

5. Communication policy and regulation

This chapter assesses the communication policy and regulatory framework in Brazil. It analyses public policy initiatives, regulatory measures and the main consumer protection issues. Policy and regulatory topics discussed include licensing, regulatory compliance, spectrum management, interconnection and wholesale access regulation, infrastructure sharing and facilitating rights of way. The chapter also assesses ex ante regulation for promoting competition and national policies for expanding access and use of broadband services. It concludes with a discussion on regional integration, international co-operation and international mobile roaming.

Policy and regulatory framework for the communication sector in Brazil

Licensing

Under the 1997 General Telecommunications Law (Lei Geral de Telecomunicações, LGT), telecommunication services in Brazil can be understood as being of “collective” or “restricted interest”. Restricted interest refers to services provided over what are commonly known as private networks. Conversely, collective interest services refer to those offered commercially in the market for profit.

The licensing of communication services is inherently linked to their classification, which is based on two dimensions. On the one hand, it considers whether the service is of “collective” or “restricted” interest. On the other, it distinguishes between the legal regime of the licence, i.e. “private” or “public”.

While services under the public regime require a concession, services under the private regime only require an authorisation. Concessions are subject to universal service obligations and required to ensure continuity of service; the State is also obliged to guarantee their economic-financial equilibrium. As a rule, when the concession ends, the assets used to provide public regime services must be returned to the State (i.e. “reversible assets”).¹ These benefits and obligations do not apply to services provided under an authorisation (i.e. private regime). Authorisations are granted with no expiration date.

The LGT established that fixed telephony needed at least one concessionaire in any given area. However, the law left it to the regulator to decide if any other service of collective interest could potentially be granted through a concession. The government, through a presidential decree in 1997, restricted concessions to fixed telephony and established only one concessionaire in any given area.

The General Concession Plan (Decree No. 2 534 of 1998, Plano Geral de Outorgas, PGO) provided the basis for granting authorisations. It divided the country into three areas for local services, which would each be assigned to a different company through an auction. Incumbent local telecommunication operators became the concessionaires of fixed telephony. Authorisations, one per service area, were granted to new fixed telephony companies (commonly referred to as “mirror companies”). After 2001, there have been no restrictions to the number of fixed telephony providers in any given area.

Some concessions granted before the LGT gradually transitioned from communication services belonging to the public regime to the private regime. This process, for example, allowed for the provision of mobile telephony and pay TV services through the less onerous licensing model of authorisations.

Since 1997 to present, the only public service belonging to the public regime concessions has been fixed telephony; this service can also be provided under the private regime. By October 2019, fixed telephony continued to be a public regime service provided through a concession, although private regime authorisations existed for the same service. Law No. 13 879 of October 2019, which amended the LGT, enabled the migration of the remaining fixed telephony concessions to the private regime (i.e. authorisations).

The National Telecommunications Agency (Agência Nacional de Telecomunicações, Anatel) has gradually simplified its classification and licensing framework over the years. From a framework with more than 60 different types of communication services, it now has four large service categories in Brazil (Table 5.1):

- fixed telephony (Serviço Telefônico Fixo Comutado, STFC)
- mobile telephony (Serviço Móvel Pessoal, SMP)
- “multimedia services” such as fixed broadband (Serviços de Comunicação Multimídia, SCMs)
- pay TV (Serviço de Acesso Condicionado, SeAC).

Table 5.1. Types of communication services provided to end users in Brazil

Classification	Service type	Regime	Licence	Legal instrument
STFC (Serviço Telefônico Fixo Comutado) ¹	Fixed telephony (local, national or international)	Public or private	Concession or authorisation	Law No. 9 472 Law No. 13 879
SMP (Serviço Móvel Pessoal) ²	Mobile telephony	Private	Authorisation	Anatel’s Resolution No. 477
SCM (Serviço de Comunicação Multimídia)	Fixed broadband and leased lines	Private	Authorisation	Anatel’s Resolution No. 614
SeAC (Serviço de Acesso Condicionado) ³	Pay TV (by cable, satellite or radio)	Private	Authorisation	Law No. 12 485 and Anatel’s Resolution No. 581

1. Although fixed telephony service (STFC) via an authorisation was already possible, the process of migrating STFC to be provided only through an authorisation (i.e. under the private regime) was recently incorporated through amendments to the telecommunication legislation in October 2019 (Law No. 3 879).

2. The Serviço Móvel Pessoal (SMP) classification replaced the Serviço Móvel Celular (SMC) classification in 2001, migrating all mobile telephony provision from the public (i.e. concessions) to the private regime (i.e. authorisations). In 2015, Anatel approved the migration of Serviço Móvel Especializado (SME), i.e. trunking or push-to-talk services under the private regime, to SMP, given that SME licences had specific restrictions that the SMP licences did not.

3. The SeAC classification unified and updated the regulation of the following pay TV services: cable pay TV (Serviço de TV a Cabo, TVC), previously under the public regime; Multichannel Multipoint Distribution Service (MMDS) (Serviço de Distribuição de Sinais Multiponto Multicanal); direct-to-home (DTH) pay TV service (Serviço de Distribuição de Sinais de Televisão e de Áudio por Assinatura via Satélite); and special pay TV subscription service (Serviço Especial de Televisão por Assinatura, TVA). Only cable pay TV service was granted over concessions (i.e. public regime), whereas MMDS, DTH and TVA are all authorisations (i.e. private regime).

Currently, all new licences for these four categories of communication services (i.e. fixed telephony, mobile service, multimedia service and pay TV) are issued through an authorisation. Under this model, there are no limits on the number of providers. Since 1997, service authorisations have been valid indefinitely (Law No. 9 472 of 1997). The only technical restriction is the availability of spectrum, which is usually assigned through auctions.

Authorisations from Anatel are subject to certain rules. For collective interest services, companies must be legally established in Brazil, and prove their technical and financial capabilities. In the past, the process was cumbersome, lasting around six months. Anatel has recently eliminated several requirements, reducing the timeframe to approximately three weeks. Most authorisation requests are granted. In addition, in 2018, Anatel reduced the granting fee from BRL 9 000 to BRL 400 (USD 2 466 to USD 110).²

In 2010, Anatel first regulated mobile virtual network operators (MVNOs), establishing two types (Box 5.1). “Authorised” MVNOs require a licence to operate, whereas certified operators (e.g. resellers) only require a commercial contract with a mobile network operator (MNO).

In the current framework, there are also services that do not require a licence as they are classified as a value-added service (serviço de valor adicionado, SVA). These services

“complement” and “assist” telecommunication activities, and are considered neither telecommunication nor broadcasting services. Value-added services include over-the-top services (OTTs), but also layers of the Internet service provision excluding “last mile” access (Chapter 2). For fixed broadband access, the most common applicable telecommunication service is “multimedia services” (Serviços de Comunicação Multimídia, SCMs).³ The most prominent example of a value-added service is the Internet connection service (i.e. authentication of the user in the network that originated in the past due to dial-up Internet services).

Box 5.1. Mobile virtual network operators in Brazil

The mobile virtual network operators (MVNO) framework established in 2010 (Resolution No. 550 of 22 November 2010) recognises two types of MVNOs: certified and authorised.

Anatel considers that certified operators, or reseller MVNOs, (e.g. branding, differentiated billing and customer service) do not provide a telecommunication service directly. As such, they are not subject to regulation and the tax on telecommunication services (Imposto sobre Circulação de Mercadorias e Serviços, ICMS) does not apply to their final rates (Chapter 7). Certified operators are bound by the interconnection, transit and roaming agreements signed by the MNO.

Authorised operators, or full MVNOs, have to fully comply with Anatel’s regulations. Unlike MNOs, MVNOs do not have a spectrum licence. They can enter into simultaneous agreements with several MNOs, and thus are not restricted by the host’s geographic area. For the use of network resources, wholesale regulation applies.

The development of MVNOs in Brazil has been slow. Since 2010, there have been 8 authorised MVNOs and 14 certified MVNOs. In 2012, Porto Seguro and Datora were granted an MVNO authorisation, both using Tim Brasil (TIM) as their host. Porto Seguro, which had reached a subscriber base of 826 000 by October 2018, decided to exit the market. It was concerned about growth in data consumption driven by unlimited offers and unfavourable wholesale agreements. Datora, which has focused on the machine-to-machine/Internet of Things (M2M/IoT) market, has more than 900 000 subscriptions, half of which are M2M data connections.

During 2016-19, six MVNO authorisations were granted. Despite recent developments, MVNOs represent less than 0.1% of the mobile market share. Anatel’s regulation on interconnection (Regulamento Geral de Interconexão) from July 2018 (Anatel, 2018^[1]) may have positive effects for MVNOs in Brazil. Certified MVNOs are no longer required to commit to an agreement with only one MNO.

Consideration could be given to abandoning the individual authorisations still being used for communication operators, replacing them with a class-licensing regime, except where there are resource scarcity constraints, such as spectrum. In other words, a single licence for all communication providers would move the country from a service-based to a convergent licensing regime.

This move would lower administrative entry barriers to the market. A licence need only subject the carrier to reporting requirements and to operate under Anatel’s regulations. In some countries, this is done through a “registry” whereby the operator notifies its intention to provide service and adhere to regulation. Changing the licensing regime would require a modification to legislation in Brazil.

Spectrum licensing requires an authorisation. In cases with more than one party interested in a given spectrum band, the spectrum is awarded through an auction in accordance with an attribution plan published by Anatel. Prior to October 2019, spectrum authorisations would last 20 years at most. They could be renewed only once with an additional payment (i.e. every two years equivalent to 2% of revenue within the authorisation area).

After the first renewal, the spectrum had to be returned and could be re-auctioned. However, with approval of Law No. 13 879 on October 2019, spectrum authorisations can be renewed indefinitely. This may yield undesired consequences on competition in the mobile market. The subsection on spectrum management analyses the implications in more detail. It is unclear whether the new regime of successive renewal of spectrum authorisations would also apply to existing spectrum licences that will expire in the upcoming years.

There are no restrictions to foreign investment in the telecommunication sector. Telecommunication service providers must be incorporated under Brazilian law or controlled by a Brazilian company; this company, however, can be controlled by a foreign company or individual.⁴

In other words, foreign entities cannot directly control companies that hold concessions, permissions and authorisations to exploit telecommunication services, but can do so indirectly. In the broadcasting sector, according to the Constitution, foreign companies or individuals cannot hold more than 30% of the total and voting capital of TV broadcasting companies.⁵

Spectrum management

Anatel is responsible for spectrum management of communication services (i.e. spectrum allocation, planning, monitoring and assignment), including the design of spectrum auctions. Although Anatel is in charge of spectrum planning for broadcasting services, spectrum assignment of these services follows a more complicated licensing process (Chapter 6).

In compliance with international treaties and guidelines, Anatel publishes a spectrum attribution, distribution and destination plan (Plano de Atribuição, Destinação e Distribuição de Faixas de Frequências no Brasil). This plan indicates the frequency allocations for communication services. Spectrum management follows Anatel guidelines originally published in 2001 and then revised in 2010 (Anatel, 2010_[2]) and 2016 (Anatel, 2016_[3]). Spectrum monitoring⁶ is periodically undertaken for spectrum used for communication services (e.g. fixed and mobile telephony, fixed and mobile broadband, pay TV, aeronautical communications), and for different technologies.

Spectrum assignment

Brazil has held 12 spectrum auctions for communication services since 1997 (Table 5.2). The first one (i.e. the B band) was carried out by the Ministry of Communications. This occurred during the liberalisation of the sector, before creation of the regulatory body. Anatel has designed and carried out all other auctions.⁷

Spectrum auctions and their design

Four important elements in spectrum auction design affect its outcome: setting spectrum caps, designing the blocks, coverage obligations and establishing the reserve prices. Spectrum auctions can shape competition dynamics as the design of blocks, together with spectrum caps, can determine how many players will prevail in markets in years to come. Thus, the design of the auctions becomes vital for the sector.

