DIGITAL ADOPTION IN LATIN AMERICA

THE ROLE OF INFRASTRUCTURE DEPLOYMENT AND OTHER REGIONAL POLICIES

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1 INTRODUCTION

The pervasiveness of technology in people’s daily lives has turned notions such as social inclusion, digitization and connectivity into familiar terms for the population. Thus, many governments and organizations worldwide have included these terms as key themes and pillars of their administrations and policies. In order for societies to reap the full benefits of technology advances, proper adoption of wireless technology such as 4G LTE which can be deployed on different frequency bands, will require a set of known and stable conditions.

Operators are constantly challenged to increase adoption and improve service provisions which call for ongoing network and infrastructure investments, among other measures, partly depending to the significant growth in the demand for telecommunications services. Globally, history has shown that sharing agreements should be based on business deals and the will of the parties as well as technical, operational and economic feasibility.

Despite these realities, the conditions and requirements faced by operators vary from country to country depending on citizen participation, timing and deadlines, procedures, the stakeholders involved and the responsible entity selected.

This white paper looks into the impact these policies have had and continue to have on network deployment and outlines the widespread and recommended practices, as well as the different legal and regulatory frameworks in selected Latin American countries.

The document is organized in sections, starting with Section 2, in which a summary is provided on the importance of telecommunications in global development, as well as the growing trend in the use of data driven by the digital revolution through increased usage of smartphones and mobile connectivity. This scenario defines the significant challenge of developing strategic policies and initiatives to invigorate and ensure the industry’s ongoing evolution by deploying infrastructure.

Section 3 explains some of the infrastructure regulations and deployment policies adopted in the region with no value judgements being made on the positive or negative nature of the policies developed in the different countries. Instead, a general overview is provided on some of the measures that have been developed in the region. Summaries are presented for seven countries in the region, namely Argentina, Brazil, Chile, Colombia, Panama, Peru and Mexico.

Section 4 summarizes the main aspects in connection with emissions, urban planning, procedures and stakeholders based on the summary of current regulations in the countries presented in the preceding chapter.

Section 5 highlights a few of the challenges faced by service providers in deploying infrastructure. Although the list is not exhaustive, the examples quoted help illustrate the obstacles that slow down and could even possibly prevent the arrival of new technologies in certain parts of the region.
In Section 6, the paper presents other policies that should be taken into consideration for digital adoption in Latin America, such as infrastructure sharing practices and new technology trends.

Finally, the conclusion presents general principles and good practices that operators, regulators and representatives from the local administrations of the different countries in Latin America should take into consideration when it comes to defining public policies that progress technology evolution in the region.

2 TELECOMMUNICATIONS: AN ESSENTIAL PILLAR TO GLOBAL DEVELOPMENT

Since the advent of telecommunications, societies have benefited from the use, adoption and advancements of the associated technologies and services. Globally, more than six billion people have access to mobile telephony compared to approximately one billion who have access to fixed telephony\(^1\), which means that mobile technology has enabled people’s participation in this trend. Estimates show that the mobile ecosystem is the largest driver of progress and economic welfare with a share of 3.8 percent of the world Gross Domestic Product (GDP) in 2014\(^2\).

In the same vein, the Internet has been labeled the main driver for the advancement of telecommunications in recent times – considering that almost three billion connected consumers and businesses browse, shop, transact and interact over the Internet\(^3\) -- where the effects of its propagation have been clear and unprecedented. Based on sound economic fundamentals, it is evident that the Internet’s contribution to the GDP is 3.4 percent in developed countries, compared to (an average) 1.9 percent in developing countries\(^4\).

For mobile Internet, factors such as the growing demand for more coverage, speed and “always-on” connectivity have become constant challenges for operators and local governments who have made this a recurring topic in the agendas of many national and regional organizations.

Estimates show that the potential for digital technologies to drive economic growth significantly raises the standard of living and productivity of corporations and businesses across entire economies on a global level\(^5\).

In November 2014, the Latin American mobile market had almost 326 million unique subscribers and it is estimated that over half of the region’s population has a mobile service

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subscription. For this reason, Latin America is considered the fourth largest market worldwide.

In addition, recent reports on the Latin American and Caribbean region have made the following projections:

- Subscriptions to smartphones are expected to double by 2020, reaching 603 million in Latin America and the Caribbean.
- By 2020, 86 percent of all mobile data traffic will be driven by smartphones, while 78 percent will be driven by 4G LTE. From 2014 to 2020, mobile data traffic will grow by seven times in the region.
- The number of 3G/4G subscribers in Latin America will climb from 40 percent in 2014 to 90 percent by 2020.

In mature markets, this growth is driven by a larger number of devices per person. Conversely, in developing regions, such as Latin America, the growth is contributed by a large number of new subscribers as smartphones become more affordable. In this regard, it is estimated that Latin America will add 330 million new subscriptions to smartphones by 2020. Likewise, the sustained growth of these devices ushers in accelerated growth in the use of data. The monthly data usage average in Latin America is expected to grow from the current 0.8 GB to 3 GB by 2020.

The take-up and usage of telecommunications services has been such that future service projections refer to the so-called "digital tsunami", characterized, as stated earlier, by an exponential growth in the demand for mobile data driven by the adoption of new 4G technologies, the region’s economic growth and a larger number of smartphone users.

Consequently, every year until 2020, mobile video traffic will grow at a striking rate of 55 percent every twelve months, representing close to 60 percent of all mobile data traffic by the end of that period. It is estimated that most of the growth is directed toward video streaming services because of changing user preferences and the growing prevalence of video in online content, including news, advertising and social media.

The growth of advanced mobile technology and the use of data, driven by increased mobile connectivity and the interest in "smartphones", are facilitating a major digital revolution. In turn, the potential for large-scale transformation will usher in new opportunities for telecommunications operators. However, to remain competitive and effective at the same time, a focus on the efficient delivery of services and the opening up of new business models will be required and coupled with sound public policies that understand these new trends.

In this context, an increasingly wider range of applications and business models are key factors in driving growth for connected devices. This will be joined by new use cases

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emerging for short and long-range applications that will trigger the development of connected devices at an even faster and unprecedented pace.

All of the above leads to new challenges for both public and private stakeholders who are encouraged to work cooperatively and in an integrated fashion to secure strategic policies and initiatives that invigorate the industry and ensure their permanent evolution.

3 DEPLOYMENT REGULATIONS AND POLICIES IN LATIN AMERICA

In this section, the white paper outlines the main legislation ruling the permit processes for the installation and deployment of new telecommunications infrastructure in selected Latin American countries. The list offered below should be regarded neither as a selection of the best nor the worst regulatory practices in the region, nor as assessment of the effectiveness or good practices comprised by the various policies. The purpose is to show the various regulations currently in force in the North, Central and South areas of Latin America regarding mobile telecommunications. The following is an objective listing of the regulations applicable, in addition to their main aspects, as at the date of publication of this white paper.

3.1 ARGENTINA

In Argentina, the telecommunications system is federal in nature, as foreseen in the country’s National Constitution⁸ (Article 75, sections 13 and 14) and in the Federal Telecommunications Act⁹. The municipalities have power to regulate urban and territorial telecommunications. For this reason, their regulations have the purpose of unifying, systematizing and updating the various regulations for the installation and maintenance of the support structures and their associated infrastructures located within municipal jurisdiction. Moreover, it is also the municipalities that use municipal ordinances to establish the requirements for approving infrastructure installation. Thus, each municipality determines installation criteria of its own. The regulations mostly cover areas such as emissions, urban planning and the relationships between federal and municipal entities.

