector came into effect, as a state entity to regulate and coordinate the national market for telecommunications in Honduras. Currently, it is the authority that is responsible for administering, developing, and democratizing the sector, as well as promoting private investment, in order to achieve universal coverage and reduce the digital divide, promoting competition, social inclusion, and quality of services.
- **Power regulator:**
  - *CNE Honduras:* The CNE is the National Energy Commission, responsible for regulating and supervising the activities of the Honduran electricity sub-sector, promoting the competitiveness of the activities of generation, transmission, distribution, and commercialization of electric energy in order to develop and modernize the national and regional electricity market.

3.1.1.2 Electrical Infrastructure Maps

Figures 3.1 and 3.2 show the maps obtained referring to the electrical system.

FIGURE 3.1

MAP OF THE TRANSMISSION NETWORK AND COMMUNICATION LINKS IN HONDURAS



Source: ENEE.

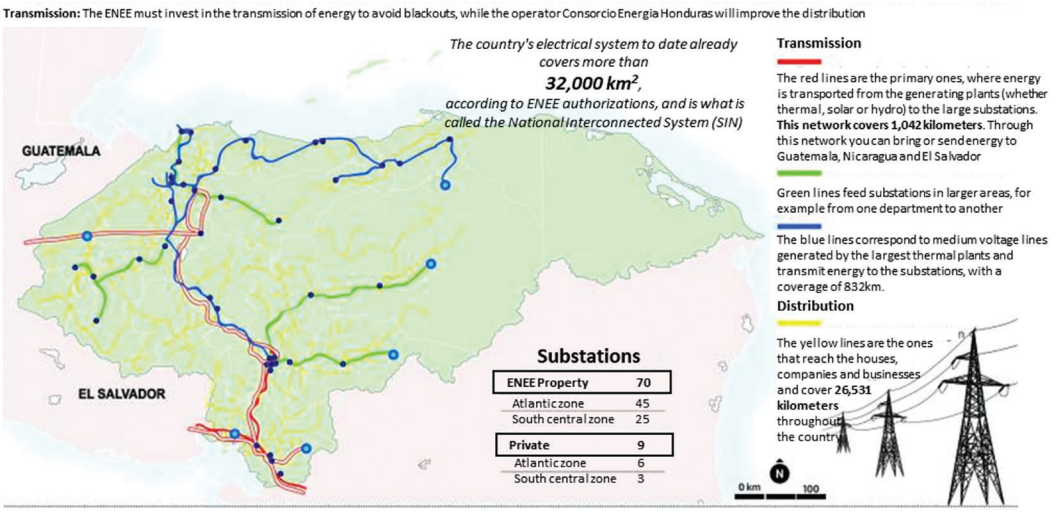
3.1.1.3 Status of Infrastructure Sharing

According to information published by CONATEL, the Framework Law of the Telecommunications Sector (LMST) establishes within the powers of CONATEL: to adopt the necessary measures so that telecommunications services are provided efficiently, uninterruptedly, without interference, and without discrimination, ensuring that telecommunications network operators give equal access to other operators and users who are in the same or similar circumstances.

Article 36 of the LMST also explicitly states that "the operators of public telecommunications services, for the sole purpose of this Law, will have the right of servitude over national and private real estate that are necessary for the establishment of the corresponding networks." Also, the General Regulation of the LMST in Title I Chapter II, Title III Chapters VIII and IX, develops the corresponding "Telecommunications Networks and Services," "Access and Interconnection of Public Telecommunications Networks," and "Servitudes and Use of Goods."

FIGURE 3.2

MAP OF THE NATIONAL INTERCONNECTED SYSTEM OF ELECTRICITY IN HONDURAS



Source: ENEE.

Through resolution NR016/14 (July 2014), CONATEL established the Regulation of Access and Shared Use of Networks to promote:

- The efficient use of infrastructure, as well as promoting greater competition in the public telecommunications services market, and
- The orderly growth of infrastructures for the provision of public telecommunications services shall be promoted in order to mitigate visual pollution and promote the rational use of public space.

This regulation was challenged at the administrative level (CONATEL) and in the courts by the mobile operators, who they claimed that it possessed expropriatory elements making "public" the "private" infrastructures. It should also be noted that:

- Additionally, according to the operators, the regulation included elements already regulated in the Interconnection Regulations (wholesale telephony market).
- Another allegation was that it did not correctly define the infrastructure to be shared, allowing for the incorporation of both passive and active elements.

On these aspects, CONATEL determined in 2016 to carry out a revision of said regulation, incorporating more modern elements and making the necessary corrections so that it would be better accepted by the operators.

Among the relevant aspects of the new regulatory proposal we can mention the following:

- Definition of procedures and time periods for the free negotiation stage. The methodology to be followed is indicated if there are access denials.
- Definition of procedures and time periods for the regulatory intervention stage.
- The sharing obligation applies to both operators and telecommunications network providers.
- The sharing obligation applies to both those who hold substantial market power and others who have essential resources.
- Active sharing is included by incorporating the possibility of national roaming in order to facilitate the entry of new actors.

In addition, the basic access offer (OBA) is established, sufficiently disaggregated and including technical, economic, and legal conditions:

- Obligations of access to the copper network
- Access to facilities (electric power, backup systems, air-conditioning, monitoring)
- Access to civil works infrastructure
- Bitstream over fiber
- National roaming services for mobile networks
- Obligation to deliver information

3.1.2 Ecuador

3.1.2.1 Key Actors

In Ecuador the main actors are:

- **Electricity transmission and distribution network operators:**
  - *CELEC (transmission):* CELEC EP is the Electrical Corporation of Ecuador, whose purpose is the provision of electric service that must follow these principles: mandatory, generality, uniformity, responsibility, universality, accessibility, regularity, continuity, and quality. CELEC EP was created in 2010 and represents 61 percent of national consumption.
  - *CNEL (distribution):* CNEL EP is the largest electricity distribution and marketing company in Ecuador and was founded in 2013. The purpose of the company is to provide public services for distribution and commercialization of electric energy. Currently, CNEL EP is the fourth-largest company in the country by income. With its service it covers 44.5 percent of the national territory and provides 50 percent of the Ecuadorian population with electricity.

- **Telecommunications regulator:**
  - *ARCOTEL:* The Telecommunications Regulation and Control Agency (ARCOTEL) is the entity responsible for the administration, regulation, and control of telecommunications and the radio spectrum and its management, as well as the technical aspects of media management of social communication that use frequencies of the radio spectrum or that install and operate networks. The Organic Telecommunications Law was enacted in 2015 and with it the creation of ARCOTEL was mandated.
- **Power regulator:**
  - *ARCONEL:* The Electricity Regulation and Control Agency (ARCONEL) is the administrative technical agency responsible for regulating and controlling the activities related to the public services of electric power and general public lighting. Under the control of the Ministry of Electricity and Renewable Energy, ARCONEL contributes to the sustainable development of the strategic electricity sector, protecting the interests of the consumer or end user. This agency was created in 2015 through the approval of the Organic Law of the Electric Power Public Service.

3.1.2.2 Electrical Infrastructure Maps

Figure 3.3 shows the map obtained referring to the electrical system. Also, CELEC publishes a map of the fiber-optic network enabled on this network, shown in Figure 3.4.

3.1.2.3 Status of Infrastructure Sharing

ARCOTEL requires access to all the infrastructure necessary to provide telecommunications services. Two sets of rules were established in this context:

- Telecommunications operators: mandatory sharing (ARCOTEL Resolution 807 of September 2017).
- Infrastructure operators and other non-telecommunications operators: mandatory sharing if it is technically feasible and capacity is available (Resolution 806 of September 2017).

Ministerial Agreement No. 017–2017 establishes the parameters, variables, methodology, and amount of compensation for the use of ducts and poles, which allows the installation of telecommunications networks. The maximum calculated costs are as follows:

- Ducts: US$3.71 (per meter, annually)
- Poles: US$8.83 (per supplier, annually)

In addition, discounts are defined according to population zones, with Zone 1 having the highest density and Zone 3 the lowest density (see Table 3.4).

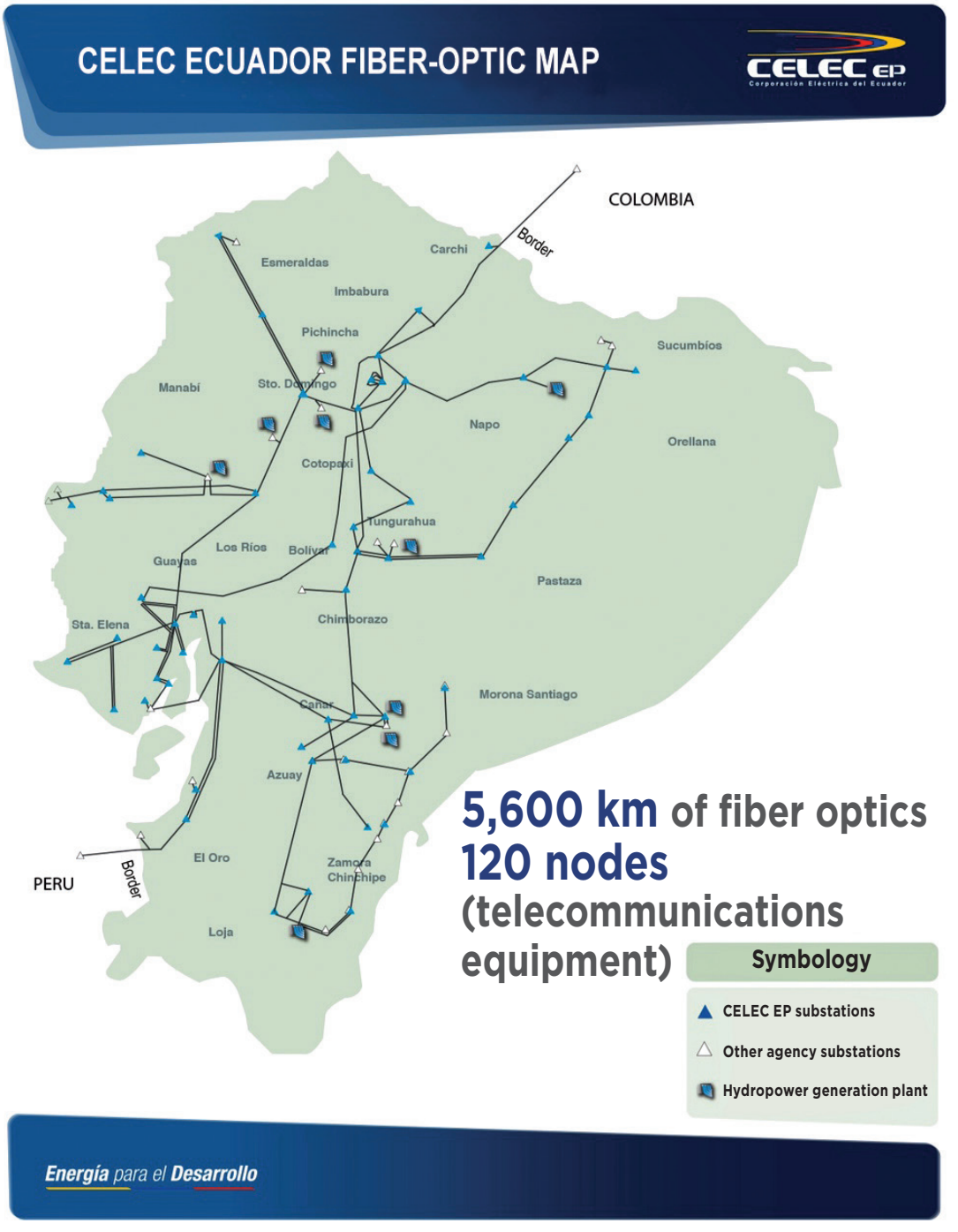
FIGURE 3.3

POWER TRANSMISSION NETWORK IN ECUADOR

Source: CELEC.

FIGURE 3.4

CELEC ECUADOR FIBER-OPTIC MAP



Source: CELEC.

TABLE 3.4

DISCOUNT RATE BY POPULATION ZONE (ECUADOR)

Zone	% Discount	Compensation
Zone 1	0	US$8.83
Zone 2	20	US$7.06
Zone 3	40	US$5.30

3.1.3. Paraguay

3.1.3.1 Key Actors

In Paraguay the main actors are:

- **Electricity transmission and distribution network operators:**
  - *ANDE (transmission and distribution):* The National Electricity Administration (ANDE) is an autonomous, decentralized institution of the public administration, of unlimited duration, with legal status and its own assets. It is the public company in charge of operating the electricity transmission and distribution system in the country. ANDE was created in 1949 and currently has more than 4,900 employees, making it one of the largest public institutions in Paraguay.
- **Telecommunications regulator:**
  - *CONATEL Paraguay:* The National Telecommunications Commission in Paraguay (CONATEL) is the state regulator responsible for promoting, controlling, and regulating telecommunications within the framework of an integrated policy of services, providers, users, technology, and industry, which contributes to the well-being of the inhabitants of the country. CONATEL was created in 1995.

3.1.3.2 Electrical Infrastructure Maps

Figure 3.5 shows the map obtained referring to the electrical system. ANDE also publishes a logical design of the available communications equipment, shown in Figure 3.6.

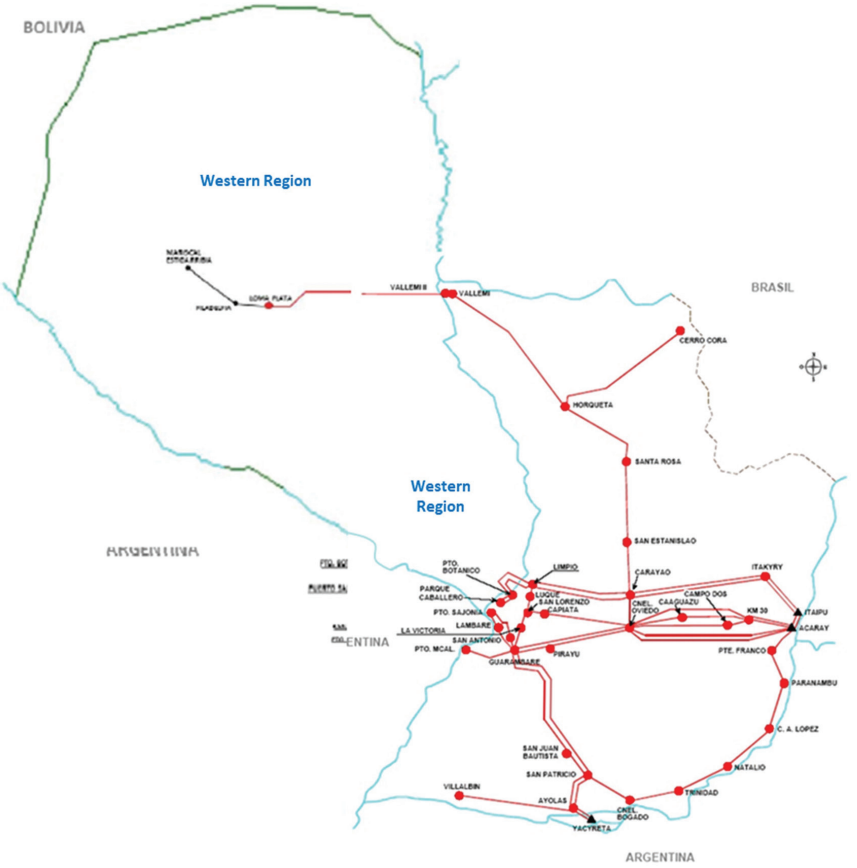
3.1.3.3 Status of Infrastructure Sharing

In 2002 CONATEL published the Interconnection Regulation (Resolution Nº871/2002), whose purpose is to establish the rules that govern the interconnection between the networks and services of the providers.

Under this regulation, dominant providers are obliged to offer the services of co-location, local transit, and use of ducts. The price at which these services are offered should be calculated from a model of long-term incremental costs.

FIGURE 3.5

MAP OF THE TRANSMISSION NETWORK IN PARAGUAY (ANDE)



Source: ANDE.

On the other hand, in 2018 the Ministry of Information and Communication Technology (MITIC) announced the creation of the National Fiber Optic Network (RNFO). This network aims to unify the public networks of the telecommunications operator (COPACO), the electric transmission operator (ANDE), and other state networks. RNFO, in addition to providing services to public institutions, could be an effective instrument to offer wholesale fiber-optic transport services and promote sharing among operators.

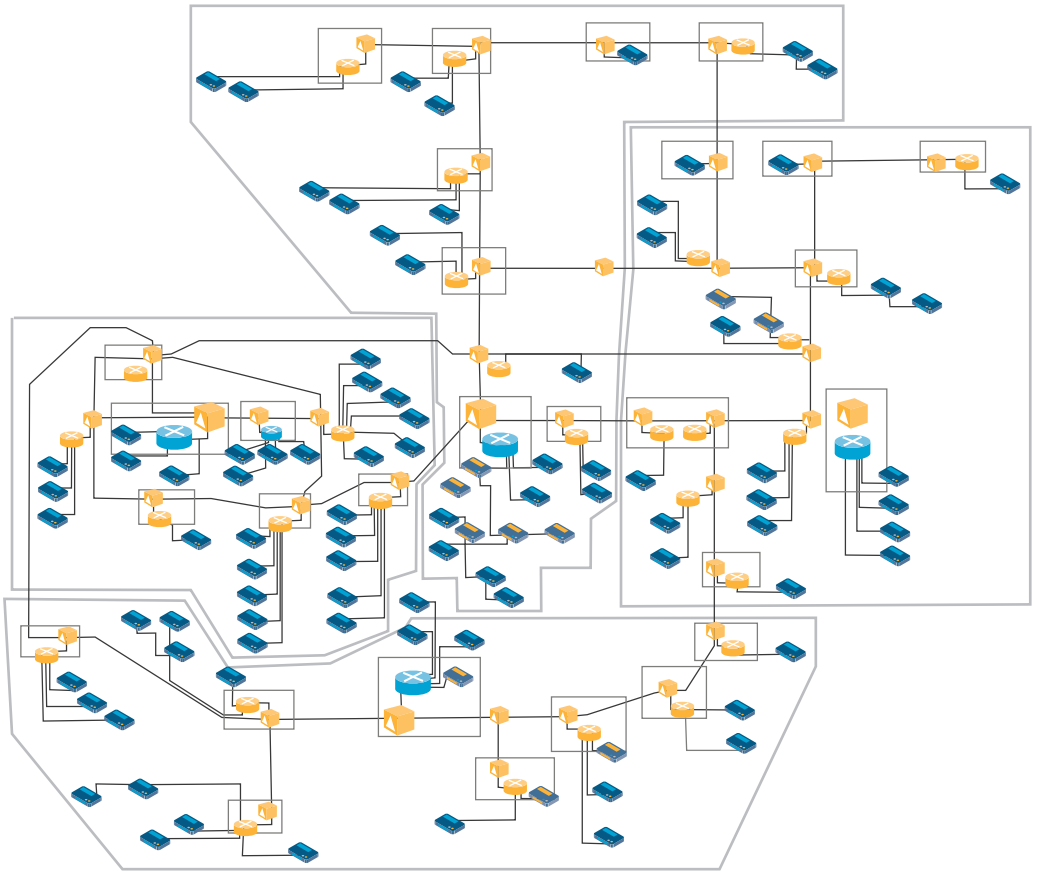
3.1.4 Dominican Republic

3.1.4.1 Key Actors

In the Dominican Republic the main actors are:

FIGURE 3.6

LOGICAL DIAGRAM OF COMMUNICATIONS EQUIPMENT (ANDE)



Source: ANDE.

- **Electricity transmission and distribution network operators:**
  - *ETED (transmission):* The Dominican Electricity Transmission Company (ETED) is a state-owned electric company in charge of operating the National Interconnected Electric System (SENI) whose mission is to provide high-voltage electric energy transportation services to all national territory. The company was created in 2008.
  - *EDENORTE Dominicana S.A.:* The North Electricity Distribution Company (EDENORTE) is responsible for the commercialization and distribution of electrical energy in the 14 provinces of the Northern Zone of the Dominican Republic: Santiago, La Vega, Duarte, Puerto Plata, Espaillat, María Trinidad Sánchez, Monseñor Nouel, Sánchez Ramírez, Valverde, Santiago Rodríguez, Montecristi, Samaná, Hermanas Mirabal, and Dajabón. EDENORTE was created in 1999.

- *EDESUR Dominicana S.A.:* This corporation is owned by the Dominican government through the Dominican Corporation of State Electric Companies (CDEEE). The company was created in 1997 in compliance with the General Law of Public Company Reform. EDESUR aims to distribute electricity in the south of the Dominican Republic. The provinces included in the geographical area are: part of the Santo Domingo province, with the municipality Santo Domingo Oeste and the National District, San Cristóbal, San José de Ocoa, Azua, San Juan de la Maguana, Elías Piña, Bahoruco, Independencia, Barahona, Pedernales, and Peravia.
- *EDEESTE S.A.:* The East Electricity Distribution Company (EDEESTE) is responsible for the distribution and commercialization of electricity from the east side of Máximo Gómez to the province of La Altagracia (Higüey), including Monte Plata and Santo Domingo Norte. EDEESTE serves more than 618,000 clients in a concession area that covers 11,700 km^2. The company was created in 1999 as part of the restructuring of the national electricity sector, established by the Law of Public Company Reform, under the capitalization modality. In 2009, the Government of the Dominican Republic assumed control of the company, formerly owned by Trust Company of the West.