Table 5.2. Spectrum auctions in Brazil (1997-2019)

Band	Year	Amount raised (BRL million)	Auction object and result
B band (850 MHz)	1997/98	10.073	First private licences awarded through an auction (Lei Mínima).
C band (1.8 GHz)	2000	Unassigned	Personal Communications Service (PCS) auction.
D band (1.8 GHz)	2000	2.559	PCS auction.
E band (1.8 GHz)	2000	522	PCS auction.
Previously unassigned spectrum (D and E bands)	2002	522	Unassigned PCS spectrum.
Previously unassigned spectrum (E band)	2004	122	Unassigned PCS spectrum.
Previously unassigned spectrum (D and E bands), and band M (1.8 GHz and extension bands)	2007	..	58 of 105 PCS blocks were assigned.
1.9/2.1 GHz (3G spectrum-F, G, I, J-bands)	2007	5.338	36 blocks in the 1.9/2.1 MHz spectrum were assigned; winners had the coverage obligation to provide service in municipalities with no service.
1.9/2.1 GHz (H band) and previously unassigned spectrum	2010	2.730	Successfully assigned 60 of 165 H band and PCS blocks.
Previously unassigned spectrum	2011	235	15 of 54 blocks in the 800 MHz and 1.8 GHz bands were assigned; no bids for the 30 blocks in the 2.5 GHz frequency band (Time Division Duplex, TDD).
2.5 GHz (intended for 4G) and 450 MHz	2012	2.930	2.5 GHz frequency successfully allocated to four bidders; no bids for 450 MHz, so it was bundled with national 2.5 GHz spectrum; licences included rollout obligations and minimum percentages of national technologies.
700 MHz	2014	5.852	3 national blocks of 10 MHz (paired) awarded plus 1 regional block (Algar); no bids in second round for unassigned spectrum.
Previously unassigned spectrum in the 1.8 GHz, 1.9 GHz and 2.5 GHz bands	2015	852.6	42 of 78 blocks in the 2.5 GHz frequency band (Frequency Division Duplex, FDD) were assigned; 5 479 out of 21 152 of the 5 GHz (TDD) blocks were assigned; blocks were offered per municipality.

Note: “..” = not available.

Sources: OECD based on data from Teleco (2018_[4]), *Licitações de frequências de celular*, <http://www.teleco.com.br/licitacoes.asp> (accessed on 17 May 2019); Anatel’s response to the questionnaire of the review.

Anatel sets spectrum caps and designs the blocks that will be auctioned to avoid undue concentration of spectrum that could unbalance competition between players. Spectrum caps are common in OECD countries, where they are widely used to encourage entry and address situations of dominance. Since 2008, most spectrum auctions by Anatel have included coverage obligations in the auction design, especially for municipalities that were poorly served (or not served at all) and rural areas. This approach is common in other OECD countries.

Concerning reserve prices, Anatel calculates them considering a new player’s operation, as the regulator has not usually reserved blocks for entrants in past auctions. In the recent public consultation regarding the 5G auction, a set-aside of spectrum is planned for small providers and new entrants. In a few cases, however, Anatel designed auctions that did not allow current players to participate in a first round of bidding. In other cases, spectrum caps limited the participation of current players for some blocks. The reserve prices of spectrum auctions in Brazil have to be audited simultaneously by the Federal Court of Accounts (Tribunal de Contas da União, TCU).

In contrast with most OECD countries, Anatel has also included temporary obligations in the rules of some spectrum auctions related to commitments by operators to the use of equipment and software produced or developed in Brazil. These commitments are a tiebreaker criterion in the event of equivalent offers (i.e. equal prices, timeframe for delivery and technical specifications). Operators within Brazil have viewed this obligation as infeasible.

Two important resolutions that affect spectrum auction design, described below, were updated in 2018.

Resolution No. 703 increased spectrum caps. This allowed players to hold up to 35% and 30% of the spectrum available under and between 1 GHz and 3 GHz, respectively. They substituted specific spectrum caps per band when the resolution was approved.

Resolution No. 695 regarding the right of use of radio frequencies (Preço Público pelo Direito de Uso de Radiofrequência, PPDUR) changed several provisions regarding payment of a spectrum licence. It also changed the elements in the formula used to calculate the reserve price for new auctions (or for renewal of licences). Reserve prices would be preferably calculated using a technical formula, which includes the amount of spectrum, population coverage obligations and spectrum coverage range. As well, the resolution allows for payment of spectrum licences in annual instalments throughout the life of the authorisation.⁸ Additionally, the price for renewing licences could be paid in kind by fulfilling coverage obligations assumed by the licence holder.

Both resolutions could affect auction outcomes as they involve changes to spectrum caps and reserve prices. However, these resolutions may be affected by Law No. 13 879 that allows spectrum licences to be perpetually renewed.

In June 2012, Anatel auctioned the 2.5 GHz band, alongside the 450 MHz band, to provide basic voice and data services in both urban and rural areas. Initially, the auction for the 450 MHz band failed to generate bids by the four mobile network operators (TeleGeography, 2012^[5]). The government swiftly changed strategy. It bundled this spectrum with the parallel 2.5 GHz band being auctioned simultaneously. Winners of the 2.5 GHz lots could make use of the 450 MHz for rural coverage.

The 2012 auction (No. 004/2012/PVCP/SPV) had several main coverage commitments. These included use of the 450 MHz band to reach 30% of rural areas by June 2014, 60% by December 2014 and 100% by December 2015 (TeleGeography, 2015^[6]). However, there was no equipment ecosystem for this band linked to 4G technology in 2012. Moreover, communication equipment vendors were sceptical about using this band for long-term evolution (LTE) (BNAmericas, 2014^[7]).

In 2014, it seemed the 450 MHz could finally be used for 4G LTE. However, by then, Brazil was ready to auction the 700 MHz band, which was ideal for rural coverage. Large industry players, including Huawei, Nokia and Qualcomm, formed the 450 MHz Alliance to promote an LTE equipment ecosystem in the 450 MHz band (Gahan et al., 2017^[8]). Nevertheless, several operators have been unable to comply with coverage obligations by the deadlines set in the 2012 auction notice; relevant equipment for the 450 MHz band was not available at such time. Some have resorted to the use of satellite technology to comply with these commitments.

The 2012 auction included coverage commitments and temporary obligations regarding the usage of nationally-produced or -developed equipment, a government measure designed to achieve industrial policy objectives. The 2014 auction of the 700 MHz band also included similar provisions with an industrial policy focus.⁹ However, the most recent auction in 2015

(remainders in the 1.8 GHz, 1.9/2.1 GHz band and 2.5 GHz bands), did not maintain this obligation. Moreover, auctions planned for 2021 were not expected to include the provision.

For the 3G and 4G auctions in 2014 and 2015 (i.e. 700 MHz, 1.9/2.1 GHz and 2.5 GHz), coverage objectives were taken into account when calculating reserve prices. This aimed to expand broadband throughout the country, including in rural and remote areas.

In 2013, Anatel approved allocation of the 700 MHz band to fixed and mobile services in order to provide voice and data communications (Resolution No. 625 of 2013).¹⁰ On 30 September 2014, Anatel auctioned part of the 700 MHz band for mobile broadband. The auction design included a spectrum cap of 10+10 MHz for the first bidding round. This was to be modified to 20+20 MHz in the second round of bidding if spectrum remained unassigned.

Unlike previous spectrum auctions carried out by Anatel, the 2014 auction design did not include mandatory coverage obligations using the 700 MHz band (CITEL/OEA, 2015^[9]). Oi, the fourth national mobile operator in Brazil, was absent from the 700 MHz auction of 2014.

The 700 MHz band was auctioned while the transition from analogue to digital television (DTT) was still being carried out by broadcasters in Brazil. The DTT transition was initially planned to happen in one wave in 2016. However, Decree No. 8061 of 2013 spread the digital switchover plan over 2015-18 (CITEL/OEA, 2015^[9]). Ministerial Ordinance No. 3 493 modified the dates again for the digital switchover in some states. It was extended for five more years, to be finalised by 2023 instead of 2018.

Operators created an association in 2014 to ease the transition to digital television services. It aimed to distribute digital television converters and release the band to provide 4G communication services (i.e. to address the “digital dividend”). The 700 MHz auction proceedings established that auction winners would have to form a third-party entity, named EAD (Entidade Administradora do Processo de Redistribuição e Digitalização dos Canais de TV e RTV). EAD was intended to manage the transition and mitigate interference between incomers and the TV broadcasting services (CITEL/OEA, 2015^[9]).

Coverage obligations in spectrum auctions have been a successful way to foster network deployment around different areas in Brazil. For example, the 3G spectrum auctions of 2007 and 2010 (i.e. H band)¹¹ included obligations to expand 3G coverage in the country. This meant coverage for municipalities with fewer than 30 000 inhabitants by December 2019.

The 2012 auction established coverage commitments with 4G networks. It started with host cities for the International Association of Federation Football (FIFA) Confederation World Cup in 2013, ending with cities with more than 30 000 inhabitants by December 2017. This same auction also included expansion of fixed telephony and broadband services with minimum connection speeds of 1 Mbps in rural communities, where rural schools would be covered and serviced free of charge. Coverage was defined as at least 80% of the area covered within 30 km from the municipality head.

According to Anatel, the auctions’ coverage obligations have been one of several factors leading to an increase of mobile broadband in the country. In 2009, the year that marks the beginning of the commitment schedule linked to auctions, 33% of municipalities did not have any mobile network present. Moreover, only 3% had presence of 3G networks. By 2016, 74% of municipalities had presence of 3G networks. By the end of 2019, 100% of Brazilian municipalities had the presence of at least one 3G network. Backhaul connectivity also increased for municipalities over 2016-19 from 57% to 70%.

Anatel coverage figures do not translate into actual geographical or population coverage (Chapter 3). The indicator simply represents a network signal or presence of backhaul in a given

municipality. Some municipalities have a large geographic span with many rural and remote areas. Furthermore, not all inhabitants of a municipality with 3G or 4G signal necessarily live within the covered area. Therefore, actual population coverage is probably lower.

Spectrum for 5G

The commercial deployment of 5G networks in Brazil is likely to begin after 2021, once the auction takes place. The 2.3 GHz, 3.5 GHz, 26 GHz (mmWave) and remainders of the 700 MHz frequency bands were chosen as the pioneer bands for 5G in Brazil. They may be auctioned at the end of 2020 or in 2021. At the moment of writing, the auction was scheduled for the end of 2020. However, in view of the economic consequences of the COVID-19 pandemic and the inherent uncertainty brought to markets, some operators are requesting to postpone the 5G auction to 2021 (Braga, 2020^[10]).

The upcoming 5G auction in Brazil has been hailed as the largest ever for 5G spectrum. Industry stakeholders and countries around the world are closely observing the auction design. Due to the 2019 reform, spectrum licences can be renewed in successive terms. This raises the stakes of the auction design as it may predetermine the competition dynamics in decades to come. At the time of renewal, the regulator can impose new obligations and a new licence fee. Still, the players that gain spectrum holdings in this auction might be the ones that can compete in the market in the long term.

In February 2020, Anatel approved a proposal for the 5G auction design and submitted it to public consultation from 17 February to 17 April 2020 (Anatel, 2020^[11]). This auction is unprecedented, as it will be the largest spectrum auction ever conducted by Anatel. It will be a multiband auction (i.e. 700 MHz, 2.3 GHz, 3.5 GHz and 26 GHz). In a novel approach, however, the proposal includes extending the 3.5 GHz band from 300 MHz to 400 MHz. This would lead to 100 additional MHz available to auction (Table 5.A.1, for the proposed blocks being made available).

This change comes with the caveat that part of the 3.5 GHz band in Brazil is currently occupied by satellite TV operators (television receive-only, TVRO), which may cause interference. Anatel has approved the proposal of the 5G auction, which was submitted to public consultation on 6 February 2020. The proposal states the intention of creating a similar model as the one used with the 700 MHz to solve the potential interference. Details on how the model would work in practice depend on results of the public consultation (Anatel, 2020^[11]). This proposal would be in line with public policy objectives for the auction published by MCTIC (Ministerial Ordinance No. 418 of 2020).

Spectrum licence duration and licence renewals

All licensing regimes require legal certainty to foster long-term investment. Specifically, exclusive spectrum licensing arrangements require strict rules of temporary property rights and protection from interference (OECD/IDB, 2016^[12]). In general, spectrum licences should be awarded for periods longer than ten years. At the very least, they should provide mobile players with sufficient certainty that their licences will be renewed. The conditions for renewal should be known well in advance and transparent.