In general, municipal approval requires the following interim stages:

- Pre-feasibility
- Feasibility
- Construction permit
- Completion certificate

The documentation required by some municipalities includes an affidavit filed to the National Communications Commission describing the site to be installed, including its location, height above the ground and sea level, coordinates and frequency to be used by the equipment.

As per the National Constitution of Argentina, municipalities do not levy taxes, but service rates on infrastructure deployment set when an individual or entity receives an actual service (for example, the enrollment in a registry).

There is no evidence of payments for installed antennas or co-location of telecommunications infrastructure on antenna support towers belonging to third-party operators.

In August 2014, a non-mandatory Model Ordinance was issued. It was written jointly by the Communications Secretariat (SECOM) and the Secretariat for Municipal Affairs (SAM) aimed at standardizing municipal regulations. It defines technical, health and safety specifications, and promotes solutions to reduce environmental and visual impact. In addition, it favors the co-location or sharing of infrastructure among the companies with the purpose of reducing environmental and visual impact.

This ordinance determines that “it is imperative to draft a regulation that contemplates all aspects involved, including system operation, urban planning criteria and health protection”. Furthermore, it grants the municipality freedom of action in this matter, for it defines that “it is the duty of the municipal government in the framework of its powers to regulate all kinds of installations” but considering that “it is necessary for the municipal regulatory framework which includes autonomy and regulatory powers on territorial matters to issue regulations consistent with the services it seeks to regulate and with federal and provincial regulations on the matter.

For this reason, regulations should be coordinated between the government tiers in the structure of the Argentine Federal State so that municipal, provincial and federal requirements can be met without affecting the delivery of the services involved”

However, Article 77 of the recently passed Act # 27.078 act\(^\text{10}\), called “Argentina Digital (Digital Argentina)” creates the Federal Authority on Information and Communications Technologies (AFTIC)\(^\text{11}\), a body that furthers the functions of the SECOM, in accordance with Presidential Decree 667\(^\text{12}\). Furthermore, section c) of Article 81 called “competencies of the enforcement authority (AFTIC)” establishes that “regulations should be provided on the technical guidelines regarding infrastructure and the equipment connected to telecommunications networks as well as on the homologation and assessment of the conformance of said infrastructure and equipment”. This act is currently in force and the complementary regulation is being drafted.

In parallel, Resolution # 202/95\(^\text{13}\) issued by the Ministry of Health and Social Welfare has passed the national security standard on exposure to radiofrequencies in the range between 100 KHz and 300 GHz. It sets power density values at 0.95 mW/cm\(^2\) for 1.9 GHz and 0.45

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11 Although the AFTIC was created as the new regulatory entity in Argentina (thirty days counted from 29 April, 2015), the regulations issued by SECOM and CNC are still applicable.
mW/cm² for 850 MHz. The Communications Secretariat’s Resolution # 530/00 establishes that it shall apply for all radiating telecommunications systems located on the national territory in the frequency range from 100 KHz to 300 GHz.

In addition, the National Communications Commission issued Resolution # 3.690/04\textsuperscript{14} stating the compliance control method for the Non-Ionizing Radiation (NIRI) levels established by Resolution # 202/95 and created the measurement protocol to be enforced across the country's territory regarding non-ionizing radiation by the professionals who perform said controls.

Finally, the Communications Secretariat’s Resolution SC # 11/14\textsuperscript{15} created the National System for the Monitoring of Non-ionizing Radiation (SINAM), which aims at measuring electromagnetic emissions in compliance with the National Security Standard for exposure to radio frequencies. This system is still pending implementation.

3.2 BRAZIL

From the perspective of electromagnetic emissions, the regulatory entity (Agência Nacional de Telecomunicações (ANATEL’s)) Resolution # 303\textsuperscript{16} has set the boundaries for human exposure to electric, magnetic and electromagnetic fields at 9 KHz - 300 GHz, following the World Health Organization (WHO- ICNIRP boundaries). Later, Act # 11.934\textsuperscript{17} confirmed the International Commission on Non Ionizing Radiation Protection (ICNIRP) boundaries recommended by the WHO and replicated in ANATEL’s standards. Although the Brazilian telecommunications regulatory entity established the maximum radiation emission boundaries following the recommendation of ICNIRP, the various municipal and some provincial governments have a series of regulations of their own, totaling more than 300 different laws.

It is worth stressing that there are two processes to be fulfilled prior to the installation of new telecommunications infrastructure – licensing before ANATEL, and a separate licensing process at the local municipal government. They are separate bodies and it is necessary to complete both licensing processes. On the other hand, the regulator is responsible for establishing the licensing rules so that the antenna is fit for use. In parallel, before the antenna can be built, an approval is required from the municipal government, which takes the form of different conditions and requirements depending on the country’s jurisdictions. In some municipalities, the licensing process for the installation and operation of new antennas for mobile services could take in excess of two years.

\textsuperscript{14} National Communications Commission, Resolution # 3.690: Establishing that the holders of base stations and license holders of broadcasting stations shall prove that the radiation from their antennas do not affect the population in the adjacent areas. Protocol for the assessment of non-ionizing radiation., 2004.
\textsuperscript{15} Ministry of Federal Planning, Public Investment and Services, Resolution # 11, 2014.
\textsuperscript{16} Agência Nacional De Telecomunicações, Resolution # 303: Approving the Regulations on Exposure Limitations to Electric, Magnetic and Electromagnetic Fields in the radio frequency band between 9 kHz and 300 GHz., 2002.
\textsuperscript{17} National Congress, Act # 11934: Providing for Limits of Human Exposure to Electric, Magnetic and Electromagnetic Fields; amending Act # 4,771 of 15 September 1965; and providing for Other Measures, 2009, 934.
In addition to the above, environmental and urban licensing is further required for the installation of new antennas and telecommunications infrastructure.

Act # 13.116\(^{18}\), known as "the antennas act", was enacted with the aim of promoting mobile network deployment and reducing the negative impact of the delay imposed by "local licensing". The following items are most noteworthy:

- The regulation and oversight of the technical aspects of telecommunications networks and services are the responsibility of the Union (the highest federal authority of the Executive Power), which delegates them onto regulatory entity, ANATEL.
- The provinces, municipalities and the Federal District are prevented from imposing any condition that might affect operators' choice of technology, network topology and service quality.
- The necessary permits for the installation of telecommunications infrastructure in urban areas shall be granted through a simplified process, without detriment to the action by responsible entities.
  - The term for issuing any of the requested licenses shall not exceed sixty days counted from the date of submission of the request.
  - The request is unique and directed to a single body or entity in each jurisdiction.
  - The body receiving the request for licensing may request clarifications once within a 60-day period. Should this be the case, the process is not considered within the 60-day term. The license term shall not be any shorter than ten years.
- The installation of small telecommunication network infrastructure, such as small cells and femto cells, is exempted from the above-mentioned licensing.
- The excess capacity in the support infrastructure (towers) should be shared under a leasing contract, unless technical reasons suggest otherwise (for example, if the maximum bearing capacity of the structure is exceeded, among other reasons).
  - The building and occupation of the support infrastructure shall be planned and executed with the purpose of enabling its sharing by as many operators as possible. Only new infrastructure is considered under this item.
  - Infrastructure sharing shall occur in a non-discriminatory manner and at arms' length conditions, taking the sectorial cost model as the benchmark.
- The installation of new base stations shall occur at minimum landscape impact, seeking aesthetic harmony and seamless integration with the urban landscape.