- **Telecommunications regulator:**
  - *INDOTEL:* The Dominican Institute of Telecommunications (INDOTEL) is the autonomous regulatory body for telecommunications in the Dominican Republic. INDOTEL is responsible for regulating, supervising, and promoting the development of the local telecommunications market, guaranteeing the provision of services within the framework of free, fair, and effective competition. It was created under the General Telecommunications Law in 1998.
- **Power regulator:**
  - *CNE:* The National Energy Commission (CNE) is the institution responsible for promoting the sustainable development of the Dominican Republic's energy sector. It is also responsible for monitoring compliance with the Law on Incentive for the Development of Renewable Energies and their Special Regimes. The CNE was created through the General Electricity Law of 2001, which establishes the activities of the energy sector: Electric, Hydrocarbons, Alternate Sources, and Rational Use of Energy.

3.1.4.2 Electrical Infrastructure Maps

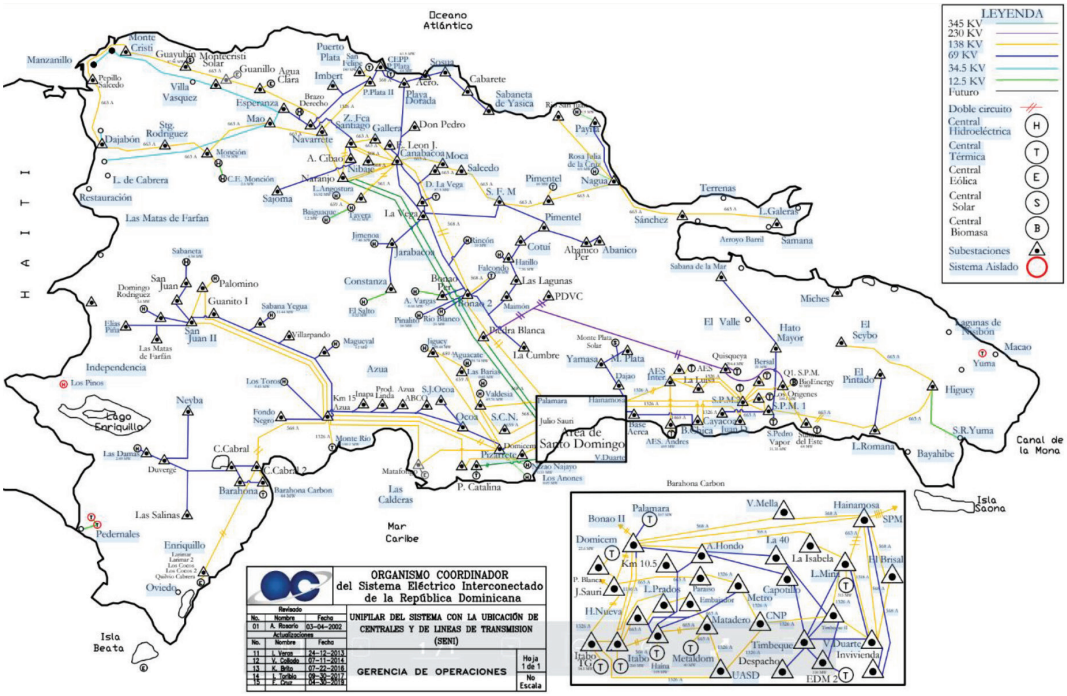
Figure 3.7 shows the map obtained referring to the electrical system.

3.1.4.3 Status of Infrastructure Sharing

The 2017 Alliance for Affordable Internet (A4AI) report on Shared Telecommunications Infrastructures in the Dominican Republic (Vidal, 2017) describes the situation of infrastructure sharing in the country. According to the study, the sharing of towers, energy,

FIGURE 3.7

MAP OF THE ELECTRICITY TRANSMISSION NETWORK IN THE DOMINICAN REPUBLIC



Source: Superintendent of Electricity of the Dominican Republic.

and physical space represents only 10 percent of the total towers, but most of the companies surveyed want to expand infrastructure sharing in order to reduce investment and operation costs. The report divides the analysis of the current infrastructure sharing into:

- **Pole sharing:** In general, the poles of the electricity distribution companies EDENORTE, EDEESTE, and EDESUR are used by the telecommunications and cable television companies that provide fixed broadband service, either with ADSL or with HFC, and in cases where it does not exist, they have their own poles to complement their network expansion needs.
- **Duct sharing:** There is no sharing between telecommunications companies, with some exceptions such as:
  - Tourism development project, Colonial City. The Dominican Republic, thanks to an IDB loan, was able to support the construction of ducts for the underground electrical distribution lines, telecommunications and TV cables, and drainage

pipes in approximately 2.6 kilometers of the streets in the Colonial City in Santo Domingo.

Companies, in general, see a good solution in the sharing of ducts in city centers. The company Viva shares ducts with Columbus Networks for the fiber connection to local companies in Santo Domingo.

- **Distribution-line sharing:** There is no sharing of distribution lines in the fixed broadband access service, so each company independently builds its own network and provides the service. According to the study, there is a future opportunity when companies that provide fixed broadband access service do so by sharing fiber.
- **National long-distance service:** In the national long-distance service it is not common for companies to share the fiber-optic backbone network, but there are some fiber infrastructure-sharing initiatives:
  - The Punta Cana–Macao Energy Consortium (CEPM) shares fiber-optic threads with some companies along the Punta Cana–NAP of the Americas route.
  - Orange and Columbus Networks share fiber-optic wires from Santo Domingo to Puerto Plata.
  - The Dominican Association of Telecable Companies Inc. (ADETEL) shares fiber-optic cable wires in the northern part of the country. This network covers Samaná, Nagua, San Francisco de Macorís, Salcedo, La Vega, Bonao, Moca, Santiago, Puerto Plata, Montecristi, Dajabón, and Mao.

According to the A4AI study (Vidal, 2017), the savings obtained by sharing the monthly operating cost of these infrastructures are estimated as follows:

- Rent of land (or roof): US$300 to US$600/month
- Energy: US$400/month
- Diesel: US$600/month
- Tower and civil works maintenance: US$300/month

Therefore, the savings for each operator if they shared the infrastructure would be half of these costs.

CHAPTER 4

Infrastructure-Sharing Models

There are numerous ways to share infrastructure between operators, and between operators and passive infrastructure providers. In general, options range from simpler sharing of passive elements, where non-electronic infrastructure such as ducts and poles, sites and masts are shared among different operators, to more sophisticated sharing of electronic elements, up to full network sharing, where a whole network is shared across operators or by different parties. Sharing of street curbs and of in-building facilities also takes place, especially in urban areas and in commercial premises.

The specific elements that are shared depends, along with commercial and regulatory considerations, on the state of the development of the market, the size of existing networks, the role and importance of the incumbent operators, and the geographic characteristics of the territory. Examples of technical sharing models of fiber networks and of wireless infrastructure are discussed in more detail below.

4.1 Sharing of Fiber Networks

As noted earlier, fiber backbones are required to support different types of last-mile access, both fixed and wireless. Fast-growing demand for data has resulted in fiber increasingly being needed to replace microwave circuits for backhaul, and for last-mile networks in many urban areas. However, the challenges of rolling out extensive fiber networks remain significant, especially in developing countries and in remote areas.

The complex geography of many developing countries often means that the costs involved in expanding networks into rural areas require ancillary infrastructure such as access roads and power supply. This makes the expansion of broadband more expensive.

Administrative barriers, including obtaining permissions and rights-of-way to undertake civil engineering works and lay ducts across different local jurisdictions, make sharing more compelling. The degree of technical sharing can vary significantly. Passive infrastructure sharing involves the sharing of the physical infrastructure such as civil engineering elements or non-electrical components. Power supply is often shared under passive models as well. Active sharing models involve sharing the electronic components of the infrastructure network such as optical node switches, software, or management systems. Finally, in the case of wholesale networks, the network is shared by operators who deliver retail access in a number of different ways.

4.2 Sharing of Ducts and Poles

Duct or pole sharing involves sharing physical facilities. This includes the conduit for enclosing cables, usually underground, and the poles on which electricity or telecom distribution cables are mounted. Ducts are the most widely used system of underground cable installation. Once deployed, ducts allow removal or installation of additional cables depending on the size of the duct and the use of sub-ducts inside the main duct.

Poles are the aerial alternative to underground ducts. In many countries, the middle mile and last mile to the users is still being delivered using poles due to their easy accessibility, reducing the need to dig to bury the cable. Ducts and poles can be shared by leasing their use from the owner, or assigning rights of use, or leasing the existing fiber cable included in the ducts or on the pole. As noted above, energy or railway networks are examples of sectors where ducts or poles are also deployed and can be shared with the telecom industry.

Regulations that promote sharing across sectors are therefore key areas for reducing telecommunications deployment costs (ITU, 2008). In Brazil for example, the regulatory bodies for electricity, telecommunications, and oil have set up a common regulatory framework for sharing infrastructure elements.

4.3 Active Sharing

Active sharing models for fiber networks involve sharing of the electronic elements of the networks. This type of sharing can provide the highest savings, as even less of the network is duplicated. This can also increase the technical and institutional complexity of sharing agreements, and can limit the potential for service differentiation between those sharing an active network.

Nevertheless, when operators lease capacity to other operators, rather than selling them ducts or dark fiber, they are effectively providing a shared active network for use by their customers. This is currently among the most common of the commercial models for the provision of backbone links. However, owning a complete fiber pair gives competing telecom operators greater potential for service differentiation and more flexibility and control over the type of electronics to use, and in the amount of capacity. Many

larger operators therefore prefer dark fiber to capacity. This option may not be feasible for smaller operators with a level of traffic that may not be able to justify the expense of a full fiber pair, at least initially, but this option may still be of interest in the long term if their traffic is expected to grow.

4.4 Shared Fixed Access in the Local Loop

Opportunities to share access to local loops, shared copper, and last-mile fiber are being adopted in urban areas where there is already significant copper infrastructure, or where population density combines with growing demand for broadband to make FTTx, or fiber to the curb/home/premises, a viable option. Copper local loop unbundling is now standard practice in most developed markets, usually through adoption of regulations which require the legacy fixed-line operator to become a wholesale reseller of its local cables to other fixed broadband providers.

In deploying fiber in the local loop, there are a variety of technologies and architectures which can be used; however, the policy and regulatory environment may need to influence operators' choice of architecture. Some of the more popular methods, such as curbside single-wavelength Passive Optical Network (PON) with pole-mounted splitters, have relatively low costs to deploy but are less suitable for shared use. In this respect, more costly but fully unbundled network architectures—that provide dark fiber to the premises, such as Home Run, or the use of Optimal Fiber Aggregation Points (OFAPs)—that do not present this problem may be preferable.[13]

4.5 Wireless Networks

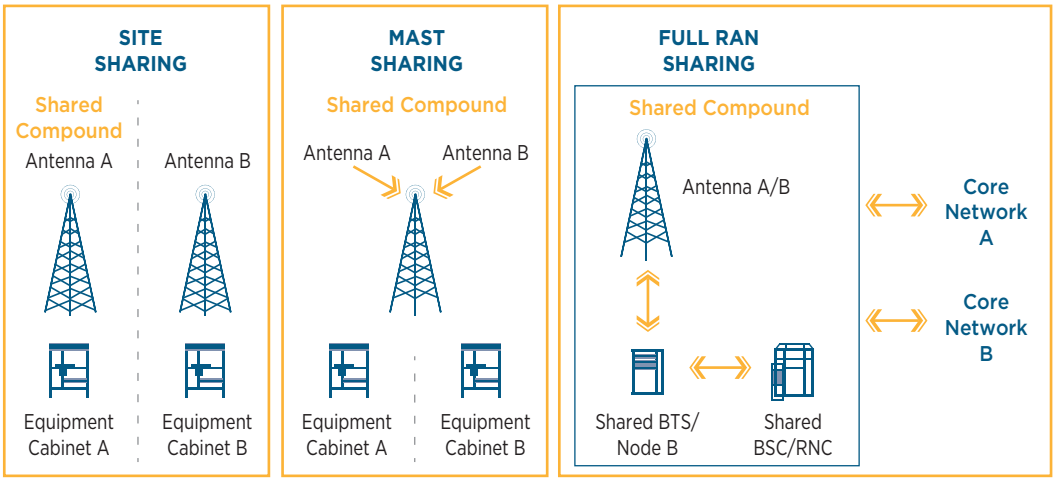
Wireless networks include both mobile GSM-based 2/3/4/5G systems which are now converging on LTE and the fixed wireless technologies for microwave backhaul and local access, such as Wi-Fi and WiMAX, as well as the new dynamic spectrum access systems used on software defined radio frequencies, such as TV White Space (TVWS).

Site sharing, mast sharing, and RAN sharing, among telecommunications operators and between operators and passive infrastructure providers, are the main wireless network–sharing models that have emerged. Site and mast sharing are termed passive sharing because only physical infrastructure or space is shared. Network operators do not actively coordinate any other activity. RAN sharing is usually defined as active sharing, with operational coordination of electronic and software elements. RAN sharing usually takes place in mobile networks, but fixed networks of shared Wi-Fi hotspots are also a RAN-sharing option. Site sharing can also fall between passive and active infrastructure sharing when it includes sharing power supplies or backup power systems and air-conditioning.

[13] For a more detailed summary of the issues, see for example: https://www.academia.edu/2850968/FTTP_Networks_Topology_and_Competition.

FIGURE 4.1

SHARING MODELS ILLUSTRATION



Source: GSMA (n.d.).

4.5.1 Site Sharing

Site sharing has been adopted by mobile operators for many years. Because of its simplicity it is one of the most common forms of network infrastructure sharing undertaken by mobile operators, in which they share the same plot of land or a rooftop, for example. New sites may be jointly planned, or if there is enough land space an operator with a pre-existing base station may lease part of the site to other operator(s). All the network components and power supply—that is, masts, towers, cabinets, antennas, backhaul equipment, and backup generator, if needed—are installed and owned independently by each operator, as shown in Figure 4.1. The solid line represents the fenced-off compound that the operators either own or lease. Power supply and air-conditioning, along with support equipment such as shelters and security systems, may also be shared.

In building out mobile networks, the major cost is in deploying the base stations. To minimize the high costs of site rental or purchase, operators often seek sharing opportunities with others. Securing land rights in the rural areas of many developing countries can also be a very time-consuming process, so use of existing sites can significantly reduce time to market in these cases. Sharing is also encouraged through necessity in many urban and suburban areas where there is a shortage of available sites or the planning requirements are onerous.

Further, financial and logistical incentives for site sharing exist in remote and rural areas, where construction costs, power supply, and access roads can represent a major portion of the total cost of network deployment.

There may be instances where operators may resist requests to share existing base station sites, considering the investment made that can create a competitive advantage. This can be particularly true in locations where it has been prohibited to install additional sites, or because the site may be located in a costly area. In these cases, the incumbent or dominant mobile operators have been incentivized by regulation to share sites. However, in most other cases, site-sharing tariffs are usually left to commercial negotiations.

4.5.2 Mast Sharing

Where operators share masts, not only do they co-locate their sites, but they also share the same mast or antenna frame. Other structures such as chimneys or steel power pylons may also be shared to accommodate many antennas.

Operators typically install their own radio infrastructure, from the antennas down to the cabinets and electronics. If a mast is to be used by multiple operators, it should be designed accordingly, or it may need to be strengthened to accommodate several sets of antennas.

The popularity of this sharing model has combined with mobile operator strategies to outsource non-core operations, resulting in emergence of several tower operating companies, such as Helios and American Tower Corp. Many of these firms are expanding their networks in sales and leaseback deals, where they buy towers from the operators and then lease space to install their active equipment.

4.5.3 RAN Sharing

Operators can also gain savings from sharing the active components of networks, commonly known as Radio Access Network (RAN) sharing, which reduces network underutilization. In many cases, network equipment will not be fully used by one operator, whereas a shared network can increase overall utilization, leading to a lower unit cost of service provision. However, this type of sharing can have a bigger impact on competitive advantage and service differentiation than site or mast sharing. As a result, RAN sharing is less common across a whole network, except for MVNOs, but may be adopted in certain parts of a network, especially for increasing voice or data coverage.

RAN sharing involves all the access equipment being shared: antennas, masts, and the radio equipment. At the point of connection to the core network, traffic then splits into the separate networks. RAN sharing can deliver substantial saving to operators, especially for rural areas, where it makes it more commercially attractive to deliver service in locations with lower ARPU and subscriber density.[14] However, even for urban areas, RAN sharing reduces the cost of equipment for new locations and in existing locations

[14] GSMA estimates that cost savings from RAN sharing could increase free cash flows by up to 20 percent for a typical European operator (GSMA, n.d.).

where infrastructure is duplicated, as well as provides the operators with the option to redeploy radio equipment to previously underserved areas.

Aside from the lower levels of independence that RAN-sharing operators have, potential barriers to RAN sharing may arise from technical differences between the existing networks whose architecture may have evolved independently. This can have implications for the inter-working of equipment purchased from different vendors, operational procedures, and control mechanisms (GSMA, n.d.).

CHAPTER 5

Commercial Opportunities

To share infrastructure, several commercial models have been implemented by operators, often with other parties in the wider telecom ecosystem. In addition to operators, equipment vendors, investors, governments, municipalities, international organizations, as well as private non-telecom companies may also be involved in sharing agreements.

Commercial models range from completely private companies to government-led entities, each with different ownership models, access terms for telecom providers, and shareholder involvement. Importantly, especially in developing markets, licensed telecom operators are not always the initiators of such models. In addition to the owner-tenant model whereby the operator leases space and access at a regulated or market price, commercial models that are described in this report include joint ventures (JVs), tower companies, fiber companies, government-led network companies, public-private partnerships (PPPs), and consortia.

When stakeholders agree to one of these models, several commercial and public policy drivers are considered, such as risk sharing (especially for new networks), access conditions for the participants or for other telecom operators, type of ownership, and profit and loss implications of CAPEX and OPEX costs, as well as funding models.

5.1 Joint Ventures

A joint venture (JV) is a commercial arrangement where two or more companies gather their capital resources in order to finance a specific project. In the context of infrastructure sharing, this is most commonly a fiber-optic network or a tower company.

Funding is typically private, raised by telecom operators which use the network for their customers exclusively; in rare cases, however, they can provide capacity to other operators.

5.2 Tower Companies

Tower companies (towercos) are infrastructure companies that do not operate their own networks but manage and lease towers to mobile and other fixed wireless operators, including broadcasters. They are typically not owned by telecom operators but by separate independent companies, which may have operator shareholders, while others may be majority owned by private funds.

There are three broad structures of tower deals:

- Sale and Leaseback: This involves a mobile operator selling towers to an independent tower company. The towers are leased back to the operator as well as to other clients of the tower company. Besides operation and maintenance, the towerco may commit to future network rollouts. In some cases, the sale of the towers has involved the operator taking a share in the tower company.
- Outsourcing: Instead of selling their towers, operators opt to solely transfer the responsibility of operation and management to the towerco and/or lease access to some of the towerco's existing sites.
- Build-to-suit: Towercos install new towers in locations requested by their clients.

As evidenced by the growing number of towers under independent operation, the tower company model is increasingly attractive for operators. It eliminates the CAPEX costs and saves on OPEX through sharing. In addition, this monetizes the operator's tower assets. From a regulatory or public interest perspective, reduction in CAPEX particularly facilitates new smaller and more local entrants, as the cost of rolling out a whole new network can often be a constraining factor in network deployment. Reduced OPEX and CAPEX similarly means that networks can be expanded into areas with lower revenue generation potential, such as in rural areas, thereby ultimately increasing overall coverage among the population. Furthermore, infrastructure sharing reduces regulatory burdens since only one construction and operation permit is shared by several operators.

5.3 Fiber Companies

Similar to tower companies, independent fiber infrastructure companies provide fiber-optic backbone resources, either on a wholesale capacity basis, or without operating a network, by simply selling dark fiber or ducts on a per-kilometer basis. These companies commonly provide services to mobile and fixed operators under a commercial contract, usually on an open-access basis, and are often present on national backbone

routes and in populated areas where it is more commercially attractive to provide fiber services. Duct-operating companies may also follow this model.

5.4 Government-Led Network Companies

When there is no commercial appetite to address potential demand for backbone fiber, such as in more remote areas or in other cases where rollout is less likely to be profitable or the degree of risk is high, government intervention may be necessary. Common models for government-led projects with varying levels of public-sector involvement are consortia and public-private partnerships (PPPs), which may also involve the participation of a multilateral development bank (MDB). Under these models, governments and MDBs absorb the primary business risk by encouraging investment and devise a fair and efficient mechanism to share this resource with existing market players or new entrants.

A number of developing countries have established government-led telecom network projects, often implemented as part of a national broadband strategy, with the goal of expanding broadband coverage to previously underserved areas and/or to help drive down prices on competing private networks. For example, in Brazil, the government established a new state-owned backbone because it became apparent that private-sector competition alone was not reducing connectivity costs sufficiently.

5.5 PPPs and Consortia

PPPs formed between government and one or more private companies to finance telecom projects are also well recognized in infrastructure-sharing strategies. Consortia are often formed for the deployment of international fiber-optic submarine cables.

PPPs provide a framework in which public entities and private companies can deliver infrastructure projects, often involving complex contractual arrangements. PPP structures usually involve risk allocation and financing requirements which are absorbed by more than one party and therefore facilitate the mitigation of potential risk by keeping it separate from the existing business of the sponsors. Similarly, the entity created by the partnership can borrow funds and this debt is usually paid back from the cash flow generated by the project (ITU, 2013).

Particular issues to consider for this model include the access terms provided to shareholders who may also be licensed operators and new entrants or operators that do not participate in the venture. For PPPs to be successfully implemented, strong legal frameworks and enforcement procedures are also needed, given the complexity of the contract structure. Most PPP failures in developing markets are typically attributed to inadequate feasibility studies. Similarly, risk needs to be appropriately assessed and shared, which demands realistic revenue and cost estimations and sound financial and economic analysis (EIB, 2009).