Many countries in the OECD opt to auction the spectrum directly instead of renewing the licences, especially when other market players have interest in the band. In fact, several OECD countries only renew the licence if there is no other party interested in the spectrum (Table 5.B.1).

Most OECD member countries have spectrum licence duration periods ranging from 10 to 30 years, depending on the spectrum band; most periods lasting 15-20 years (Table 5.B.1). For OECD countries within the European Union, the European Electronic Communications Code (EECC) of December 2018 is clear. Article 49 specifies that member states should provide regulatory certainty for at least 20 years. Furthermore, spectrum licences should last at least 15 years with the possibility of an “adequate” 5-year extension (European Commission, 2018^[13]).

With regards to licence renewals, Article 50 of the EECC allows regulators to decide against spectrum licence renewal in favour of organising new spectrum awards. This is particularly relevant if there is evidence of market demand from other parties than current licence holders (European Commission, 2018^[13]).¹²

The 2019 reform allows spectrum licences to be renewed indefinitely in Brazil without an auction. Periodic renewals require a payment set by the regulator, which operators may exchange for investment commitments. The renewal may be subject to new obligations.

Some mechanisms introduced in the 2019 reform (e.g. spectrum trading, as well as cost-based infrastructure-sharing models) may help mitigate undesired anticompetitive side effects. However, this change towards successive renewal of licences reduces tools available to foster competition. It may also hinder the possibility of new entrants in the mobile market through spectrum auctions. Furthermore, efficient allocation of spectrum in the primary market (i.e. assignment to the player that will use it most efficiently) has implications for the secondary market as well. Inefficient assignment in the primary spectrum market means that efficiency in the secondary market cannot be guaranteed (Milgrom, 2000^[14]; Hazlett, Muñoz and Avanzini, 2011^[15]).¹³ Given the significance of the secondary spectrum market, this is an important consideration.

Spectrum trading in the secondary market is a complementary tool to ensure efficient spectrum management, alongside with spectrum sharing. Although the 2019 reform allows spectrum trading in the Brazilian market, Anatel had not yet defined specificities on how secondary spectrum markets will be regulated. According to common practice in the OECD, spectrum trading could provide additional flexibility for some players in Brazil to optimise their mobile assets. However, spectrum transactions in the secondary market should be subject to case-by-case competitive review to ensure they do not harm competition.

Longer licensing regimes and transparent renewal processes does not mean that regulators cannot revoke licences. The United Kingdom, for example, removed predefined licence terms to increase certainty surrounding spectrum licences. However, the regulator (Ofcom) can revoke any licence for spectrum management grounds, with a five-year notice. That is, “indefinite licences” only mean that Ofcom has limited rights of revocation during an initial term of 20 years. After this period, with proper notice, Ofcom can revoke the licence. Ofcom retained the right to revoke licences due to the risk of specific market failures, including lack of competition. The regulator should be able to retain all possible tools to foster competition in mobile markets. In addition, the regulator should always safeguard the efficient use of spectrum.

It is unclear whether Anatel could revoke a spectrum licence in response to market failures based on changes to the conditions of spectrum licence renewals from Law No. 13 879 (art. 167 of Law No. 9 472 of 1997, modified by art. 2 of Law No. 13 879 of 2019). The law is vague on whether Anatel could revoke a licence to correct for market failures such as lack of competition through a new auction process. It only explicitly states that licences can be revoked in case of infringement of regulation or if the spectrum band will be allocated to another use.¹⁴

As one argument for successive renewal of licences in Brazil, Anatel already has experience revoking licences for spectrum management reasons. However, revoking spectrum licences, in spite of idle use, can prove more complicated than expected. For example, eight years after the 450 MHz was auctioned in Brazil, the spectrum in this band remained mostly unused in 2020. In 2014, Vivo filed an administrative appeal against Anatel. It disagreed with the decision of the Superintendence of Regulatory Compliance to deny the company the possibility of fulfilling coverage obligations stemming from the 2012 auction through the use of satellite technology.¹⁵

As its main rationale, Vivo argued the 450 MHz band lacked the necessary equipment ecosystem to comply with coverage obligations. Five years later, in June 2019, the Board of Commissioners agreed to allow all spectrum holders of the 450 MHz band to use satellite technology to meet coverage obligations of the 2012 auction. In exchange, spectrum holders had to increase broadband speeds. They also had to return spectrum back to Anatel if they failed to use such frequencies within the deadline set in the relevant auction notice (Anatel, 2019_[16]). Vivo has challenged the decision in the courts. If it loses the appeal, the company may also lose its right to exploit the 450 MHz band (TeleGeography, 2020_[17]).

Anatel should carefully monitor how this new spectrum licensing mechanism may impact market entry. Regulators use spectrum auctions as one of their main tools to foster competition in mobile markets. Some changes introduced in the law, such as spectrum trading and infrastructure sharing, may reduce some undesired effects in the competitive dynamics of the market. However, these concerns are heightened due to the juxtaposition of the successive renewal of spectrum licences and the vast amount of spectrum planned to be placed in the market with the upcoming 5G auction. These two factors may shape market dynamics for many decades to come.

Most OECD countries, while they seek to ensure regulatory certainty that strengthens incentives to invest in networks through licences lasting around 20 years, many opt to undertake auctions when other parties show interest in making use of the spectrum.

Interconnection and wholesale access regulation

The LGT and the General Interconnection Rules of 1998 (Regulamento Geral de Interconexão, RGI) set forth the interconnection framework in Brazil. The LGT established that network interconnection on a non-discriminatory basis is mandatory. In some other countries, this is known as an “open network architecture”.¹⁶ The RGI implements this requirement. It was updated in 2005 (Resolution No. 410 of July 2005) and more recently, in 2018 through Resolution No. 693.

The original interconnection framework set different rules based upon a classification of services provided (e.g. fixed and mobile services). It also set up processes to negotiate an agreement on interconnection rates and resolve any disputes among providers. The 2018 update of the RGI framework significantly changed the rules, eliminating the classification of services. It mandates the existence of Public Reference Offers (PRO) and sets additional obligations for those providers deemed to have significant market power. The obligations are set forth in the General Competition Plan (Plano Geral de Metas de Competição, PGMC), approved by Anatel in 2012 and updated in 2018.

The PGMC contemplated the creation of a “wholesale supply supervisor entity” that would accomplish two aims. First, it would manage a wholesale database (i.e. a computer system with demand and supply information of wholesale market products). Second, it would be an intermediary in contracts between communication providers (Anatel, 2012_[18]).

Among its features, the 2018 PGMC amendment defines a new market for high capacity data interconnection (*interconexão de dados de alta capacidade*). This market is subject to transparency requirements and wholesale rate control measures.

The PGMC sets criteria to evaluate which communication providers have significant market power. In addition, it issues guidelines to identify the wholesale products in relevant markets to be considered for *ex ante* regulation (i.e. asymmetric measures imposed to players with significant market power) to promote competition.

In response, Anatel has taken concrete steps to address *ex ante* regulation of wholesale access for players with significant market power. For example, such operators must publish a PRO. Anatel defines the wholesale access rates according to a cost model. These measures apply to the following wholesale services:

- leased lines
- passive infrastructure
- fixed interconnection
- mobile interconnection
- roaming
- data links over 34 Mbps
- local loop unbundling of copper lines.

With regards to local loop unbundling, the PGMC requires public regime service providers with significant market power to share their fixed access network infrastructure. Specifically, they must share infrastructure for data transmission through copper wires at transmission rates of up to 12 Mbps. Such providers with significant market power must also share their passive infrastructure at prices determined by bilateral negotiations between operators.

Operators with significant market power in data transmission links over 34 Mbps must submit PRO for leased lines, backhaul connectivity and “Class V interconnection”, which includes peering, transit and direct interconnection.

Firms with significant market power in the fixed wholesale interconnection market are Oi, Claro and Vivo. In mobile interconnection markets these firms are Oi, Claro, TIM and Vivo. These markets are subject to rate regulation, as well as transparency requirements.

Following the 2018 PGMC amendment, five companies were declared to have significant power in the market for high capacity data interconnection: Oi, Vivo, Claro, Algar and Copel. This market will have transparency requirements in municipalities according to two classifications. Category 2 represents potentially competitive markets, while Category 3 represents wholesale rate regulation (i.e. a low degree of competition). Anatel defines the categories of municipalities (Nescimento, 2018^[19]).

Fixed and mobile termination

The Brazilian model for telephony interconnection divides the territory into more than 4 500 local areas for fixed networks. It also creates 67 “registry areas” for mobile networks, each one defined by the first two digits of the national number. Operators are obliged to interconnect their networks in each of those areas. They create either a virtual or physical interconnection point, which acts as a boundary for delimiting interconnection obligations. As metropolitan areas expand, the number of local areas has been gradually reduced.

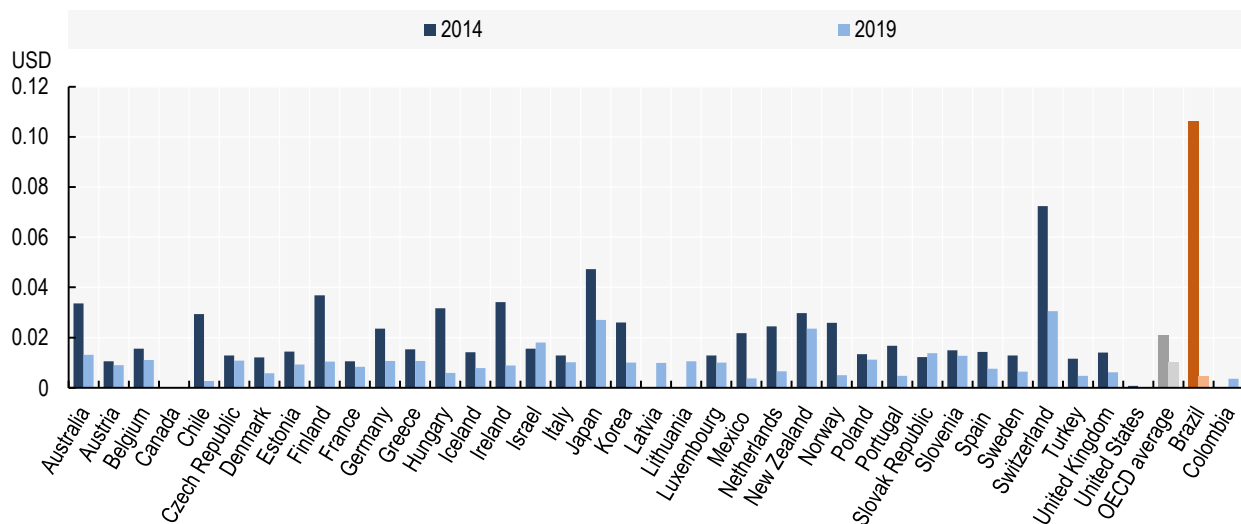
The regulatory interconnection model does not make any technological distinction on how the networks transmit voice calls, except if calls are initiated on the Internet. This means that operators are free to develop their own network architecture for voice services, based on legacy technology or Internet Protocol (IP) networks. Calls from IP networks not initiated from the Internet are regulated in the same way as legacy network calls.

Fixed and mobile termination rates in Brazil are regulated *ex ante* by Anatel and apply to all operators. Asymmetric termination rates existed until July 2018. In other words, the player with significant market power in the retail market paid a termination rate up to 20% higher than those paid by players without significant market power. However, since 2018, *ex ante* interconnection rates determined by Anatel are symmetric.

In 2014, Anatel approved a resolution establishing a glide path from 2014-19 to reduce fixed and mobile termination rates. With Resolution No. 639 of July 2014, Anatel set the maximum reference values for fixed and mobile interconnection tariffs. These included mobile termination rates and dedicated leased lines based on long-run incremental cost models. Traditionally, Anatel had used a top-down fully allocated costs model based on historical accounting costs (FAC-HCA). However, it changed to a bottom-up, long-run incremental cost (BU-LRIC) methodology to establish mobile termination rates (MTR). The MTR glide path was defined to start with the values from the FAC-HCA model and end in BU-LRIC costs.