The regulation recognizes the fact that mobile networks shall experience strong growth from their densification with smaller cells, as described in below, to support the explosive data traffic growth and ensure quality of service. In consideration of the above, the

Brazilian government passed Act # 13.097\textsuperscript{19}, whose articles 134 and 135 suppress the collection of the oversight rate (FISTEL) for small cells, characterized by their power boundary of up to 5 W. This amendment resulted from a protracted dialogue between the industry and the government, which concluded that collecting the rate made the deployment of small cells unfeasible.

However, for the basic installation of mobile service, the TFI (Installation Oversight Rate) is R$ 1,340.80 during the first year, and is later slashed to half that amount in subsequent years - R$ 670.40 (TFF or Operation Oversight Rate)\textsuperscript{20}. This translates into savings that can be used, for example, to add network density, which in turn benefits the population.

3.3 CHILE

In the Chilean framework, there are two parallel instances of authorization for the installation of antenna supports and radiating systems which are required in any telecommunications infrastructure deployment. The former instance is fulfilled before the municipality, while the latter is fulfilled before the regulator, the Under secretariat of Telecommunications (Subtel) of the Ministry of Transport and Telecommunications (MTT).

On the one hand, Act 20.599\textsuperscript{21}, called the Tower Act, regulates the installation of emitting and transmitting antennas for telecommunications services. It sets radiation caps, in addition to defining radiation-sensitive areas based on the shortest distance between them and the antennas. It further restricts the maximum heights for antenna structures and establishes the requirements for the authorization of radiating systems, among other provisions.

Without detriment to the above, the act differentiates rural and urban areas and requires an installation notice addressed to the Directorate of Municipal Works. For urban areas, the stakeholder should request an installation permit from the Directorate of Municipal Works, in addition to meeting a series of requirements depending on the size of the tower. To that end, the legislation foresees tower heights of less than three meters, three to twelve meters, and over twelve meters as measured from the ground and considering all of the antennas and radiating systems. The main requirements are:

- Towers in excess of twelve meters: the permit request should be filed at the Directorate of Municipal Works together with a technical project signed by a competent professional specializing in telecommunications, the total project budget, the structural calculation project for the tower, a certificate issued by the Chilean Mail to confirm that a certified letter has been sent to the Board of Neighbors and

\textsuperscript{19} Presidential Office of the Republic, Act # 13097: Reduz a Zero as Aliquotas Da Contribuição Para O PISPASEP, Da COFINS, Da Contribuição Para O PIS/Pasep-Importação E Da Cofins-Importação Incidentes Sobre a Receita de Vendas E Na Importação de Partes Utilizadas Em Aerogeradores, 2015.

\textsuperscript{20} Values of TFI and TFF of US 338 and US 169 approximately, as per the exchange rate at 30 September 2015 (Central Bank of Brazil exchange rate= R$3,9729)

\textsuperscript{21} Ministry of Transport and Telecommunications, Act # 20.599: Regulating the installation of Emitting and Transmitting antennas of telecommunications services, 2012.
Owners of the neighboring property at the planned tower site, a written proposal for improvement works for the public area, a certificate from the General Directorate of Civil Aviation stating the total height of the tower to be installed, a certificate from the Under secretariat of Telecommunications stating the submission of the request for granting or changing the concession (a procedure whereby base stations are added to the existing concession) and a certificate of official line and prior information.

- Three to twelve-meter towers and towers designed to merge with the urban environment: this type of structure should be accompanied by a request before the Directorate of Municipal Works, and a technical project signed by a competent professional specializing in telecommunications, a certificate from the Under secretariat of Telecommunications stating the submission of the request for granting or changing the concession and a certificate of official line and prior information.
- Three-meter (or shorter) towers: this type of structure requires submission of an installation notice to the Directorate of Municipal Works, as stated above, whose processing incurs lower costs than a permit. The same requirement applies to structures erected on buildings that are more than five floors high. No permit or notice is required at the municipal entity for the installation of antennas and radiating systems approved for placement on an infrastructure that has already been authorized to the concessionaire for such purpose.

On the other hand, there is a normative body, the Overall Telecommunications Act\textsuperscript{22} (L.G.T., # 18.168), which regulates the procedure for the installation of macro cellsites with new infrastructure before the Ministry of Transport and Telecommunications through the Under secretariat of Telecommunications by virtue of the concession system in place. This law contemplates a process and timing as indicated in Figure 1 (calendar days). The process starts with the reception of the Request to Change the Concession (SMC), which contains technical background information and the location of the infrastructure. The regulator then sends back to the operator an entry “statement” within thirty days. The operator has thirty business days to publish said statement in the Official Gazette and in a newspaper of regional scope.

As from the publication in the Official Gazette, any citizen may present duly grounded objections over a period of thirty calendar days, which objections would be relayed to the requesting operator by an Ordinary Order. Conversely, Subtel shall prepare a decree and report to the operator its authorization for change within approximately sixty business days. Finally, the decree is ready for publication in the Official Gazette within a deadline of thirty business days. Said publication provides final authorization for the operator to install and operate the base station.

3.4 COLOMBIA

Although a normative project is being considered, there is currently no national regulation in Colombia providing for any special administrative procedure for the granting of telecommunication infrastructure installation permits. Thus, the overall administrative procedure is applied under Act # 1.437\textsuperscript{23} established in the administrative and administrative-contentious procedural code.

Decree # 195 of 2005\textsuperscript{24} regulates the human exposure limits to electromagnetic fields and adjusts procedures for the installation of base stations, among other provisions. The following are the main provisions in the Act as they relate to the entities granting the following permits:

- The Ministry of Information and Communication Technologies issues the authorizing title and permit for the use of radio spectrum.
- The Special Administrative Unit of Civil Aviation issues the Permit for Antenna Installation.
- The Ministry of the Environment, Housing and Territorial Development or the Regional Autonomous Licensing Corporations grants permits or other types of authorization certifying environmental compliance when installations are planned for environmentally protected areas.
- Urban curators: in absence of the above, Municipal/District Planning Offices grant Urban Planning Licenses when installations call for the execution of civil works.

In addition, in case an installation will be made in buildings declared of cultural interest at the federal level, a permit is required for the intervention of the property (as per Act # 1.185\textsuperscript{25}). For installations planned for areas where ethnic communities reside, a prior consultation process should be conducted.

\textsuperscript{24}Ministry of Communications, Decree 195: adopting human exposure limits to electromagnetic fields, adjusting procedures for the installation of base stations and issuing further provisions, 2005.
Notwithstanding the above, territorial entities or municipalities have autonomy to manage their affairs. Thus, each of them is empowered to establish special regulations for infrastructure deployment. Each municipality or district usually demands a permit from the planning office for the placement of telecommunications infrastructure, and a permit from the authority in charge of architectural, cultural and heritage protection if the infrastructure will be installed in this type of location.

