



**Spectrum use in Latin America**  
**Case studies of Argentina, Brazil, Colombia,**  
**Ecuador, Peru and Venezuela**  
**Supplementary summary report**

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## Introduction

The Association for Progressive Communications (APC), through research on the spectrum as part of the Action Research Network, aims to increase understanding of the spectrum regulation policies in Africa, Asia and Latin America. This work is financed by the International Development Research Centre (IDRC) of Canada.

The research explores how the spectrum is shared, by whom and under what regulatory frameworks. It also examines the true extent of the supposed "spectrum shortage", particularly given the evolution of new technologies like cognitive radio (a more efficient form of two-way radio) and new transmission protocols.

In Latin America case studies were done in Argentina, Brazil, Colombia, Ecuador, Peru and Venezuela. This report reviews and summarises the most relevant aspects of these studies. It aims to complement the information and vision for the region, in three main areas:

- The infrastructure needed for the universalisation of broadband and how to make large-scale, high quality, permanent internet access practical
- The regulation of the spectrum and the opportunity for the public to participate in decision making
- The challenges of community use of the spectrum, specifically the assignment of the digital dividend (frequencies released in the transition to digital television) and new technologies that open the underutilised spectrum or allow for secondary use of the spectrum.

The report concludes with a summary of the conclusions and recommendations presented in each case study.

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## Broadband plans, spectrum and democratisation of access

All the countries in this study have proposed and are carrying out national plans to expand broadband (meaning the supply of permanent connectivity at a monthly fixed price, supposedly at speeds compatible with customer needs). This is true in all of the Latin American countries covered in this APC spectrum study: Argentina, Brazil, Colombia, Ecuador, Peru and Venezuela.<sup>1</sup>

In the debate on ways to democratise access to the internet, based on current problems with transmission infrastructure, some propose that mobile connectivity (or digital radio) will be the definitive solution. Unfortunately that is only partly true.

If we consider the cartel control of end user prices in the region (Brazil, for example, has the highest average price for typical mobile services in the world),<sup>2</sup> we can see that the mobile network cannot be considered only solution for digital inclusion (ensuring individuals and disadvantaged groups have access to information and communication technologies (ICT)) . The majority of the population uses prepaid mobile (cell) phones that rarely allow for internet use. To choose a mobile network solution without an effective strategy for quality home (fixed) connections is to maintain a “class” structure. Those who can afford it will have the best smartphones and the best fixed network at home. People without sufficient income will not have a fixed home connection and will use prepaid mobile phones at a much higher data cost with minimum quality.

Statistics illustrate the challenge of large-scale digital inclusion with regard to the necessities of data transport. Data collected by the telecommunications firm Cisco<sup>3</sup> projects data traffic on mobile networks growing globally by 26 times between 2010 and 2015, rising to an average of more than 230 petabytes (241,172,480 gigabytes) per day. This is primarily due to increasing demand for mobile video and leads to a large increase in data transfer between internet “clouds”, which depend on fibre optic trunk lines.

At times of high demand the transit (carriage) of several million connections over the trunk lines can reach a level where no digital radio technology can overcome data congestion. This could result in the severe restriction of services. This can be seen today in 3G mobile services in the highest demand areas of large cities. The connection with the radio base station might be perfect, but it competes with thousands of other connections and the station does not have enough bandwidth for the demand, whether for peering (interconnecting) with other stations or for transit to the major internet backbones. As a result, the radio base station degrades the 3G connection to an EDGE connection,<sup>4</sup> or even GPRS<sup>5</sup> at much slower speed. Or it simply cuts off data transmission.

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<sup>1</sup> Available online at <http://www.apc.org/es/node/12283/>

<sup>2</sup> UNCTAD, Information Economy Report 2011, esp. p. 23. See [www.unctad.org/Templates/Download.asp?docid=15711&lang=1&intItemID=2068](http://www.unctad.org/Templates/Download.asp?docid=15711&lang=1&intItemID=2068)

<sup>3</sup> Cisco Systems. Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2010-2015, February 2011

<sup>4</sup> Improved Data Rates for the evolution of GSM (Global System for Mobile Communications)

<sup>5</sup> General Packet Radio Service

To make permanent connectivity widely available it is essential to extend fibre optic trunk lines so that they reach municipalities and, in the case of large urban concentrations, to extend them with local fibre optic rings. So discussions about the democratisation of the spectrum must take into account the basic infrastructure that makes full use possible. This means a favourable combination (technically determined by the characteristics of each geographic area and its socioeconomic characteristics) of fibre optic trunk lines with one or more points of presence in municipalities and several kinds of local distribution networks (fixed and wireless).

It is essential that local access service initiatives (whether by local enterprise, community groups or local governments) have equal access to those points of presence at costs that make the operation of those services viable. To a large extent, particularly in cases where points of presence are in the hands of private operators, the price of access is arbitrarily defined based on their economic interests (including the preservation of the local market for the future extension of service).

### **Broadband strategies**

All countries in this study have plans to expand their national fibre optic networks to some extent. With the exception of Colombia, state owned enterprises are in charge of fibre optic network installation, either directly or through public-private partnerships. With the exception of Argentina, we did not have access to the details of those plans.

The most significant trunk line infrastructure project (in relation to the geographic and population scale) is in Argentina. That project proposes installing several interconnected regional fibre optic rings, covering every province plus optical connections to Bolivia, Brazil, Chile and Uruguay. Argentina is also the only country of the group that proposes a goal of broadband download speed of 10 Mb/s by 2015. That is ten times more than Brazil's goal for 2014.

Brazil has developed a significant fibre optic network infrastructure, which is controlled by both the main telecommunications operators (Telephone/Alive, Oi, Clear/Embratel, TIM/Intelig), as well as the recently reactivated state company Brazilian Telecommunications S. A. (Telebras). After the privatization of telecommunications (in 1998), Telebras continued operating at a minimum. It basically served as a source of public employees for the National Telecommunications Agency (Anatel). That was its main function until May 2010 when President Luiz Inácio "Lula" da Silva signed Decree 7175, establishing the National Broadband Plan (PNBL), with Telebras at the centre of it.

Article four of the decree defines the role of Telebras, which includes:

- Providing support for public policies relating to broadband connectivity for services in the public interest

- Providing communications infrastructure and network support to telecommunications services operated by private companies, states, the federal administration, municipalities and non-profits
- Providing broadband connectivity to end users, though only in areas where such services are not available at an adequate quality.