The glide path to decrease mobile termination rates set by Anatel represents a 93% reduction between 2014 and 2020. In 2014, the average mobile termination rate was BRL 0.25 (USD 0.1064) per minute. By 2020, the average termination rate of all three regions was BRL 0.018 (USD 0.0047). The highest termination rate in region III of the country was BRL 0.027 (USD 0.0068). In this sense, Brazil transitioned from having one of the highest mobile termination rates compared to OECD countries to a country with a rate lower than the OECD average (Figure 5.1).

Figure 5.1. Mobile termination rates in Brazil compared to the OECD area, 2014 and 2019



Note: MTR set by Anatel for 2020 represents an average of three regions and amounts to 0.018 BRL. The exchange rates used are 2.35 BRL/USD in 2014 and 3.927 BRL/USD in 2019.

Sources: OECD (2020^[20]), *Broadband Portal* (database), www.oecd.org/sti/broadband/oecdbroadbandportal.htm (accessed on 20 May 2020); Anatel's response to the questionnaire of the review; Possebon (2020^[21]), "Anatel revê para baixo valores de interconexão para 2020-2023", https://teletime.com.br/18/02/2020/anatel-reve-para-baixo-valores-de-interconexao-para-2020-2023/?utm_source=Teletime (accessed on 16 March 2020).

National roaming and on-net roaming

National mobile roaming allows mobile users to access communication services using their own access number when outside their home network. In Brazil, this situation occurs when the user is in another operator's network. Moreover, additional charges are applied when users of the same operator are out of the geographical area where it was registered as a home network (on-net roaming).

Since the launch of mobile services in the early 1990s in Brazil, national roaming and charges for on-net roaming (i.e. for calls within the same network) in different registry areas have been common, usually at high prices. Operators were allowed to include an additional charge for calls made or received outside the user's local area, independently of whether the originating and receiving carrier was the same company.

Once Brazil introduced the mobile cellular service authorisation model for licensing in 2001, this policy began to change. Tim Brasil (TIM), which had significantly expanded its coverage through several spectrum auctions, began offering free on-net roaming to its users for intra-network communication (often known in other countries as on-net calls). Oi, the other new entrant, subsequently began following this same strategy.

Since 2012, due to pressure from consumer associations, several bills were discussed in both houses of Congress to address the issue of charges for on-net roaming. The aim was to eliminate all associated charges. In 2015, the Senate approved a law that would forbid these charges (No. 85 of 2013), but the Chamber of Deputies halted the project in 2018.

The issue has not been solved by law, but operators have gradually eliminated charges for on-net roaming in their commercial offers. Anatel also assessed the "on-net" roaming market and found no general market failure to justify symmetrical or asymmetrical regulatory measures. However, the same study found that national roaming charges (i.e. between different networks) were considered harmful for regional operators. Anatel imposed asymmetric measures for players with significant market power in the domestic roaming market, as explained below.

By the mid-2000s, the nature of competition among operators began to change. Operators began considering the size of their national footprint (i.e. network coverage) as their competitive advantage. As they did, operators with spectrum within the same service area (i.e. infrastructure-based competition) did not carry out domestic roaming agreements.¹⁷

The lack of national roaming agreements became an increasing concern for Anatel. Infrastructure-based competition would ultimately make areas with lower population density less attractive for investment. This, in turn, would disadvantage them in terms of network coverage. Anatel was concerned that some areas could barely support the existence of one network as a reasonable financial investment.

In 2007, the 3G spectrum auction included coverage obligations (i.e. to cover all municipalities with fewer than 30 000 inhabitants). It also included domestic roaming provisions. Specifically, as many of these localities only had one network in place, the auction winner had to offer national roaming to rival networks. However, Anatel did not set the *ex ante* wholesale roaming rate. As a result, all operators set high rates for wholesale roaming. Therefore, roaming in these new areas was insipient.

To remedy this situation, Anatel started intervening in the national wholesale roaming market in 2010. However, it was not until 2012 – with the publication of the PGMC – that all operators were declared MNOs with significant market power in the national roaming market. Under the new rules, all four operators (Vivo, Claro, Oi and TIM) were obliged to submit a PRO to Anatel for approval. Wholesale rates had to be lower than the lowest roaming retail price.

Despite the new rules, challenges regarding compliance remained. Oi and TIM were delaying national roaming services to users from rival networks in municipalities with fewer than 30 000 inhabitants. In response, Anatel fined the two companies in 2013. Oi had to pay BRL 5.6 million (USD 2.6 million), while TIM had to pay BRL 6.9 million (USD 3.2 million).¹⁸

With the revision of the Competition Plan in 2017, Anatel's approach to competition changed substantially. All four operators were again declared agents with significant market power in the domestic roaming market. Furthermore, the regulator set the wholesale reference rates (Table 5.3) to diminish the differences from existing reference offers. However, wholesale rates were calculated using FAC-HCA modelling. In the same way that Anatel determines *ex ante* mobile termination rates, the regulator could benefit from using LRIC to set wholesale mobile roaming rates.

Table 5.3. Reference wholesale rates for national mobile roaming in Brazil

Product	Operator with significant market power			
	Oi	Vivo	Claro	TIM
Voice (BRL/min.)	0.04	0.07	0.07	0.08
Data (BRL/MB)	0.03	0.02	0.02	0.01
SMS (BRL/SMS)	0.05	0.03	0.06	0.03

Note: MB = megabyte; SMS= short message service.

Source: Anatel's response to the questionnaire of the review.

Infrastructure sharing and co-ordination of deployment

Infrastructure sharing may help reduce network deployment costs. At present, most OECD countries encourage infrastructure sharing, provided the advantages outweigh the drawbacks. In other words, sharing must not be detrimental to competition.

The LGT in Brazil recognises the advantages of infrastructure sharing. Article 73 states that telecommunication operators have the right to access posts, poles, ducts and rights of way owned by other operators or by other public utility providers in a non-discriminatory fashion at "fair" prices and conditions.

This principle of infrastructure sharing among different utility networks in the LGT was first implemented through the Joint Resolution No. 1 of November 1999 by Anatel, the electricity sector regulator (Agência Nacional de Energia Elétrica, Aneel) and the oil sector regulator (Agência Nacional do Petróleo, ANP). The resolution established how operators seeking to use passive infrastructure owned by other public utility networks would work. It specified that infrastructure sharing could only be denied for security or technical reasons.

The Anatel-Aneel-ANP joint resolution of 1999 stated that the parties would negotiate rates and, in case of dispute, the relevant agencies would intervene. The dispute resolution process was defined in 2001, two years after the regulation was issued (Joint Resolution No. 2 of March 2001). It created a commission of two representatives per regulator that would convene in case of disputes. The commission addresses price disputes involving electricity distributors and telecommunication providers, particularly on the occupation of electricity poles.

In practice, communication service providers seeking to access passive infrastructure of other utility networks have faced major hurdles in Brazil. Complaints regarding the price and the number of cables per electric pole increased. In response, a joint resolution between Aneel and Anatel (No. 4 of 16 December 2014) established additional rules regulating pole attachments. Operators were encouraged to enter into price negotiations. However, in case

of dispute, Aneel and Anatel agreed to a reference price of BRL 3.19 (USD 1.36)¹⁹ per month per attachment point in each electric pole. The agreement also set a maximum of one attachment point per pole per operator. Operators occupying more than one attachment point would need to reduce the number to one, except where it was not technically viable.

Despite rulings on specific cases from the joint commission, the issue with respect to pole attachments has not been fully resolved. Some regional providers are paying significantly more than the reference price, often due to lack of enforcement. Moreover, many electric companies around the country continue to cut off cables from telecommunication service providers without the due notification or conflict resolution process.

Presidential Decree No. 9 759 of 11 April 2019 extinguished the joint Anatel-Aneel-ANP commission, along with a series of commissions constituted under the public administration. This decree took effect from 28 June 2019, leaving unresolved cases in limbo and ongoing cases without an authority to resolve conflicts.

Until its abolishment, the joint commission had received 237 cases, and acted to resolve conflicts and avoid long legal disputes (Faria, 2020^[22]). A general conflict resolution body on other passive infrastructure, such as roadside ducts, under the responsibility of different regulatory agencies and ministries has never existed in Brazil.

The deployment of communication infrastructure, especially concerning access to rights of way and the installation of cellular sites, has also been cumbersome in Brazil. Operators must comply with federal as well as local regulations, which may vary by municipality.

To alleviate the issue, the Senate started debating in 2012 how to develop a framework to standardise, simplify and streamline the process to obtaining rights of way. This initiative culminated three years later with the approval of the “Antennas law” (Lei das Antennas, Law No. 13 116 of 20 April 2015). This law mandated infrastructure sharing, when technically possible. It also obliged all public interest infrastructure projects (e.g. roads, electrical grid infrastructure) to accommodate deployment of communication infrastructure, commonly known as “dig-once” policies.

However, the concept of what constitutes “public interest infrastructure” remains to be defined; a decree to implement the Antennas law is being developed. This decree will likely define public interest infrastructure as roads, railways, public transport infrastructure, electricity transmission lines, oil and gas pipelines, and water supply and sewerage networks.

The Antennas law included two other important changes, which are described below.

In its first major change, the Antennas law established that each state must streamline procedures under a single point of contact (i.e. “one-stop shop” or “single window”) and respond within 60 days. The original project contemplated an automatic tacit approval of requests in case of non-response (i.e. positive administrative silence or *afirmativa ficta*). That idea was ultimately rejected in favour of a rule that transferred the decision from the municipality to Anatel if the former would not respond within 60 days.

This proposal was vetoed by the President’s Office (Casa Civil) as such clause was considered a violation of the Constitution since land-use and zoning are the prerogative of municipalities. Congress is still debating the issue. Several bills mandating a tacit approval for antennas have been included, in broad terms, in the law of Economic Freedom (Lei de Liberdade Econômica, Law No. 13 874 of 2019). The law has been implemented by Decree No. 10 178 of 2019. Although there has been progress towards streamlining rights of way, states and municipalities have been slow in adapting local rules to the Antennas law.

In its second major change, the Antennas law established there would be no cost for the rights of way in public roads, even for those operated by private concessionaires. However, the Ministry of Transport, through the National Department of Transportation Infrastructure (Departamento Nacional de Infraestrutura de Transportes) considered such rules applicable only to urban infrastructure. It thus exempted rural roads from such provisions. This issue was still under discussion among different federal agencies. Network operators are responsible for installation, maintenance and operating costs of the deployed infrastructure.

Enforceable regulation that streamlines rights of way would help foster broadband deployment in Brazil. Furthermore, co-ordination of civil works and establishment of a body to support broadband deployment should lower deployment costs. Such a body would harmonise relevant agencies and ministries at the federal level, and also bring together agencies at the state and municipal levels. Streamlining rights of way will be crucial to ensure that coverage targets of affordable and quality broadband are achieved in Brazil. This is especially important in a context of the densification of cells required by 5G. The 5G Fast Plan from the United States offers a good example of co-ordinated efforts across several government levels to reduce delays in deploying infrastructure (Box 5.2).

Box 5.2. The United States 5G Fast Plan

On January 2017, the Federal Communications Commission (FCC) in the United States established the federal Broadband Deployment Advisory Committee (BDAC) to advise it on how to accelerate deployment of high-speed broadband access. BDAC has three working groups: disaster response and recovery; increasing broadband investment in low-income communities; and broadband infrastructure deployment job skills and training opportunities.

Several initiatives resulted from BDAC's advice and broader consultations. States and municipalities, for example, adopted model codes. In addition, the FCC adopted rules to reduce federal impediments to deploying infrastructure needed for 5G and help to expand its reach.

Under the 5G Fast Plan, the FCC also reformed legacy rules to accommodate small cells and banned certain municipal roadblocks for 5G deployment. At the same time, it gave states and localities a reasonable deadline to approve or disapprove small-cell siting applications.

Source: FCC (2020)^[23], "The FCC's 5G Fast Plan", <https://www.fcc.gov/5G> (accessed on 10 March 2020).

Concerning infrastructure sharing among communication providers, in 2001 Anatel published rules that also applied to passive infrastructure, such as rights of way, ducts, poles and towers. This replicated part of the 1999 inter-agency regulation on the subject, with some additional details (Resolution No. 274 of 5 September 2001). Following the 2001 resolution, infrastructure owners would set the conditions for the sharing agreement, provided they were non-discriminatory and that the agreement would not raise anticompetitive concerns. Furthermore, the infrastructure owner's network deployment plans would take precedence over third-party requests. All infrastructure-sharing denials had to be answered in writing with a detailed explanation; any delay would be considered anticompetitive behaviour.