It is worth pointing out that given the normative conditions for infrastructure deployment established by local regulations, the Federal Government has included a rule in the Federal Development Plan (PND)\textsuperscript{26} which establishes the Communications Regulation Committee (CRC) as the body in charge of protecting the infrastructure deployment of telecommunications networks in all the territorial entities (departments, districts, municipalities and indigenous territories).

As stipulated in Act 1.753\textsuperscript{27} approving the PND, authorities of every territorial order shall identify the “obstacles that might restrict, limit or prevent the necessary telecommunications infrastructure deployment for the exercise and enjoyment of constitutional rights, and shall proceed to adopt whatever measures and actions it deems fit to remove them”. Once the CRC has been notified of the obstacles to the deployment of new telecommunications infrastructure, the process to determine “the best way to implement the technical conditions that will ensure deployment” of infrastructure may take up to eight months.

Article 193 of Act 1.753 further determines the following:

Paragraph 2: As from the time the license request has been filed for the building, installation, change or operation of any equipment for providing telecommunications services, the competent authority shall have a term of two months to either grant or deny said permit. Should the term elapse without notification having been received, the license shall be deemed granted in favor of the requesting party as per the terms requested on account of the positive administrative silence, except in cases pointed out by the Constitutional Court. Within the ensuing seventy-two hours after the two-month term, the competent territorial authority shall acknowledge the positive administrative silence to the requesting party, without prejudice to the capital and disciplinary liability that may arise from said abstention for the decision-making official.

Paragraph 3. The transmission and reception elements that are part of the infrastructure of network and telecommunication service providers, such as pico cells or micro cells, whose size and weight enable installation without the need for civil work for supporting purposes, shall be authorized for installation at no requirement of land use licensing.

provided that they observe the regulations in the matter as issued by the National
Spectrum Agency (ANE) and the Communications Regulatory Committee (CRC).

3.5 PANAMA

The National Authority on Public Utilities (ASEP) has jurisdiction and exclusive powers to
regulate infrastructures and electromagnetic measurements of telecommunication services
at the national level as per the following legislation:

- Executive Decree # 138\(^{28}\), issuing regulations for the use of facilities dedicated to the
  provision of public telecommunication services, radio and TV broadcasting
  promotes the efficient use of the infrastructure and ensures operator access.
- Act # 24\(^{29}\) regulates public radio and TV services.
- Executive Decree # 562\(^{30}\) grants the national authority on Public Utilities the
  competence to regulate and communicate technical standards, tower installation
  and inspection systems for public telecommunications, radio and TV service
  antennas.
- Resolution AN # 2.848-Telco\(^{31}\) establishes the regulations applicable in the
  installation, operation and shared use of towers and/or support structures for
  telecommunication antennas.

In this country, the municipalities have competence within their territories for the approval of
construction drawings and the collection of the municipal tax on constructions. The
requirements for the formality are adopted by the so-called Municipal Agreements. In
addition, according to Article 43 of Act # 24\(^{32}\), the assets used in providing
telecommunication services shall not be subject to municipal taxes.

The regulatory framework has a regulation on Towers and Antennas adopted by ASEP
through Resolution AN # 2.848\(^{33}\) which regulates the installation, operation and shared use
of towers and/or support structures for telecommunication antennas. Electromagnetic
emissions are part of this Regulation and match ICNIRP (International Commission on Non
Ionizing Radiation Protection) standards, ITU’s K-52\(^{34}\) recommendations on compliance with

\(^{28}\) Ministry of the Interior and Justice, Executive Decree # 138: Rules are issued for the use of facilities dedicated to the
\(^{29}\) Legislative Assembly, Act 24: regulating public radio and TV services and issuing other provisions, 1999.
\(^{30}\) Ministry of Health, Decree 562: granting the National Authority on Public Utilities the competence to regulate and
communicate technical standards, tower installation and inspection systems for public telecommunications, radio and TV
service antennas, as well as other provisions, 2008.
\(^{31}\) National Authority on Public Utilities, Resolution AN # 2.848-Telco: Adopting the regulations that shall rule the
installation, operation and shared use of towers and/or telecommunications support structures for antennas after receiving
and assessing the comments submitted in the public consultation held from 16 March to 6 April, 2009, 2009.
\(^{32}\) Legislative Assembly, Act 24: Regulating the public radio and TV services in addition to other provisions.
\(^{33}\) National Authority on Public Utilities, Resolution AN # 2.848-Telco: Adopting the regulations that shall rule the
installation, operation and shared use of towers and/or telecommunications support structures for antennas after receiving
and assessing the comments submitted in the public consultation held from 16 March to 6 April, 2009, 2009.
\(^{34}\) ITU, “Recommendation K.52: Guidance on Complying with Limits for Human Exposure to Electromagnetic Fields,”
February 2000.
human exposure limits to electromagnetic fields and K-61\textsuperscript{35}, delivering guidance on the measurement and numerical prediction of electromagnetic fields to prove that telecommunication installations are within human exposure limits. It contains three general principles on which the processing requirements are established:

- Favoring co-location to avoid tower proliferation and duplication.
- Strict compliance with technical parameters based on the location and type of structures involved to ensure end-to-end security for said structures and any equipment installed, in addition to the protection of persons and their property.
- A Citizen Consultation as a mechanism to provide information to the population residing within 100 meters of the tower core.

The regulation states that a registry of structures is necessary when equipment is placed on rooftops, advertising panels, etc., on shared infrastructures (through co-location), or on transportable structures. Furthermore, in these cases, no citizen consultation or filings are required before the municipalities. In the case of transportable structures, ASEP’s authorization is only granted for a three-month period and may be extended.

The procedure applicable for the installation of new structures consists of two stages: if co-location is not technically feasible, a permit from ASEP is required for which an authorization from the owner of the land should be submitted, in addition to a scale diagram of the elements to be installed, including technical features, a report on the intensity measurements of the electromagnetic field stressing the maximum value detected in the coverage area (if the site will be installed in the proximity of protected areas, cultural or historical heritage sites, or an airfield, permits from the competent authority should be submitted), an authorization from the Security Office in the Firefighters Department and, finally, proof of having held the citizen consultation (call for consultation, educational material delivered, minutes from the hearing including the list of attendants).

The second stage consists of a Municipal Construction Permit from the relevant municipality. Said permit is initiated at the Municipal Engineering Office by submitting the construction drawing, ASEP’s authorization, the permit from the Firefighters Department and an approval from the Community Board in the respective municipality. This Board shall control whether the Public Consultation has taken place and the residents’ agreement.

Finally, when installed equipment is commissioned, a further measurement of the electromagnetic load should be made to determine the contribution of these new pieces of equipment to existing levels in the area, and the completed site should be registered before the ASEP.

It should be noted that there are several municipal taxes or permits to be paid by the stakeholders for the deployment of infrastructure, which shall vary depending on the municipality.

There are rules for the protection of cultural heritage and national parks that require a previous permit from the Directorate of Historical Heritage and an authorization from ANAM (National Environmental Authority) only in such areas.

A few aspects regulated thereby are the maximum height, which should not exceed 12 meters, in addition to requiring infrastructures to be harmonized with the environment (as per Executive Decree # 51\(^{36}\)), and rules on the conservation of protected areas (Acts # 91\(^{37}\) and # 16\(^{38}\)).