Article seven of the decree defines the role of Anatel as “to implement and execute the regulation of network and telecommunications infrastructure services related to broadband connectivity” with the objectives of:

- Promoting competition and initiative
- Stimulating innovative businesses that develop the use of convergent services
- Adopting agile processes for the resolution of conflicts
- Assuring that the disaggregation (separating into parts) rules are followed
- Assuring management of infrastructure and public goods, including the spectrum, that reduces costs and expands the supply of broadband services.

The article also requires that “in executing the directives in this article, Anatel will follow the policies established by the Ministry of Communications”.

Telebras assumed control of a large fibre optic network network already installed in electrical transmission lines and circuits operated by Petrobras (a total of 11,400km which includes the federal capital and 15 other state capitals). The PNBL plans on expanding that network to 30,800km, which will connect the capitals of ten more states by 2014 and will reach directly or via digital radio point-to-point connections to more than 80% of the 5,565 municipalities in the country.

Ecuador, in its new Digital Ecuador Strategy, which complements or replaces the previous National Connectivity Plan, proposes extending fibre optics to the provinces of Azuay, Bolivar, Cañar, Cotopaxi, el Oro, Esmeraldas, Guayas, Loja, Los Ríos, Manabí, Morona Santiago, Napo, Pichincha and Tungurahua. But the plan only specifically mentions the installation of 401km of fibre optics. It is understood that, as in all of the other cases, the reach of the fibre optic network to all localities will be made by high speed digital radio with fixed point-to-point connections, operating at frequencies between 5 GHz and 40 GHz. There is no precise information on the number of addresses or municipalities that will be reached through the plan by the end of its mandate in 2017.

In June 2011 internet (fixed and mobile) reached almost 30% of the population of Ecuador. Compared to 2006, Ecuador has five times the number of internet users. Mobile telephones reach all of the urban population and 68% of rural households.

The Ecuador plan has the following goals:

- Tripling the number of broadband connections by 2016
- Connecting all urban public schools and 55% of rural schools to broadband (a total of 9,320 schools)
- Connecting 50% of public health centres, 450 rural co-operatives and 60 social rehabilitation centres to broadband.

Peru initiated its National Broadband Development Plan in 2011 on the basis of a very detailed study of the sector, which took special account of the gap in access between coastal and interior cities. Today nearly 4.4% of the population access the internet via broadband, whether fixed (76% of all connections) or mobile (24%).

The specific goals for 2016 are to have:

- 100% of educational centres, health establishments, police stations and other state entities in urban zones permanently connected at a minimum speed of 2 Mb/s
- 100% of districts with coverage that, at minimum, connects the municipality, major educational centres and public health establishments in the district at a speed of at least 2 Mb/s
- To triple the number of national broadband connections (from 1.3 to 4 million)
- To reach 500,000 broadband connections at 4 Mb/s or more.

The plan includes a significant extension, through 2016, of the main fibre optic trunk networks, which are currently found only on the coast. New fibre optic installations will be required to set aside part of their capacity for state use. All new physical infrastructure works (roads, electricity lines, oil or gas pipelines, etc.) should consider installing fibre optic lines at the same time.

Venezuela's strategy for universal broadband access is part of the National Telecommunications, Information Technology and Postal Services Plan (PNTIySP - Plan Nacional de Telecomunicaciones, Informática y Servicios Postales), launched in 2007 with goals through 2013.

The strategy includes plans for installing a fibre optic network backbone using resources from the Universal Services Fund (FSU - Fondo de Servicio Universal). The structure proposed by the state

company CANTV is a multi-connected fibre optic network, of which 336km are active (Valencia - Puerto Cabello - Barquisimeto) and another 7000km are in the process of being installed towards the south. Private companies are also installing their trunk networks. The company Inter must reach a total of 14,000km. Telefónica has also extended its fibre optic network, connecting its radio base stations and offering mobile and fixed broadband services.

The Venezuela study says:

“The roll out of these opportunities for internet access through fibre optic trunks and satellite links facilitates the integration of new ICT services promoted by regional and local governments (municipalities, city halls, communities, etc.) to achieve integration and citizen access to the benefits of ICTs. This is the case of initiatives like the Chacao Municipal Wireless Network, which has community municipal mobile broadband infrastructure citizens can use. This is through a channel not offered by conventional operators since they are unlicensed industrial, scientific and medical (ISM) bands at 2.4 and 5 GHz (WiFi and WiMAX (worldwide interoperability for microwave access)), that is interconnected with CANTV. This initiative allows citizens to access government information, pay taxes, and request services from city hall. The municipality is now concentrating its efforts on becoming a “digital city” where users have free wireless internet, video-monitoring, citizen services, IP telephony, location of assets through telemetry for vehicles, water systems, e-commerce, e-learning, etc”<sup>6</sup>

In all of the countries analyzed, the national plans for universal access and large scale connectivity consider the development of national fibre optic infrastructure as essential for data transport. Presumably all countries working on national broadband plans have, in one way or another, similar strategies.

In some cases, public policies, with the strong presence of the state as infrastructure operator, are considered strategic and are under way. This is the case in Argentina and Brazil, despite strong opposition by private operators. In other countries, such as Colombia, public policies aim to facilitate and even demand large-scale access through fiscal regulation and incentives.

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<sup>6</sup> Benítez Uzcátegui, Sandra Lisdee and Ermanno Pietrosevoli. *Open Spectrum for Development - Venezuela Case Study*, APC, August 2011

## Regulation structure

The experience of the regulatory agencies in the region is not uniform. In many cases they do not have the independence to effectively regulate in favour of those who should be their central focus: the end user. In those countries where most or all telecommunication services are in private hands, operators and large media enterprises frequently have political control of the regulatory agencies. In those cases effective user representation is symbolic, ineffective or nonexistent. And when the telecommunications system is in large part or exclusively in the hands of the state, there is no independent regulation.

In either case, there are no reports of effective pluralist (one person, one vote) participation in the decision making processes of the regulatory bodies. In cases where public consultations are held, the percentage of decisions affected is negligible.

Unfortunately it is difficult to find an effective neutral regulatory agency with a central objective of guaranteeing universal access to high quality services at the best cost/benefit ratio for the general population, with transparent processes of public consultation in its decision making.