The 2001 resolution set a formula to calculate the reference prices, considering fully allocated costs, including additional expenses incurred due to infrastructure sharing. The rules defined negotiation deadlines and set a dispute resolution mechanism.

In 2017, Anatel's resolution on infrastructure sharing between communication network operators was updated (Resolution No. 683 of 5 October 2017) to incorporate provisions

in the Antennas law. Since then, operators are exempt from sharing in three cases: i) if exposure to electromagnetic fields exceeds legal limits; ii) if there is potential interference between systems; or iii) if it compromises the provision of collective interest services or the safety of the infrastructure. Moreover, the 2017 resolution states that all new infrastructure has to consider future sharing with other operators.

Since these changes were introduced, all communication network operators must publish their infrastructure that is available for sharing. This includes geographic co-ordinates and criteria for pricing. It also includes the timeframe for using an electronic system managed by Anatel named Wholesale Offers Negotiating System (Sistema de Negociação de Ofertas de Atacado, SNOA).²⁰ The SNOA lists reference offers, approved by Anatel, of equipment that makes up the infrastructure to support broadband services. Typically, players are more likely to reach lower prices together than the ones offered in the SNOA. For that reason, they normally negotiate directly outside of the SNOA. Moreover, some players claim that information in the SNOA about available capacity may be incomplete.

Additionally, the new rules established by Anatel require players with significant market power to publish a PRO, subject to the process defined in the PGMC. Tower sharing is mandatory when base stations need to be closer than 500 metres of each other, except when they are on rooftops or deployed before 2009.

Box 5.3. Infrastructure-sharing agreements among Brazilian operators

In 2013, Anatel and the Administrative Council for Economic Defence (Conselho Administrativo de Defesa Econômica, CADE) approved a Radio Access Network (RAN) sharing agreement between TIM and Oi in the 2.5 GHz band to meet their 4G coverage commitments.

In 2014, TIM and Oi agreed to negotiate joint construction of their respective 2G and 3G networks, which was approved by Anatel. In November 2015, TIM and Telefônica Brasil (Vivo) filed an agreement to share their 3G networks under a multiple operation core network (MOCN), RAN¹ sharing agreement. This includes frequency sharing in certain cities based on their rural coverage obligations in the municipalities where only one network is in place. There is also an agreement for rural coverage between Claro and Vivo.

In March 2018, TIM and Oi entered into a new RAN sharing agreement. This changed the sharing modality set in 2012, evolving it from the multi-operator RAN to MOCN and included part of the LTE radio frequency bands (1.8 GHz bands).

In July 2019, Vivo and TIM announced they would start sharing their 2G spectrum in a single grid model. They would also share their 3G and 4G spectrum in cities with fewer than 30 000 inhabitants. Furthermore, they signalled the possibility of extending such agreements to other parts of the network. The companies involved consider these initiatives offer them operational and financial efficiencies. They will allow their customers to benefit from enhanced user experience stemming from increased traffic capacity and service coverage, with the entry of one of the operators in cities where Vivo or TIM were not present (Telefônica, 2019^[24]). More such agreements are being negotiated.

By the end of 2019, in 11% of the small municipalities (where there is only one network), all four operators provided service through active infrastructure-sharing agreements.

1. Radio Access Network (RAN) sharing is a way for multiple mobile network operators to share equipment such as radio network controllers, base station equipment and antennas, and most backhaul equipment. If spectrum is shared, it is considered a multi-operator core networks (MOCN) architecture.

In 2018, Decree No. 9 612 established that backhaul infrastructure promoted by the Ministry of Science, Technology and Innovation (Ministério da Ciência, Tecnologia, Inovações e Comunicações, MCTIC) and Anatel should be available on a wholesale basis to any operator. However, the decree does not cover co-ordination of civil works (such as through dig-once policies) among federal, state and municipal levels.

In July 2019,²¹ Anatel published a toolkit detailing relevant aspects of infrastructure sharing, which encouraged the use of its electronic system. However, these are only guidelines, and lack of infrastructure sharing may raise broadband deployment costs in Brazil.

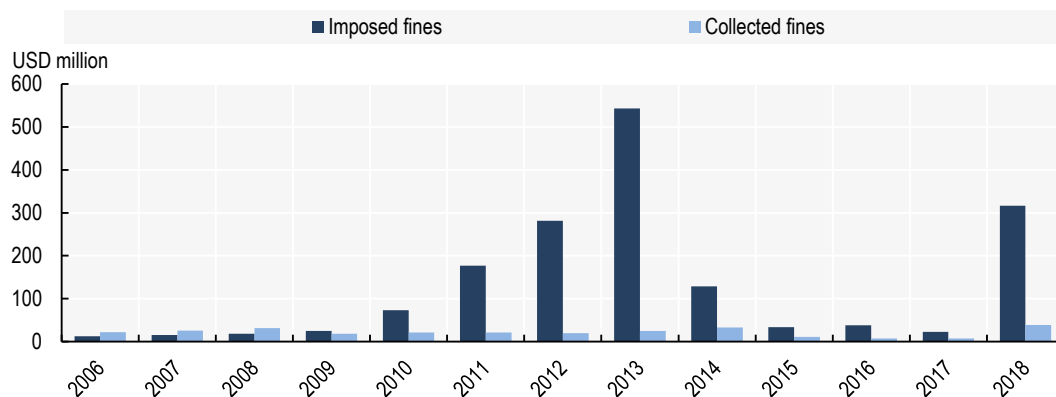
Regarding active infrastructure sharing, during 2013-19, mobile operators started experimenting with innovative approaches by implementing Radio Access Network (RAN) sharing agreements (Box 5.3).

Regulatory compliance

Anatel is required to constantly monitor the regulatory compliance of communication providers, intervening when necessary, and applying fines in certain cases. These functions were established by the LGT in 1997 and by ministerial guidelines concerning regulatory supervision (Ministério das Comunicações, 1997^[25]).

The first decade of post-liberalisation saw an exponential increase in demand of telecommunication services. However, the accompanying increase of services did not always meet the quality of service (QoS) standards set by Anatel. From 2007 onwards, Anatel started to enforce its compliance standards on communication providers (Fonseca, 2015^[26]). This enforcement, however, was done without a prior standardisation of QoS criteria by Anatel. As a result, the number of applied fines increased dramatically from 2008-13 (Figure 5.2). The shock of incoming fines accumulated in a short time led communication service providers to revise their internal processes related to regulatory compliance. It also resulted in many appeals of Anatel's sanctions.

Figure 5.2. Applied and collected fines by Anatel (2006-18)



Source: Anatel (2019^[27]), *Relatório Anual 2018*, <https://www.anatel.gov.br/institucional/noticias-destaque/2343-relatorio-anual-2018-ja-esta-disponivel>.

Since 1997, Anatel has imposed 63 000 fines, for a total of over USD 1.9 billion (BRL 6.9 billion). However, by 2018, it had only collected USD 225.2 million (BRL 827.7 million). This corresponds to 66% of total processes, but to only 12% of the total value of fines (Table 5.4).

Table 5.4. Total fines imposed by Anatel (1997-2018)

Fines	Value (USD million)	Share of total value (%)	Number of processes	Share of total processes (%)
Collected	225.2	12	41 733	66
Partially collected	1.6	0.09	2329	4
Not collected	1 664	88	18 942	30
Judicially suspended	592.7	31	731	1
Staggered payment	4.4	0.002	884	1
Active debt and/or CADIN ¹	1 066.9	56	17 327	28
Total	1 890.8	100	63 004	100

1. Sum of all the fines in the process of notification of non-payment by debtors or already registered in the Information Registry of Unpaid Credits of the Federal Public Sector (Cadastro Informativo de Créditos não Quitados do Setor Público Federal, CADIN) and/or the Active Debt of the Union (Dívida Ativa da União).

Note: This table uses the exchange rate of 3.65 BRL/USD for the year 2018 from OECD.stat (<https://stats.oecd.org/>).

Source: Anatel (2019^[27]), *Relatório Anual 2018*, <https://www.anatel.gov.br/institucional/noticias-destaque/2343-relatorio-anual-2018-ja-esta-disponivel>.

The legal challenges and costs involved in the collection of fines from the peak period of fines in Anatel led to study groups and public consultations aimed at standardising regulatory compliance. In 2012, Anatel adopted new rules concerning regulatory monitoring. These included the Sanction Guidelines (Regulamento de Aplicação de Sanções, Resolution No. 589 of May 2012) and the Guidelines of Regulatory Monitoring (Regulamento de Fiscalização, Resolution No. 596 of August 2012). Moreover, Anatel began publishing an Annual Monitoring Plan (Plano Anual de Fiscalização) and an Operational Monitoring Plan (Plano Operacional de Fiscalização).

To foster responsive regulation, promote public policy objectives and reduce the costs involved with collecting fines, Anatel has been implementing alternative solutions for regulatory compliance. For example, Anatel has used the legal instrument of operators' Conduct Adjustment Agreements (Termos de Compromisso de Ajustamento de Conduta, TAC).

Through this approach, an operator non-compliant with regulatory obligations can invest in broadband networks rather than pay fines. In practice, TAC agreements have faced difficulties with TCU audits (Box 5.4. and Chapter 4). In particular, it is challenging for Anatel to observe the counterfactual investment level in broadband networks by operators in the absence of those commitments. This is especially true given that operators choose the localities for investment in the TACs. These agreements raise another relevant issue. The investment in networks negotiated via TACs should comprise open access obligations, which has not been the case at present, in order to foster infrastructure sharing and access by other service providers.

In TACs, arrangements are negotiated *after* communication service providers have already been fined. However, Anatel has also been experimenting with sanctioning providers *before* fines are decided. Specifically, non-monetary sanctions would replace eventual monetary sanctions through “future obligations” (obrigação de fazer).

In February 2019, Nextel was the first service provider to be sanctioned with this type of non-monetary measure. The sanction involved providing coverage to a number of unserved municipalities within 12 months (Possebon, 2019^[28]). In this model, if the operator chooses not to accept Anatel's – non-negotiable – terms, a monetary fine would be imposed. Anatel expects this instrument will accelerate the resolution of sanctioning processes.²²

Box 5.4. Conduct adjustment agreement (TAC)

Anatel first negotiated a Conduct Adjustment Agreement (Termos de Compromisso de Ajustamento de Conduta, TAC) with Vivo in 2013. It enables an exchange of BRL 3.3 billion (USD 1.53 billion)¹ in fines for investments that the operator would, in theory, never have made. It was not well received by other operators and many authorities, delaying its approval until 2017.

At the time, TCU reviewed the negotiation and approved it with certain adjustments. It gave general guidelines for Anatel to follow in future TAC negotiations. These included setting intermediate values for the indicators to be followed and possible sanctions for non-compliance, as well as restrictions on the values of such sanctions.

Eventually, after Anatel complied with TCU's requests, the regulator could not reach an agreement with Telefonica and both desisted in 2018 (Chapter 3). Around the same period, Claro and Oi also entered into negotiations with Anatel to exchange fines for investment commitments, but the regulator did not approve them.

Anatel is persuaded that TACs could help expand broadband infrastructure in underserved areas. In August 2019, Anatel approved a TAC with TIM and Algar for BRL 627 million (USD 159.65 million) and BRL 86.7 million (USD 22 million), respectively.² The agreement with TIM foresees the deployment of 4G in 369 municipalities that only have 2G or 3G, and 4G where no other MNO is present.

In March 2020, TCU approved Anatel's TAC with TIM, finding no irregularity in the agreement. Nonetheless, when approving this TAC, TCU included recommendations to both MCTIC and Anatel concerning future TACs (Gondim, 2020^[29]):

- MCTIC should define coverage targets to be included in future TACs.
- MCTIC should be able to guide establishment of targets when they are considered to help implement communication public policies.
- Anatel should not include ongoing sanctioning process that have not been fully evaluated.
- Anatel should seek to address inequality between regions when choosing localities and projects that will be part of the TACs.
- Anatel should assess whether the benchmark of 80% of coverage set as acceptable within TIM's TAC is indeed sufficient, and propose a solution for reaching the remaining 20%.