CHAPTER 6

Infrastructure-Sharing Constraints

While the business case for infrastructure sharing is clear, there still exist several risks and constraints that can prevent the benefits from infrastructure sharing to be fully realized in developing markets.

6.1 Lack of National, International, and Cross-Industry Coordination

One of the most important barriers to more sharing appears to be the lack of coordination in cross-border, national, and local government policies on access to rights-of-way, as well as, across regulators of different sectors, in relation to major infrastructural projects that are being planned or implemented in developing markets. While a multitude of infrastructure projects may be underway, data and information are often not in the public domain, which makes it difficult for telecom operators to incorporate them into their strategic planning.

In addition, the lack of a common approach among different countries in the same region, and lack of guidance from international and regional organizations, increases the costs for large multinational investors in dealing with many often small and fragmented market environments.

A typical example of lack of coordination is encountered when investors in major infrastructure programs, including in the telecom sector, negotiate with national and state governments as well as local municipalities for rights-of-way to lay down infrastructure. The fees imposed are often designed primarily to raise revenue for the government rather than to support the development of the sector. The lack of coordination between different government entities also raises the cost of network construction and creates delays.

Central coordination or guidelines to local authorities may be required to overcome these problems. For example, the OECD has indicated a number of policy guidelines to improve access to rights-of-way and to reduce the costs associated with access (OECD, 2008).

6.2 Lack of Stable and Transparent Regulations

Telecom networks involve large sunk costs and a long period for the investment to be recovered, which creates risks to operators and investors. This is in addition to other investment risks—such as instability, higher costs, and lack of resources—that are typical in developing and often unstable markets.

In developing markets where networks are often in different stages of implementation, operators are often reluctant to take the initiative and invest in new infrastructure due to the concern that subsequent regulation may reduce investment profitability. For example, in Burundi, after the government and the operators invested capital in a national fiber network, the government unexpectedly issued an additional license, jeopardizing return on investment.

Equally, in cases where an operator expects to gain a competitive advantage by investing in underserved areas, any ex post obligations that mandate sharing on terms that do not compensate for a fair return on investment will affect the initial incentives to invest. As such, regulatory inconsistency and lack of homogeneity in developing markets mean that investors may fear that the return on investment will be diminished by regulators on the grounds of competition policy or national interest. This adds a premium to investment, and often, even if sharing could deliver significant benefits, this premium combined with a marginal business case, such as in rural dispersedly populated areas, can lead to no investment at all. Depending on the situation, investors may need to balance these risks against the fact that infrastructure sharing can reduce the overall capital required for deploying the network.

6.2.1 Competition Concerns

The significant cost efficiencies and economic benefits of infrastructure sharing have been discussed in detail above. Regulators have recognized that, especially in the context of extending broadband access to rural areas, infrastructure sharing represents the most efficient technical solution. The review of impacts of infrastructure sharing in developing markets suggests that many benefits can be delivered as a result of sharing. However, some regulators and governments have expressed concern that sharing may also create risks of anticompetitive behavior. There are two main areas of concern:

- Collusion between sharing operators is a concern often raised by regulators and smaller operators. It may arise in the context of two or more operators being able to coordinate their activities as a result of sharing. Exclusive sharing agreements

between operators may prevent other operators from being able to access the infrastructure, effectively increasing their market power. Risks of refusing to share infrastructure with smaller competitors on arbitrary grounds can be mitigated by establishing transparent sharing negotiation mechanisms.

- Risks of abuse of dominance arise if an operator can increase its market share as a result of sharing. Risks to service innovation and reduced investment could arise if oligopolies are reinforced through sharing, however the pace and innovation of the telecom market suggest these risks are limited.

Typically, regulators have considered that the benefits from sharing outweigh the potential competition implications. This is supported by the review of the impacts of tower sharing on mobile markets outlined above, which suggests that market concentration decreases as tower sharing increases. The combined market shares of the largest operators have not increased over time, and no impacts on prices and usage have been registered in markets where a high level of tower sharing has occurred. The independent infrastructure provider model, like towercos, has a positive impact on competition since it brings down the barrier of an established operator not wanting to share its infrastructure.

6.2.2 Lack of Financial Incentives

In most countries, there remain certain geographic locations where the business case is so marginal that operators would not invest even with infrastructure sharing. During the research, operators indicated that financial incentives may be required to unlock investment in these instances.

6.2.3 Implementation Issues

Even where governments and regulators encourage infrastructure sharing, several issues often materialize in the implementation of these projects. While these issues are often specific to a country's particular local market and political environment, there are also a set of common implementation problems. The regulatory and competitive environment within a country can have a significant impact on the success of a shared network once it has been completed. In some cases this has negatively affected the success of the project and, as a result, the benefits of infrastructure sharing are not being realized.

The nature of infrastructure sharing means that many parties and stakeholders are involved, such as central and local government authorities, as well as operators. The management of these different parties, with their varied goals and targets, can have a significant impact on the overall success of the project. If the governance of these parties is poorly managed, disengagement and delays may arise. This can result in targets differing and organizations taking their own approach to solve these issues, potentially resulting in the duplication of infrastructure and undermining of the original business model.

Government-led projects can suffer from inflated costs, quality issues, delays, and administrative failures as a result of poor public management.

6.3 Case Study: Regulatory Aspects to Consider in the Energy Sector

Successful cross-sectoral infrastructure sharing requires not only smooth cooperation between market players but also deep cooperation at an institutional level. Therefore, it is important to identify enablers as well as barriers to infrastructure sharing, based on which concrete recommendations could be proposed. This is especially the case when cross-sector infrastructure sharing requires not only the telecom sector but also the domestic sector. In the case of electricity, for example, it would be the electricity sub-sector of the energy sector.

The main interests of the infrastructure-sharing stakeholders tend to focus on the recommendations concerning regulatory and legislative changes to facilitate cross-sector infrastructure sharing; on the design of the interface regulation for enabling operation, maintenance, and future investments in shared infrastructure; on the types of licenses or authorizations that would need to be granted in order to guarantee access to the network; and on possible approaches to address financial disincentives, including the issue of "non-regulated revenues" in the context of the energy regulatory frameworks.

Telecom-energy infrastructure sharing occurs when two separate sectors—energy and electronic communications—start to interact based on their own rules, regulations, and dynamics. For market players that are involved in this complex environment it is important to understand the rules of the game from both sectors. Energy sector regulation prescribes conditions under which energy sector market players (e.g., transmission system operators, electricity distribution companies[15]) may or may not be involved in the commercial activity of offering electronic communication services.

This report therefore outlines the major types of legislation and regulations in the energy sector and their key features with respect to infrastructure sharing. Key findings and conclusions of this work are then presented at the end.

6.3.1 Major Aspects to Consider

Analysis of energy sector legislation shall consider these aspects:

- *Ability to engage in activities outside electricity sector:* Whether energy legislation clearly prescribes under which conditions the responsible authority could issue the

[15] From here on, these are collectively referred to as "electricity companies." It should be noted that transmission system operators are the ones that most commonly own excessive fiber capacities, which are required for their own operations; therefore, those companies are more likely to engage in the provision of telecommunications services than other electricity market players.

decision allowing an electricity company to offer electronic communications services to third parties;

- *Approach to regulation of additional revenues:* Whether the regulation of additional revenues (those that do not come from the company's main activities, also commonly referred to as non-regulated revenues) exists as such and whether these additional revenues should be treated as a part of the regulated energy revenue; and
- *Approach to cross-subsidization and related requirements:* To prevent cross-subsidizing, discrimination, and distortion of competition, electricity companies should keep separate accounts for each of their transmission or distribution activities, apart from other activities.[16]

The first aspect will determine to what extent it is difficult (or not) for an electricity company to engage in infrastructure-sharing activities. The second aspect reflects how flexible an electricity company is or could be in managing its finances with respect to additional activities, and, finally, the third aspect indicates potential transparency and avoidance of possible market distortions (in the electricity market).[17]

These aspects should be analyzed jointly with the review of the company's statutes, which may need to be amended to include relevant provisions. It is also important to analyze relevant energy development strategy, which sometimes contains strategic direction towards cost-accounting approaches and other important matters that could influence aspects related to infrastructure sharing.

In terms of the institutional setup in the energy sector, similar to that of electronic communications, it is commonly governed by two major institutions: the ministry as a policymaking body and an independent energy regulator as an executing body.

6.3.2 Major Energy Sector Regulations

The major energy sector legislation relevant to the purposes of facilitation cross-sector infrastructure sharing is:

- Energy Law or Law on Electricity, if one exists (primary legislation)
- Methodology for Calculating the Electricity Transmission Tariffs (secondary legislation, usually prepared by the energy regulator)

The Energy Law (or Law on Electricity, if one exists) is the most important piece of the energy sector legislation. Generally speaking, the purpose of the law is to ensure

[16] For instance, such requirement is established in the European Union by Directive 2009/72/EC of the European Parliament and of the Council, of July 13, 2009, concerning Common Rules for the Internal Market in Electricity.

[17] Note that mirroring requirements (e.g., separate accounts, etc.) are commonly established from the electronic communications market side.

the legal framework for guaranteeing a reliable and safe electricity supply to customers through the establishment of a functional and competitive power market, taking into consideration the customers' interest, security, and quality of the electric power supply service, and complying with the requirements of environmental protection.

If an electricity company would like to launch a telecommunications business line, this activity must be first and foremost allowed by the Energy Law and the law should establish major conditions for that activity. It should be noted that the law does not normally refer specifically to telecommunication activity but addresses all activities outside of the major business of the company in general. As a general principle, the law shall seek to avoid discrimination, cross subsidies, and distortion of competition as a result of electricity provision and/or other activities.

As provision of electricity is a fully subsidized activity with the above goals, the law typically establishes the basic principle of accounting separation. Therefore, the law normally requires energy companies that carry out regulated energy activities to separate their internal accounts for each of these activities as if they were carried out by dedicated enterprises. The law may require companies to keep accounts, which may be consolidated, for other non-regulated electricity activities. However, usually all energy companies will have separate accounts for their energy activities and for all other activities and will ensure that such accounts are audited.

Where appropriate, the law may allow them to keep consolidated accounts for other, non-energy activities. Relevant provisions of the Energy Law may vary greatly from country to country and the same objectives may be implemented through heavier legislative provisions. For instance, there could be cases where the Energy Law prescribes that the only way for an energy company to start a non-electricity-related activity (e.g., leasing excess capacities) is through the establishment of a subsidiary (daughter company), which, in principle, means investments to guarantee a steady cash flow to cover the daughter company's staff and other related costs. In this case, any electronic communications activities by the electricity company itself are not permitted. Requirement to establish a subsidiary for non-regulated activities is commonly considered to be overregulation because the same objectives could be ensured through lesser intervention, for instance, through a requirement to implement accounting separation as described above. Countries that seek to promote cross-sector infrastructure sharing are amending their laws to remove such limitations.

If an electricity company is allowed by law to engage in the provision of electronic communication services (i.e., allowing the company to lease optical fibers or provide capacity services to third parties), it would normally require a formal authorization from the energy/electricity regulator and should be regulated by the telecommunications regulator. As a common practice such authorization is being issued at the request of the electricity company and on the grounds of the law. Authorization would permit such activities as long as this activity does not have any negative financial impact on the company's primary activity (electricity) or any negative impact on its human or technical resources.

It is thus up to the energy regulator to determine whether the electricity company should be allowed to lease its excess fiber-optic infrastructure. To grant authorization, the regulator would need to understand if this activity might damage or endanger the electricity company's primary activities and/or other networks. It is sensible to expect that leasing of optical fibers would not endanger activities and other networks of the electricity company, since its optical fibers have been installed separately in the optical ground wire (OPGW) cable (that is, separate fibers). Each pair of fibers uses a different transmission system, so the separation is done on the lowest level of the interconnection model. This explains why infrastructure sharing, including active sharing, has become so mainstream and desirable from the standpoint of policymakers: it increases competition for the benefit of end users without damaging or endangering an electricity company's activities and other networks. Following the authorization from the energy regulator, the company may proceed with obtaining relevant license/authorization from the telecom sector regulator.

The Methodology for Calculating Electricity Tariffs[18] is an important legal act that would determine whether the electricity company is allowed to keep the revenues (commonly referred to as "non-regulated" revenues) obtained from provision of other services, such as, in our case, from provision of telecom services to third parties. The methodology is a legal act prepared and adopted by the energy regulator. It is therefore subject to the regulator's decision whether to deduct the non-regulated revenue (due to telecommunications activity) from the regulated activity (due to electricity activity).

The methodology prescribes how to treat the non-regulated revenue. There are many options, such as to deduct some part from the regulated revenue and decrease the price for electricity end users, or to not deduct it and have part of the revenue be directly invested in the development of the electronic communications activity.

One of the mandates of the energy regulator is to ensure the customers' benefit, which includes, among other things, affordable electricity tariffs. How does this objective tie to the practice of infrastructure sharing? While it may not be immediately obvious, leasing of additional optical capacities and provision of other telecom services to third parties by an electricity company can eventually decrease the electricity tariff prices because it deducts the non-regulated income of an electricity company. The infrastructure-sharing practice allows an electricity company to obtain additional revenues, which consequently lowers the tariff prices for customers. However, compared to the sizable revenues of the electricity company from its major business, revenues that could potentially be earned from the provision of non-regulated services are marginal. It is therefore highly debatable whether deduction of such revenues would eventually have a perceivable impact, if at all, on the electricity tariff. Deduction of the non-regulated revenues, on the other hand, would be a discouraging factor for an electricity company's decision to engage in this line of business.

[18] Or electricity transmission tariffs, if the electricity company is a transmission system operator.

At the same time, it should be noted that the energy regulator may opt not to deduct the revenue of the telecommunications activity from the regulated income of the electricity company, in which case this additional revenue should be used to reinvest in the infrastructure of electronic communications. Based on this latter approach, which is deemed to be highly desirable, an electricity company could use the non-regulated revenue of the telecommunications activity for reinvestments, for example, in new services (e.g., smart metering systems, etc.) that would extend the customers' benefits even further.

How to regulate income such as that arising from provision of commercial telecom services to third parties which is not part of the major business activity is a key question to address in the Methodology for Calculating Electricity Tariffs. However, many countries would not have explicit regulations for such revenues. In countries promoting cross-sector infrastructure sharing, the regulators calculate this income as non-deductible from the total income, if there is no explicit regulation and/or if the company keeps separate accounts in a correct way.

However, there have been cases where it was difficult to split the costs between the regulated and non-regulated or secondary activity (telecommunications), and it was decided that the income based on the leasing of dark fiber would be equally spread between the electricity company and buyers of electrical energy. In these specific cases, 50 percent of the annual income based on leasing of dark fiber was approved as extraordinary (other) income in the process of approving the regulatory income of the electricity company. The regulators made this decision because there was no negative impact on the primary activities of the electricity company for leasing the dark fiber, which was originally built for internal use, to third parties.

Countries that promote cross-sector infrastructure sharing seek ways to allow the electricity company to keep the entire revenue so that it can run its electronic communications activity normally. From this point of view, the company could potentially invest the net profit from the electronic communications activity into its further development, as well as offer new services in the process of building smart-grid solutions.

CHAPTER 7

Cross-Sector Business Models

Cross-sector infrastructure-sharing arrangements take many forms and are often designed around the unique circumstances and needs of participating infrastructure owners and telecommunications network operators. This section generally describes and provides examples of some of the more common business models.

7.1 Joint Planning and Construction of Infrastructure

Through joint planning and construction, infrastructure owners and telecommunications operators can coordinate the deployment or refurbishment of infrastructure. By working together in this way, the participants save costs and can produce a superior outcome in terms of infrastructure suitability and flexibility, with less disruption to economic and social activities in the construction area that might be created by separate projects happening at different times.

When sharing is considered beforehand, this model has a greater potential to maximize the possible efficiencies. Infrastructure sharing can be added into the design to most efficiently address the needs of all participating parties, including telecommunications operators. In contrast, sharing often requires additional expenditures to modify or supplement the existing infrastructure, such as the cost of extending connectivity from the infrastructure access points to where telecommunications operators need it. After-the-fact sharing also often requires telecommunications operators to accept suboptimal technical or geographic conditions that could have been optimized if sharing had been anticipated when the existing infrastructure was constructed or refurbished.

7.2 Hosting Third-Party Telecommunications Facilities

Another common business model for infrastructure sharing is for the owner to host third-party telecommunications facilities installed by network operators in, on, or under the owner's existing infrastructure. This is the business model previously employed by railways in hosting telegraph poles and lines in their rights-of-way and still employed by electric utilities in hosting copper telephone lines, coaxial cable television lines, and fiber-optic cables on their distribution poles. It is the oldest and most common form of cross-sector infrastructure sharing between the telecommunications sector and other network sectors.

Under this business model, the host infrastructure owner authorizes a telecommunications network operator to install its own facilities on the host infrastructure. The compensation to the infrastructure owner may comprise a combination of cash payments, which could be one-time and/or recurring, in-kind use of excess capacity on the telecommunications facilities installed, or the provision of telecommunications services by the operator to the infrastructure owner.

The host infrastructure owner's role is limited to that of a passive landlord by allowing defined use of its land corridors and the improvements and fixtures in those corridors. The host is not required to invest in or own any telecommunications facilities or provide any telecommunications services to the guest network operator. Although the specific arrangements may vary, the telecommunications network owner is essentially leasing space for the installation of facilities.

7.3 Commercializing Excess Utility Dark Fiber

Another common business model for cross-sector infrastructure sharing is the provision by the infrastructure owner to telecommunications network operators of the use of dark fiber installed and owned by the infrastructure owner.

The dark fiber business model is often adopted by infrastructure owners that have already installed or planned to install fiber-optic cable for internal use. Increasingly, infrastructure owners install their own fiber-optic cables for internal communications purposes. For example, electric utilities around the world now routinely install fiber-optic cable on all new or refurbished electricity transmission grids to enable network protection, SCADA activities, and better load management through interaction between supply and loads on the grid.

The dark fiber can be made available for use by telecommunications network operators on either:

- a capital lease basis: long-term right of use with a large portion of the total consideration being paid up front as the purchase price for the right of use and smaller

increments of the total consideration being paid on a recurring basis as operations and maintenance fees; or

- an operating lease basis: short-term right of use, typically renewable, with the total consideration being paid on a recurring basis as rent or service fees.

7.4 Utility Joint Venture with a Third-Party Operator

In this business model, the host infrastructure owner provides its existing utility infrastructure, including the excess capacity in any fiber-optic cable facilities. Either or both of the parties may provide the capital to illuminate the existing excess fiber or new fiber as an operating telecommunications network, although the telecommunications operator will typically assume that responsibility. In addition, the telecommunications operator will assume responsibility for operating the network, marketing and sales of services, customer support, billing, and collections. The financial arrangements between the JV parties can vary widely depending on the relative contribution each makes, how those contributions are valued, the market potential of the business, the preferences of the parties, and the regulatory environment.

7.5 Providing Co-Location Space, Tower Sites, and Ancillary Services

This infrastructure supports fiber connectivity from point to point but does not address the need to install equipment and other facilities at the various fiber access points. Therefore, regardless of the business model selected, infrastructure owners often supplement their lateral infrastructure offerings with additional services such as the provision of co-location space and tower sites to telecommunications operators. Though such infrastructure has relatively low value in its own right, offering shared use of it in conjunction with the lateral infrastructure can enhance the value of the lateral infrastructure to telecommunications operators and can generate additional revenue for the infrastructure owner.

CHAPTER 8

Benchmarks in the Americas

In some countries, passive infrastructure sharing is a general obligation that is imposed by law. When implemented, it is based on commercial negotiations and prices, with regulators intervening only in case of dispute. In other countries, including in Brazil, Canada, Costa Rica, Mexico, Paraguay, Peru, and the United States, access to ducts and poles is mandated as an asymmetric obligation only on incumbent operators, or operators designated as having significant market power (SMP) in the relevant market.

Brazil, Canada, and Colombia adopted joint rules with energy authorities to grant telecom operators access to poles. Argentina also promotes access by telecom operators to non-telecom passive infrastructure through a newly created type of undertaking, the so-called "independent passive infrastructure operators." Such entities do not require a license to rent infrastructure to telecom operators, although they must notify the national regulatory agency (NRA).

In the United States, the Federal Communications Commission (FCC) has been fostering "one touch makes ready" policy, which involves predefining works at poles making them ready to use, allowing for multiple access to poles in a more competitive, cheaper, and orderly manner.

Table 8.1 presents a more detailed overview of infrastructure sharing in some Latin American countries.

In terms of regulatory policies on infrastructure and spectrum sharing, mandating passive sharing among mobile operators is the most common approach, and some countries also allow active sharing agreements (see Table 8.2).