It is particularly worrisome considering the authority of these regulatory bodies over the spectrum, which normally includes:

- Establishing standards related to the use of the spectrum
- Defining what application each frequency will be used for (spectrum attribution)
- Planning and determining the processes for granting authorisation, including acquisition values (spectrum allocation)
- Approval of all transmission and reception equipment
- Oversight of all related contracts and services.

In all of the countries that are included in this APC study, the spectrum is considered a community asset under the supervision of the state and it cannot, in theory, be bought or sold as a commodity. The portions of spectrum are granted, in several legal forms, for the purpose of providing a service defined in the allocation contract or in regulatory standards.

From a legal and regulatory point of view, Argentina has a complex institutional structure. As in several other countries, the Argentine system of spectrum allocation and oversight separates traditional broadcasting (radio and TV, including digital modes) from data transmission.

The main interrelated entities that affect the attribution, allocation and oversight of spectrum use are:

- The Communications Secretariat (SECOM - Secretaría de Comunicaciones)
- The National Communications Commission (CNC - Comisión Nacional de Comunicaciones ) for data transmission
- The Federal Authority for Audiovisual Communications Services (AFSCA - Autoridad Federal de Servicios de Comunicación Audiovisual) for radio and TV.

In Brazil, spectrum control is the responsibility of the Ministry of Communications (MiniCom - Ministério das Comunicações) and Anatel. Anatel was created in 1997 by the General Telecommunications Act (LGT - Lei Geral das Telecomunicações) as a formally independent regulatory body, following the general model of the Federal Communications Commission (FCC) in the United States. It has authority over telecommunications, while broadcasting (radio and TV) continued under the MiniCom.

Anatel has the authority to:

- Approve, suspend and cancel authorisations
- Regulate licences and processes for the provision of services
- Supervise operations of companies with concessions
- Administer the spectrum, including orbital systems
- Certify telecommunications products and equipment.

The administration of the spectrum includes:

- Establishing standards and conditions of use
- Definition of the frequency ranks (ranges) for each type of service
- Planning of authorisations
- Managing attribution of frequency ranks and processes of authorisation for each service
- Licensing of transmission and reception stations.

Anatel is financially and administratively independent from the MiniCom. The president of the republic chooses the members of the Anatel board, including the president, from candidates approved by the Senate. Board members have a fixed term that is not affected by elections. MiniCom is the primary body of the Brazilian federal government in charge of radio and television policies. It also controls the Brazilian Post and Telegraph Corporation (Correios/ECT - Empresa Brasileira de Correios e Telégrafos).

Colombia does not have an independent regulatory agency for telecommunications. Final decision making is in the hands of the Ministry of Information and Communications Technologies (MinTIC - Ministerio de Tecnologías de la Información y las Comunicaciones). Compared to Argentina, the organizational chart of institutional control over telecommunications is quite simple. All of the entities are under the authority of one ministry. The National Spectrum Agency (ANE - Agencia Nacional del Espectro), created in 2009, is an agency that offers technical and operational support to the MinTIC. The National Spectrum Committee (CNE - Comité Nacional del Espectro), created in 2011, is limited to making recommendations to the ministry.

Given their recent creation, the parties that contribute to the regulation and construction of policies in Colombia are very new at dealing with the strategic problems they face. Colombia also does not have significant telecommunications infrastructure in the hands of the state. But this situation does not imply that strategies for universal access and inclusion are necessarily put at risk, which often happens in developing countries in these cases.

In Colombia there is even the capacity for public consultations or forums for participation with pluralist representation to influence decision making. These ANE initiatives to allow participation and even popular decision making over the spectrum appear to be unique in the region.

In Ecuador, the regulatory agencies were the National Broadcasting and Television Council (CONARTEL - Consejo Nacional de Radiodifusión y Televisión) and the National Telecommunications Council (CONATEL - Consejo Nacional de Telecomunicaciones), which have now merged into one body under the second name.

An additional body responsible for monitoring and oversight, the Telecommunications Supervisory Commission (SUPERTEL - Superintendencia de Telecomunicaciones), was created under CONATEL as part of the structure for managing the spectrum. CONATEL is under the Ministry of Telecommunications, which is the policy making body. As in Colombia, Peru and Venezuela, there is no an independent regulatory agency for the oversight of telecommunications.

With the exception of Argentina, the countries in the study require separate licences for authorisation of service type and for use of the spectrum. The licence for spectrum use defines the type of service to be offered and the technology (MMDS, 3G, 4G/LTE, etc.). None of the countries allow the licensee to give up portions of the spectrum for secondary use.

Some analysts believe that the frequency ranges for mobile applications in these countries are narrow, which could contribute to the higher prices for the customer. But it is not easy to determine what portion of the increase is due to that factor versus that they operate in monopoly, near-monopoly or cartel situations. It is also difficult to determine what portion of the cost that represents compared to, for example, the cost of carriage on internet trunk lines. A stronger analysis could be made of the necessity and availability of larger frequency ranges in the portions of the spectrum allocated for mobile services.<sup>7</sup>

In Peru there is also no independent regulatory agency. Governance of the spectrum is in the hands of the Ministry of Transport and Communications (MTC - Ministerio de Transportes y Comunicaciones). Actual management of the spectrum is under the Vice-Ministry of Communications. As in the other countries in the study, the spectrum is considered "patrimony (heritage) of the nation". An agency under the MTC, the Private Telecommunications Investment Supervisory Commission (OSIPTEL - Organismo Supervisor de Inversión Privada en Telecomunicaciones), is involved in plans for distribution and allocation of frequencies, as well as oversight of use - but authorisations, licences and permissions are managed by the Authorisations Office (Dirección de Autorizaciones) of the MTC.

Venezuela created a formal regulatory agency, the National Telecommunications Commission (CONATEL - Comisión Nacional de Telecomunicaciones) which basically conforms to the standards recommended by the International Telecommunications Union (ITU). CONATEL was under the Ministry of Infrastructure, but as of 2009 it is under the Executive Vice-President's Office. The document stresses the importance of assuring that the regulatory agency is truly independent, with equal participation by all interest groups in its decision making processes.

The independence of CONATEL is quite relative from a political and economic point of view, a characteristic common to all regulatory bodies in the region, whether for telecommunications or other sectors. Unfortunately, it is difficult to find a truly neutral regulatory agency in the region whose main objective is to guarantee universal access to the best quality services at the best cost/benefit ratio for the general population. And one which uses a transparent public consultation process in its decision making.