The adoption of Resolution AN # 2.848-Telco\(^{39}\) filled a gap by recognizing ASEP’s competence. As a result, there are currently only two instances: ASEP and the Municipality\(^{40}\).

3.6 PERU

The Ministry of Transport and Communication (MTC) is the competent regulatory and policymaking authority from the Executive Power with national jurisdiction. It is further charged with granting concessions, authorizations, permits and registries for the provision of Public Telecommunication Services through the Supervisory Body for Private Telecommunication Investment (OSPITEL).

The regulatory framework for the expansion of telecommunication infrastructure in Peru is mainly regulated by Act # 29.022\(^{41}\), including its extensions and regulations. This Act and its regulations (currently repealed and replaced by a new set of regulations) had for the first time established a specific temporary system for four years during which the only requirements a given municipality could impose in granting base station installation permits were the ones stated in said regulations. This formality entailed a previous assessment and was considered by different internal commissions to determine its feasibility. To this end, the Act provided for a term of thirty business days after which a positive administrative silence was applied.

Later, Act # 30.228\(^{42}\), known as the Act on the Strengthening of Telecommunication Infrastructure Expansion, mainly amends the former Act on the Expansion of Telecommunication Infrastructure (# 29.022) by establishing that municipal authorizations should be obtained automatically provided that a complete technical file is submitted. In

\(^{36}\) Presidential Ministry, Executive Decree 51: approving a handbook of rules and procedures for restoration and rehabilitation of the historical Panama City area, 2004.

\(^{37}\) National Legislative Council, Act 91: regulating the historical monuments of historical Panama, Portobelo and Panama City historical area, 1977.


\(^{39}\) National Authority of Public Utilities, Resolution AN # 2.848-Telco: adopting the regulations for the installation, operation and shared use of towers and/or structures supporting telecommunications antennas upon reception and assessment of the commentaries submitted during the public consultation held from 16 March to 6 April 2009, 848.

\(^{40}\) Note that from the legal perspective, a Resolution does not have equal force and effect as a Decree-Lay or an Act.


addition, the Official Gazette has recently approved and published Supreme Decree # 003-2015-MTC\(^{43}\) approving the Regulations of Act # 29.022, which establishes a unique procedure for the automatic authorization of the installation of antennas and operator stations, as well as the deployment of infrastructure associated to these devices.

The main provisions in the above-mentioned regulations are:

- Definition of the Unique Form for the Installation of Telecommunications Infrastructure (FUIIT) as a required document in requesting installation authorization.
- An automatic approval process for the authorizations required in Telecommunications Infrastructure.
- The entities managing public domain assets shall provide the operator or, if applicable, the passive infrastructure provider, the facilities needed for purposes of installation, operation, maintenance, improvement work, emergency work, stripping and/or removing Telecommunications Infrastructure.
- Installation authorization is subject to the following validity periods:
  - Up to 120 calendar days for the installation of base stations.
  - Up to 180 calendar days for the installation of telecommunications infrastructure other than base stations.
- The commission for the elimination of burocratic barriers from the National Institute for the Defense of Competition and Intellectual Property Protection (INDECOPI) shall be responsible for exercising sanctioning powers vis-a-vis the entities in case of non-compliance with legislation regarding the removal of burocratic barriers.
- Operators and passive infrastructure providers shall regularize the installed telecommunications infrastructure prior to the effective date of Act # 29.868.

In consideration of the above, for automatic approval, the infrastructure installation process shall be initiated at the respective municipality by first submitting the Unique Telecommunication Infrastructure Installation Form (FUIIT), which should state the capacity of the requesting party (concessionaire, infrastructure provider, etc.), include a schedule of works and an environmental management instrument, in addition to complementary permits.

Upon confirming that all the previously mentioned documents have been filed, the respective municipality prints a Received stamp granting the requesting party the Municipal License to build the new infrastructure.\(^{44}\)

These complementary permits should be followed by a positive opinion from the Civil Aviation Directorate (DGAC) regarding the approval of the infrastructure resolution for obstacle monitoring surfaces, which the body may issue within 60 business days. In addition, the Ministry of Culture should issue a Certificate of Absence of Archaeological


\(^{44}\) Should inconsistencies be found in the documents, the interested party has two days to redress it and file the documentation again.
Remains (CIRA) within 20 business days in the area where the site will be located. Should archaeological remains be found, the interested party should conduct an Archaeological Monitoring Plan with the purpose of obtaining approval from the competent authority.

When the interested party is ready to start operations and commission the site, a radio link approval resolution should be sought from the MTC, which the Ministry should issue within 30 days.

It is important to note that no taxes are paid in infrastructure deployment, but rather processing charges for the municipalities’ authorization of installation.

3.7 MEXICO

In Mexico, the deployment of passive telecommunications infrastructure (i.e., ancillary elements that support active infrastructure\(^{45}\)) including rights of way required in network installation and operation, as well as in providing telecommunications and broadcasting services, are regulated exclusively by the municipalities, as per Article #115 in the Political Constitution of the United Mexican States. This article establishes that the municipalities shall be empowered under federal and relevant state legislation to:

- Formulate, approve and manage municipal zoning and urban development plans
- Participate in the formulation of regional development plans
- Authorize, control and oversee the use of land in the sphere of their competency and jurisdiction
- Grant construction licenses and permits

Active infrastructure (i.e., elements of the telecommunications or broadcasting networks that store, send, process, receive or transmit text, images, sounds, signals or other type of information) shall be regulated by the federal level.

Like in other countries, municipalities are free to determine the specific procedure, requirements and charges applicable for the passive infrastructure deployment with no other authority bearing any influence in the matter. This implies that in Mexico there is a variety of procedures and requirements for obtaining infrastructure deployment licenses that matches the number of municipalities in the Mexican territory – 2,457 municipalities in addition to sixteen delegations in the Federal District.

Despite the exclusive competence municipalities have over passive infrastructure deployment (civil work), the Constitutional Amendment\(^{46}\) created an autonomous constitutional body separate from the Federal Executive Power, called the Federal Telecommunications Institute (IFT), which was charged with regulating access to both active and passive infrastructure.

\(^{45}\) For example, frames, underground and aerial wiring, channelings, constructions, piping, works, posts, power supply systems, air conditioning systems, sites, towers and other fittings.

\(^{46}\) Standing Commission of the Honorable Congress of the Union, Decree amending and adding provisions to Articles 6°, 7°, 27°, 28°, 73°, 78°, 94° Y 105° of the Political Constitution of the United Mexican States on Telecommunications Affairs., 2013.
Likewise, the same constitutional amendment granted the Federal Executive Power the responsibility to lead the universal digital inclusion policy, which includes, inter alia, infrastructure goals and targets.

Later, the Federal Act on Telecommunications and Broadcasting (LFTR) was issued, where Article 5 in the First Title regarding authorities’ competency mentions that infrastructure issues are of "public interest and use".

These provisions determine the prohibition to impose monetary charges in addition to those agreed by the concessionaire and the owner of a property for the installation of infrastructure.

The same article grants specialized telecommunications courts the competence to hear in potential conflicts between concessionaires and the federation, federal and municipal entities, a system which did not exist prior to this Act.