These guidelines were expected to be implemented before the approval of a new TAC with Vivo by the TCU, requested in 2019.

1. Using the average yearly BRL/USD exchange rate of 2.156089 in 2013 from OECD.stat (<https://stats.oecd.org/>).

2. Using the exchange rate of 3.93 BRL/USD for the year 2019 from OECD.stat (<https://stats.oecd.org/>).

Data collection and reporting

Successful implementation of policy and regulatory measures requires data collection. Such data inform the policy-making process and help assess the impact of public projects and regulatory remedies. Among OECD countries, indicators are essential for “evidence-based” policy making.

Various entities in Brazil collect and analyse data to inform public policy. The Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística) collects general census data on household usage of information and communication technologies (ICTs) (IBGE, 2020^[30]). Anatel collects data regarding access to regulated services, while MCTIC has indicators concerning public policies. CETIC.br, a centre for statistics within the multi-stakeholder organisation CGI.br (Box 5.5), collects data regarding use of Internet-related services and applications in various sectors.

Box 5.5. CETIC.br

The Regional Centre for Studies for the Development of the Information Society (CETIC.br), created in 2005, is a department of the Brazilian Network Information Centre (NIC.br). CETIC.br monitors the access, use and appropriation of information and communication technologies (ICTs) in Brazil. The centre produces indicators on the access, use and appropriation of ICTs in various segments of society, such as households, enterprises, educational, health and cultural organisations. In 2012, CETIC.br became a UNESCO Category II Centre, the first centre related to the development of information and knowledge societies.

Source: CGI.br (2020^[31]), “Sobre o CETIC.br”, <https://cetic.br/pagina/saiba-mais-sobre-o-cetic/92>.

Anatel released an ambitious new data portal, the Painéis de Dados, in 2019. This portal compiles and provides public access to a wide set of data on the communication sector. This includes indicators on access, infrastructure coverage and technology, investment, numbering, the allocation of licences, spectrum, competition, product certification, QoS and consumer issues. The portal will also include metrics on regulation, providing a quantitative analysis of the number of regulations in place and those revoked (Box 5.6).

Box 5.6. A single data portal for communication services by Anatel

In 2013, Anatel published for the first time open data on its website and on the government mapping website (Infraestrutura Nacional de Dados Espaciais) (<http://inde.gov.br>).

In 2016, Anatel acquired self-service business intelligence tools and developed its first Open Data Plan, publishing sectoral data on the open data governmental portal (<http://dados.gov.br>).

In 2018, Anatel started implementing the second version of its Open Data Plan. This included fostering capacity building, creating a data dictionary and developing data dashboards with the main information and indicators of the telecommunication sector in Brazil.

In 2019, Anatel published its first dashboards; more are expected. The main dashboards concern access, product certification, consumers, spectrum, concessions and licensing, quality and regulation (Anatel, 2020^[32]). In each dashboard, users can access the original data, broken down by service and region, and use the system to build their own analysis and figures. More than 30 data dashboards were developed for Anatel’s internal use related to data of regulated entities.

Anatel’s single data portal is based on open source software, which it hopes other Brazilian agencies and government institutions will also use to develop their own solutions.

Anatel has also been making efforts to improve data collection on backhaul and backbone availability, including from small ISPs, to allow for the mapping of communication infrastructure (Anatel, 2019^[33]). Additionally, MCTIC's Department of Digital Inclusion commissioned a detailed study and mapping of broadband networks in Brazil. It assigned the study to the Centre for Strategic Management and Studies (Centro de Gestão e Estudos Estratégicos), a non-governmental organisation with a special statute that enables it to provide public services to MCTIC.

By June 2020, the project was set to deliver an interactive and georeferenced map with granular data (using the same census-level block grid) of transport and “last mile” networks in Brazil. Nevertheless, at the moment of writing, there was no detailed information on fixed broadband networks coverage in Brazil.

Anatel has conducted an annual Satisfaction and Perceived Quality Survey on the major telecommunications providers since 2015.²³ The survey is a key instrument for Anatel to assess QoS. It includes questions on general satisfaction, quality of phone calls, broadband speed, repair, installation and customer service. Its findings have been used as evidence for regulation and are instrumental in shaping Anatel consumer policy. The results of the survey are also made available in Anatel's data portal.

Expanding broadband and promoting its use in Brazil

Extending broadband access to rural and remote areas to achieve digital inclusion is a primary objective of public policy in Brazil. It has been challenging to foster broadband deployment and increase its adoption and use in Brazil for several reasons. Brazil has a large territory, a sizeable population in rural and remote areas and important socio-economic differences both at regional and local levels. Moreover, Brazil, like other emerging economies, does not have extensive fixed broadband networks in contrast to other OECD countries.

National broadband strategies

In 2009, the Brazilian government started developing its first National Broadband Plan (Programa Nacional de Banda Larga, PNBL), which would be published a year later. It prepared a working document that assessed challenges, established a shared vision and set out an action plan with an initial cost assessment (Ministério das Comunicações, 2009^[34]). In 2010, 73% of households in Brazil did not have access to the Internet (CGI.br, 2010^[35]).

In 2010, the government published the National Broadband Plan, which was approved by Presidential Decree No. 7 175 of 12 May 2010. The plan set the target of providing 35 million households with broadband access by the end of 2014. It also set the conditions so that Telebrás, the previous holder of the privatised telecommunication companies, could help implement part of the plan.

The 2010 National Broadband Plan included initiatives in a number of areas, such as network deployment and pro-competitive regulatory measures. It had three main goals: increasing broadband affordability, increasing coverage and access to broadband, and increasing broadband connection speeds.

It sought to achieve these goals through initiatives along four dimensions: regulation, financial and tax incentives; industrial policy promoting the development of national technology; and infrastructure. In the area of infrastructure, the government decided to set up a new national fibre backbone based on available dark fibre already deployed by government-owned companies. This new backbone aimed to provide additional wholesale transport capacity nationwide. The plan also included several regulatory measures designed to stimulate competition, including a much wider deployment of Internet exchange points (Cavalcanti, 2011^[36]).

The 2010 National Broadband Plan considered it strategic for Brazil to own and operate a satellite. This would support the provision of broadband, as well as development of the Geostationary Defence and Strategic Communication Satellite (Satélite Geoestacionário de Defesa e Comunicações Estratégicas, SGDC).

The SGDC satellite was launched in 2017, but has encountered several difficulties: a failed bid to commercialise its capacity, problems in finding a partner and a series of legal issues. These setbacks delayed its use until late 2018. The SGDC satellite is being used to expand broadband in remote areas, mostly serving schools and health centres. Viasat and Telebrás have partnered to ensure the deployment of fixed and mobile (terrestrial) broadband infrastructure through satellite technology. Telebrás also plans to deploy community Wi-Fi antennas, which could provide a low-cost means to provide Internet access (Boxes 5.2 and 5.3).

Law No. 12 715 of 2012 established a special taxation regime for the deployment of broadband (Regime Especial de Tributação do Programa Nacional de Banda Larga para Implantação de Redes de Telecomunicações, REPNBL-Redes) (Brazil, 2012^[37]), later regulated by the 2013 Decree No. 7 921 (Anatel, 2013^[38]) (see Chapter 7).

In 2016, Brazil launched the second phase of the National Broadband Plan (Programa Brasil Inteligente). It aimed primarily to cover 70% of municipalities with fibre backhaul infrastructure, up from 52% at the time. This second phase contemplated that 60% of the beneficiary municipalities had to be in the North and Northeast of Brazil. Nonetheless, due to the lack of budget and to political changes in Brazil in 2016, the plan did not become effective and was revoked in 2018.

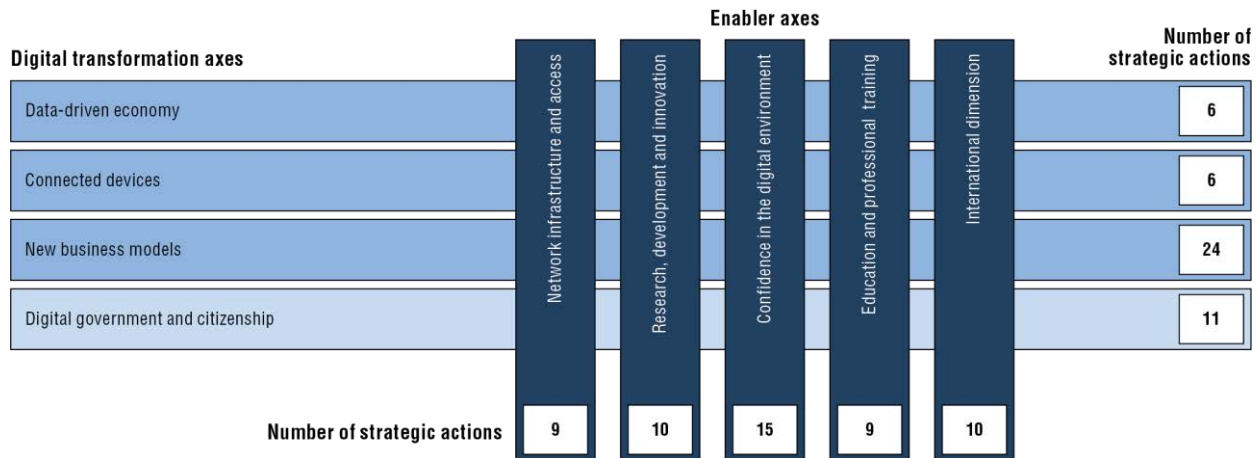
In 2017, the Federal Court of Accounts (Tribunal de Contas da União, TCU) evaluated Brazil's broadband strategies (Document TC 032.508/2017-4 TCU and Agreement 2.053/2018) (TCU, 2018^[39]). TCU identified the main pending challenges that needed to be tackled simultaneously to maximise widespread broadband adoption: i) lack of infrastructure; ii) insufficient education; iii) low and unequal income; iv) insufficient relevant content; and v) behavioural barriers.

These challenges were reiterated in document that TCU provided to Congress to inform the federal budget for 2019 (Agreement No. 2 608 of 2018) (TCU, 2018^[40]). It noted a lack of adequate diagnosis of policy issues to tackle the digital divide, deficient management and co-ordination between the parties involved, and failures in evaluation of programmes. TCU also mentions lack of co-ordination between different branches of the federal government and states creates redundancies and wastes public resources. This, in turn, hampers digital inclusion. Public telecommunication access points, for example, have been installed in the same municipality by the federal government and by the city.

In March 2018, a new phase of broadband policies in Brazil started with the Brazilian Digital Transformation Strategy entitled E-Digital 2018-20 (Presidential Decree No. 9 319). The strategy aims to co-ordinate different governmental initiatives related to digital issues within a coherent framework. In so doing, it wants to harness the potential of digital technologies for economic, sustainable and inclusive growth through increased innovation, competitiveness, productivity and employment (Brazil, 2018^[41]). Infrastructure and access to ICT is one of five enabling axes of the Digital Transformation Strategy (Figure 5.3).

The infrastructure axes of the Digital Transformation Strategy have three main objectives: enable access to backbone connectivity in all municipalities; expand fixed and mobile broadband access in rural and urban areas; and foster initiatives for digital inclusion.

Figure 5.3. Axes of the Brazilian Digital Transformation Strategy



Source: MCTIC (2018^[42]), *Brazilian Digital Transformation Strategy: E-Digital*, <http://www.mctic.gov.br/mctic/export/sites/institucional/sessaoPublica/arquivos/digitalstrategy.pdf>.

The background document of the Brazilian Digital Transformation Strategy sets the stage for action. It provides a diagnosis from relevant studies and available data from Anatel and CGI.br (Chapter 3). It identifies the most important challenges to expand broadband in Brazil, particularly in rural areas. Finally, it provides an overview of ongoing and potential solutions for bridging the connectivity gap in the country (MCTIC, 2018^[42]). The following strategic actions for infrastructure were identified:

- Connect 22 000 public schools with high-speed broadband (either with terrestrial or satellite technologies).
- Enable the use of funds for broadband networks (e.g. financial reserves associated with fees or sanctions).
- Set priorities to define new investment obligations for mobile broadband, to be included in spectrum auctions.
- Speed up 4G deployment by accelerating the DTT transition to free-up the 700 MHz band.
- Encourage states to implement tax relief policies focusing on mobile broadband networks.
- Adapt FUST legislation to enable its use for broadband.
- Strengthen participation in R&D and standardisation.
- Promote long-term investments and co-ordinate initiatives on infrastructure deployment, data processing and storage to integrate research, education, health and digital security.