In the case of Venezuela, labour law (la Ley Orgánica del Trabajo) was significantly reformed in 2010, transferring the national control of domain names to CONATEL, whereas the regulation of tariffs went directly to the Vice-President's Office. These are very significant changes in the reach and role of a telecommunications regulatory agency.

In particular, the control of internet domain names by CONATEL reveals that in Venezuela the regulation of the different layers of internet over the physical infrastructure and signaling (logical connectivity, transport of data and applications; what is conventionally called "value-added

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<sup>7</sup> Hazlett, T.W. and R.E. Muñoz. Spectrum Allocation in Latin America: An Economic Analysis, George Mason Law & Economics Research Paper No 06-44, May 2009

service”) appears to be under the control of the central government.<sup>8</sup> The situation of assignment and control of the internet's logic layers requires clarification.

## **Reversible goods**

Depending on the resources granted (for example, the privatization of fixed telephone (landline) networks), some concession or licence contracts can have “reversible goods” clauses - where goods are given back to the state in the case of the lapse of the concession contract.<sup>9</sup>

In the case of services that use the spectrum, this includes cellular networks and privatized satellite networks. Only the Brazil case study mentions policies for reversible goods. In fact there is no easily accessible information on this subject for several countries of the region, although thousands of millions of dollars may be involved.

## **The digital dividend and television “white spaces”**

The spectrum attributions table of a country is very long and generally includes the attributions proposed by the ITU as well as those actually in effect in the country. It is important to have a clear idea of the attributions between 50 MHz and 6 GHz (the best part of the spectrum for typical FM radio, TV and data transmission applications).

Television frequencies in Latin American countries go from 54 to 216 MHz (VHF channels 2 to 13) and from 470 to 890 MHz (UHF channels 14 to 83). Channel 37 in the United States, Canada and other countries, is reserved for radio astronomy, and channels 52 to 83 (698 to 890 MHz) are assigned to terrestrial mobile services and are generally in dispute for use with 4G/LTE technologies (3GPP Long Term Evolution, a new standard for mobile communications).

The ITU considers the portions of the spectrum originally assigned to analogue TV that will no longer be used for digital TV to be a digital dividend: 47 to 68 MHz and 174 to 230 MHz in VHF and 470 to 862 MHz in UHF. These portions of the band are or will be in dispute with the migration to the digital television. Now that they will no longer be necessary for digital TV, it is not clear what the criteria will be for the allocation of these “white spaces” (the separation channels in each region that have no signal to eliminate the interference between active channels).

Defining channels or portions of this part of the spectrum “for community use” is an important public policy issue, especially given the use of new cognitive radio technologies.

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<sup>8</sup> In Brazil the Ministry of Communications recently asked Anatel to study a possible change to Norm 4 (which since 1995 has defined logic layers of applications and internet content as a value-added service) such that parts of the internet can be treated as a telecommunications service under the regulation of Anatel.

<sup>9</sup> It is estimated that in Brazil, in the case of the privatization of fixed telephony, today's market value of reversible goods is more than USD 70 billion. Anatel is responsible by law for those goods, but it is known that massive contract violations exist (illegal sale of reversible goods on the part of the concessionaires) and there is no public access to data on those goods.

An opportunity that is generally forgotten, or made difficult by regulation, is the supply of services of limited reach (to a neighborhood, a smaller city, or urban or rural communities that are socially and/or geographically limited). In the regulation of the spectrum there are only a few narrow established ranks of frequency that are defined as "unlicensed", generally based on the recommendations of the ITU.

This is inadequate, given that all ranks are licensed, the only variation being how flexible the criteria for use is. If the innovations offered digital TV and cognitive radio technologies are combined with regulations that make effective use of frequency ranks viable at a local level - in particular allowing local enterprise to offer wireless services of reasonable quality and reach with minimum interference - it can open up many possibilities. This includes the mobilisation of civil society organizations and social movements around community services. These opportunities also require a policy of access to the trunk networks at a cost/benefit ratio that makes such local initiatives viable. For example, the facilitation of this access component for local initiatives is part of the strategy of Telebras in Brazil in its role as central agent of the PNBL.

In effect, the advance of these technologies can make more viable what is called "secondary use" of portions of the spectrum that are already assigned but only partially in use, as well as "automated" use (automatic search for free frequencies) of the white spaces.

In our region, for example, the analogue TV channels occupy a bandwidth of 6 MHz. Using digital transmission with advanced modulation technologies (like those used in 4G/LTE networks) data densities can reach more than 15 bits/Hz. Therefore, in theory, more than 90 Mb/s could be sent at 6 MHz (compared to the approximately 20 Mb/s for digital TV broadcasting), which would make an endless number of community applications viable.

At the 450 MHz there are already technologies and examples of using cognitive radio for the networks of large organizations that traditionally use the band for their internal networks.<sup>10</sup> In these cases available ranks could even be utilized for secondary use.

The frequencies today occupied by analogue TV have a long reach compared to WiFi frequencies. Transmissions at 700 MHz reach nearly four times the distance of those at 2.4 GHz, with the same propagation conditions. This makes their use for data transmission in areas of low population density all the more important. One crucial economic benefit is that a network operating at 700 MHz needs fewer repeating stations to cover the same area.

The ITU's recommendation 224 for Region 2 (Americas) suggests using the frequencies from 698 to 806 MHz (UHF channels 52 to 69) for mobile data applications. But that does not prevent other analogue channels, as they are released by the transition to digital TV in each country, from being considered for the digital dividend. In 2006 the Inter-American Telecommunications Commission (CITEL - Comisión Interamericana de Telecomunicaciones) expanded on the recommendations of

<sup>10</sup> See the example of Petrobras in Brazil at [convergenciadigital.uol.com.br/cgi/cgilua.exe/sys/start.htm?infoid=27950&sid=17&utm\\_medium=twitter&utm\\_source=twitterfeed](http://convergenciadigital.uol.com.br/cgi/cgilua.exe/sys/start.htm?infoid=27950&sid=17&utm_medium=twitter&utm_source=twitterfeed)

the ITU, proposing that frequencies from 698 to 794 MHz and from 776 to 794 MHz be used for mobile services, reserving the frequencies from 764 to 776 MHz and from 794 to 806 MHz for government use. So far there has been no explicit adoption of this recommendation by the countries in this study.