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
ARGENTINA	**Ducts**	Yes • Operators must grant access to their infrastructure according to specific rules and on a non-discriminatory basis (authorization regime). • Public bodies and state-owned companies (except the state-owned operator Arsat) must offer access to passive infrastructure that can be used to deploy telecom networks (Decree 1060/2017). • As for "independent operators of passive infrastructure," i.e., companies without a telecom license but with infrastructure that can support provision of telecom services (including pay TV), sharing is not mandated. These operators do not need an authorization, but Enacom will create a registry and may require information on their passive infrastructure (implementing regulation pending, Decree 1060/2017).	Yes Telecom Argentina RIO Telefónica Argentina RIO	Commercial	Yes	No

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
ARGENTINA *(continued)*		• The government proposed guidelines for telecoms and cross-sector infrastructure sharing, the proposal was approved in the Senate and is waiting for its final approval in the deputies chamber, timing undefined. • In Aug. 2018, the Modernization Secretariat consulted on specific infrastructure-sharing rules, including the need to have a centralized registry and methodologies to calculate fees and available elements. • Conditions for shared access must be commercially negotiated.				
	Poles	Yes Same as for ducts (see above)	Yes Same as for ducts (see above)	Commercial	Information not available	No

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TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
BRAZIL	**Ducts**	Yes In Nov. 2012, ANATEL adopted the general competition plan (PGMC), establishing a general set of rules based on competition law principles applicable to telecommunications markets. In the PGMC, ANATEL identified a relevant market on passive infrastructure for fixed network services, mandating access to ducts on operators with significant market power (SMP), including an obligation to publish a duct reference offer. In its 2018 review of the PGMC, ANATEL maintained duct access obligations. Under the Telecommunications General Act (LGT), n. 9472, of July 16, 1997 (Art. 73), telecommunications operators have the right to request access to other operators' infrastructure at fair and non-discriminatory terms and conditions. The general principle is further developed in ANATEL's passive infrastructure-sharing regulation (Resolution	Yes Reference offers of SMP operators in this market (Vivo, Oi, America Movil and CTBC) are published in a centralized wholesale negotiation platform (SNOA).	Commercial Reference offers must be approved by ANATEL prior to their publication. According to ANATEL's regulation on passive infrastructure, duct-sharing prices should be negotiated commercially, be fair, and ensure a sufficient economic return. Reference prices established by ANATEL in Nov. 2018.	Information not available. The SNOA system does not publicly report statistics on wholesale users' demand. There is no information about the actual duct stock, or a deal closed for duct sharing.	Yes The SNOA includes a registry of infrastructure as reported by SMP operators. The registry may only be accessed by agents accredited to use the system.

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
		274/2001). Provision terms are, however, subject to commercial negotiation, with ANATEL intervention in case of dispute. ANATEL approved a new passive infrastructure-sharing regulation in October 2017. Operators amended reference offers to comply with the regulation on April 9, 2018.				
BRAZIL *(continued)*	**Poles**	Yes ANATEL passive infrastructure regulation Joint regulation by the Brazilian telecoms and energy regulators In its 2018 review of the PGMC, ANATEL maintained pole-sharing obligations. See also consultation on access to poles by the telecoms and energy regulators.	No	Commercial Reference price use for dispute resolution. Reference prices established by ANATEL in Nov. 2018. See ANATEL passive infrastructure regulation and joint regulation by telecoms and energy regulators.	Yes On April 6, 2018, a Brazilian regulatory dispute resolution body ruled that Claro, Oi, Telefónica, and TIM must tidy up overhead cables laid on more than 2,000 utility poles in São Paulo state within 90 days.	No

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TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
CHILE	**Ducts**	Yes General obligation to share and collocate (General Telecommunications Law, Art. 26). Decree 167/2018 on passive infrastructure sharing	No	Commercial	No	No Not available yet but mandated by Decree 167/2018
	Poles	Yes General obligation to share and collocate (General Telecommunications Law, Art. 26) Decree 167/2018 on passive infrastructure sharing	No	Commercial	Yes	No Not available yet but mandated by Decree 167/2018
COLOMBIA	**Ducts**	Yes All telecommunications operators, including cable TV service providers, must share ducts used for the provision of telecommunications services, provided sharing is technically feasible and there is a commercial agreement on the compensation and conditions of use. (CRC Resolutions 2014 of 2008 and 5283 of Dec. 2017)	Yes	Regulated CRC sets a maximum monthly price formula (2017 prices, subject to indexation): COP 1,574.70 (US$0.5321) per meter of duct	Yes In 2017 CRC published a report analyzing 11 fixed infrastructure-sharing agreements.	No However, operators have to register all infrastructure-sharing agreements before CRC.

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
COLOMBIA *(continued)*		Other regulation: • Law 690 of 2001, Art. 13: Mandates all public service providers to share ducts and poles (if technically feasible). • Law 1341 of 2009, Art. 3.3: Mandates the efficient use of infrastructure for the provision of telecom networks and services (at least 30% of total installed capacity must be reserved for access requests in new ducts).		(CRC Resolution 5283 of Dec. 2017) CRC Resolution 5050 of Nov. 2016 sets maximum prices that electricity companies can charge to telecoms or media operators for using their ducts and poles, prices apply in case parties cannot agree on commercial basis (energy regulator, CREG, set pricing methodology in July 2008).		

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TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
COLOMBIA *(continued)*	**Poles**	Yes All telecommunications operators, including cable TV service providers, must share poles used in the provision of telecommunications services, provided sharing is available and technically feasible and there is a commercial agreement on the compensation and conditions of use. (CRC Resolutions 2014 of 2008 and 5283 of Dec. 2017) Other regulation: • Law 690 of 2001, Art. 13: Mandates all public service providers to share ducts and poles (if technically feasible).	Yes	Regulated CRC sets a maximum monthly price formula (2017 prices, subject to indexation): • 8-meter pole COP 4,636.80 (US$1.57) • 10-meter pole COP 6,030.40 (US$2.04) • 12-meter pole COP 6,176.80 (US$2.09) • 14-meter pole COP 7,083.80 (US$2.39)	Yes In 2017 CRC published a report analyzing 11 fixed infrastructure-sharing agreements.	No However, operators have to register all infrastructure-sharing agreements before CRC.

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
COLOMBIA *(continued)*				(CRC Resolution 5283 of Dec. 2017) • CRC Resolution 5050 of Nov. 2016 sets maximum prices that electricity companies can charge to telecoms or media operators for using their ducts and poles, prices apply in case parties cannot agree on		

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TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
COLOMBIA *(continued)*				• commercial basis (energy regulator, CREG, set pricing methodology in July 2008 and quality and operation rules in June 2013).		
COSTA RICA	**Ducts**	Mandated on the preponderant ("important") operator (Arts. 75 and 77 of Law 7593) ("Important" operator designation criteria: Art. 6.17 of the GTL and Art. 12 of the Access and Interconnection Regulation)	Yes Duct-sharing general conditions are set by Sharing Infrastructure Regulation decree.	Commercial Set by regulator in case of dispute (Arts. 26 and 27 of the Access and Interconnection Regulation)	Yes	No

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
COSTA RICA *(continued)*	**Poles**	Mandated on the preponderant ("important") operator (Arts. 75 and 77 of Law 7593) ("Important" operator designation criteria: Art. 6.17 of the GTL and Art. 12 of the Access and Interconnection Regulation)	Yes Pole-sharing general conditions are set by Sharing Infrastructure Regulation decree.	Commercial Set by regulator in case of dispute (Arts. 26 and 27 of the Access and Interconnection Regulation)	Yes	No
ECUADOR	**Ducts**	Yes Regulator mandates access to all infrastructure required to provide telecommunications services. There are two sets of rules: • Telecom operators: Sharing mandated (ARCOTEL Resolution 807 of Sept. 2017). • Infrastructure operators and other non-telecom operators: Sharing mandated if technically feasible and capacity is available (Resolution 806 of Sept. 2017).	Yes (telecom operators)	Regulated Price cap US$3.71 per duct meter per year (Mintel Ministerial Agreement 017 of Sept. 2017)	Yes	No It is mandatory to provide the NRA with information on access and shared use of infrastructure.

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TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
		• ARCOTEL also sets rules to encourage underground networks, including general duct-sharing obligations and rules on labeling cables in shared ducts (ARCOTEL Resolution 144 of April 2017).				
ECUADOR *(continued)*	**Poles**	Yes ARCOTEL mandates access to all infrastructure required to provide telecommunications services. There are two sets of rules: • Telecom operators: Sharing mandated (Resolution 807 of Sept. 2017). • Infrastructure operators and other non-telecom operators: Sharing mandated if technically feasible and capacity is available (Resolution 806 of Sept. 2017).	Yes (telecom operators)	Regulated Price cap US$8.83 per pole, per operator, per year (Mintel Ministerial Agreement 017 of Sept. 2017)	Yes	No It is mandatory to provide the NRA with information on access and shared use of infrastructure.

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
MEXICO	**Ducts**	Yes Mandated on the preponderant operator, América Móvil. Access to ducts is also under the scope of the company's functional separation plan. Promoted between other operators (proposed guidelines on symmetric sharing were submitted to public consultation in 2016). IFT consulted on draft rules for telecommunications and broadcasting passive infrastructure sharing until Nov. 22, 2018. The proposed new rules aim to establish: • Guidelines to promote shared access to public infrastructure; and • A procedure to settle disputes amongst passive infrastructure owners and access seekers.	Yes 2018 reference offer	Commercial Set by regulator in case of dispute. Regulator defines maximum prices by LRIC model. Annual prices of ducts charged by decentralized public administrations are set by the Federal Rights Law, at MXN 807.97 (US$42.58) per km or fraction of km per cable installed.	Yes	Yes

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TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
MEXICO *(continued)*	**Poles**	Yes Mandated on the preponderant operator, Telmex. Access to poles is also under the scope of the company's functional separation plan. Promoted between other operators. Poles from the Federal Electricity Commission (CFE) may be offered at annual prices defined by the Federal Rights Law. Proposal submitted to public consultation in Dec. 2017.	Yes 2018 reference offer	Commercial Set by regulator in case of dispute. Regulator defines maximum prices by LRIC model. Annual prices for use of CFE poles (up to two cables per pole) is set by the Federal Rights Law, at MXN 73.45 (US$3.87) per cable installed.	Yes	Yes
PARAGUAY	**Ducts**	Yes Mandatory for SMP operators (Conatal Resolution 871/2002, Art. 9)	No	Regulated SMP operators should offer access to ducts at prices based on LRIC cost model (to be set, timing undefined).	Information not available	No
	Poles	No	Not applicable	Not applicable	Not applicable	No

TABLE 8.1

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
PERU	**Ducts**	Yes Mandated on "important operators" in the Infrastructure Access Law of 2008 (as defined in Osiptel's Resolution 99/2011). Includes access to poles, ducts, conduits, chambers, towers, and other network elements. Telefónica is currently the only operator designated as an important operator in Market 25 (wholesale internet and data transmission).	Yes Important operators must present to Osiptel an infrastructure-sharing basic offer (Art. 12 of the Infrastructure Access Law of 2008). Telefónica has a reference offer in Market 25 (wholesale internet and data transmission).	Commercial Regulator intervenes in case of dispute.	Yes	Yes

(continued on next page)

TABLE 8.1 *(continued)*

INFRASTRUCTURE-SHARING BENCHMARKS IN THE AMERICAS

Country	Category	Sharing mandated?	Reference offer published?	Are prices set by regulator or by commercial negotiation?	Sharing used in practice?	Infrastructure register available?
PERU *(continued)*	**Poles**	Yes Mandated on "important operators" in the Infrastructure Access Law of 2008 (as defined in Osiptel's Resolution 99/2011). Obligations include access to poles, ducts, conduits, chambers, towers, and other network elements. Telefónica is currently the only operator designated as an important operator in Market 25 (wholesale internet and data transmission).	Yes Important operators must present to Osiptel an infrastructure-sharing reference offer (Art. 12 of the Infrastructure Access Law of 2008). Telefónica has a reference offer in Market 25 (wholesale internet and data transmission).	Commercial Regulator intervenes in case of dispute.	Yes In Nov. 2016, Osiptel issued rules on the removal (and burying) of aerial cables by telecom operators in historic areas of Peru, to comply with Law 30477 of June 2016 on the execution of utilities' works.	No

Source: Authors' elaboration based on various publications.
Notes: For Colombia, see https://www.crcom.gov.co/es/pagina/condiciones-comparticion-infraestructura-pasiva (p. 38). For Mexico, see http://www.ift.org.mx/comunicacion-y-medios/comunicados-ift/es/el-ift-publica-los-lineamientos-para-el-despliegue-acceso-y-uso-compartido-de-infraestructura-de. For Peru, see https://portal.mtc.gob.pe/comunicaciones/concesiones/registros/infraestructura_pasiva.html.

TABLE 8.2

COUNTRIES IN THE AMERICAS THAT HAVE INFRASTRUCTURE-SHARING POLICIES

Country	Passive Sharing	Active Sharing
Argentina	O	O
Brazil	O	O
Canada	O	O
Chile	O	X
Colombia	O	O
Costa Rica	O	X
Ecuador	O	X
Mexico	O	X
Paraguay	X	X
Peru	X	X
US	X	X

Source: Authors' elaboration based on various publications.

NRAs in 8 out of the 11 countries covered so far have obliged mobile network operators (MNOs) to share their passive network infrastructure, although in Mexico and Costa Rica this obligation only applies to the designated SMP operators. In the United States, Paraguay, and Peru, there is no such obligation, as mobile infrastructure and network sharing is unregulated.

A common trend is to outsource or sell towers to an independent third party, which then leases them to MNOs. Colombian operators are required by their 4G licenses to grant access to active and passive network elements, but there are no active sharing agreements between MNOs.

Active infrastructure sharing in all other countries is generally left to commercial agreements among operators, although Argentina, Brazil, and Canada have regulatory frameworks in place supporting active infrastructure and spectrum sharing.

Brazil is the only country with active RAN-sharing agreements.

Wireless-sharing policies in various countries are outlined in more detail in Table 8.3.

TABLE 8.3

WIRELESS-SHARING POLICIES FOR MOBILE NETWORK OPERATORS

Country	Category	Site Sharing	Mast Sharing	RAN Sharing, Separate Spectrum	RAN Sharing, Joint Spectrum	Core Network Sharing
Argentina	**Mobile Operators**	Mandated • Telecommunications Law (Art. 39) • Advanced mobile communications regulation (Art. 6) • 4G spectrum award rules • NRA's regulation template to approve site installation • Government plan to promote infrastructure deployment and sharing • Government mandated public bodies and state-owned companies to offer access to passive infrastructure to deploy telecom networks set prices for state-owned rooftops, sites, and other properties. • Passive-sharing regulation.	Mandated • Telecommunications Law (art. 39) • Advanced mobile communications regulation (Art. 6) • Government plan to promote infrastructure deployment and sharing • Passive-sharing regulation	Allowed Active-sharing regulation	Allowed Active-sharing regulation	Unregulated

TABLE 8.3

WIRELESS-SHARING POLICIES FOR MOBILE NETWORK OPERATORS

Country	Category	Site Sharing	Mast Sharing	RAN Sharing, Separate Spectrum	RAN Sharing, Joint Spectrum	Core Network Sharing
		In Aug. 2018, the Modernization Secretariat consulted on specific infrastructure-sharing rules, including the need to have a centralized registry and methodologies to calculate fees and available elements.				
Brazil	**Mobile Operators**	Mandated	Mandated	Available in practice	Available in practice	Unregulated
Chile	**Mobile Operators**	Mandated	Mandated	Unregulated	Unregulated	Unregulated
	SMP Operators	Mandated	Mandated	Unregulated	Unregulated	Unregulated
Colombia	**Mobile Operators**	Mandated • Resolution CRC 2014 of Nov. 2008 • 4G license obligations to grant access to active and passive infrastructure • Infrastructure-sharing rules	Mandated • 4G license obligations to grant access to active and passive infrastructure • Infrastructure-sharing rules	Mandated 4G license obligations to grant access to active and passive infrastructure	Mandated 4G license obligations to grant access to active and passive infrastructure	Unregulated

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TABLE 8.3 *(continued)*

WIRELESS-SHARING POLICIES FOR MOBILE NETWORK OPERATORS

Country	Category	Site Sharing	Mast Sharing	RAN Sharing, Separate Spectrum	RAN Sharing, Joint Spectrum	Core Network Sharing
Costa Rica	**Mobile Operators**	Available in practice	Available in practice	Unregulated	Unregulated	Unregulated
	SMP Operators	Mandated See infrastructure-sharing regulation.	Mandated See infrastructure-sharing regulation.	Unregulated	Unregulated	Unregulated
Ecuador	**Mobile Operators**	Mandated • NRA Resolution telecom operators: Sharing mandated (CONATEL Resolution 807 of Sept. 2017) • NRA Resolution 803 of 2012: Model to set charges for mobile-infrastructure sharing	Mandated • NRA Resolution telecom operators: Sharing mandated (CONATEL Resolution 807 of Sept. 2017) • NRA Resolution 803 of 2012: Model to set charges for mobile-infrastructure sharing	Unregulated	Unregulated	Unregulated

TABLE 8.3

WIRELESS-SHARING POLICIES FOR MOBILE NETWORK OPERATORS

Country	Category	Site Sharing	Mast Sharing	RAN Sharing, Separate Spectrum	RAN Sharing, Joint Spectrum	Core Network Sharing
Mexico	**Mobile Operators**	Available in practice	Available in practice	Unregulated	Unregulated	Unregulated
	SMP Operators	Mandated Preponderance obligations imposed on Telcel in March 2014 and confirmed in the preponderance review of 2017.	Mandated	Unregulated	Unregulated	Unregulated
Paraguay	**Mobile Operators**	Unregulated	Unregulated	Unregulated	Unregulated	Unregulated
Peru	**Mobile Operators**	Unregulated	Unregulated The infrastructure sharing legislative decree establishes infrastructure-sharing obligations on "important" (SMP) providers. No mobile operator was found as having SMP in the market.	Unregulated	Unregulated	Unregulated

Source: Authors' elaboration based on various publications.

CHAPTER 9

International Case Studies

9.1 Passive Infrastructure-Sharing Projects

Passive infrastructure accounts for a large part of the cost of building telecommunication networks and represents a very high part of the sunk costs for network deployments. For example, civil works (ducts, poles, and so forth) account for 68 percent of the total of the first-year costs for deploying a new fiber network (OECD, 2008).

Passive infrastructure is not only expensive, it also takes a long time to deploy, constituting a clear entry barrier for infrastructure-based competition. This issue is especially relevant for new entrants who, unlike incumbent operators, do not own a pre-existing access network inherited from the monopoly era. Because of this, passive infrastructure deployment and sharing should be facilitated and encouraged in general by policymakers and regulators, provided that lowering costs via infrastructure sharing does not raise concerns regarding the reduction of competition.

Some specific good practices aimed to foster passive infrastructure sharing are:

i. Promote regulation that fosters infrastructure sharing and ensure that this regulation is homogeneous at all levels (federal, state [department] and local [municipal]).
ii. Establish obligations for dominant operators that own ducts, masts, and any other passive infrastructure to share them at regulated prices with other operators, even when the passive infrastructure belongs to a parent company (e.g., electricity utility).
iii. Apply "dig-once" policies, encouraging diverse utilities (gas, electricity, telecommunications, water) to adhere to a common shared excavation plan. This can reduce

investments for all parties involved, minimize problems and inconvenience in the public space, and help to better organize deployment and future maintenance.

iv. Invest as well in deploying ducts that could be used by any operator under open access cost-based conditions to deploy their own networks. This is worthwhile when planning new public infrastructures, such as highways, and is especially useful when there is a lack of backbone or backhaul infrastructure.

v. Utilize relevant parts of the passive infrastructure deployed by other utilities such as gas, water, or electricity companies for telecommunication services. Utility companies performing civil works that are fully or partly financed by public means could be required to meet reasonable requests from telecommunication companies to coordinate civil works in order to deploy high-speed broadband networks. This is, for example, the case in the European Union, where Directive 2014/61/EU of May 15, 2014, on reducing the costs to deploy high-speed broadband networks, addressed these types of obligations.

9.2 Case Study: Bahamas' Infrastructure-Sharing Regulations

The Utilities Regulation and Competition Authority (URCA) in the Bahamas enacted a set of infrastructure-sharing regulations on September 2015, setting obligations, procedures, and directives on price setting for infrastructure sharing among operators. These regulations also include special provisions for construction, use, and sharing of communication towers. According to URCA's regulations, infrastructure providers—those operators owning passive infrastructure facilities—must set commercially negotiated access rates based on their actual costs and in accordance with the following principles:

- The charge should serve to promote the efficient use of assets and sustainable competition and maximize benefits for customers;
- Access charges must reflect a reasonable rate of return on capital employed and consider the investment made by the infrastructure provider;
- Access charges must only reflect the unbundled components that the infrastructure seeker wishes to use. An infrastructure provider must unbundle distinct facilities and corresponding charges sufficiently so that the infrastructure seeker need only pay for the specific elements required;
- Access charges must be transparent; and
- Access charges must be impartial, non-discriminatory, and no less favorable than those the infrastructure provider offers its subsidiaries, affiliates partners, or any other licensee.

In order to ensure efficient use and sharing of passive infrastructure, it is essential that operators have access to accurate information on its availability. This implies development of IT systems showing geo-referenced information on this infrastructure, as well

as supporting processes for requesting its use, provision, and maintenance. When the passive infrastructure to be shared is from the dominant operator, the implementation of these systems can be part of the obligations imposed on its access. When passive infrastructure to be shared includes elements provided by other utilities and/or other infrastructures, the corresponding project to implement and collect data from different organizations should be managed by the administration. An example of an infrastructure atlas—managed and launched in 2012 by the German regulator—is illustrated in the next case study.

9.3 Case Study: Germany's Infrastructure Mapping

In December 2012, a nationwide infrastructure atlas was put into operation by the German regulatory agency, Bundesnetzagentur. The atlas contains spatial data information on existing infrastructures in Germany that can be shared in principle for the construction of broadband networks and to increase the transmission capacity of existing networks. Data are included on existing passive infrastructure provided by infrastructure owners from different industries. These include companies in the energy and telecommunication sector as well as relevant infrastructure of the public sector.

The purpose of the infrastructure atlas is to bring together stakeholders to arrange broadband expansion projects with infrastructure owners. Operators can access information about the location of relevant infrastructures and obtain contact details for infrastructure owners in order to negotiate a joint use of the existing infrastructure.

The Federal Network Agency has a legal basis for the acquisition of data. Most infrastructure owners have opted to voluntary participate. Network sharing and co-investment are especially relevant for alternative operators that could not realistically undertake large-scale deployments in the access network on their own, or when the deployment of new networks or technologies requires substantial investments that can be shared by several actors. In this sense, such agreements can be seen as an opportunity rather than a threat to competition.