The Brazilian Digital Transformation Strategy was an important step towards establishing a coherent governance model for digital initiatives. It will be analysed in depth by the *OECD Reviews of Digital Transformation: Going Digital in Brazil* (OECD, forthcoming^[43]).

For its part, the present review briefly notes several challenges with the strategy. First, with the exception of the number of public schools to be connected, broadband targets are not measurable and rely on aggregate global comparison indexes. Second, while the E-Digital

decree and background document both mention “high-speed broadband”, they do not indicate a minimum speed for it. Most OECD countries base their concrete broadband targets with an end date. They also measure in terms of percentage of population, households or business connected with 30 Mbps, 50 Mbps, 100 Mbps or even 1 Gbps (OECD, 2018^[44]). Third, the strategy does not organise the patchwork of connectivity initiatives in Brazil. Rather, it simply offers a general vision and list of potential actions for infrastructure for the digital transformation.

Together with the Brazilian Digital Transformation Strategy, the Presidential Decree of 17 December 2018 (Decree No. 9 612) set the tone for the most recent phase of broadband policy in Brazil. The 2018 decree revoked Decree No. 4 733 of 2003, changing the focus of public policy from fixed telephony to broadband. It concluded the two previous phases of the National Broadband Plan. It emphasised the need to deploy both backbone and backhaul networks in underserved areas, as well as mobile communication infrastructure. It also mandated that Anatel should prioritise coverage obligations when setting investment commitments from operators, especially through TAC or spectrum auctions.

In this sense, broadband deployment obligations determined by Anatel must be directed towards three areas. These comprise expanding backhaul and backbone connectivity, increasing mobile network coverage and expanding fixed broadband networks. It also established that new backhaul infrastructure deployed should be made available in an open wholesale access basis to any operator.

In 2019, MCTIC elaborated the Connected Brazil Programme (Programa Brasil Conectado). It had four main axes to bring together ongoing and future initiatives:

- **Connectivity.** Foster connectivity through the following initiatives: i) North and Northeast Connected; ii) Electronic Government Citizen Services (GESAC) and Internet for All; iii) National Education and Research Network (RNP); iv) the Geostationary Satellite Constellation for Defence and Strategic Communications Satellite (SGDC); and v) 5G auctions.
- **Technology and inclusion.** Promote technological diffusion and digital inclusion through the following initiatives: i) Smart cities; ii) Computers for inclusion; iii) Artificial intelligence; and iv) the Internet of Things (IoT).
- **Institutional reforms.** Reform the institutional framework through: i) Brazil’s engagement in OECD peer reviews; ii) updating the LGT; iii) reform of fiscal and sectoral funds (FUST and FUNTTEL); and iv) regulation on infrastructure.
- **Sectoral partnerships.** Prioritise co-operation among different ministries and stakeholders in education, health, agriculture and national defence.

The present review focuses on initiatives related to connectivity and institutional reform related to telecommunication and broadcasting. Technology and inclusion, as well as sectoral partnership initiatives, except for issues related to connectivity of the IoT, are addressed in the *OECD Reviews of Digital Transformation: Going Digital in Brazil* (OECD, forthcoming^[43]).

For the connectivity axis, many initiatives are a continuation of previously established governmental actions. While the Connected Brazil Programme provides a better overview of ongoing initiatives, measurable targets and detailed information on progress continue to be unavailable for most of them. The main initiatives for connectivity are analysed below.

Electronic Government Citizen Services and Internet for All

Since 2002, the Electronic Government Citizen Services programme (Governo Electronico – Serviço de Atendimento ao Cidadão, GESAC) has promoted universal Internet access, targeting primarily the most vulnerable groups (Ministerial Ordinance, Ministry of Communications, No. 256 of 2002, amended by Order No. 2 662 of 2014). MCTIC leads the programme in partnership with other ministries, particularly the Ministry of Education. GESAC is serviced by Telebrás (Box 5.7), through SGDC, the Brazilian geostationary satellite for civil and military use launched in 2017 (Box 5.8).

Box 5.7. Telebrás

Telebrás is a partially State-owned company founded in 1972. Before the liberalisation process, it controlled the 27 regional operators and the long-distance operator (Embratel), providing fixed and mobile telephony services in Brazil. In 1998, during the privatisation, Telebrás was broken into 12 separate different companies (i.e. *Baby Bras* firms) that were auctioned to private agents.¹

In 2010, Telebrás was re-established as a State-owned company linked to the Ministry of Communications (now MCTIC). It primarily managed the National Broadband Plan (Programa Nacional de Banda Larga, PNLB), which includes provision of infrastructure and the support of networks needed for telecommunication services. It also aims to offer broadband services in areas with low coverage at affordable prices.²

As Telebrás implemented the National Broadband Plan, it managed the expansion of public network fibre backhaul and backbone connectivity. It also holds exclusive rights over the SGDC satellite to provide connectivity to isolated populations, health and education centres and governmental institutions.

The role of Telebrás has changed since its reactivation in 2010. This role has not always been in line with the company's main purpose to promote the universalisation of Internet services. For instance, during the FIFA World Cup Championship in 2014, Telebrás provided all official broadband services and image transmission of the games. In 2013, Telebrás was mandated to provide all data communications and transmissions for all federal public institutions;³ however, this policy goal was removed in 2018.⁴ Discussions are ongoing regarding the privatisation of Telebrás (Sabina, 2019^[45]).

1. For more details, see OECD (2008^[46]), *OECD Reviews of Regulatory Reform – Strengthening Governance for Growth in Brazil*, <https://doi.org/10.1787/9789264042940-en>.

2. Article 4 of Decree No. 7 175 of 2010.

3. Decree No. 8 135 of 2013.

4. Decree No. 9 612 of 2018.

GESAC offers free-of-charge broadband services through satellite and terrestrial broadband connections. These connections are available in schools, public health clinics, indigenous villages, international border stations and “quilombola” communities (i.e. traditional African-Brazilian communities), as well as telecentres. Participants in the GESAC programme are institutions selected by the public administration (either local or national) that establish a co-operation agreement with MCTIC.

The original programme foresaw the installation of 3 500 access points in 2 700 municipalities. The federal government pays for the broadband connections, which are supplied by private companies. These companies benefit from an exemption of state-level taxes imposed on

telecommunication services (ICMS) through an agreement with the Brazilian National Council of Finance Policy (Conselho Nacional de Política Fazendária, CONFAZ). CONFAZ is the government agency composed of all states to promote unity among them regarding the ICMS tax (Chapter 7).

The GESAC programme was broadened in 2017 (Ministerial Ordinance No. 7 154 of 2017) under the name Internet for All (*Internet para Todos*). This programme intends to include broadband access at lower prices for people living in communities with inadequate or no access to broadband. It primarily targets most vulnerable communities in rural and remote areas, as well as in urban peripheries.²⁴

The Internet for All programme foresees tax incentives for ISPs (i.e. exemption of the ICMS tax). However, the tax exemption arrangement with CONFAZ would only cover, in principle, satellite connections. Therefore, MCTIC is revising the GESAC/Internet for All programme.

The proposed solution is to separate once again the GESAC programme from the Internet for All programme. The government would pay connections for GESAC, while Internet for All would incentivise ISPs to provide Internet access in remote locations at affordable prices. Internet for All will restart once MCTIC finishes negotiating a separate ICMS exemption for the programme with CONFAZ.

Internet for All, which operates through partnerships between MCTIC and municipalities, is implemented by operators accredited by the ministry. To participate in the programme, municipalities must sign an agreement with MCTIC. This agreement defines the municipality's obligations, such as the guarantee to provide the basic infrastructure for network deployment.

The municipalities indicate the places to be covered by the programme. Residents at these municipalities can contract Internet connection services offered by operators directly, without contact with the ministry (although companies have to be accredited).

Internet for All does not offer free services for individuals, but companies have to provide services "at a fair and reasonable price".²⁵ Operators have the freedom to define such prices, and municipalities may supervise service provision.

The GESAC programme is in its fifth edition (i.e. Brazilian law allows service contracts for a maximum of five years). By mid-2018, it had 4 500 access points and was served by Oi, Embratel and Vivo. In 2018, the contract was transferred to Telebrás so it could serve schools, health centres and border points through its satellite.

By 14 February 2020, GESAC provided broadband services to approximately 11 218 institutions and public places. Most were served by a 10 Mbps connection with no data cap. Of all serviced institutions, 80% were rural public schools, covering about 3 million students.

According to MCTIC, GESAC aimed to cover, from 2019 onwards, 5 000 additional public spaces, with more than half belonging to the Ministry of Education. The GESAC connections hired by the Ministry of Education are part of the Connected Education programme (Programa de Inovação Educação Conectada).

The Connected Education programme was established in 2017 (Decree No. 9 165). It aims to make high-speed Internet access available to all through subsidies and to promote use of digital technologies in basic education. The Ministry of Education continues to lead the programme with support of MCTIC, Anatel and the Brazilian Development Bank. Several education institutions are also involved. These include the Innovation Centre for Brazilian Education, the National Board of Secretaries of Education and the National Union of Municipal Education Leaders.

The programme aims at creating an environment in schools to receive an Internet connection (partially supported by GESAC), open new avenues of educational content and allow elementary school students contact with new technologies. It is being rolled out in three phases. Phase 1 (2017-18) developed the plan and reached 44.6% of students; phase 2 (2019-21) aims at reaching 85% of the student base and to start the programme evaluation; phase 3 (2022-24) aims to reach 100% of students.

GESAC also provides connectivity to telecentres. These are public spaces with computers, IT equipment and broadband connections, which promote digital and social inclusion among the communities they serve. These telecentres primarily foster social and economic development to reduce the digital divide and create opportunities for the population.²⁶

Proposal of a Geostationary Satellite Constellation for Defence and Strategic Communication

The SGDC satellite was conceived in 2012 and launched in 2017. After several judicial hurdles, the SGDC became operational in 2019, particularly to support GESAC (Box 5.8).

Box 5.8. The Geostationary Satellite for Defence and Strategic Communication (SGDC) launched in 2017

During the privatisation of Telebrás in 1998, the government divested all its shares in satellite communication. At this time, X-band communications, reserved for the military, was transferred to Embratel Star One. Several ministries joined forces to regain control of these communication services and support the 2010 National Broadband Plan to provide Internet services to remote areas. The Ministry of Communications, the Ministry of Defence and the Ministry of Science, Technology and Innovation developed a joint plan for a Brazilian, State-owned satellite.

The Geostationary Satellite for Defence and Strategic Communication (Satélite Geostacionário de Defesa e Comunicações Estratégicas, SGDC) was created through Decree No. 7 769 of 28 June 2012. Telebrás would work with a steering committee to plan and manage the budget. The committee was composed of five stakeholders to plan and manage the budget: Ministry of Defence, Ministry of Communications, Telebrás, the Brazilian Space Agency and National Institute of Spatial Research. The steering committee would be formed by a member of each of the parties involved in developing the plan.

The first step towards implementation of the SGDC was the creation of Visiona Tecnologia Espacial, in July 2012, as a public-private partnership between Embraer and Telebrás. In 2013, Visiona signed a BRL 1.3 billion (USD 600 million)¹ contract with Telebrás. The original launch date was set for 2016. Thales Alenia Space was selected as the satellite manufacturer, and Ariane Space would conduct the launch.

The contract with these providers, signed by Visiona, included technology transfer clauses that would be co-ordinated by the Brazilian Space Agency. After two delays, the SGDC was launched in May 2017, becoming fully operational two months later. The complete operations centre, together with five gateways, a tier four data centre, and eight carrier monitoring system stations, commenced operations in December 2018. The investment in the project surpassed the budget of BRL 2.7 billion (USD 697 million).² The satellite has 50 kiloampere (kA) transponders with a capacity of 58 Gbps and 7 X-band transponders for military usage. The Ka-Band would be used to meet part of the National Broadband Plan goals.