Additionally, by agreement in the ITU, there are no “free” bands. They are all regulated in some way. This includes the bands referred to as “unlicensed”, which each country translates into different forms of “light licensing”. It is significant that in Ecuador the band between 2.3 GHz and 2.5 GHz has been assigned to the armed forces, in contradiction to ITU recommendations. However the band's reach is limited and should not prevent its current widespread use for WiFi devices.

Media companies in Brazil plan to retain at least part of the UHF spectrum of the digital dividend to offer internet services. In the dispute over the 700 MHz band, media companies argue that it is too early to decide on the attribution of the band. They say that telecommunications companies already have large quantities of spectrum that they do not use efficiently. According to the calculations of the Brazilian Association of Television and Radio Broadcasters (ABERT - Associação Brasileira das Emissoras de Rádio e Televisão), telecommunications companies in Brazil already hold spectrum equivalent of 759 MHz, whereas that same sector in the United States (where there is much more intensive use of broadband) uses 574 MHz. There is evidence in both countries of the ineffective use of that spectrum.<sup>11</sup> ABERT says that the need for an additional 1280 MHz, as indicated by the ITU on the basis of a sample of 14 countries, is not confirmed in practice.

The MiniCom says that the attribution of ranks in the 700 MHz band will only happen after the deactivation of analogue TV. Civil society organizations that monitor spectrum policies in Brazil insist that the attribution of spectrum bands must be decided on the basis of public policies shaped in consultation with society and not only on the basis of business models. Brazil's constitution calls for a public TV system, but that has never materialized, precisely because of the alleged lack of spectrum. Now the opportunity exists, with digital TV, to create such a system.<sup>12</sup>

For community networks and the wireless networks of “digital municipalities”, the combination of WiFi radios at 2.4 GHz for local distribution and 5.8 GHz for the interconnection of a local wireless backbone offers an excellent cost/benefit ratio. Additionally, there are digital transceivers that have been on the market for some time that combine both functions at low cost. It would be interesting to have more details on how those applications are or could be implemented in countries like Ecuador.

Currently variations of light licensing are practised in the countries in the study, even for the “open” or “unlicensed” bands, depending on type of use (commercial or not) and broadcast reach (limited to 400 mW, for example, for non-commercial use). In general WiFi does not require a licence as

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<sup>11</sup> Grossman, Luis Osvaldo. “Teles e radiodifusão afiam disputa pelo 700 MHz”, *Convergência Digital*, November 25, 2011, at [convergenciadigital.uol.com.br/cgi/cgilua.exe/sys/start.htm?infol=28199&sid=17&utm\\_medium=twitter&utm\\_source=twitterfeed](http://convergenciadigital.uol.com.br/cgi/cgilua.exe/sys/start.htm?infol=28199&sid=17&utm_medium=twitter&utm_source=twitterfeed)

<sup>12</sup> Those entities include Intervozes ([www.intervozes.org.br](http://www.intervozes.org.br)) and the Nupef Institute (Núcleo de Pesquisas, Estudos e Formação, [www.nupez.org.br](http://www.nupez.org.br)).

long as it is not for commercial use and does not exceed a certain limit of power. There could be an additional requirement that it be restricted to a certain local geographic area (a university campus, a community, etc.). This practice could be extended to cognitive radio applications in community networks on several of the frequencies that are today white spaces, or which could be freed for some type of secondary use.

### **Interactivity in digital TV, educational and cultural use**

The following countries in the region have confirmed the adoption of the Japanese-Brazilian system of digital TV: Argentina, Bolivia, Brazil, Chile, Costa Rica, Ecuador, Nicaragua, Paraguay, Peru, Uruguay and Venezuela. The confirmed date for the “analogue blackout” (switching off analogue TV transmitters) in most countries is 2016.

This system includes an open standard and a programming language (Ginga-NCL and Ginga-J) for interactivity, but the specific implementation details in each country can vary.

The digital TV networks in the countries in this study are being installed and interactive capacities have yet to be activated. It will be interesting to see who will benefit from the opening up of the white spaces and other frequencies by the installation of digital TV and radio. In addition, what uses could be proposed for educational, cultural and community applications and what channels will be reserved to cover training and cultural needs. Interactivity will play a crucial role in those applications.

### **Attributions in the short term**

The details of the case studies do not allow for the creation of a precise table (by country) of the frequencies that will be assigned in the next two or three years. However the bands that might be allocated (or are in the process of allocation) in that period will be around the following frequencies: 450 Mhz (mobile services in rural areas), 2.5 GHz (4G/LTE and other mobile communication services), and 3.5 GHz (mobile communication services).

As mentioned, it is possible that pressure from large telecommunications companies will lead to allocations of the 700 MHz band in the same period, based on the argument that the higher part of the spectrum of what is currently the UHF band is not in use. A report contracted by the Hispanic-American Association of Telecommunication Companies and Research Centres (AHCINET - Asociación Hispanoamericana de Centros de Investigación y Empresas de Telecomunicaciones) argues that with the use of the 700 band of MHz, mobile broadband coverage could increase from 75% to 95% in Argentina and Brazil, from 53% to 90% in Colombia, from 39% to 94% in Mexico and from 65% to 89% in Peru.<sup>13</sup> But this is still a disputed territory. As the telecommunications

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<sup>13</sup> Study contracted by Telecom Advisory Services LLC (TAS) for the GSMA and the AHCINET. See [convergenciadigital.uol.com.br/cgi/cgilua.exe/sys/start.htm?infoid=27781&sid=17&utm\\_medium=twitter&utm\\_source=twitterfeed](http://convergenciadigital.uol.com.br/cgi/cgilua.exe/sys/start.htm?infoid=27781&sid=17&utm_medium=twitter&utm_source=twitterfeed)

companies look to improve their multimedia services (internet protocol television (IPTV) and others), current media companies that have channels around 700 MHz are planning to offer mobile services.

One example of a policy to be supported by civil society would be to propose that, starting immediately, the countries in this study should reserve at least two contiguous channels on the UHF band (a total of 12 MHz) for community applications around 700 MHz. The same can be said of unlicensed frequency ranks around 5.4 GHz and 5.8 GHz, which work for point-to-point and point-to-multipoint applications for local network structures, and where bandwidths could be extended for community use.

At the same time efforts should be made for regulatory agencies to consider authorising community use of white spaces with cognitive radios.