9.4 Case Study: Japan's Tunnel Association

In a densely populated country where infrastructure costs may be lower compared to expected returns, certain types of locations can still benefit from network sharing, including of active components. In Japan, for example, tunnels are used to overcome obstacles such as mountainous terrains or those commonly associated with urban areas. The use of tunnels can still present challenges for MNOs. They may have, for example, a limited space to place cables, in addition to the cost to deploy infrastructure in a tunnel.

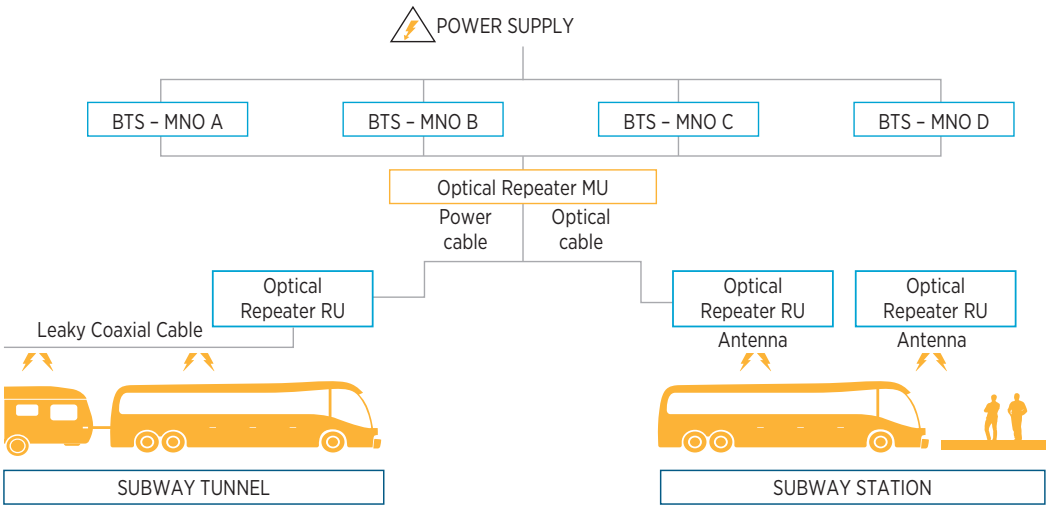
In 1994, the Japan Mobile Communications Infrastructure Association (JMCIA), a public entity, was established to provide a solution for active network sharing in tunnels. Its membership includes all MNOs, major facility vendors, and developers. It builds

mobile infrastructure shared by those operators inside the tunnels of railways, roads, and subways, as well as underground shopping malls. As shown in Figure 9.1, the association provides transmission facilities from base transceiver stations (BTS) to antennas, including power supply, whereby the BTS are separately operated by the MNOs. In the fiscal year ending March 2014, the association had completed deployments and made mobile broadband services available at 473 points in subway tunnels with which all underground lines in Tokyo have been covered, 211 points in road tunnels, 82 points in railway tunnels, and 765 points in subway stations.

From a policy perspective, it can be noted that the association's efforts are similar to other successful examples of network sharing, such as the practice in Sweden. It aims at developing new infrastructure by coordination through a joint entity, mainly financed by the operators. Government policy also supports this process. In some cases, the government subsidizes the development of shared facilities in less populated areas, although this is proportionally a very small part of the association's revenue (2.7 percent in FY2012). The association has also benefited from lower taxation requirements, as it is an authorized public interest entity.

FIGURE 9.1

SHARED FACILITY OPERATED BY JMCIA IN THE SUBWAY



Source: JMCIA.
Note: "MU" and "RU" stand for Master Unit and Remote Unit, respectively. The BTS is operated by each MNO.

CHAPTER 10

Best Practices on Key Regulatory Aspects

10.1 Major Aspects for Best Practices

The harmonization of land-use regulations for the deployment of passive infrastructure for cellular telephony is a critical element in promoting the expansion of connectivity. National or federal regulation that guides municipalities on these regulations facilitates and accelerates the process of construction of towers and micro cells, avoids the demand of requirements and arbitrary and illegal rates, generates legal security, and encourages an orderly deployment of passive infrastructure. This regulation should be accepted by all municipalities in the national territory, reaffirming its local character and at the same time recognizing the nature of the telecommunications public service as a national interest.

It is essential that national regulations expressly state that the passive infrastructure of telecommunications is compatible with the urban and rural zoning regulations of municipalities.

It is important to emphasize that each one of these regulations should be part of an ordinance, model, or decree at the national or federal level. In other words, the permit system for wireless telecommunications infrastructure must be comprehensive and include standards on municipal fees, minimum distances, and co-location or infrastructure sharing.

i. Location and Distances between Towers

- In order to avoid proliferation and promote the co-location of towers, both in urban and rural areas, the minimum distance we consider to be reasonable is 500 meters between structures in urban areas and 1,000 meters in rural areas.

In any case, the radius of protection in rural areas must be greater than in urban areas. However, with the introduction of 5G networks and IoT, these distances could be smaller if tower, mast, and pole sharing is mandatory, where technically feasible, and if compliant with visual impact and environmental regulations.

- The protection radius should be a privilege of the towers that allow the co-location of the structure.
- Exceptionally, additional infrastructure may be built within this radius only if existing structures do not have structural capacity to install additional equipment or if for duly justified technical reasons an additional structure needs to be installed. These circumstances must be tested by the proponent and verified by the municipality.
- Zoning and land-use norms should consider telecommunications services as basic services like water, drainage, and electricity, and, thus, compatible with any zoning.

ii. Co-Location or Infrastructure Sharing

- The regulation must promote and encourage the co-location or infrastructure sharing and limit the cases in which a second structure can be built where there is already one built within the protection radius.

iii. Payment of Construction Fees

- It is important to prevent municipalities from charging fees in a discretionary manner, often in order to deter the construction of new structures and/or disguise municipal taxes under the mantle of a fee.
- A single payment must be established for the granting of any permit. The calculation formula should be generally applicable to all municipalities.[19]
- The fees should not include recurring fees or payments at the discretion of municipalities. If recurring fees are included, these must be proportional to the effective service provided by the municipalities and must not be confiscatory.
- Both single and recurring fees must be subject to constitutional and legal tax principles; in particular, they must be reasonable and proportional to the service provided.
- The annual rate growth must be subject to a defined percentage (i.e., the change in the consumer price index).

iv. Observations/Additional Requirements/Positive Administrative Silence

- A maximum period must be established in which the planning office and/or the administration responds to a license application, performs a complete and total review of the documents submitted, and issues observations only once and in a complete way. This period must not exceed 30 calendar days from the date of the permit application.

[19] For example, in Chile it is 5 percent of the cost of the project or an average of US$2,500–3,000. In Ecuador, it is set to "x" number of times the current annual minimum wage.

- The municipality may not make subsequent observations on issues that it did not indicate the first time and may not include new requirements other than those that were published.
- In the absence of a response during the established period, positive administrative silence will be applied for site installation licenses, as long as the sites comply with the technical and legal requirements established in the legislation.

v. Granting of Licenses and Permits for Micro Cells or Use of Urban Structures

- In the case of micro cells or towers of a height less than 15 meters, the granting of permits and licenses must be given within a term not exceeding 30 calendar days from the date of application and in any case less than the established term for permits or licenses of macro towers. In the absence of a response during the established term, positive administrative silence will be applied for site installation licenses, as long as the sites comply with the technical and legal requirements established in the legislation.
- Permission will not be required in the case of an addition to existing urban structures—such as electricity poles, roofs, and billboards—in order to encourage their use. In this case, a notification to the municipality will be enough, and it will operate as an automatic authorization. Such authorization shall be subject to subsequent control to verify the execution in accordance with that presented by the proponent in its notification in compliance with the established technical and legal requirements.
- The authorization process must include the fiber-laying permit, considering that it is essential for connection and transmission in the deployment of this type of infrastructure.
- Under no circumstances may the deployment of macro sites in indiscriminate or arbitrary preference over micro cells be expressly or tacitly prohibited (i.e., through a very burdensome process).

vi. Health and Citizen Participation

- There must be an express prohibition of denying licenses or construction permits for sites adducing their proximity to sensitive areas (schools, hospitals, nursing homes) or for health reasons. Any consideration of health issues in the regulation of passive infrastructure should be limited to that stated in the regulation and control of the power of the equipment as recommended by the World Health Organization or the national authority competent in the matter.
- Local regulation may include processes to notify neighbors located within a certain radius near the tower[20] in order to inform the community about the project and its benefits. Nonetheless, the consent of the community may not be deemed

[20] In Costa Rica there is a mechanism of the environmental authority called the Community Communication Plan. The telecommunications company SBA communicates its site construction plans by displaying posters in common places and delivering flyers to immediate neighbors located within 50 meters of the tower's radius.

a requirement for the installation of sites. Nor should the community be empowered to reject the type of installation or request urban improvement measures to the neighborhood in exchange for the construction of the site.

- If notification to the community is necessary, it may be done by publishing the project in a local newspaper in advance of the application for the construction permit.
- The regulation should take into account technical assistance to local authorities, by the regulator or other competent authority, in order to guide them in the development of the regulatory framework related to the construction of passive and active infrastructure.

10.2 Price Regulation

Considering that contracts between infrastructure providers are clearly private and in order to respect contractual freedom between the parties, the prices agreed between the parties cannot be regulated, with the exception of the price regulations imposed on SMPs.

No national or local regulations should require the prior approval of contracts by the regulatory entity or the delivery of contracts with financial terms, both in relation to the land and to the operator's lease agreement.

10.3 Mimicry or Camouflage

Mimicry, a technique for hiding the infrastructure, will only be required exceptionally in the case of protected areas or when the environment merits it, for example, in areas with cultural, historical, or scenic significance. These protection zones must be properly identified and regulated by the corresponding competent authority.

In case mimicry is required, it should be simple and should consider costs so that the construction of the infrastructure does not become prohibitive and to avoid the discretion of the local authority.

Mimicry should give flexibility so that the builder can propose structures or include a catalog with designs that allow to co-locate more than two operators.

10.4 Regularization of Old Sites

The legislation must provide the possibility of a "regulatory truce," legalization, or sanitation in the case of sites (i) that existed before the regulations on current passive infrastructure, (ii) that cannot meet the urban requirements, and (iii) which are necessary for the coverage and provision of telecommunications services.

In the case of a regulatory truce, a minimum period of two years must be given so that sanitation requirements can be met.

New legislation on passive infrastructure should not consider the retroactivity of the requirements.

10.5 Administrative Responsibility

It would be convenient to establish administrative, personal, and disciplinary responsibility for those public officials who unreasonably hinder or delay the approval of licenses or permits through conduct such as including a partial and incomplete analysis of the submitted documentation, making multiple observations at various times, or demanding additional requirements other than those officially published for the issuance.

10.6 Concession Need or License for Infrastructure Providers and Tower Registration

Considering that passive infrastructure does not use the spectrum or other public property, it should not be subject to a concession system.

In case an inventory of telecommunications infrastructure in the country is required, the simplest way is a registry of sites managed by the regulatory entity, with the obligation to send information only about the location and height of the tower, with a frequency of not less than each trimester. This record must include information on the operators that use the tower, regardless of whether the sharing is active or passive.

10.7 Provision of Real Estate and Public Spaces

To the extent that municipalities offer their public spaces' portfolio, easements, and real estate, they must be required to do so indiscriminately by offering them both to operators and providers of passive telecommunications infrastructure for the installation of telecommunications structures. In any case, the structures built in these spaces or places must comply with all corresponding standards, including minimum distance requirements.

Likewise, regulations on the use of public space, easements, and real estate must define a reasonable price for which such public space will be available so that it is not subject to sudden or unilateral changes by the administration of the day, except for applicable annual increases in accordance with the change in the consumer price index.

In the case of micro cells, the obligation of co-location or infrastructure sharing should be established.

The public space or easements should be available for minimum legal terms of 20 years for the peaceful and continuous use thereof, preventing the municipality from arbitrarily revoking the award to the detriment of the continuity of the public service provided and the investment made by the telecom infrastructure providers.

In case of early termination by the municipality, there must be an obligation to relocate the site at the cost of the municipality or a compensation or criminal clause that

includes the recovery of the non-amortized investment plus a reasonable return as expected for the affected site.

10.8 Temporary Sites

The regulation should consider the temporary installation of temporary structures that don't require prior granting of a permit, since such facilities do not require any construction work and are temporary structures that are easily uninstalled.

10.9 Granting of Licenses and Permits for Micro Cells or Use of Urban Structures

Permission will not be required in the case of an addition to existing urban structures—such as electricity poles, roofs, and billboards—in order to encourage their use. In this case, a notification to the municipality will be enough, and it will operate as an automatic authorization. Such authorization shall be subject to subsequent control to verify the execution in accordance with that presented by the proponent in its notification.

10.10 Facilitation of Rooftop Use

More lax requirements must be established so that communities living in buildings can approve the use of roofs for the installation of telecommunications infrastructure.

If applicable, permits or licenses for the installation of telecommunications infrastructure should not be subject to the existence, attainment, or status of building permits, except in the case of structural damage.

CHAPTER 11

Recommendations for the Roadmap for Infrastructure Sharing

Technical	Internal	Regulatory	Policy
• Pricing strategy for the services to be provided (model, LRIC calculation) • Sales model (e.g., IRU/non-IRU model) • Standard terms and conditions • GIS and Asset Management System • To close the national OPGW network gaps	• Setup of internal processes to support telecom activities • Model and process for billing and separate accounting • Flexible procurement process • Project manager (new employee) • Market research and business plan • Market activities plan	• Authorization from the energy regulator to engage in provision of other services (outside electricity market) • Explanation/decision of the energy regulator with regards to treatment of "non-regulated" revenues • Authorization (license) from the telecom regulator to engage in provision of wholesale backbone services/ infrastructure	• Relevant and coordinated policy provisions in relevant digital and energy strategies • Secure support towards infrastructure sharing through the ownership structure, including strategic and political support

(continued on next page)

(continued)

Technical	Internal	Regulatory	Policy

• **For provision of capacity services, in addition to the above the following is required:**
  ◦ To deploy IP/ MPLS
  ◦ To deploy DWDM
• **For infrastructure sharing cross-border, the following is required:**
  ◦ To close the international OPGW network gaps with neighboring countries
	• New plan for customer implementation process
	• Access to the sites (security process part of general terms and conditions)
		• Review/update of the regulatory framework for infrastructure sharing, including dispute resolution
		• Perform/update an analysis of the relevant market for wholesale provisioning of trunk (backbone) segments of leased lines
		• Review/update the Law on Procurement to allow efficient and quick purchase of telecom equipment for (public) electricity company
		• **For infrastructure sharing cross-border, the following is required:**
		  ◦ Review of the applicable regulation with regards to cross-border connections and contracts	

Annex I
Example of Legislation for Infrastructure Sharing

The Municipality of [name] approves the following General Ordinance of regulation for the installation of Supporting Infrastructure for Telecommunications Antennas and related infrastructure, where the procedures and technical standards for the construction and installation of Radio-Electric Stations used in the provision of the public services of technology, computing, and communications throughout the municipal territory and other related provisions are issued.

Considering:

That the liberalization of the telecommunications market and the constant technological advances in recent years have motivated the emergence of new communication services, accompanied by an increase and multiplication of telecommunications facilities in relation to existing ones, which have a visual and environmental impact on the urban and natural environment, so the need arises for the Municipal Administration, within its competence and under the budget of its autonomy in planning and territorial administration, to establish general parameters that govern the granting of municipal licenses regarding the construction, commercial exploitation, and land use related to the Supporting Infrastructure for Telecommunications Antennas.

That technological development has given a strong boost to radiocommunication systems that are used in different services such as public and private security, mobile telephony, high-speed internet, financial transactions, social networks, streaming, and big data, among others.

That the role of the different networks to support technological convergence must necessarily be part of a homogenous regulatory framework suitable for the industry's development, that promotes a competitive market among mobile phone service operators and that benefits users and consumers so that they can access a greater quantity and diversity of such services and at lower prices.

That mobile telephony systems work with a technology called "cellular" because each transmitting antenna is part of a cell, of several related to each other, so that all together have a certain coverage area.

That each cell has a limited coverage capacity so that the number of cells and, consequently, of antennas is related to the coverage and the quality of the service depending on the density of users that each cell covers.

That, in order to minimize the impact of the Antenna Support Infrastructures, it is a worldwide recognized practice to install antennas of different companies in the structure of one of them, this practice being called "co-location" or "sharing" of infrastructure.

That from the growth of the use of mobile telephony it is necessary to increase the number of cells that operate in a certain municipality to adequately provide the services offered to users. Consequently, it is necessary that the municipal administration, within its competence and under the budget of its autonomy in the matter of planning and territorial administration, establish the general parameters that govern the granting of municipal licenses in relation to construction, marketing, and land uses related to such facilities or infrastructure.

That other regulatory aspects related to Antenna Support Infrastructures such as their environmental and human health impact are the competence [exclusively of the corresponding national or federal agencies (or those specifically delegated), in particular the Ministry of Health or its equivalent and the Ministry of Environment or its equivalent, respectively.] Likewise, the parameters used to determine the environmental and health impact must be based on international standards on non-ionizing radiation, such as the guidelines published by the International Commission on Non-Ionizing Radiation Protection, in order to guarantee the application of a universal and transparent criterion.

That the so-called information and communications technologies allow citizens the free exercise of the rights to freedom of expression and access to information guaranteed by the national constitution and numerous international treaties of constitutional hierarchy [indicate corresponding articles] play a relevant role in the democratic strengthening; education; cultural identity; and economic, industrial, and technological development of its peoples, being essential when defining a strategic country project in the context of a globalized world.

That [indicate the constitutional and legal norms, as well as the decrees and regulatory resolutions from which this ordinance derives, if necessary].

That, by virtue of the foregoing, the Municipal [Manager/Mayor], in use of his powers and attributions, sends for its study and subsequent sanction the following General Ordinance of regulation for the installation of Supporting Infrastructure for Telecommunications Antennas and related infrastructure.

Chapter I – General Dispositions

Article 1 – Definitions. For the purposes of this Ordinance, the following definitions shall apply:

Applicant: Passive Infrastructure Provider or Telecommunications Operator that asks the competent Municipality to award an Installation Permit.

Canon for the Use of Public Use Goods ("Canon"): The amount to be paid for the use of Public Use Goods or Private Property Goods of the Municipality for the installation of Supporting Infrastructure for Telecommunications Antennas.

Co-Location: Agreement between the owner of a Supporting Infrastructure for Telecommunications Antenna and a Telecommunications Operator, under which the owner authorizes the use of a part of the Supporting Infrastructure Telecommunications Antenna for the installation of Telecommunications Antennas.

Construction or Installation Permit ("Installation Permit"): Administrative act issued by the competent Municipality that authorizes the construction of a Supporting Infrastructure for Telecommunications Antennas.

Information and Communication Technologies ("ICTs"): Technological and communication tools or resources that serve to facilitate the issuance, access, and treatment of information through varied codes that can correspond to texts, images, and sounds, among others.

Legal Minimum Wage: Minimum amount of money paid to a worker in a country through an officially established law, for a given work period (hour, day, or month) and that must be paid by employers to workers for their work.

Non-Proliferation Radius: Minimum distance equivalent to a radius of 500 and 1,000 meters in urban and rural areas (or other areas defined in the corresponding jurisdiction), respectively, that must exist between a Passive Infrastructure and another. Said distancing will be measured from the vertical axis of the existing Passive Infrastructure. For the purposes of this Ordinance, Passive Infrastructure that was constructed without the Installation Permit that was in force at the date of its construction will not be considered for the determination of the Non-Proliferation Radius. However, with the introduction of 5G networks and Internet of Things (IoT), these distances could be smaller if tower, mast, and pole sharing is mandatory, where technically feasible, and if compliant with visual impact and environmental regulations.

Passive Infrastructure Provider ("Provider"): Natural or legal person that develops Passive Infrastructure for the use of Telecommunications Operators or other third parties.

Private Property Goods: Movable and immovable assets other than those defined as Public Use Goods.

Public Use Goods: Movable and immovable assets that belong to the National or Federal State, the Departments or Provinces, the Municipality or other entities of the public administration and that by the express will of the legislator or by provision of the

competent authority are intended to the community or to the public interest or used as private property.

Radio-Electric Station: The set of Supporting Infrastructure for Telecommunications Antennas and/or Passive Infrastructure and Telecommunications Antennas.

Regulator: Specific public body whose purpose is to regulate the telecommunications industry and increase legal security in such industry and transparency for the benefit of consumers in the sector it regulates.

Rural Area: Any geographic extension that is outside the Urban Area.

Special or Protection Area: An area or movable or immovable asset that by national legislation has been classified as being of national architectural, cultural, or historical heritage or having environmental protection and that is subject to a special set of rules due to its nature or condition.

Supporting Infrastructure for Telecommunications Antennas ("Passive Infrastructure"): A set of physical equipment permanently attached to the ground through a foundation, installed on the roof of an existing building, or attached to a facade, intended to support Telecommunications Antennas, including pipelines, ducts, poles, towers, antenna supports, cables, backup and regeneration energy, as well as systems and/or intelligence equipment necessary to optimize the use of said infrastructure.

Telecommunications Antennas ("Antennas"): Physical element that can radiate electromagnetic signals intended to provide telecommunications, cellular telephony, and data provision services to the community in general or to a particular group of people.

Telecommunications Operator ("Operator"): Natural or legal person that provides telecommunications services.