The former represents a solution to avoid unwarranted delays and bureaucracy in the processes of municipal licensing and collection of charges. Article 5 of the LFTR is quoted below for further detail:

- "General communication routes, the civil work and rights of way, passage, or usage rights associated to public telecommunications networks, broadcasting stations and complementary equipment, as well as satellite communication systems regulated by the Act and the services provided through them shall fall in the federal purview.
- The installation, operation and maintenance of infrastructure used for public telecommunications networks, broadcasting stations and complementary equipment are considered of public interest and use and shall be exclusively ruled by federal powers in their respective spheres of authority, while state, municipal and Federal District regulations should be observed in the matter of urban development.
- No contributions or other monetary charges shall be imposed in addition to those agreed by the concessionaire and the owner of property for the installation of relevant infrastructure.
- In their spheres of competence, the Federal Executive Power, the States, Municipalities and the Federal District Government shall cooperate and grant facilities for the installation and deployment of infrastructure and the provision of public services of general telecommunications and broadcasting interest. In no case might the installation of telecommunications and broadcasting infrastructure used in providing the public services regulated in this Act be restricted.
- Any controversy between concessionaires and the Federation, Federal Entities and Municipalities in connection with the provisions herein shall be resolved by specialized courts on economic, broadcasting and telecommunications matters."

47 General Congress of the United Mexican States, Decree issuing the Federal Act on Telecommunications and Broadcasting, and the Act on the Public Broadcasting System of the Mexican State; and amending, adding and repealing various provisions in the area of telecommunications and broadcasting., 2014.
4 SUMMARY OF THE MAIN ASPECTS

In this section, the paper will provide a summary and add the main aspects relative to emissions, urban plans, procedures and stakeholders in the process of infrastructure deployment, as revised in Section 4.1

4.1 AS RELATED TO EMISSIONS

Generally speaking, in several countries in the region, the regulations on infrastructure installation are associated with emissions. For example, Inter-American Telecommunications Commission (CITEL) member countries have adopted the limits for non-ionizing emissions recommended by the ICNIRP and the World Health Organization (WHO).

On the other hand, it is advisable for operators’ own calculations on all of their base stations under operation or soon to be commissioned to serve as the basis for compliance with the limits to exposure to emissions. It is further suggested that any request for review of compliance with maximum exposure limits is performed only upon request from a party and at said party’s expense.

These calculations should be available at all times for consultation by any party that might so request under justified grounds or, as an alternative, be regularly submitted to the regulator.

A recommendation is made to carry out awareness actions targeting the population regarding this matter proactively and in coordination with the stakeholders – governmental telecommunications body, operators and municipalities.

4.2 AS RELATED TO URBAN PLANNING

The concern about the alleged effect on the urban environment receives varying treatment levels. As a result, in some countries this aspect has become more relevant since there are more regulated aspects, while in others the associated regulation seems to be more lenient.

Generally speaking, local regulators and national authorities are responsible for managing the situation.

Evidence shows that for a more expeditious deployment of telecommunications infrastructure, the relationship between installed equipment and the environment becomes highly relevant. Thus, it seems advisable for telecommunications authorities and operators to develop a local proposal of “good deployment practices” for antennas in order to reduce the visual impact on the environment, in addition to specific practices in areas of historical interest.

Without prejudice of the above and based on information gathered, at the time of making a deployment, operators must meet the environmental protection requirements, structure
security and requirements for the preservation of the urban and natural landscape, in addition to successfully minimizing spatial occupation and impact from the installations. Along this line, the new technologies enable the design of smaller infrastructures which blend and harmonize with the urban landscape (lighting columns, traffic lights, etc.).

4.3 AS RELATED TO PROCEDURES AND STAKEHOLDERS

In Latin America, there are frequent cases where municipal regulations are not consistent or coherent with provincial or national regulations. As a result, requesting the permits for base stations is a time consuming and complex task yielding uncertain outcomes and, in some cases, resulting in legal claims against the installation regulations by municipalities. In practice, there is evidence that new regulations and ordinances enacted by different countries in the region, if implemented and executed in the spirit in which they were discussed (such as promoting infrastructure deployment, investment and growth for the country, among other aspects) are a good starting point toward approving and streamlining the process for new telecommunications infrastructure installation in the region.

5 REGIONAL CHALLENGES FOR LATIN AMERICA IN ENCOURAGING DIGITAL ADOPTION

In recent years, telecommunications regulators in the various jurisdictions in Latin America have adopted measures to expedite the deployment of infrastructure in their territories. This resulted in a growing trend towards process streamlining and the standardization of the processes for requesting authorization for the building and/or expansion of telecommunications networks.

However, telecommunications service providers still face significant challenges in the region. For this reason, in addition to promoting policies and regulations that stimulate infrastructure deployment, the different regulators should ensure accurate interpretation of the spirit of the law at the time of enactment in order to prevent local regulations from superseding national regulations. Currently, one of the main issues faced by telecommunications service providers is the protracted implementation timing of legal amendments regarding telecommunications network deployment.

Some central governments in Latin America have not been able to avoid the barriers imposed by local governments which take different, and even opposing, measures on infrastructure installation by issuing their own regulations and requiring compliance with unique procedures. This situation can harm the community by delaying the expansion of service coverage and the progress of new wireless technologies in the region, while imposing new artificial costs for operators.

Heterogeneous authorization processes continues to be one of the main barriers to infrastructure deployment. In many Latin American markets, the responsibility for issuing said permits lies with local authorities, which may use different requirements and procedures for the approval of requests for tower construction or the deployment of new
antennas. Considering that the number of local municipal bodies in each country in the region ranges from around one hundred to several thousands, with each potentially observing their own regulations, the resulting bureaucracy is inefficient, raises costs and can delay the deployment of investment in new networks.

Another barrier to increased telecommunications coverage is lack of information among different sectors of civil society and/or government entities regarding the effects the installation and commissioning of telecommunications infrastructure could have on health. As a result, false data has sometimes led the relevant authorities to issue regulations and measures contrary to recommended practices and guidelines for infrastructure deployment.

In addition, there is community resistance to the installation of antennas or towers mainly owing to alleged visual pollution and/or the depreciation of surrounding property. There are also a number of regulatory initiatives that respond to the requests from these communities by imposing measures that restrict the installation of infrastructure in "sensitive areas" and demand conditions that either limit or delay the deployment of new networks that call for the installation of new towers. All of the above is contrary to the encouragement and significant appeals from national central governments to improve the coverage of new wireless technologies and reduce the traffic congestion that operators may experience.

This reality prompts the need for greater efforts in educating the different sectors of civil society and the various government entities regarding the true impact of telecommunications networks on citizens’ health. It is important for decision-makers to understand that it is not possible to increase the coverage of wireless networks unless antennas are deployed and towers are built to host them.

Finally, it is essential for the healthy and efficient development of the sector to minimize interventionistic measures that affect telecommunication operators’ investment. This is especially true if these measures are economically inefficient for the key stakeholders in the wireless deployment ecosystem, technically unfeasible or if the problem could be solved satisfactorily in a reasonable timeframe through the negotiation among the key stakeholders involved.