## **Summary of conclusions and recommendations of the reports**

Because aspects of the challenges and opportunities are similar in the countries in the study, the conclusions and recommendations for each country are, to a great extent, applicable to the others. The following is a summary of the conclusions and recommendations made by the authors of the studies.

### **Argentina**

There is no indication that Argentinean public policy regarding attribution of the spectrum will change. Once assigned, it is the operator who decides what service will be used.

The federal and provincial initiative to develop fibre optic networks seeks to significantly improve the cost of access and transmission capacities. One expected result is a price reduction of five times or more.

The connection of the trunk networks to specific localities (municipalities, neighborhoods, etc., depending on size) is generally made by an optimal combination of fibre optics and point-to-point radios. According to the report, there is no clear regulation in Argentina on use of the spectrum for point-to-point applications. The point-to-point radio links can reach speeds of 1 Gb/s over distances limited by the skyline, but the lack of definition can make the generalized use of this alternative difficult.

The report describes to the creation and regulation of the Universal Service Fund (Fondo Fiduciario del Servicio Universal), a fund created in 2010 on the basis of similar examples in other countries of the region like Brazil, Colombia and Venezuela. In 2010 the SECOM, through Resolution 154/2010, approved the method for receiving contributions to the Universal Service Fund account. These funding initiatives are useful and stress the responsibility of private players. The challenge is

to make their use effective.

User communities face many obstacles in establishing free community networks, including cost and the availability of transit connections.

The report recommends that the state encourage the relationship between different trunk networks in the country so that it benefits providers of last mile access, with a possible reduction of transit costs.

Argentina has a social tariff for cable TV services, created by the Audiovisual Communication Services Act (Ley de Servicios de Comunicación Audiovisual) but there is nothing similar for broadband services. It would be an interesting alternative to explore.

### **Brazil**

The spectrum in Brazil should, in theory and according to the constitution, be a common good under the supervision of the state, licensed for temporary use by means of public processes and consultations, not a commodity that can be bought and sold. However those processes are frequently of questionable transparency and the allocation of the spectrum ends up favoring certain economic and political interests.

Since 1995 the allocation of radio and TV channels has been granted by an auction process. Before that they were allocated by state governors or other powerful politicians. Currently 90% of the spectrum for analogue broadcasting is in the hands of commercial media companies, although the constitution requires a balance between commercial, non-commercial and government sectors.

Only one FM channel is reserved for community radio in each locality and just 2% of the spectrum for radio and TV can be assigned to community radio. This restriction is not justified technically, it exists only because of pressure by commercial interests. It is of concern that between 1997 and 2008 more than 93% of the almost 1,000 broadcasting authorisations were given to those who paid the highest sums at auction. Less than 5% went to applicants with the best technical proposals.

The perception that large media companies are in control is perpetuated because renewal of authorisations is automatic. The cancellation of an authorisation that is up for renewal must be approved by a minimum of 40% of the House of Representatives. In cases where there is a judicial dispute, the licence renews automatically until the process is complete. This can take several years.

It is no surprise that the allocation of portions of spectrum for data transmission suffer from similar biases. On the other hand, pluralist participation in the governance of the spectrum in Brazil is practically nonexistent. Anatel holds public consultations occasionally but rarely do they result in any modification of a proposal already prepared by the agency.

Brazilian civil society groups pushing for democratisation of the spectrum consider the concept of “open spectrum” to be applicable in several cases, taking into consideration that the state will always have supervision and that regulation will be always be a necessity. The introduction of digital radio and TV and advances in low-cost wireless communication are examples of technical foundations that allow for a much more efficient use of spectrum. There is agreement that the use of the spectrum for certain large scale applications will continue under a model of authorisations and licensing. The ranks already available for free use will continue to be set by recommendations and standards such as levels of power, bandwidth limits, modulation technologies, etc.

In 2007, several civil society organizations and social movements launched the National Campaign for Democracy and Transparency in Radio and TV Authorisations (Campaña Nacional por la Democracia y la Transparencia en las Autorizaciones de Radio y TV), that included a National Communications Conference (CONFECOM - Conferencia Nacional de Comunicaciones) to reformulate public policies and construct a new regulatory framework. The first CONFECOM was held in December 2009.

One of the most significant events was the approval of a proposal that divides the radio and TV spectrum into proportions of 40% for commercial operations, 40% for community and nonprofit stations and 20% for the state. On specific criteria for the authorisations, the CONFECOM also approved:

- A guarantee of diversity of offers for the authorisations
- To promote the relationship between public, community and private systems
- Preference for interest groups that do not yet have channels
- To stimulate local cultural production
- To stimulate local employment generation
- To extend the free programming time available for independent producers and social organisations.

But the conference did not arrive at a consensus or agreement on the use of the spectrum for digital platforms. Nor was there agreement on the granting of permissions for multiprogramming on digital radio and TV channels.<sup>14</sup>

Unfortunately, the CONFECOM did not address subjects such as the use of the digital dividend or white spaces as part of a regulatory framework for wireless data communication.

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<sup>14</sup> Digital TV technology allows for more than one programme to be transmitted simultaneously on the same channel. Broadcasters generally resist allowing multiprogramming except for their own services.

In 2007 the House of Representatives established the possibility of public hearings to evaluate media companies, but no such hearings have been held.

## **Colombia**

Given the changes in ICT policies instituted by Law 1341 of 2009, in particular related to the use and management of the spectrum, many of the processes related to this subject are under construction in Colombia. This can be seen in the Spectrum Public Consultation Document (Documento de Consulta Pública del Espectro Radioeléctrico) that was published in June 2011, as well as in the Manual of Spectrum Management (Manual de Gestión del Espectro Radioeléctrico), which is currently under development.

This indicates that the country is at a crucial moment in the definition of policies that allow for a rational and effective use of the spectrum. However civil society does not have the training needed to understand the impact of spectrum policies on society. It is important to establish mechanisms for outreach and, in particular, for discussion. In this regard, the Ministry of Information and Communications Technologies (MinTIC - Ministerio de Tecnologías de la Información y las Comunicaciones) is carrying out the Spectrum Experts project, which aims to increase the knowledge of the general public, professionals in the ICT sector and experts in the area.

The strategy directed at the general public aims to offer basic knowledge on the subject, but there is little outreach around these processes. It would be useful to have a discussion phase with the participation of different sectors of society, government and other parties. This should not be limited to ICT professionals because the spectrum is a public good and the services offered through it are used and enjoyed by the general public.