Temporary Supporting Infrastructure for Telecommunications Antennas ("Temporary Infrastructure"): Structures installed on the ground, suitable for being transported by car or that can be transported autonomously and that have structural capacity to support Telecommunications Antennas. This type of infrastructure will not be subject to the obligation to comply with minimum distancing from the demarcation of the property and may remain installed for the entire time indicated in Article 9 of this Ordinance.

Urban Area: Imaginary line that defines an urban area from other areas. Urban areas, for the purposes of this Ordinance, will be those designated by the communal territorial planning instrument issued by the corresponding Municipality. [Depending on the legislation,

include the different delimited areas in each municipality (i.e., Suburban, Industrial, Commercial, etc.).]

Article 2 – Objective. This Ordinance pursues the following objectives:

a. Establish the requirements and procedures to obtain a Passive Infrastructure Installation Permit and regulate the technical and regulatory conditions for its installation.
b. Ensure that the Supporting Infrastructure for Antennas necessary for telecommunications systems are planned, designed, and located in the form and coordinates where there is a need for coverage.
c. Ensure that the Passive Infrastructure is installed in accordance with the technical specifications under which they were authorized.
d. Facilitate the issuance of Installation Permits and guarantee the deployment, efficient use, and sharing of Passive Infrastructure for the provision of telecommunications networks and the services that may be provided on them, in Private Property Goods and Public Use Goods.
e. Contribute so that municipal development is carried out in accordance with the constitutional and legal stipulations on territorial planning, protection of public space, and access of citizens to public services, with a vision of smart cities.
f. Encourage the development of infrastructure that tends to guarantee access and use of telecommunications by citizens and guarantee the exercise and effective enjoyment of the telecommunications service. For these purposes, the implementation of an existing Passive Infrastructure regularization plan will be promoted, among other initiatives.
g. Establish the minimum distances that must exist between the Supporting Infrastructure for Telecommunications Antennas or Radio-Electric Stations in order to encourage infrastructure sharing and its orderly deployment throughout the municipal territory and avoid unnecessary proliferation of such infrastructure.
h. Establish a single national process that facilitates the issuance of licenses and permits, accelerates the deployment of wireless networks, encourages investment, offers legal security, and, in general, allows the implementation of public policies on connectivity and closure of the digital gap.

Article 3 – Scope. The regulations described in this Ordinance apply to all sites. Passive Infrastructure is compatible with all types of zoning and use, including, with no limitation, urban and rural, residential, without distinction by demographic, commercial, agricultural, industrial, or mixed density, except for the limitations that apply in Special or Protection Areas declared by law.

This ordinance shall apply without distinction to all natural or legal persons, public or private, that require or request Installation Permits, in the role of Operator, Provider, or in any similar role, regardless of the areas where infrastructures are installed, whether public

domain or public access, or private domain or private areas, and as long as they are within the jurisdiction of the Municipality.

Likewise, Passive Infrastructure Providers will not be required to present documentation or additional information not expressly stated in this ordinance in order to obtain permits.

Chapter II – Requirements for Issuance of Installation Permits

Article 4 – Municipal Authority. It is the municipal administration's responsibility to know, assess, monitor, and resolve the Installation Permit applications, in particular [adjust wording in the case of a federal, national, or state/departmental law or decree]:

a. Dictate the necessary measures for the fulfillment of this Ordinance in order that the installation of Passive Infrastructure meets the technical, safety, conservation, and integration conditions of the urban and environmental context of the Municipality.
b. Grant the Installation Permit when the Applicant meets the requirements and conditions set forth in this Ordinance.
c. Order the suspension, closure, or demolition of Passive Infrastructure that is not subject to the provisions of this Ordinance, unless it already has an Installation Permit at the time of entry into force of this Ordinance, or that has been subject to the transitional regularization regime of Passive Infrastructure stated in this Ordinance.
d. Request and receive criteria and technical guidelines that the Regulator establishes in exercising its power, with the purpose of coordinating and ensuring an adequate balance between the national interests of the telecommunications service's development and the local interests represented by the Municipality.
e. Maintain a record, in accordance with Annex 1 of this Ordinance, updated and available to the public that includes the following information: (1) name of the Applicant, number of the plan registered, and address where it is to be built; (2) geo-referencing with longitude and latitude coordinates; (3) date and time of receipt of the Installation Permit application; and (4) date of grant or denial of the Installation Permit.

The Municipality must send to the Regulator [or competent authority in each country] an electronic file with the information indicated, with a minimum frequency of quarterly.

Article 5 – Requirements for Issuance of Installation Permits. From the time of the publication of this Ordinance, the installation of Passive Infrastructure throughout the municipal territory will be allowed after issuing the respective Installation Permit. To obtain the installation permit, the Applicant must submit the following requirements:

a. Technical Requirements
    1. Geo-referencing of the location of the proposed Passive Infrastructure center with longitude and latitude coordinates in WGS84 formats and/or local system,

if applicable, together with the corresponding nomenclature or cadastral information.

2. Technical description of the project, typology to be used, necessary installation height, the area covered by the structure, capacity of the structure reflected in the number of operators that can be installed, technical characteristics of the structure, and implementation sketches.
3. Project construction drawings that include the location and identification of the property or land indicating the official coordinates; the elevation of the land on which the station will be installed; the relation to adjacent properties; the location, distribution, and height of the Passive Infrastructure; and localization of zone differentiation signaling. Likewise, and in order to clearly show the dimensions and/or size of the facilities, the civil and electromechanical engineering drawings, technical details, calculations, and any other analog and/or written means that facilitate their understanding. In addition, letters of responsibility duly signed by the corresponding responsible professionals must be included.
4. If the Passive Infrastructure for which the permit is requested is to be installed on a previously constructed property, the structural study of this construction must be provided together with the letter of responsibility of the respective calculation engineer, guaranteeing that the stability and earthquake resistance of any property will not be threatened by the weight of the Radio-Electric Station or any element of it.
5. When it is necessary to carry out construction, extension, modification, or demolition of buildings, the respective construction license issued by the urban curator or the competent municipal or district authority must be attached.
6. For the installation of Passive Infrastructure in Special or Protection Areas, the authorization of the competent entity for such Special or Protection Area must be attached.
7. Other permits granted by administrative entities other than the Municipality and reasonably requested by it, such as the corresponding permit from the civil aviation or air authority, environmental permits or those from the fire department or other entities responsible for conservation, protection, social security, and similar areas.

b. Legal Requirements

1. Title under which one acts for the procedure and documentation submission proving the right of use, pleasure, and enjoyment of the respective property as owner, proxy, or holder or any other faculty of use and disposition of the property that the Applicant has.
2. Extra-contractual civil liability policy with a minimum coverage of US$500,000, which may be the general extra-contractual civil liability policy held by the company requesting the respective Installation License.

3. An affidavit, in accordance with Annex 2 of this Ordinance, stating that: (i) Passive Infrastructure has been designed to co-locate at least two Operators, and (ii) there is no Passive Infrastructure at a minimum distance of 500 meters in urban areas and of 1,000 meters in rural areas from the center of the proposed Passive Infrastructure. This minimum distance does not apply when the existing Passive Infrastructure (i) lacks the structural capacity to install additional Antennas, (ii) has structural capacity but the owner of said Passive Infrastructure is not willing to make the necessary technical modifications to install additional Antennas, or (iii) for duly justified technical reasons an additional structure needs to be installed, in accordance with the exceptions provided for in this Ordinance. However, with the introduction of 5G networks and Internet of Things (IoT), these distances could be smaller if tower, mast, and pole sharing is mandatory, where technically feasible, and if compliant with visual impact and environmental regulations.

Article 6 – Public Use Goods. The Municipality may authorize the installation of Passive Infrastructure in Public Use Goods, movable assets or real estate, as long as its final public destination or its private use is not impaired. In this case, the Applicant must sign a lease for Public Use Goods with the Municipality, which must include the following minimum conditions:

a. Minimum and irrevocable initial term by the Municipality of 30 years.
b. Expressed authorization to the lessor to sublet or assign the lease without the need for prior or additional authorization.
c. Lease fee with annual increases not exceeding the inflation rate. The applicable fees for the lease of public space for the installation of Radio-Electric Stations will be 10 percent of the monthly legal minimum wage in force per square meter leased at most or a similar measure established in local or national legislation.
d. The easements necessary for the operation of the Radio-Electric Station will not generate additional charges for any reason.
e. Exclusion of early terminations by the Municipality, except those due to public utility declared by formal administrative act or to modifications approved by local land-use regulations regarding a new destination of leased public space for declared public utility purposes. In this case, the Municipality must make available to the Applicant a new Public Use Good under the same rental conditions.
f. The parties will not respond in any case for loss of earnings [if national legislation permits].
g. This contract must be attached to the Installation Permit application together with the other documents contained in this Ordinance.

With the purpose of contributing to the local telecommunications and connectivity development plan, the Municipality will prepare an official map of the Public Use Goods that may be used for the development of Passive Infrastructure.

Chapter III – Process for the Application and Issuance of the Installation Permit

Article 7 – Process for the Application and Issuance of the Installation Permit. The permit application must be submitted to the corresponding entity of the Municipality, accompanied by the necessary technical and legal requirements described in Article 5 of this Ordinance.

a. From the day following the submission of the application for the Installation Permit, the corresponding municipal authority will have a maximum of ten (10) business days to carry out the complete and total review of the documents presented and issue observations only once and to require the Applicant in a complete form to supplement, extend, or modify the request. In turn, the Applicant must respond within a maximum period of five (5) business days from the date it receives the notification to supplement, extend, or modify the request. The proof of application submission will be enough for the local energy supplier to proceed with the analysis and supply of electrical energy to the Radio-Electric Station project.
b. Once the application has been corrected in a proper way and within the indicated period, the Municipality may not make subsequent observations on issues that it did not indicate the first time and may not include new requirements other than those contained in this Ordinance. Consequently, the authority must issue the Installation Permit within a term not exceeding (20) business days from the date on which the application was submitted, the application was duly corrected, or the initial term of five (5) business days mentioned in subparagraph (a) has expired without the respective municipal authority appearing. If the Applicant does not correct the application within the term indicated here, it must initiate a new application process for the Installation Permit.
c. If the initial term of five (5) business days mentioned in subparagraph (a) has expired without the respective municipal authority appearing, it may not require the Applicant to correct the application by supplementing, extending, or modifying it and must issue the Installation Permit within a maximum period of twenty (20) business days from the date on which the period to comment on the request for the Installation Permit expired.
d. In case the request for an Installation Permit is not answered within the maximum period mentioned in subparagraphs (b) or (c), as appropriate, the silence of the administration will have positive legal effects with respect to the approval and the Municipality must issue the Installation Permit. In the event that the Municipality does not issue the Installation Permit, and as long as the request for the Installation Permit meets all the technical and legal requirements indicated in Article 5 of this Ordinance, the Applicant may file a certificate of verification of such event in the Public Notary and said notarial certificate will be considered as an Installation Permit

granted for the purposes of this Ordinance and shall have full effect for the Municipality, the Applicant, and third parties.

e. The Municipality will not grant an Installation Permit in the following cases:
   1. When there is a previously granted Installation Permit for a Passive Infrastructure, which:
      ii. Has sufficient capacity for Co-Location, after considering any technical or structural modification that the owner of such infrastructure is willing and able to perform, and
      iii. Is located at a distance less than 500 meters in an urban area or 1,000 meters in a rural area, measured between the center of the proposed Passive Infrastructure and the center of the previously approved Passive Infrastructure. With the introduction of 5G networks and IoT, these distances could be smaller if tower, mast, and pole sharing is mandatory, where technically feasible, and if compliant with visual impact and environmental regulations.
   2. When the Passive Infrastructure to be installed does not allow shared use or Co-Location, unless a duly substantiated technical exception is presented with the file, in accordance with Article 15, subparagraph (b), about Co-Location.
   3. If the authorized construction has not yet been executed, requests for Installation Permits will not be rejected outright but will be placed on hold in order of submission until (i) the execution of the previously approved work is completed or (ii) the authorization period of the previous Installation Permit expires without completion of the work.

Article 8 – Payment of Rights. For the processing and issuance of the Installation Permit, the Municipality will charge a single and non-recurring fee equivalent to three (3) Current Monthly Legal Minimum Wages. The Applicant must pay within fifteen (15) business days from the date on which he has been notified of this payment. The Municipality may only demand payment of rights once the review process has concluded with favorable resolution approving the work and prior to the issuance of the administrative act of granting the Installation Permit. Once the Installation Permit has been issued, the owner of the Radio-Electric Station will have no further obligations to pay periodic fees or sums of any kind.[21]

[21] In those countries where there are recurring rates, the following paragraph will be added: In addition to the payment for the Installation Permit, the Municipality, by means of a special ordinance, may charge an inspection fee to the Passive Infrastructure in accordance with constitutional principles and legal tributaries. Consequently, the fees must be directly proportional and linked to the inspection service provided by the Municipality. In any case:

a. The maximum monthly rate applicable for this recurring rate may not exceed 10% of the current monthly legal minimum wage.

Article 9 – Temporary Infrastructure. While the Installation Permit is processed by the respective municipality, the Applicant may install, inside the property where the Passive Infrastructure is intended to be installed or at another site near it, a Temporary Infrastructure whose height does not exceed thirty (30) meters measured from the ground and for all the time that elapses from the beginning of the process until sixteen (16) weeks after the date of issuance of the Installation Permit. After the sixteen (16) weeks mentioned above or in case the Municipality rejects the issuance of the Installation Permit and said rejection is firm and enforceable, the Applicant must remove the Temporary Infrastructure or pay a fine equivalent to sixty (60) times the current legal minimum wage or twenty-five thousand ($25,000) dollars of the United States of America, whichever is greater. The aforementioned term for Temporary Infrastructures will not expire and will be extended for every day in which there is any conflict with the community, any authority, or any third party that prevents the construction or installation of the permanent Radio-Electric Station.

Article 10 – Installation Permits in Special or Protection Areas. Except when expressly prohibited by national legislation, the Municipality shall issue Installation Permits in Special or Protection Areas, as long as they comply with the requirements set forth in Article 5.

Article 11 – Validity of the Installation Permit. Once the Installation Permit has been granted, the Applicant will have the right of preference to build the Passive Infrastructure for a period of one hundred twenty (120) calendar days. After this period has elapsed without the Applicant having completed the Passive Infrastructure, the Installation Permit will expire and the Municipality may grant the Installation Permit within the preferential area to another Applicant, in the order in which applications are submitted that meet all the established requirements. The aforementioned term for Temporary Infrastructures will not expire and will be extended for every day in which there is any conflict with the community, any authority, or any third party that prevents the construction or installation of the permanent Radio-Electric Station.

If the Installation Permit has expired and two or more Installation Permit applications coincide within the Non-Proliferation Radius, the Municipality will resolve them according to the order in which the applications were submitted. If it is not possible to determine which application was submitted first, the Municipality will grant the Installation Permit as appropriate to the Applicant that completes its requirements first. In case all interested parties have also completed their requirements, the Installation Permit will be granted to the Infrastructure that allows the greatest number of Co-Locations and, in case this number is equal for all interested parties, the permit will be granted by lottery.

b. The Municipality may not create rates that are equivalent to an indirect tax on the gross or net income of the Applicant, whether considered of a confiscatory nature or not.
c. Annual rate growth will be governed by increases in the consumer price index.

For this purpose, the Municipality will convene the parties at an oral and private hearing where said lottery will be held, from which a record will be drawn up.

Article 12 – Resources if the Installation Permit is Not Granted. In the event the Municipality denies the Installation Permit, the Applicant may appeal such decision and bring the resources contemplated by the administrative regulations to the Regulator or other competent authority, within the terms and conditions indicated therein.

Chapter IV – Obligations of the Provider, Minimum Distances, Co-Location

Article 13 – Obligations of the Provider. The Provider will have the following obligations in relation to Passive Infrastructure:

a. Place a visible sign at the entrance to the corresponding property from the beginning of the Passive Infrastructure construction, with a minimum dimension of 0.45 x 0.60 meters and made of any resistant material, containing the following data:
    1. Name, denomination, or registered name.
    2. Installation Permit Number.
    3. Telephone contact numbers in case of emergencies and for the maintenance of Passive Infrastructure.
    4. Address and/or means to receive notifications.
b. Maintain the Passive Infrastructure in good physical and safe condition.
c. Comply with the permits applicable to Passive Infrastructure according to current legislation.
d. Restrict the entry of unauthorized third parties to the property where Passive Infrastructure is installed.
e. Pay and keep up to date the insurance policy indicated in Article 5.
f. Submit within a maximum period of eight (8) business days after the conclusion of the Passive Infrastructure the report of the responsible professional, in which the execution is accredited according to the project, as well as the strict compliance with the technical conditions of law, corrective measures, and conditions established and imposed in the Installation Permit.
g. Inform the Municipality and process an update to the Installation Permit in case of extension or modification of the Passive Infrastructure, in accordance with what is indicated in this Ordinance.
h. Comply with any other national or local standards, regulations, and other guidelines issued by both the competent national/state/provincial authorities or the Municipality in relation to the construction of civil works.

Article 14 – Minimum Distances between Supporting Infrastructures for Telecommunications Antennas.

a. In both Urban and Rural Areas, Providers of Supporting Infrastructure for Telecommunications Antennas, as well as Mobile Telecommunications Operators, must respect the Non-Proliferation Radius.
b. The competent municipality and [add name of the Ministry of Telecommunications and/or regulatory body] will be entitled to order the immediate withdrawal of that Passive Infrastructure that has been built without respecting the Non-Proliferation Radius,[22] without prejudice to the administrative and civil sanctions that in law correspond against the party that has infringed on the Non-Proliferation Radius.

The request to the respective municipality for the installation of a second Passive Infrastructure within the Non-Proliferation Radius must be rejected outright by the Municipality, including those cases in which the first Passive Infrastructure has not been built but the process of issuing the Installation Permit has been initiated and is pending decision. Notwithstanding the foregoing, exceptionally a second Passive Infrastructure may be authorized to be installed within the Non-Proliferation Radius in the cases expressly set forth in Article 15, subparagraph (b), on exceptions to mandatory Co-Location.

Article 15 – Co-Location.

a. Before installing Telecommunications Antennas, Mobile Operators must verify whether there is, within the coverage area that they intend to establish, a Supporting Infrastructure for Telecommunications Antenna from another Operator or from a Passive Infrastructure Provider that has been authorized in accordance with the provisions of this Ordinance or the applicable law at the time of building said infrastructure. If there is infrastructure within the coverage area, the Operator must request authorization from the Passive Infrastructure owner to co-locate its Telecommunications Antennas in said infrastructure; this authorization will come to fruition via a signed contract between the parties.
b. The owner of the Passive Infrastructure may deny Co-Location to the requesting Operator only in the following cases:
    1. When the Passive Infrastructure is camouflaged with the urban environment and is not suitable to co-locate;
    2. When there are technical studies that determine that the installation of new Telecommunications Antennas may affect the normal operation of existing Telecommunications Antennas; or
    3. When the structural capacity of the Passive Infrastructure is not sufficient to support the equipment that the Telecommunications Operator has requested to

[22] However, with the introduction of 5G networks and Internet of Things (IoT), these distances could be smaller if tower, mast, and pole sharing is mandatory, where technically feasible, and if compliant with visual impact and environmental regulations.

install, and the latter is not willing to cover the total investment needed to adjust the structural capacity of the Supporting Infrastructure for Telecommunications Antennas.

In the event that the owner of the Passive Infrastructure refuses to authorize the Co-Location, the requesting Telecommunications Operator may appeal to [add name of the Ministry of Telecommunications that corresponds to each country or the regulatory entity] to determine whether the Passive Infrastructure owner's refusal was justified according to the causes established above.

Leases or similar contracts that are signed with the owners of Private Property Goods or Public Use Goods and that allow the use and enjoyment of a land space for the installation of Passive Infrastructure may not contain clauses that, directly or indirectly, prohibit Co-Location. Said clauses shall be deemed unwritten for all legal purposes that may arise.

If the studies and technical evaluations conclude that Co-Location is not possible, the case will be reviewed exceptionally for the possible issuance of the Installation Permit, with the fulfillment of the other requirements established in this Ordinance.

Chapter V – Miscellaneous Provisions

Article 16 – Responsibility Regime of Public Officials. In the event that an official hinders, limits, delays, or unreasonably rejects the process of an Installation Permit, for example by making a partial and incomplete analysis of the documentation presented or indicating multiple observations at the wrong time or demanding different additional requirements to those published in this Ordinance, this official shall incur the disciplinary sanctions contemplated in the corresponding administrative rules and shall be liable to the ordinary courts for the payment of damages arising from their conduct.

In these cases, the Applicant may file the corresponding disciplinary and civil actions in order to demand compliance with the provisions of the legislation and to claim the payment of damages related to the facts generated by negligence of the municipal administration.

It is the obligation and responsibility of the corresponding municipal officials to be attentive to identifying barriers that may exist to encourage the deployment of Passive Infrastructure and propose measures for their elimination either on their own or on behalf of the Applicant.

Article 17 – Transition Regime. Within three (3) years after the issuance of this Ordinance, the owners of Passive Infrastructure must present a list of structures they own with the technical characteristics of each, attaching the extra-contractual civil liability policy and letters of responsibility of the calculating engineers that guarantee their stability in the conditions under which they were built. The inventories of structures that

have the aforementioned requirements will be automatically regulated or authorized by the respective authority by means of an Installation Permit as regularization and will be valid for an indefinite period. This permit will be issued within two (2) months following the expiration of the term mentioned in the previous paragraph. If the Municipality does not resolve within the period provided for in this provision, positive administrative silence shall be applied in accordance with the provisions of Article 7 of this Ordinance.