6 OTHER POLICIES CONDUCIVE TO DIGITAL ADOPTION

6.1 INFRASTRUCTURE SHARING PRACTICES

In the regulations perused, actions in this regard seem to be sufficient, for simplified processes are established in cases where sharing is possible, which has maintained a balance enabling continued network competition and the shared use of resources when incentives and the necessary conditions exist. However, it is deemed advisable for future regulations and agreements to consider the following guidelines:

- Infrastructure sharing should be done voluntarily based on reciprocal terms and conditions. The levels of saturation of the number of lines and the evolution of
wireless technologies make it increasingly attractive for operators to expand their geographical coverage. This creates pressure among the different providers in the same market to secure agreements with their competitors so as to jointly deploy a network that will allow them to cost-effectively expand coverage in districts where the deployment of a network by a single operator is not economically feasible.

- The will of the parties to enter into infrastructure sharing agreements should be privileged, as well as their economic terms. In other words, infrastructure sharing should be based strictly on business agreements and contractual freedom. Governments should efficiently recognize the free market commercial agreements reached through negotiation among the stakeholders, for these respond to their immediate needs, resulting in enhanced service offerings in new districts.

- The framework for infrastructure sharing should be technical, economic, operational and legal feasibility, avoiding government intervention to the extent possible. Regulatory authorities should understand that any regulation on infrastructure sharing should be delivered in a feasible framework for both parties. Establishing regulations that are technically impossible to meet or cause economic loss to either party harms the healthy development of the wireless sector and could have adverse consequences such as a reduction of the infrastructure for new geographic areas, which implies the possible risk of negatively affecting network development and expansion.

- The authority should strive to protect existing investments in infrastructure and promote its growth and penetration. In this regard, regulations should be implemented to reduce the tax burden on imported telecommunication infrastructure and devices. This will enable expanded coverage and accelerate the time to adoption of new technologies by consumers.

6.2 NEW TECHNOLOGY TRENDS

Given the huge success of broadband and smartphones, mobile operators and infrastructure and service providers must keep up to speed with an accelerated pace of change.

In this regard, with the purpose of delivering a satisfactory mobile broadband experience, networks require adequate capacity and coverage levels at all times, as well as very low latency to enable the handling of a large number of data using a scarce resource – radio spectrum – in the most efficient way and ensuring high quality user experience. Even in markets where 4G LTE networks have been deployed, users are still being moved from 3G to 4G coverage, not only for voice but also for data. Thus, it is important for the mobile broadband experience not to deteriorate dramatically as they move from 4G to 3G, which increases the challenges of network deployment and management for operators.
Furthermore, mobile broadband users want and expect a seamless experience regardless of whether they connect over a macro network or a small cell. This means that the different parts of the network, its domains and components need to be closely linked in an unprecedented way, since a "silied" vision of different radio access types or cell layers would not meet the increasingly demanding user expectation of "a single network experience".

In this context, the exponential growth of mobile traffic requires permanent technological enhancements and advancements from operators worldwide.

Thus, technology and service providers are making large investments in research and development and innovation in order to face the challenges related both to this exponential and relentless growth in mobile data traffic and that associated with infrastructure deployment. In addition, for operators, building, expanding and enhancing their mobile networks requires the deployment of new locations and antennas to provide geographical coverage and take a holistic view of their spectrum resources while balancing their investments on all technologies. In this way, they can leverage the use of resources to maximize user experience across 2G, 3G and 4G networks and start projecting upcoming 5G networks.

It is therefore extremely important for sectorial governmental policies to be developed in consideration of these new technological trends and increasingly demanding network features when it comes to drafting regulations that enable the deployment of mobile infrastructure in an innovative and efficient manner.

In turn, the new technologies being developed have the purpose of absorbing traffic growth and improving user experience, contributing more efficient ways of carrying and controlling traffic on all device types. To this end, radio technology breakthroughs are considered which improve spectral efficiency, the use of new frequencies and, most importantly, raise network density, which will seek to reuse the available spectrum with current radio technologies.

For example, in addition to more exclusive use licensed spectrum, one key aspect for efficiently improving network performance lies in combining the enhancement and higher density of the macro cell layer for coverage and capacity in general and the addition of the so-called small cells, which are placed in strategic locations. Therefore, it is clear that we are evolving toward the so-called "heterogeneous networks" which is a densification of the overall network architecture.

A detailed look at this notion to understand the new technology trends and the new implicit challenges for all stakeholders of the mobile ecosystem would conclude that:

- Enhancing existing macro cells implies, among other considerations, deploying more spectrum, advanced antennas, a larger variety of enhanced transmission and/or reception and greater processing power of the baseband both inside and between

Both public and private players.
nodes. In this regard, the on-going evolution of the WCDMA / HSPA and LTE technology improves macro network efficiency through specialized features, such as higher order modulation, more sectorization, multi-carrier multi-antenna solutions, as well as spectrum reuse by hybrid radio solutions. Thus, the increase in data capacity and bit rates can minimize the need for new sites.

- Increasing the macro network density in strategic locations implies adding cells with smaller coverage, mainly in areas of heavy traffic and high user density to improve capacity and data rates, especially when improving and adjusting the existing macro network is no longer feasible as the only action to meet growing demand. This approach maintains the total number of macro sites relatively equal while network performance is enhanced, especially in the areas with the heaviest traffic concentration.

- Adding small cells implies complementing macro networks with micro and pico cells, and optional embedded WiFi, as well as dedicated "indoor" solutions. This offers high capacity per user and coverage in heavy traffic areas with the potential of improving the macro network performance by offloading the traffic created by "hotspots". Overall network performance will therefore depend on the degree of integration and coordination that can be reached through said heterogeneous networks.

How and when each method should be used depends on several factors, such as: existing networks (density of macro networks), the availability of backhaul, spectrum availability, estimated traffic volumes and necessary data rates, as well as the technical and economic feasibility of each specific array.

6.2.1 VARIOUS SOLUTIONS FOR DIFFERENT SITUATIONS

There is no "one size fits all" solution for the introduction of heterogeneous networks, since rural, suburban and urban areas vary widely in terms of their coverage needs and expanded capacity and each requires a different deployment strategy. For example, in urban areas and, in particular, those which are denser, there is a growing need to improve user experience both in terms of network coverage and capacity through heterogeneous solutions.

Evolving a macro network toward a heterogeneous network will be the result of, inter alia, a combination of mobile broadband operator strategies, the existing infrastructure, and the availability of spectrum, sites and backhaul.

In this context, different solutions will be required for different situations. For example:

- In urban centers, overall coverage, especially in streets and parks and indoors, may improve efficiency by using complementary macro cells and small cells. The backhaul could be reached either by reusing fiber or by one dedicated microwave.

• In small public areas such as coffee shops and restaurants, the mobile network might be complemented with pico cells, Wi-Fi access, or both, in an end-to-end arrangement.
• In streets and squares of densely populated cities, coverage and capacity could be improved by using small outdoor base stations or by including a Remote Radio Unit (RRU) with an adequate backhaul solution.
• In large indoor spaces such as railway stations, shopping malls and airports, performance could be maximized by using small RRUs.
• In an office environment, depending on the size of the building, it may be feasible to deploy pico cells or some form of distributed architectural solution.

Thus, by integrating this type of solution which uses small cells in coordination with an improved and denser macro layer, higher performance is achieved. Therefore, as networks become more heterogeneous, certain mechanisms will be required to ensure seamless user experience with a robust network and greater network management capacity.

Given that mobile networks evolve steadily and despite the growing number of tools available to enhance them and face issues of congestion perception and irregular coverage, comparative studies of network performance worldwide show that the best performing networks are those which are adequately sized, equipped with the latest features and software and high performing terminals that support high data throughputs with advanced receivers.