It is a good time to review the processes for management and allocation of the spectrum, considering not only the economic conditions for the allocation of frequencies, but other aspects like their social value.

In this regard, it is also necessary to review the means for frequency allocation and consider models that assess the best use of the spectrum rather than economic objectives.

The alternatives proposed by the National Spectrum Agency (ANE - Agencia Nacional del Espectro) regarding infrastructure sharing, the arrival of virtual operators and the establishment of a secondary market, should be evaluated for both national and regional needs. This is so that new operators can participate in the allocation of portions of the spectrum to satisfy the needs of local markets at competitive costs. It is not clear how needs are currently identified in planning. It appears that they are shaped more by the concept of the market than that of social equity.

There is an urgent need to maintain and publish updated information on the attribution and allocation of frequencies at a national level to facilitate research on the topic and the development

of alternative proposals for offering telecommunications services.

There are several opportunities to expand wireless access in Colombia. The extension of the fibre optic network will create a network with enough capacity for newly connected municipalities to access applications and services. But it is important to define strategies so that the access networks that are implemented allow not only the institutions that are the beneficiaries of the extension project to access the resource, but also other private and community institutions.

Taking this and the populations that will not be covered with the fibre optic networks into consideration, decisions must be made on the use of the digital dividend band, as well as other bands, such as 450 MHz. Additionally, innovative projects that take advantage of these resources to offer connectivity in more remote areas by means of diverse technologies should be supported and offered access to these frequencies. Projects in the regions (areas outside of Bogotá) have local experiences that should be shared with and exported to other regions.

Given the lack of knowledge of the subject, outreach is needed to offer information and research on subjects that allow for the presentation of well-supported proposals.

Civil society needs to remain active in the discussions proposed by the government through the ANE and the MinTIC in regards to policies for planning, management and administration of the spectrum. For this, participation is needed in areas such as public consultations with groups of experts, so as to present solid proposals directed to the extension of wireless access from the viewpoint of the civil society.

It is important to share experiences at a regional level - in particular on innovative approaches for the use and management of the spectrum. And to undertake joint research that can be shared in different international arenas and that can have a long term impact in different nations, particularly in the use of low frequency bands to cover areas with low demographic density.

## **Ecuador**

On a positive note, we should first highlight that after the constitutional assembly process in 2007-2008, the state took back the governing role recently handed over by previous governments who favoured a market oriented management model.

The presence in the new constitution of strong concepts such as "universal access" and "collective interest" must be taken advantage of in the construction new laws.

Second, grounds have been established for the democratisation of the spectrum, and because work is being done on the new legislation, it opens an extremely valuable opportunity for advocacy.

Third, the present government, since 2007, has undertaken a process of rationalisation of

management, unifying the administration of all frequencies under CONATEL. This was done on a precarious legal basis (by executive decree rather than by law).

Fourth, it has strengthened the role of the control agency (SUPERTEL), which is now part of the Participation and Social Control Function (Función de Participación y Control Social). This means it is obliged to incorporate citizen participation in control tasks.

Regarding challenges, we can note that there is no clear law to establish the application of constitutional principles like universal access, particularly in regards to free bands. Yet this absence is also a great opportunity to work for a new model.

The instruments that should guide this new model are primarily the Communications Act, the Telecommunications Act, the National Telecommunications Development Plan, the Connectivity Plan and the Digital Transition Master Plan. It also requires a reform of the laws on which service delivery is based, using the free bands to allow not only registered enterprise operators to offer services, but also communities and non-profit or self-sustaining organizations to do so as social or community providers.

In other words, the laws regarding service delivery on wireless networks must incorporate other types of operators under appropriate conditions, in accordance with constitutional principles and the corresponding laws. The norms that regulate the Telecommunication Development Fund (FODETEL - Fondo de Desarrollo de las Telecomunicaciones) must also be brought into line for this. In so doing, its impact will increase. The idea is that, whether or not they apply for this fund, organizations can fully operate networks using free bands.

Given the interests at stake and the lobbying capacity of private operators, these legislative processes need to be watched, as do the processes of digital transition and those related to the auction or reassignment of bands to operate wireless internet and LTE technology. There is a need to increase the opportunities to be found through these two last processes regarding democratisation of the spectrum.

The discussion process is focused on and dominated by the technical debate. It is necessary to refocus it, from a social and political perspective, towards the democratisation of ICTs and, in so doing, gain allies. In that regard, as stated, advocacy has to focus on sectors and stakeholders that care about the issue. This includes educational institutions, unions of professionals, organizations supporting a better standard of living, civil society organizations that deal with issues of communication and the information society, as well as those that promote and defend human rights.

It is also important to open channels of dialogue with the private service providers. The role of the military should also be noted, considering that it was on the basis of "national security" that many of the roadblocks to the operation of free bands were implemented or justified in the past.

However elements of the new constitution seem to turn the armed forces into a potential ally. A strategic alliance with universities and research centres is particularly important as it can constitute a neutral territory where several types of participants can come together and from which harmony can be created in society in general.

## **Peru**

The management of the spectrum in Peru, like all the telecommunications plans, is framed by a policy of opening the market and allowing free competition. This has prioritised the expansion of services, expressed, for example, in the principles of the goals of use for the granting of concessions of frequency bands, which focus on the expansion of telecommunications services over the efficient use of the bands.

The administration of the spectrum promotes the concessions of bands to large telecommunications companies. Small operators face administrative barriers and requirements that limit their chances of obtaining a licence. These processes have contributed to the expansion of access but not necessarily to the diversification of services, the promotion of medium and small telecommunications companies, or the democratisation of spectrum use.

In spite of this, the administration of the spectrum has generally been efficient. However in the context of the digital transition, the expansion of telecommunications services, and technological convergence, it is debatable whether the present policies and procedures will allow this efficiency to continue. The current situation requires changes in the management and regulation of the spectrum that incorporate other sectors, plan for its reuse and establish long-term policies that consider future needs and are flexible in the face of technological changes.

It is important to analyze the conditions for developing a secondary spectrum market that does not concentrate benefits but instead introduces a policy of democratisation into the use of this resource.

Although information on the attribution and allocation of frequencies is published, the methods used do not allow for precise observation of the use and management of the spectrum. The modernisation of the applications that allow access to that information, complemented with other relevant information, would allow for the development of a useful and timely "spectrum watch".