The Passive Infrastructure that is not present in the inventory mentioned here will be subject to administrative sanctioning processes that will seek its dismantling and minimum fines equivalent to sixty (60) times the current monthly legal minimum wage or twenty-five thousand ($25,000) dollars of the United States of America, whichever is greater.

Article 18 – Health Considerations. In compliance with the recommendations and international pronouncements issued by the World Health Organization and accepted by the national competent authority, all Radio-Electrical Stations that comply with the electromagnetic field emissions within the powers established by the technical standard issued by the International Telecommunication Union (UIT) in its Recommendation UIT-TK-52 are authorized. Consequently, no request for an Installation Permit may be rejected by the officials or authorities in charge of its issuance under arguments related to health or its proximity to educational centers, nursing homes or hospitals, or any other similar place, under penalty of incurring the sanctions outlined in Article 16 of this Ordinance.

Article 19 – Repeal and Validity. This Ordinance is effective as of the date of its publication and repeals all municipal regulations previously issued regarding the installation of Passive Infrastructure and its respective Installation Permits.

Registration Form for Supporting Infrastructure for Telecommunications Antennas

1. Name of Applicant
2. Registered plan number
3. Address of the property where it will be built
4. Geo-referencing with longitude and latitude coordinates
5. Date and time of receipt of the Installation Permit Application
6. Date of grant or denial of the Installation Permit

Affidavit of Compliance with Minimum Distances

In [city] on the [date]*th* day of [month] [year], I [full name as it appears on identification], identified with [name of document] number [document number] and with permanent address in [city], acting on behalf of [company name], identified with [tax identification number]

I declare under oath or solemn promise that:

1. [Company Name] is processing the application for a Passive Infrastructure Installation Permit in the place and conditions indicated in the application,
2. The Passive Infrastructure has been designed to co-locate at least two Operators, and
3. According to our knowledge and corresponding research, there is no Passive Infrastructure at a minimum distance of 500/1,000[23] meters from the center of the proposed Passive Infrastructure.

This declaration was made for all legal purposes that may arise, aware of the civil and criminal responsibility that it entails. And for the record and the corresponding legal effects, I sign this declaration in the city and date indicated above.

[Signature]

Name

Identification No.

[23] Use 500 meters for urban areas and 1,000 meters for rural areas. However, with the introduction of 5G networks and Internet of Things (IoT), these distances could be smaller if tower, mast, and pole sharing is mandatory, where technically feasible, and if compliant with visual impact and environmental regulations.

Annex II
Example of Infrastructure-Sharing Contract

No. _____ No. _____

Service Contract

Concluded between:

[Name of the Electricity Transmission Operator (TSO or the company that was enabled by the TSO to provide services over its infrastructure], with offices at [address], registration number [number], Unique Registration Code [registration code], IBAN code [IBAN code], opened with [...], represented by [name, surname], as **PROVIDER**, hereinafter referred to as "**PROVIDER**"

and

[Name of the company], with offices at [address], registration number [number], Unique Registration Code [registration code], IBAN code [IBAN code], opened with [...], represented by [name, surname], as **BENEFICIARY**, hereinafter referred to as "**BENEFICIARY**".

Whereas:

a. [Name of the company, Company, PROVIDER] is empowered by [Name of the TSO] to trade available capacities of [TSO]'s telecommunications infrastructure, based on contract no. ....; [to be added only if such arrangement is the case]
b. [PROVIDER] has the right to provide electronic communications networks and/or services, being the holder of the standard certificate/license issued by [Regulatory Authority for Telecommunications];
c. The BENEFICIARY wishes to install equipment in the locations provided by PROVIDER mentioned in Annex 1 and to use the internet service provided by PROVIDER (Annex 1) (if applicable).

The parties have agreed as follows:

General Conditions

These General Conditions are supplemented by the Specific Conditions

1. Definitions and Interpretation

1.1. The terms below, when used in this contract, are defined as follows:

a. **Collocation** – the provision by the PROVIDER to the BENEFICIARY of physical space on site and technical facilities necessary to accommodate and to supply 220 Vca;

b. **Installation fee** – the amount payable by the BENEFICIARY, corresponding to the installation, connection, and configuration by the PROVIDER of the BENEFICIARY's equipment;

c. **Reconnection fee** – the occasional amount payable by the BENEFICIARY corresponding to the reconnection thereof to the contracted services;

d. **Internet services rate** – the monthly amount, payable by the BENEFICIARY, corresponding to the use by the BENEFICIARY of the internet services;

e. **Rate for access services** – the occasional amount, payable by the BENEFICIARY, corresponding to the accompanied access service on site;

f. **Rate for collocation services** – monthly amount, payable by the BENEFICIARY corresponding to the collocation of the equipment of the BENEFICIARY according to the provisions of the Specific Conditions;

g. **The rate for renting the electrical conduit and cable maintenance** – monthly amount, payable by the BENEFICIARY, corresponding to the renting of the electrical conduit and the maintenance of the fiber-optic (FO) cable of the BENEFICIARY within the site area;

h. **Rate for utilities** – monthly amount, payable by the BENEFICIARY, corresponding to the maintenance of the utilities and consumption associated with the BENEFICIARY's Equipment;

i. **Equipment** – equipment owned by the BENEFICIARY in any way and used in connection with the collocation provided for in the Specific Conditions;

j. **Force majeure** – any event beyond the control of the parties, exclusive of fault, unpredictable and insurmountable, after the entry into force of the contract and which makes the execution of the contract impossible. Force majeure events include but are not limited to: wars, revolutions, fires, floods or any other natural disasters, as well as situations that stem from quarantine measures or from embargo. An event shall not be considered force majeure if, without leading to the impossibility of performing the contractual obligations, it makes the execution of these obligations particularly burdensome for the respective party;

k. **Confidential information** – for each of the parties, this refers to all information of any kind, in any form, coming from any source related to either party (including, but not limited to, information regarding the activities of the parties, their financial statement, current or future operations, goods, obligations, customers, suppliers, business methods, manufacture, products, operating techniques, marketing methods or procedures, on any territory), which reach the other party by virtue of execution of this contract;
l. **Location** – site made available by the PROVIDER, defined in Annex 1, where the equipment of the BENEFICIARY is installed;
m. **Party (Parties)** – PROVIDER and/or BENEFICIARY depending on the context;
n. **Representatives** – employees or proxies of any party, as long as they act in this capacity;
o. **ODF** – (Optical Distribution Frame) terminal equipment of fiber-optic connection;
p. **Local loop** – telecommunication connection made by the BENEFICIARY, having as its final purpose taking over and having access to the contracted services;
q. **Day** – calendar day, if not indicated otherwise.

1.2. References made in this contract to "clauses" will be considered as references to the clauses of this contract, and references to "Parties" or "Party" will be considered as references to the parties or a party of this contract.
1.3. Any Annex to this contract shall be an integral part thereof and shall enter into force as stipulated in this contract. Any reference to this contract will also be a reference to its Annexes as amended and agreed in writing by the parties.
1.4. The titles of the articles in this contract are only intended to facilitate reading and will not affect the interpretation thereof.
1.5. The amounts mentioned in this contract do not include VAT.

2. Obligations of the Parties

2.1. Obligations of the PROVIDER:
2.1.1. to ensure the provision of the services contracted to the BENEFICIARY as well as their proper performance, in accordance with the provisions of Annex 1;
2.1.2. to ensure the integrity and security of the BENEFICIARY's collocated equipment, so that the services to the BENEFICIARY or the security of the BENEFICIARY's own information are not affected;
2.1.3. not to alienate or intervene on the equipment of the BENEFICIARY;
2.1.4. to allow the BENEFICIARY to pick up the equipment, at the request of the BENEFICIARY, after the payment of the services provided to them;
2.1.5. at the request of the BENEFICIARY, the PROVIDER undertakes to provide the following information:
a. the technical parameters of the services provided to the BENEFICIARY;

b. the developments that are planned, in progress, or already implemented by the PROVIDER, which could have implications on the performance of the contracted services;
c. the major circumstances that may affect the quality of the service provided to the BENEFICIARY.

2.1.6. to notify, within maximum 3 (three) business days, any changes in the escalation procedure or to notify the names/phone numbers of the persons involved in the maintenance/service of the installed equipment;

2.1.7. to prepare the installation documentation for the equipment and the local loop of access in locations, in collaboration with the representatives of the BENEFICIARY.

2.2. Obligations of the BENEFICIARY:

2.2.1. to pay the rates provided for in section 2 of the Specific Conditions, within the terms and conditions stipulated in this contract;

2.2.2. to notify the PROVIDER of the names of persons for whom access is requested in the locations. The list of the persons nominated with access rights will be transmitted within 5 (five) days from the date of signing of the contract. Any changes to this list will be given to the PROVIDER at least 3 (three) days before it becomes effective;

2.2.3. to comply with the Works Agreements of the PROVIDER concluded with TSO (according to Annex 6);

2.2.4. to notify by phone the Network Operations Center (NOC) of the PROVIDER about any defect at the level of the internet service, in the shortest possible time (according to Annex 1).

3. Contractual Liability

3.1. Each party is responsible on its own behalf for the operation of its own equipment that ensures the provision of the services contracted under this contract.

3.2. The PROVIDER and the BENEFICIARY shall each be liable for the hidden defects of the works performed by each of the parties.

4. Representations and Warranties

4.1. The PROVIDER warrants that all the services provided will be qualitatively appropriate, respecting the technical instructions in force and its own quality manual certified according to SR EN ISO 9001/2001 (ISO 9001: 2000) as well as the policies and procedures regarding the information security management system certified according to SR EN ISO 27001: 2005, throughout the duration of the contract, in compliance with the provisions of this contract, according to the technical parameters and requirements specified in the contract and in the Annexes, which are part of the contract.

4.2. The PROVIDER does not exercise any control whatsoever over the content of the information transmitted through the BENEFICIARY's equipment.

4.3. At the date of signing of this contract and at any time during the duration of this contract, the PROVIDER represents and warrants to the BENEFICIARY the following:

4.3.1. The PROVIDER operates legally and holds all the licenses, approvals, and authorizations necessary to provide the services that are the object of this contract, from all the competent authorities and bodies, in accordance with all applicable laws, rules, orders, and regulations, and they do not violate any normative or administrative act or any exclusive right of any third party. All of these licenses, approvals, and authorizations are in force and produce effects, and there are no circumstances that threaten or lead to the suspension, cancellation, or limitation of any licenses, approvals, or authorizations.

4.3.2. The conclusion and execution of this contract is not and shall not be:

a. in conflict and will not cause the violation nor be a breach by the PROVIDER of any terms, conditions, or provisions: (i) from any contract or arrangement to which the PROVIDER is a party at the moment, (ii) from any license or authorization held by the PROVIDER, or (iii) from the Articles of Incorporation of the PROVIDER.

b. in contradiction with and will not violate any law, regulation, order, decree, ordinance, or other normative or administrative act or the exclusive right of any third party and will not give the right of any person to receive from the BENEFICIARY any reward, commission, or compensation.

4.3.3. No notification has been received from any competent authority regarding the breach by the PROVIDER of the legislation or regulations in force.

4.4. At the signing date of this contract and at any time during the duration of this contract, the BENEFICIARY represents and warrants to the PROVIDER the following:

4.4.1. The BENEFICIARY operates legally and holds all the licenses, approvals, and authorizations necessary for the use of the services that are the object of this contract, from all competent authorities and bodies, in accordance with all applicable laws, rules, orders, and regulations, and they do not violate any normative or administrative act and no exclusive right of any third party. All of these licenses, approvals, and authorizations are in force and produce effects, and there are no circumstances that threaten or lead to the suspension, cancellation, or limitation of any licenses, approvals, or authorizations.

4.4.2. The conclusion and execution of this contract is not and shall not be:

a. in conflict and will not cause the violation nor be a breach by the BENEFICIARY of any terms, conditions, or provisions: (i) from any contract or arrangement to which the BENEFICIARY is a party at the moment, (ii) from any license or authorization held by the BENEFICIARY, or (iii) from the Articles of Incorporation of the BENEFICIARY.

b. in contradiction with and will not violate any law, regulation, order, decree, ordinance, or other normative or administrative act or the exclusive right of any third party and will not give the right of any person to receive from the PROVIDER any reward, commission, or compensation.

4.4.3. No notification has been received from any competent authority regarding the breach by the BENEFICIARY of the legislation or regulations in force.

5. Installation and Provision of Services

5.1. The acceptance for the installation of the BENEFICIARY's equipment and the testing of the internet service (if applicable), as well as the records of the access in the locations, will be registered in the Protocols (templates attached to this contract in Annexes 3, 4, 5) by representatives of both parties.

5.2. In the event of finding an operation inconsistent with the provisions of the contract, the representative of the BENEFICIARY will mention the objections in the Protocols, the PROVIDER having the obligation to remedy, at its own expense and liability, all the noncompliances within maximum 72 (seventy-two) hours from the signing date of the Protocols, with objections from the BENEFICIARY.

5.3. The signing with no objections of the Protocols will represent the completion of the start-up of the respective services and the beginning of the application of the rates stipulated in section 2 of the Specific Conditions, but not later than the deadlines stipulated in the schedule agreed, in advance, between the parties (Annex 1). Overrunning these deadlines due to the BENEFICIARY will entail the beginning of the application of the rates provided in section 2 of the Specific Conditions. Overrunning these deadlines due to the PROVIDER will entail the application of a penalty of [0.04 percent] per day of delay calculated on the value quantification of the obligation not executed or improperly executed.

6. Payment Methods

6.1. The monthly invoicing of the services provided will be made on the basis of the unit rates and the quantities in this contract, according to section 2 of the Specific Conditions.

6.2. The invoices will be issued on the [5th (fifth)] business day of the month, for the current month, in [currency] equivalent calculated at the exchange rate [currency]/[USD or EUR] of [National Central Bank] on the date of invoicing, and the BENEFICIARY will make the payment of the amounts due, VAT included, by crediting the bank account indicated on the invoice within a maximum of 14 (fourteen) days from the date of receipt of the invoice.

6.3. If the amounts owed by the BENEFICIARY under this contract are not paid on the dates when they become due, the BENEFICIARY owes to the PROVIDER delayed payment penalties of [0.04 percent] for each day of delay, applied to the amount due and payable.

6.4. In the event that the BENEFICIARY does not pay the invoice within 14 (fourteen) days from the due date, after written notification from the PROVIDER, the services will be

interrupted. At the request of the BENEFICIARY, services will be reconnected after the payment of the outstanding debts, the corresponding delayed payment penalties, and the reconnection fee.

7. Penalties

7.1. For improper execution or non-performance of the obligations undertaken under this contract, the defaulting party owes penalties of [0.04 percent] per day of delay calculated on the value quantification of the obligation not executed or improperly executed or on the amount not paid at the due date.

7.2. The PROVIDER will deduct from the value of the invoice for the following month the value of the rate for the provision of the internet service related to the period of non-use (according to the guaranteed availability) by the BENEFICIARY of the respective service, due to any cause not attributable to the latter. [if applicable]

8. Termination of the Contract

8.1. This contract may be terminated in any of the following cases:

- 8.1.1. if on the term provided in section 3 of the Specific Conditions, the BENEFICIARY wishes to terminate the contract. The contract termination notification will be sent by the BENEFICIARY 30 (thirty) days prior to the final term stipulated in section 3 of the Specific Conditions, otherwise the extension of the contract will be made automatically for a further period according to section 3 of the Specific Conditions;
- 8.1.2. by mutual agreement of the parties, expressed in writing;
- 8.1.3. when the insolvency procedure is opened, in accordance with the provisions of Law [number] on the insolvency procedure, with regard to any of the parties;
- 8.1.4. by rescission of this contract by either party, if the other party breaches this contract and this breach remains unresolved for a period of 30 (thirty) days ("Notification Period"). The 30 days will be calculated from the date of the notification, in writing, by the affected party. The rescission will take effect immediately upon the expiry of the notification period, without the need for any other prior formalities and without the intervention of the court.
- 8.1.5. one of the parties no longer holds the authorizations, approvals, licenses, certifications, etc. in connection with the fulfilment of the object of the contract, without the intervention of a court and without the fulfilment of other formalities besides written notification.

8.2. Any termination under this contract will be made without bringing prejudice to the rights of any party resulting from this contract and existing at the termination date of the contract.

8.3. In the event of termination of the contract for any reason, the services provided to the BENEFICIARY will be discontinued immediately.

8.4. Any provision of this contract stipulating an obligation to fulfil or to comply will remain valid and in force after the termination of this contract for any reason.

8.5. The provisions of this section (8. Termination of the Contract) do not exclude the liability of the defaulting party that has caused the termination of the contract.

9. Force Majeure

9.1. The force majeure exonerates the party invoking it, provided that the other party is informed within 3 (three) days from the date when such an event occurred and makes it impossible to fulfil its obligations. Within 15 (fifteen) days from the date of the announcement of the occurrence of the force majeure event, the party invoking it must provide evidence regarding the occurrence data of the force majeure event, issued by [the Chamber of Commerce and Industry of [country]] and/or other competent authorities. The duration of this contract is extended by the period when a force majeure event occurs and makes it impossible for the parties to fulfil their obligations. If a case of force majeure is extended for more than 2 (two) months, the parties agree to renegotiate the terms of the contract or to terminate it, without either of them being able to claim damages against the other.

9.2. The fulfilment of the contract will be suspended for the period of existence of the force majeure, but without prejudice to the rights arisen in favor of the parties until its occurrence, and the party invoking the force majeure has the obligation to take any measures available to them in order to limit its consequences.

10. Confidentiality

10.1. The parties agree to keep confidential throughout the contract, and for 1 (one) year after termination of the contract for any reason, and not to disclose, report, make public, directly or indirectly, or transfer or use for personal purposes or that of third parties, the confidential information received or obtained as a result of the execution or duration of this contract.

10.2. Each party is responsible for complying with the provisions of this section (10. Confidentiality) by any of its representatives or third parties to whom confidential information for the purpose of this contract has been disclosed.

10.3. The obligations stipulated in paragraph 10.1 and 10.2 do not apply in the case of information that:

a. is, at the date of the execution of this contract, or will become subsequent to this date, known to the public other than by violation of the clauses of this document by a party or persons acting on its behalf; or

b. is required to be disclosed by a competent public authority.

10.4. However, without prejudice to the provisions of this article, both the BENEFICIARY and the PROVIDER shall have the right to disclose, without any restriction, the mere existence of this contract and the nature of the relations between the BENEFICIARY and the PROVIDER resulting from it.

10.5. The obligation of confidentiality is not applicable in the relationship of the parties with the shareholders, the directors, or the creditor banks.

11. Assignment of the Contract

11.1. Except for a legal successor, the parties undertake not to transfer the rights and obligations arising out of this contract without the prior written consent of the other party, subject to the cancellation of the contract.

11.2. The agreement provided for in the preceding paragraph must be communicated by the assignee within 7 (seven) days from the date the assignor requested this agreement; otherwise, it is assumed that the assignee did not consent to the assignment of the contract.

12. Applicable Law and Settlement of Disputes

12.1. This contract is governed by and will be construed in accordance with the law of [country].

12.2. In the case of any and all disputes/arguments arising out of or in connection with the conclusion, execution, breach, or termination of this contract or its invalidity, the amicable settlement between the parties will be attempted first, within 15 (fifteen) days calculated from the date of receipt of notification of such a dispute or argument.

12.3. If the parties do not reach an agreement within the time period agreed above in paragraph 12.2, the dispute or argument will be submitted for settlement to the competent courts.

13. Other Clauses

13.1. Each person who signs this contract on behalf of one of the parties represents and warrants that he/she has been fully authorized to sign this contract and that all necessary measures have been taken to authorize the signing of this contract.

13.2. This contract represents the entire will and sole understanding of the parties regarding the matters herein regulated and shall prevail over and supersede any other prior agreements and any other promises, statements, or warranties, written or oral, made by or on behalf of a party to the other or included in any document sent to one of the parties by the other, regarding the matters herein regulated.

13.3. No modification of this contract will take effect unless it is made in writing and signed by each of the parties. The contracting parties have the right, during the fulfilment of the contract, to agree the amendment of the clauses of the contract, by an Addendum, in case of the modification of the contracted configurations provided in the General Conditions and the Specific Conditions. The addendum may also be executed if circumstances arise that harm the legitimate commercial interests of the parties and which could not have been foreseen at the date of conclusion of the contract.

13.4. Any waiver of any right under this contract must be made in writing. Unless expressly stated otherwise, any waiver will be effective only in the case and for the purpose for which it is given.

13.5. Each of the provisions of this contract is independent. Consequently, if any such provision is or becomes void or cannot be enforced in any respect in accordance with the law, it will not affect the validity or enforcement of the other provisions of this contract, and the parties will make every reasonable effort to negotiate in good faith in order to replace it with one or more provisions satisfactory to any competent authority in the matter, but which will differ as little as possible from the replaced provision.

13.6. In the event of a conflict between the General Conditions and the Specific Conditions, the latter shall prevail.

Specific Conditions

These Specific Conditions are supplemented by the General Conditions

1. Object of the Contract

Under the conditions provided by this contract, the PROVIDER undertakes to provide services to the BENEFICIARY according to the table below, and the BENEFICIARY undertakes to pay the PROVIDER for the service provided according to section 2 of the Specific Conditions.

Services Code	Name of Services
[service code]	
[service code]	
[service code]	

2. Price of the Contract

2.1. The installation fee is [currency] [amount] and will be paid within [...]

2.2. The monthly price of the contract consists of the following rates, plus VAT:

				Unit rate	Total
No.	Services Code	Service provided	Quantity	[currency]	[currency]
1.	[service code]	Internet (if applicable)			
2.	[service code]	Collocation			
3.	[service code]	Electrical conduit and cable maintenance			
4.	[service code]	Utilities			
GRAND TOTAL PER MONTH					

2.3. If the BENEFICIARY requests to stop the provision of services earlier than the [day] st/nd/rd/th month of the contract, they will have the obligation to pay the PROVIDER an amount equivalent to the contract value for [.....] months, in addition to the payment obligations related to the services provided up to that date.