As a summary, considering the trends and notions described, we could state that some of the critical features associated with providing this “single network experience” are related, for example, to radio coordination, common network and traffic management, in addition to the enhancement and further interaction between the access network and the backhaul.

The need for increased density is implemented by dividing a given coverage area into multiple smaller areas, each containing lower power cells – small cells – effectively multiplying the traffic capacity by the number of smaller areas. As mentioned, its most common application appears as an alternative to provide more capacity than the antennas distributed in enterprise (office) environments and crowded public environments (such as shopping malls, sports stadiums, etc.), although the trend is to use increasingly more small cells in any location that requires additional capacity.

The Small Cell Forum points out as the main benefits contributed by the use of small cells the fact that capacity and coverage depth are increased, the possibility to implement new services and enhancements in the congested levels of macro cells, which combine to provide better user experience. The use of small cells will be essential in deploying new mobile technologies like 5G, described later, whose objectives are still being developed by

50 Ibid.
51 Authority gathering more than 150 members from technology, telecommunications and other related industries worldwide.
several standardization groups. Small cells, however, have the consensus that higher density is a basic requirement in providing the required capacity and latency based on the various preliminary use cases.

On the one hand, multiplying the number of cells installed in heavy traffic areas has a direct impact on operator infrastructure costs, demanding more resources in the acquisition of sites, their licensing and the installation of backhaul transport and energy. The need for connectivity and mobile services in historical and tourist sites where the visual appearance and the preservation of the original characteristics of the location are of the essence, creates a challenge that can only be faced efficiently by deploying small cells with the macro network in a coordinated and integrated fashion.

Thus, to allow operators to continue evolving their networks facing the significant traffic growth, it is important for public policies to be drafted specifically for rendering the deployment economically feasible and the evolution of networks towards, for example, heterogeneous solutions that include small cells as part of their planning.

In that regard, and considering all of the above, the effort made by mobile operators to face these technology trends whereby networks are permanently evolving calls for very significant investments that require the backing of governments and regulators themselves in the form of public policies and regulations that favor infrastructure deployments and the creation of a sustainable environment that promotes the offering of networks, applications and services.

6.2.2 UPCOMING 5G NETWORKS

In considering the new network technology trends described, we cannot help but mention the early efforts made in the creation of 5G networks as the next evolutionary step for mobile networks and, therefore, the ensuing need for the private and public sectors to coordinate and plan at an early stage to favor a harmonized and smooth deployment.

As a brief summary, we could state that 5G networks will be a key component in achieving truly connected societies and will help realize the vision of unlimited access to information and data exchange anytime anywhere for anyone and any “thing”, since it will not only provide mobile connectivity for persons but also ubiquitous connectivity for any type of device and on any type of application that might benefit from a connection.

Mobile broadband will continue to be a vital service and lead to the need for more systems featuring increasingly higher data capacities and rates. In addition, 5G will provide wireless connectivity for a wide range of new applications and uses, including intelligent homes,

53 A more detailed discussion of the various deployment scenarios for small cells, including examples of amendments already made in the regulations of several countries to facilitate deployment may be found in a document published by the Small Cell Forum (“Regulatory White Paper,” March 2015).
wearables, intelligent traffic control, applications for industry sectors, as well as for the delivery of media communications at very high rates.

Unlike previous generations, 5G should not be viewed only as a specific radio access technology. On the contrary, it will be a global solution to address the demands and requirements of mobile communications in 2020 and beyond, including a large number of changes to the entire network (RAN, core networks, etc.) in line with a holistic end-to-end approach.  

Consequently, the need for network deployment on mobile networks will also evolve toward the new 5G networks, demanding greater cooperation and planning efforts among all the key stakeholders in the ecosystem, public policymakers and regulatory decision-makers to properly stimulate said deployments to benefit society as a whole.

7 CONCLUSION

In Latin America, the dialogue among operators, the regulatory entity and representatives of the local administration in search for deployment practices for new infrastructures is essential for achieving consensus and adopting common regulations. In this regard, deployment policies and their principles may be declared in either good practices or another tool, which should consider the following general principles.

Establishing defined procedures in a clear, accurate and standardized way nationwide will stimulate the deployment of infrastructure, facilitate industry development and, therefore, result in effective digital adoption.

In addition to differentiated installation request procedures, which should be unique and standardized nationwide, processing time by the competent authority should be brief, distinct and consider automatic acceptance (of the administrative silence type) in case no opinion is issued. Consideration should also be given to the heavy investment required which, in case of delays, remains frozen, thus becoming an inefficient asset for the companies and missed opportunities for users and a significant loss of wellbeing for the state, mainly driven by reduced job creation, both direct and indirect, on account of paralyzed investments.

Stakeholders are encouraged to facilitate digital adoption by infrastructure deployment. To do this effectively and efficiently, a single authority should be in charge of granting permits for new infrastructure, thus avoiding countless formalities and inefficiencies along the process.

When defining authorization procedures, it is recommended for the regulations to take into account the different types of telecommunications infrastructure and their impact on the environment, such as by small solutions or indoor network elements that have lower required load than outdoor solutions.

Legislation should efficiently recognize and encourage co-location contracts of a voluntary nature by enacting policies that reduce and simplify the process of request, validation and approval of authorizations for the installation of new elements on the already authorized infrastructure or that which is in the process of being authorized.

In addition, infrastructure sharing should take place through free market voluntary business agreements based on reciprocal terms and conditions, subject to technical, economic, operational and legal feasibility in all cases.

Aspects of infrastructure deployment and construction should be treated separately from emissions, in line with the ministerial organization of each country, since the WHO and other organizations have conducted in-depth studies. Therefore, the recommendation is to treat these aspects separately by virtue of the fact that the cautionary principle has already been ensured.

It is necessary to advocate in favor of the advantages, importance and benefits brought about by the telecommunications industry for the different players and users in order to raise awareness and educate society about the industry’s contribution to the country’s development by creating jobs, new businesses, increased GDP, among other benefits, in addition to the direct benefit created for the population from the fact that they can communicate in different situations, such as health emergencies, or the simple fact of connecting families and persons who are geographically isolated. This task should be undertaken jointly by the industry and governments.

In many countries, the infrastructure installation process is associated to high outlays by operators on account of administrative costs like taxes on the installation of new infrastructure. These can discourage deployment and jeopardize effective digital adoption. We suggest an assessment and weighting of the deterring implications these may have with the purpose of developing the tax mechanisms that promote infrastructure deployment. Specific progress has been witnessed from the joint work between companies and regulators on this matter. There are cases where small size infrastructure is being encouraged through differentiated systems of authorization, a lower tax burden, the standardization of authorization procedures and short timeframes. Measures like these and others are becoming more frequent and aim in the direction of favoring the adoption of new technologies and services.

Finally, all of the above should be framed in a government policy that has a clear legal framework and seeks to encourage deployment of wireless technologies and whose administration recognizes telecommunications as a main pillar for economic development with a view to effectively leading to digital and telecommunications adoption.
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<td>4G</td>
<td>Fourth Generation Technology</td>
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<td>AFTIC</td>
<td>Federal Authority on Information and Communications Technologies</td>
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<td>ANATEL</td>
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<td>HSPA</td>
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ACKNOWLEDGEMENTS

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