The spectrum, recognized as a common good (as the property of all citizens) is considered by public opinion to be a space for the development of profitable activities. The presence of non-commercial bands such as those used by amateur (ham) radio operators are seen as the exception to the rule. We need better outreach processes around the importance of the spectrum, as well as its regulation and management, for the development of telecommunications and universal access.

The introduction of digital television promotes discussion on the use and management of the

spectrum. As mentioned, the policies and norms for this management were not designed for present circumstances. We need to review them and propose a framework more appropriate to current requirements. Policies on the use of the digital dividend are still not defined. Although trends indicate that they will be sought for the extension of services offered by private operators. We should take advantage of the opportunity that this represents to diversify use and extend internet access.

Civil society organizations should prepare to participate in discussions related to the regulation of the spectrum and how to make good use of the digital dividend. We need to reactivate areas for coordination and networks of civil society organizations that allow for coordinated advocacy and policy proposals. There is also a need to participate actively in the decision making on the use of the digital dividend, and in others areas like Digital Agenda 2.0 and the National Broadband Development Plan.

Greater knowledge about spectrum management at a national and local level is needed to allow for the active participation of the parties involved. This includes community radio that will, in the short term, be part of the process of the digital transition towards terrestrial digital broadcasting.

The policy of installing a fibre optic backbone should be linked to plans regarding the spectrum and wireless internet access services. It should be noted that the traffic that will be generated on the mobile networks will be enormous. Only with a high speed and high capacity backbone that connects the main groups of users (in the country or within a city) will this be able to be used efficiently. The state should implement methods that allow for increasing the quality of broadband services (fixed and mobile) while lowering prices as conditions for the extension of universal broadband access.

Coordination between the two agencies covering the planning and management of the spectrum (MTC and OSIPTEL) or the creation of a body with greater independence that unites all of the functions related to the spectrum (both telecommunications and broadcasting) could be an effective answer to the challenges that management of the spectrum will face.

Finally, an update is necessary to the National Frequencies Attribution Plan (PNAF - Plan Nacional de Atribución de Frecuencias) with changes that are focused on the needs of small national operators and the expansion of technologies that reduce the digital divide. In order to do so it will be necessary to study how management is done in other countries and to evaluate the needs of other sectors, like culture, health, education and agriculture.

## Venezuela

This research has determined that the government has been radicalizing a political model that promotes changes in institutional structures. The telecommunications sector has not escaped this process, since it is considered fundamental to consolidating the strategies established in the National Plan which seeks, amongst other things, the democratisation of the spectrum.

Consolidating a socialist model in Venezuela requires reforming the constitution. Recent changes by the government have generated debate and stakeholders have watched the legal reforms aimed at making these changes with concern.

With respect to moving CONATEL directly under the vice president's office as a measure to guarantee political stability in Venezuela, different groups are pointing to the necessity, in a democratic country, of maintaining high levels of pluralism and diversity, and of guaranteeing the impartiality and independence of the bodies that apply the norms. In this way, one can avoid the telecommunications sector being controlled by political or economic groups. Nearly two years after the measure was implemented, CONATEL has withdrawn the use of the spectrum from 34 broadcasters and given the frequencies to community broadcasters.

The reforms to the labour law (*Ley Orgánica del Trabajo*) and the Social Responsibility in Radio and Television Act (*Ley Responsabilidad Social en Radio y Televisión*) introduce greater controls in the telecommunications sector. CONATEL now regulates not only areas such as data transmission protocols, frequency allocation and coordination of satellite links, but also value-added services such as internet, domain name allocation for the country domain “.ve”, and, most controversially, the control of the content that circulates via communications networks. Simply put, there is state control over all internet layers. CONATEL may also run the risk of over diversifying its functions and being weakened if it does not have a management structure that meets its new demands. This could harm users.

CONATEL uses technological tools to audit and monitor the use of frequency bands across the country. However there is a high degree of discretion on the part of the telecommunications governing body. This is a threat to what is a public act that should be managed with impartial criteria that guarantee and promote the development of the sector.

There are efforts on the part of the government and different key players in the telecommunications sector (private and community media) to meet the objectives of the national plans and establish national agreements on universal access to ICTs, infrastructure extension, installation of networks in zones of high-priority for development, the increase and penetration of ICT services, and the integration of national and regional networks. But political, economic, and energy factors, among others, are blocking the fulfillment of these objectives, which creates uncertainty in Venezuelan society. ICT development initiatives disappear (projects become paralyzed or are not supported) and efforts are lost.

It was found that CONATEL has no explicit plans regarding digital TV or for the use of the digital dividend - which generates disinformation and does not create the conditions for coordinating action between the sectors involved.

CONATEL has a policy of allocating unlicensed frequency bands that helps strengthen wireless broadband networks. There are also efforts to consolidate fibre optic networks and satellite links through CANTV, the telephone company of Venezuela. It was returned to the state in 2007. This creates internet access opportunities which, if they are united with those offered by the current private and community service providers in the country, will extend possibilities for developing and integrating more sectors of society to ICTs.

The promotion of community and alternative media points to social awareness of the need for communication as a means for achieving social inclusion, the penetration of telecommunications, the strengthening of national identity, and citizen participation in development processes.

This is why the consolidation of a legal framework that contributes to the expansion of community media, the appropriate use of licences, and training for organized communities in the face of new development opportunities are fundamental needs of Venezuelan society.

In summary, the recommendations of the Venezuela case study are:

- to reconsider the impartiality of the regulating body, as much from political as from economic interests, as a way to guarantee the pluralism and independence of powers and the sustainable development of the telecommunications sector.
- to guarantee transparency and access to institutional and public information of the agencies responsible for telecommunications, as a right of all citizens to audit and watch the actions of government employees for the benefit of the development of a democratic sovereign and pluralist country.
- that the government create opportunities for all areas of the society to observe strategic national projects such as: legal reforms, technological migration plans like the transition to digital TV, growth plans for high-priority regions, technological needs, etc. In this way collective efforts that contribute to positive development in the country, particularly in the telecommunications sector, will prevail.

Alternatively, disinformation on strategic telecommunications projects and the absence of consolidated institutional portals do not guarantee access to information, which must be managed by the responsible agencies.

Spectrum use in Latin America. Case studies of Argentina, Brazil, Colombia, Ecuador, Peru and Venezuela. Supplementary summary report

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