2.4. The reconnection fee ([service code]) represents the equivalent in [currency], calculated at the [National Central Bank] exchange rate on the day of invoicing of the amount of [currency] [amount]/location.

2.5. The rate for accompanied access services ([service code]) represents the equivalent in [currency], calculated at the [National Central Bank] exchange rate on the day of invoicing of the amount of [currency] [amount]/day.

3. Duration of the Contract

3.1. This contract enters into force on its signing date and has a duration of [...], starting with the signing date of the Start-up Protocols of the contracted services, subject to the fulfilment of the terms and conditions contained therein.

3.2. This contract will automatically be extended for new periods equal to the original one, if the parties do not request its rescission at least 30 (thirty) days before the expiration.

4. Contract Documents

4.1. The documents of this contract are:

- Annex 1 – Technical Parameters of Services;
- Annex 2 – Rules of Access to Locations;
- Annex 3 – Acceptance Protocol for Testing the Operation of the Internet Service;
- Annex 4 – Acceptance Protocol for the Installation of Equipment in Location _____;
- Annex 5 – Records Protocol of Accompanied Access;

5. Notifications

5.1. Any communication to be made in relation to the matters regulated by this contract shall be in writing and shall be deemed to be properly transmitted:

a. if it has been delivered to the address mentioned in paragraph 5.2 of the Specific Conditions or to another address previously communicated to the other party, from the moment of delivery;

b. if it has been delivered by fax to the number mentioned in paragraph 5.2 of the Specific Conditions or to another number previously communicated to the other party, from the moment of receipt by the sender of the confirmation of the end of transmission, and is subsequently transmitted within no more than 5 (five) business days, according to paragraph 5.1.(a) of the Specific Conditions or paragraph 5.1.(c) of the Specific Conditions;

c. if it is sent by registered letter to the address mentioned in paragraph 5.2 of the Specific Conditions or to another address previously communicated to the other party, upon receipt of the confirmation from the respective post office.

5.2. Any communication that will be made in relation to the matters regulated by this contract will be sent to the following addresses:

Provider	Beneficiary
Client Account Manager:	Client Account Manager:
Name:	Name:
Phone Number:	Phone Number:
Fax:	Fax:
Email:	Email:

6. Other Clauses

6.1. The PROVIDER will ensure the maintenance and continuous operation of the services, except for the interruption periods planned for maintenance, which will be notified in writing to the BENEFICIARY 2 (two) business days in advance. The PROVIDER shall have the right to suspend the services for their own planned maintenance, provided that the maximum duration of suspension at any given time does not exceed 4 (four) hours.

6.2. Procurance and transport to the site of the BENEFICIARY's equipment and auxiliary materials for their installation and connection to the network will be the responsibility of the BENEFICIARY. The installation of the equipment will be performed by the BENEFICIARY, and the works to interconnect the BENEFICIARY's equipment with the [PROVIDER or TSO] equipment will be carried out by the PROVIDER, according to the approved installation documentation.

6.3. In locations, the BENEFICIARY shall install a fiber-optic cable of its own between the BENEFICIARY's communication hub and the BENEFICIARY's ODF located at the site in the vicinity of the hub, according to the approved installation documentation. The ownership right over that fiber-optic cable belongs to the BENEFICIARY.

6.4. The PROVIDER will obtain access for the installation team inside the respective locations in order to install the fiber-optic cable. In order to avoid any doubt, under no circumstances will the provisions of section 6 of the Specific Conditions be interpreted to mean a transfer of the ownership right over the equipment from the BENEFICIARY to the PROVIDER, the collocation having no effect on the ownership right.

6.5. The BENEFICIARY shall observe all the rules of access in locations according to Annex 2.

This contract has been signed on [date], in two original copies, in [language], one for each party.

Provider **Beneficiary**

Annex I – Technical Parameters of Services

AI.1. Technical parameters of the internet access service

AI.1.1. The provision of the internet access service will be carried out as follows:

Guaranteed Internet Channel [Mbps]:	Maximum metropolitan and national access channel [Mbps]:
SERVICE CODE: [service code]	Port used: ☐ FastEthernet ☐ Gigabits Ethernet
Service delivery address (City, County, st., no.):	Nr. of assigned IP addresses: AS client: AS + SET client:

Technical Quality Parameters	
Technical quality parameters	**Values**
Rated/maximum speed	**[...] Mbps/ [...] Mbps**
Guaranteed minimum speed	**[...] Mbps**
Delay	**[...] ms**
Latency	**[...] ms**
Packet loss rate	**[...] %**

Administrative Quality Parameters	
ADM quality parameters	**Values**
The term for the beginning of the provision of access to internet	**[...] (calendar days)**
The term for remediation of defects	**[...] (hours)**
The term for solving the BENEFICIARY's complaints	**[...] (hours)**

AI.1.2. **IP packets.** IP packets are transported directly over Ethernet and no other protocols such as PPPoE are used.

AI.1.3. **MTU 1500 bytes.** The connection is made between the PROVIDER and a single piece of equipment of the BENEFICIARY (router) that will separate the network of the PROVIDER from that of the BENEFICIARY at level Layer 3. It is not allowed to connect Layer 2 between the PROVIDER and the clients of the BENEFICIARY.

AI.1.4. **Use of MAC.** The PROVIDER will communicate with a single piece of equipment of the BENEFICIARY who will have a single MAC. The PROVIDER will block the traffic to the BENEFICIARY if several MACs from the BENEFICIARY appear on the interconnection link.

AI.1.5. **Use of AS Number.** If a BGPv4 session has been established between the PROVIDER and the BENEFICIARY, the BENEFICIARY has the obligation to announce only their own classes and ASs or those of their own clients and to notify the PROVIDER at least 24 (twenty-four) hours before their modification, including the addition of new classes and/or ASs and AS-SETs. If the BENEFICIARY wishes to publish more ASs, then they have the obligation to create an AS-SET in the RIPE database and to communicate it to the PROVIDER at least 24 (twenty-four) hours before being introduced by the PROVIDER in the configurations.

AI.1.6. **RIPE database.** The BENEFICIARY has the obligation to keep their own information up to date in the RIPE database; to record all the prefixes published in the RIPE database; to aggregate, as far as possible, all the published prefixes; to publish all the routes from their own AS on all public peerings; to publish the same prefix to all public peerings, and to honor MED (Multi-Exit Discriminator) if more sessions are established.

AI.1.7. **IP Addresses.** The PROVIDER may change the IP addresses assigned to the BENEFICIARY by notifying the BENEFICIARY at least 24 (twenty-four) hours in advance. Upon completion of the service under the contract, the BENEFICIARY has the obligation to release the assigned IP address(es).

AI.2. Interventions. Defects

AI.2.1. Interventions in order to solve defects will be carried out without additional costs for the BENEFICIARY, unless the defect occurred due to the BENEFICIARY's fault. The defects will be notified by the BENEFICIARY to the NOC of the PROVIDER by phone and email.

Contact details: NOC of PROVIDER	
Phone	
Email	

Technical contact details: BENEFICIARY	
Name	
Phone	
Email	

AI.2.2. If the contact details for the PROVIDER's NOC change, the BENEFICIARY will be informed at least 48 (forty-eight) working hours in advance of the new contact details becoming valid.

AI.2.3. Notification of defects by email can only be made after notifying them by phone. Any notification sent by the BENEFICIARY via email or fax must contain the full description of the problem and at least the capture of a traceroute to [www.XXX.XX, www.XXX.XX], and www.google.com.

AI.3. Use Policy of Internet Services

AI.3.1. Abuse or illegal use of the network is defined as:

a. any commercial email that is sent to an address that has not requested and confirmed the wish to receive such messages. Commercial emails include and are not limited to: commercials, opinion polls, promotional offers, etc. These types of messages are called "Unsolicited Broadcast Email"/"Unsolicited Commercial Email" and will continue to be referred to as SPAM;
b. any activity aimed at obtaining information/resources that are not of public nature. These types of activities include, but are not limited to: exploiting security breaches on other computers connected to the internet, searching (scanning) for security breaches of some computers connected to the internet, using proxy-type services without the consent of the owner of these services;
c. the transmission, distribution, and storage of materials that violate the laws in force, are protected by copyright, trademark, brand or service mark, or any other intellectual property right without the necessary authorizations, without being limited to them;
d. transmission, distribution, and storage of obscene, discriminatory, or racist materials or materials in violation of the export control laws in force.

AI.3.2. Any overloading of the PROVIDER's network will be considered an unauthorized use of the PROVIDER's network and is therefore prohibited. Similarly, the use of "IP multicast" without the permission of the PROVIDER is prohibited.

AI.3.3. The BENEFICIARY or any other third party using the PROVIDER's network is forbidden and must not, in turn allow the PROVIDER's network to be used in order to send SPAMs and to abuse the network. If mass emails are sent, the senders must keep data confirming each recipient's approval to receive such messages before the messages were sent. If such evidence does not exist, the PROVIDER may consider, in good will, that the approval has not been obtained and is considered

abuse. The PROVIDER is not responsible for the content of any message, regardless of whether the message was sent by one of their clients.

AI.3.4. The BENEFICIARY will be responsible for all abuses committed by them, their clients, and their partners, by their connection to the PROVIDER's network.

AI.3.5. Any attempt to breach the network security or abuse is prohibited. The PROVIDER will investigate complaints related to these incidents and will cooperate with legal institutions in order to detect the causes and the perpetrators of these incidents. If the PROVIDER receives a complaint addressed to one of their clients (client of the BENEFICIARY, partner of the BENEFICIARY) or notices an abuse, they will block the traffic to/from the IP address/addresses involved until the PROVIDER is convinced that the problem has been solved and that precautions have been taken in order to prevent future incidents. The PROVIDER may block traffic to the IPs involved in the complaint, or to all of the client's IPs, until they are convinced that security measures have been taken by the BENEFICIARY in order not to repeat the incidents.

AI.3.6. The BENEFICIARY that manages a domain (DNS) has the obligation to configure, in addition, two mailboxes: [XXX@XXX.XX and XXX@XXX.XX]. The messages will be processed by people who can make prompt decisions to solve the reported problems and to immediately notify the PROVIDER.

AI.3.7. In some cases, the PROVIDER may block traffic to/from certain IPs that are not part of the PROVIDER's network, if it is considered that those IPs are used to distribute SPAM, are "open relay," or are used to gain access to resources which are not public. In these cases, no customer will be able to send/receive traffic from those addresses.

AI.3.8. The PROVIDER only discusses with the BENEFICIARY. It is the BENEFICIARY's responsibility to discuss with their clients in order to solve problems that have arisen.

AI.3.9. The BENEFICIARY must promptly investigate any complaint received from the PROVIDER.

AI.3.10. When the BENEFICIARY uses an email list, they must ensure that they have the confirmation of each recipient who wishes to receive their messages.

AI.3.11. The BENEFICIARY has the obligation to compensate the PROVIDER against any claims and legal actions related to the violation of the use policy of the PROVIDER's services.

AI.4. Quality of service provided (SLA)

AI.4.1. Service availability

AI.4.1.1. The PROVIDER's network is available for information transport (data transmission or internet) 24 hours a day, 365 days a year. The minimum monthly availability of the services offered accepted by the PROVIDER and offered to the BENEFICIARY is 99.5 percent.

AI.4.1.2. Scheduled interruptions of the service (maximum 2 hours per month) performed by the PROVIDER will not be taken into account. Scheduled interruptions are announced by the PROVIDER by phone, email, or any other form considered appropriate to the PROVIDER at least 12 (twelve) hours before such interruption. Also, interruptions due to force majeure, as defined in the service contract, will not be taken into account.

AI.5. Interruptions

AI.5.1. Defining lack of service

a. It is considered lack of service provided by the PROVIDER, as defined in the contract, if the sum of all unplanned interruptions during a day exceeds the availability of the service specified in point AI.1.1.
b. Interruptions that are scheduled and notified in advance by the PROVIDER are not to be considered lack of service. Interruptions due to causes linked directly or indirectly to the BENEFICIARY (interruption of the communication equipment, modification of the settings, lack of electrical voltage at the BENEFICIARY's location, etc.) are not considered lack of service.

AI.5.2. The PROVIDER will calculate the total hours of downtime of the service and will deduct the corresponding value from the monthly rate.

AI.5.3. The PROVIDER shall notify the BENEFICIARY in writing with regard to the amount of the discounts for downtime granted. The discounts are granted for the previous month on the invoice for the current month. The notification will be made, together with the invoice for the current month, by an annex specifying the number of hours of downtime from the previous month and the amount that will be granted as a discount to the invoice for the current month. If the BENEFICIARY does not agree with the discount granted by the PROVIDER, they may request, in writing, within 1 day (24 hours) from the receipt of the notification, verification of the downtime between the Technical Department of the PROVIDER and that of the

BENEFICIARY. The verification will take place within a maximum of 3 (three) business days from the BENEFICIARY's written request, otherwise the discount notified by the PROVIDER is considered accepted. Following the discussion, the parties will sign a protocol which stipulates the mutually agreed value of the discounts.

AI.6. Round-Trip Delay (RTD)

AI.6.1. Definition: The round-trip delay introduced by the PROVIDER's distribution network means the average time between transmitting the first bit of a 60-byte IP packet ("ping") from a network interface designated as the source and receiving the last bit of the same packet transmitted as an echo from a relevant destination network interface, located in the PROVIDER's network (according to RFC 2681).

AI.6.2. Unlimited services, for which at least one of the two routers—source and destination—do not belong to and are not maintained by the PROVIDER, are not included in this determination. Also, the unreturned ping packets are not taken into account, and the determination is made on the channel allocated to the client when there is no client traffic that can lead to the contracted bandwidth limitations.

AI.6.3. The round-trip delay introduced by the network is determined on the basis of an average made on a set of measurement samples. For each set of measurement samples, the parameters, the packet size, and the flow of the access lines are specified. The average delay of 20 ms, required for packet processing in the two source and destination routers, is also taken into account. The average round-trip delay between any two routers in the PROVIDER's network, for internet service distribution, is less than 55 ms. Calculation frequency: monthly, based on samples. The calculations are done globally.

AI.6.4. Exceeding the average RTD time is considered unavailability. The following values of the average round-trip delay are purely indicative because the PROVIDER cannot control the quality of communications services from other networks connected to the internet:

a. Between a router in [country] and a router in Europe: <[...] ms.
b. Between a router in [country] and a router in the United States: <[...] ms.

AI.7. Throughput

AI.7.1. Definition: The throughput represents the volume of data transferred by the BENEFICIARY between two locations connected to the PROVIDER's network, within a specified time interval. Expressed in Kbit/s, Mbit/s, Gbit/s.

AI.7.2. Method of determination: The throughput is determined at least at three different diurnal moments: 9:00, 15:00, 21:00. The throughput can be expressed as average rate or as peak rate.

AI.7.3. The peak value of the throughput is over 85 percent of the guaranteed minimum value of the access band, according to the type of contracted service. The throughput is always lower than the access band due to the efficiency of the IP (packet packing) protocol.

AII.1. List of locations and collocated equipment

#	Location	Address	Collocated equipment
1			

The collocation facilities provide the following:

- Space for placing the racks (cabinets) of equipment: 1.5 m^2 for each rack of 600x600 mm type, respectively 2.5 m^2 for each rack of 800x800 mm type;
- Electricity for power supply at 220 Vca – 1kWh for each rack;
- Supply continuity is made from its own internal services, ensuring the return of the voltage after an interruption of maximum 2 seconds, and in cases of failure, maximum 1 minute;
- Connection to the earth socket with resistance less than 4 Ω;
- Access to cable ducts and bridges in order to place their own RDS connections on the entire surface of the objective on existing routes;
- Lighting of at least 500 Lux at floor level;
- Safety lighting in case of failure;
- Air-conditioning to maintain a temperature of approx. 21ºC;
- Room humidity below 30 percent;
- Non-destructive protections against local disasters (floods, fires);
- Rooms secured by metal doors and locks with controlled access;
- Guard and protection 24 hours/day, 7 days/week, by direct or video surveillance.

Provider **Beneficiary**

Annex II – Rules of Access to Locations

1. Scheduled access to locations

Access to the collocation locations can be made only after a written notification, sent 2 (two) days in advance to the contact numbers in the contract.

The notification must contain:

- Name of the location where access is desired
- Estimated date, time, and duration for which access is desired
- The persons for whom access to the location is desired
- The reason for requesting access to the location (description of work and access areas)

The PROVIDER shall transmit the acceptance for access to the location within a maximum of 48 (forty-eight) hours from the time of transmission of the notification. In case access cannot be permitted, the PROVIDER will provide the reason for the refusal and will propose another date when access can be allowed.

Access to the location will be made only in the presence of a representative of the PROVIDER and only after the identification of the representatives of the BENEFICIARY, according to the written notification sent to the PROVIDER.

2. Documents required for access

a. Access request for the entire period of the contract
b. List of staff who will have access to locations (ID number, [other relevant authorization]).

3. Documents required for carrying out work

a. Installation documentation (technical report, drawings, etc.)
b. Time schedule
c. Name of the person in charge of the work

4. Access to locations in emergency situations

In exceptional situations, in the event of failure, in case of equipment failure of the BENEFICIARY or other unforeseen events, access to the locations can also be ensured following a notification sent by the BENEFICIARY in writing and/or by phone [...] hours in advance for the location at [address] and respectively [...] hours [between 8:00 and

16:00] for location at [address], observing the access procedure by mentioning the person previously appointed by the BENEFICIARY and on the access list.

5. Access conditions

The duration of the access to the location is considered from the time of presentation to the dispatcher of the location until the closing time of the works agreement with the same dispatcher of the location.

The employees of the BENEFICIARY will respect the local rules of each location and will specify the area where they will perform works.

6. Conduct in collocation locations

The staff of the BENEFICIARY (employees or subcontractors) will be supervised by the PROVIDER's representative during the entire duration of the works.

Third-party employees may not have independent access to the locations and have no right to operate any equipment, cable, or system of the BENEFICIARY.

The BENEFICIARY must clear the location of the materials used for packaging or works, as well as any other waste.

Smoking, drinking, and eating are forbidden on the premises of collocation, except for in the places marked for these activities.

If the instructions of the PROVIDER's staff are ignored, the employees of the BENEFICIARY may be asked to leave the location and be forbidden future access to the location, based on a written notification.

Provider **Beneficiary**

Annex III – Acceptance Protocol

For testing the operation of the internet service

Services Code: [service code]

Date:_____/_____/_____

Between:

1. [Name of the Electricity Transmission Operator (TSO or the company that was enabled by the TSO to provide services over its infrastructure], registered with the Trade Register under number [number], with headquarters at [address], as **PROVIDER**, hereinafter referred to as "**PROVIDER**"

   and

2. [Name of the company], with offices at [address], registration number [number], Unique Registration Code [registration code], IBAN code [IBAN code], opened with [...], represented by [name, surname], as **BENEFICIARY**, hereinafter referred to as "**BENEFICIARY**".

Whereas:

a. The parties concluded on _____ / _____ a Service Contract.
b. The parties proceeded to test the operation of the internet service,

By this acceptance protocol:

i. **PROVIDER** declares that the obligation to start up the internet service has been fulfilled in accordance with the contract,

   and

ii. **BENEFICIARY** confirms that the operating parameters of the internet service are appropriate.

Concluded in 2 copies, one copy for each party.

Provider **Beneficiary**

Annex IV – Acceptance Protocol

For the installation of equipment in location _____

Services Code: [code]

Date:_____/_____/_____

Between:

1. Name of the Electricity Transmission Operator (TSO or the company that was enabled by the TSO to provide services over its infrastructure], registered with the Trade Register under number [number], with headquarters at [address], as **PROVIDER**, hereinafter referred to as "**PROVIDER**"

   and

2. [Name of the company], with offices at [address], registration number [number], Unique Registration Code [registration code], IBAN code [IBAN code], opened with [...], represented by [name, surname], as **BENEFICIARY**, hereinafter referred to as "**BENEFICIARY**".

Whereas:

a. The parties concluded on _____ / _____ a Service Contract.
b. The parties proceeded to the start-up of the equipment in [...] location,

By this acceptance protocol:

i. **PROVIDER** declares that the obligation to connect and supply the equipment [.....] has been fulfilled according to the contract,

   and

ii. **BENEFICIARY** certifies the quality of the works performed by the PROVIDER according to the provisions of the contract.

Concluded in 2 copies, one copy for each party.

Provider **Beneficiary**

Annex V – Records Protocol

Of accompanied access in location _____

Services Code: [code]

Date:_____/_____/_____

Between:

1. [Name of the Electricity Transmission Operator (TSO or the company that was enabled by the TSO to provide services over its infrastructure], registered with the Trade Register under number [number], with headquarters at [address], as **PROVIDER**, hereinafter referred to as "**PROVIDER**"

   and

2. [Name of the company], with offices at [address], registration number [number], Unique Registration Code [registration code], IBAN code [IBAN code], opened with [...], represented by [name, surname], as **BENEFICIARY**, hereinafter referred to as "**BENEFICIARY**".

Whereas:

a. The parties concluded on _____ / _____ a Service Contract.
b. The need for the execution by the representatives of [insert name of companies], as they have been appointed according to the contract, of some maintenance works on their own equipment collocated in the location,

By this records protocol:

The presence in the location of the representatives of [insert name of companies] is certified, as follows:

No.	Date	Access time	Exit time	Surname and name Representative PROVIDER	Signature Representative BENEFICIARY	Notes

Concluded in 2 copies, one copy for each party.

Provider **Beneficiary**

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