After several delays, the two blocks were put up for auction in October 2017, both including National Broadband Plan obligations. The winner of the largest block would also be required to furnish all equipment for Telebrás to exploit its capacity. However, no bids were received. As equipment for Telebrás' own use was subject to having a winning bidder, the company could not start the widespread deployment of its terrestrial network. It took Telebrás another four months to find a new partner.

In February 2018, it entered into a revenue-sharing agreement with Viasat, a United States-based company. Viasat would help meet the National Broadband Plan goals. At the same time, it would explore satellite services for enterprise and commercial aviation markets, as well as satellite-enabled Wi-Fi hotspots and residential services (Viasat, 2018^[47]).

Nevertheless, the agreement was temporarily suspended in March 2018 by the judicial power in response to a demand from Via Direta, a Brazilian company. Via Direta argued it had been in conversation with Telebrás to operate one of the blocks from the void tender. Meanwhile, the Association of Fixed and Mobile Telecommunications Companies (Sinditelebrasil) and the Association of Satellite Communications Operators filed their own court complaints. The first argued that Telebrás had been directly assigned the GESAC contract without a bidding process. The second argued the agreement between Telebrás and Viasat was substantially different than the conditions stipulated on the original tender.

In July 2018, the courts authorised the contract between Telebrás and Viasat. In the meantime, in response to a Sinditelebrasil request, TCU evaluated the legality of the contracts between Telebrás and MCTIC regarding the GESAC programme, and between Telebrás and Viasat. While TCU approved both acts, it requested Telebrás to renegotiate several clauses in the contract that it deemed unfavourable against Telebrás. The revised conditions were approved in May 2019.

1. Using the exchange rate of 2.160 BRL/USD for the year 2013 from OECD.stat (<https://stats.oecd.org/>).

2. Using the end of year (2018) exchange rate of 3.8742 BRL/USD from OECD.stat (<https://stats.oecd.org/>).

In addition to the SGDC, MCTIC proposed a new project in 2019 called the “Brazilian Geostationary Satellite Constellation for Defence and Strategic Communication” (Sistema de Satélites Geoestacionários de Defesa e Comunicações Estratégicas). It proposed launching a second satellite, SGDC-2 to have a Brazilian satellite constellation.

Telebrás entered into an agreement with Visiona, its joint venture with Embraer, to select providers for the construction and launching of the satellite. Nevertheless, TCU found this agreement might not fully comply with legislation.²⁷ Therefore, MCTIC and Telebrás are redefining the strategy. Several issues under discussion may affect implementation. These include the cost-effectiveness of producing and maintaining national satellites with public funding to expand affordable broadband in underserved communities compared to using other technologies.

National Education and Research Network

The National Education and Research Network (Rede Nacional de Ensino e Pesquisa, RNP) is Brazil's academic broadband network (backbone). Created in 1989, it was deployed in 1991 and continues to be expanded each year. The RNP, through the Ipê Network (Rede Ipê), has 27 points of presence (i.e. one in each of the 26 Brazilian states and in the Federal District). It connects 15 state networks and over 1 522 education, research and health institutions in more than 40 cities, benefiting more than 3.5 million users (RNP, 2020^[48]).

Moreover, the Telemedicine University Network (Rede Universitária de Telemedicina) connects 138 universities, allowing for the exchange of technical information on healthcare and science. The RNP is connected to RedCLARA, the network that links academic networks in Latin America. It is also connected to the AmLight Exp (Americas Lightpaths Express and Protect) network, which links science and engineering research and education communities in the United States and the Western hemisphere.

North and Northeast Connected Initiatives

MCTIC is developing two initiatives to connect the North and Northeast regions of Brazil, the most underserved regions in the country. Through the Connected Science initiative (Ciência Conectada – Ciência Forte), officially announced in August 2019, MCTIC plans to expand the RNP fibre backhaul and backbone connectivity. The first phase will cover the North and Northeast regions aiming to increase backhaul connectivity in 77 localities, 16 cities and 64 research institutions. The plan is to deploy 16 metropolitan networks by 2021, connecting 1 317 education centres. The RNP would manage and maintain the fibre.

For the Northeast region, Connected Science will provide broadband access to 16 localities (in the Paraíba, Pernambuco, Rio Grande do Norte, Bahia and Ceará states). This will connect 52 research institutions and 824 urban schools through agreements with municipal governments and local ISPs.

For the Northern region of Brazil, MCTIC is planning to expand the Connected Amazon project (Projeto Amazônia Conectada). This was launched in 2015 as a joint initiative between the Ministry of Defence, and the Ministry of Communications and Ministry of Science, Technology and Innovation before they merged into MCTIC in 2016. It aims to expand communications infrastructure to help meet the National Broadband Plan.

By 2017, 849 km of sub-fluvial optical backbone cables had been deployed along the Solimões River from Manaus to Tefé (i.e. 690 km). The Negro River from Manaus to Novo Airão (i.e. 127 km) was joined by another 24 km of terrestrial links. Only 1 of the 12 pairs of fibre has been lit. The deployment and maintenance of this kind of infrastructure has been challenging. A ring architecture does not provide redundancy of the cable. Therefore, cable cuts, which have happened in 12 points so far, have been hard to repair.

In 2019, the Connected Amazon project was reconfigured as the Integrated and Sustainable Amazon Programme (Projeto Amazônia Integrada e Sustentável). The new objective is to deploy around 10 000 km of sub-fluvial fibre backbone from Macapá to Tabatinga. The project will also branch out to Porto Velho, Boa Vista and Rio Branco, repairing and linking with the previously deployed fibre (from Manaus to Tefé). The project aims to also link Peru and French Guiana. RNP will be involved in the management of the cable, but eventually a private investor, through a public-private partnership, will assume all responsibilities for operating the sub-fluvial infrastructure.

Regulatory measures to promote broadband expansion

In addition to the ministerial initiatives, other important measures to foster broadband access in Brazil were established through Anatel regulations (Chapter 2). In 2008, Anatel suggested an amendment to the Universal Service Plan goals in fixed telephony (Amendment to PGMU goals, Decree No. 6 242 of 4 April 2008). In response, the regulator highlighted that a national backbone, able to support high volumes of data traffic, was a key condition to the further adoption of broadband in Brazil.

In 2018, the fourth version of the Universal Service Plan was published (PGMU 4, Decree No. 9 619 of 20 December 2018), building on previous versions. The main change was the obligation to install fixed wireless broadband services in 1 473 localities using 4G technology or higher. In addition, this service had to be available to at least 10% of all localities by the end of 2019.

The most recent effort by Anatel to foster widespread deployment of broadband is the Structural Plan of Broadband Networks 2019-24 (Plano Estrutural de Redes de Telecomunicações, PERT). The PERT diagnoses broadband networks in the country, emphasising the role of regional ISPs in broadband deployment. It identifies gaps and areas where deployment is not profitable, proposes seven broadband infrastructure projects and suggests possible financing mechanisms.²⁸ The projects focus mostly on expanding backhaul connectivity in underserved municipalities, as well as fostering deployment of mobile networks. As the PERT was published recently, most proposed initiatives have not been implemented.

Due to the growth of small ISPs, Anatel has been implementing several regulatory measures to encourage them to provide broadband coverage in underserved areas. Through the Small Telecommunications Service Providers Committee (Resolution No. 698 of 2018), Anatel expects to advance on regulatory measures favouring small ISPs. Through the resolution, it also hopes to gather more information about demand in areas where these operators are present. In January 2020, Anatel explicitly recognised Community Networks as an option for Internet access in Brazil (Anatel, 2020_[49]). In so doing, it explicitly linked its decision to an outcome of the Internet Governance Forum 2018 – “The Community Network Manual: How to build the Internet yourself” (Belli et al., 2018_[50]).

Moreover, Anatel has also been trying to expand mobile broadband coverage through auctions (reserve prices with coverage obligations, see subsection on spectrum auction design) and through the TACs (see subsection on monitoring regulatory compliance). Auctions have proven to be a powerful tool for investment, coverage and expansion; the TACs are still being designed to fully meet Anatel’s expectations.

Fostering the Internet of Things

The IoT is expected to grow exponentially, connecting many billions of devices in a relatively short time (OECD, 2015_[51]). It represents the next step in digital convergence – on an unprecedented scale – after the convergence of fixed and mobile networks and the telecommunication and broadcasting sectors. Moreover, the IoT holds the promise to contribute substantially to further innovation, growth and social prosperity (OECD, 2018_[52]). It also brings about increased demands for networks and challenges for traditional communication regulatory frameworks.

Together with the potential benefits of the IoT, new policy and regulatory challenges may emerge in some areas (e.g. privacy/security concerns, as well as interoperability, numbering and standardisation issues). To foster the IoT ecosystem, several issues become crucial: interoperability; spectrum management; extra-territorial use of numbers; and solutions to help users switch providers and avoid lock-in. Likewise, privacy, security, liability and reliability around the use of the IoT need to be built (OECD, 2018_[52]).

In addition to increased requirements around quality and ubiquitous networks, another challenge regarding IoT development concerns international mobile roaming. International mobile roaming was intended for communication devices used by people travelling to and from countries. It was not initially conceived for devices permanently deployed across borders as is the case of the IoT.

When it comes to massive and dispersed connected devices, and as supply chains become more sophisticated, the IoT has evolved to provide new solutions, particularly at a global scale. Many IoT devices may be initially activated in one country and exported to another permanently. In those cases, for example, many IoT solutions across industries (i.e. logistics, automotive and aerospace, among others) require devices to access networks in a co-ordinated manner, independently of location. That is, many IoT applications and services transcend borders.

IoT devices that are activated in one place, but used or sold in another country, may require permanent connectivity. Permanent roaming would allow IoT devices to use data internationally without restriction. Among other benefits, IoT connections under permanent roaming are frequently more reliable than local connections. This is the case because these devices can access, most of the time, any available network, with coverage not being limited to one specific network. It can also simplify contracting and billing solutions for IoT service providers, as connections in different networks can be contracted for and billed only once via a single provider-to-customer relationship. Permanent roaming may arguably lead to market distortions, as differential conditions (i.e. taxation, coverage and rates) may place local operators at a disadvantage. However, it can also create significant opportunities for expanding innovative IoT services, and is already successfully employed in countries around the world.

In 2017, the International Telecommunications Union (ITU) issued international mobile roaming strategic guidelines. These encouraged regulators to explore solutions regarding IoT and M2M services to promote measures to apply permanent roaming services, and the application of specific prices and conditions for IoT/M2M traffic” (ITU, 2017^[53]).

With the objective of promoting innovative services, many countries allow, or do not explicitly prohibit, permanent roaming for the IoT. However, a few countries (e.g. Brazil, and Turkey) have banned it completely. In 2012, Anatel ruled that foreign-based carriers using foreign SIM cards may not offer services in Brazil on a permanent basis. Doing so would be considered to be providing an unauthorised telecommunication service, which the LGT explicitly prohibits. Anatel has also argued there are important consumer protection issues as the foreign IoT service providers would not be under its regulatory reach. This implies that only locally licenced carriers with local SIM cards can offer M2M and IoT services in Brazil.

Brazilian network operators generally oppose permanent roaming. They argue that national networks are dimensioned and built to host domestic SIM cards. Therefore, permanent roaming devices could create network capacity and management problems. They also regard any such international providers as unfair competition as they would not be subject to local regulation and taxation (Chapter 7). However, such concerns may be mitigated if permanent roaming arrangements are subject to freely negotiated commercial rates between Brazilian network operators and international providers.

Intermediaries provide many international IoT services to comply with regulation in Brazil as permanent roaming is not allowed. These are mostly MVNOs specialised in M2M and the IoT. More recently, Anatel has argued the advent of the eSIM (embedded SIM) has made the permanent roaming issue outdated.²⁹ On the one hand, several players have already launched this solution in Brazil.³⁰ On the other, eSIMs can host multiple connectivity providers, but do not solve the integration costs and contractual complexities of multi-operator relationships for some industry stakeholders.

As discussed in Chapter 7, the taxation system for telecommunication services is burdensome and complex. For the development of the IoT, it has become a considerable bottleneck. Countries such as Brazil that pay a fixed fee per connection (once on activation or

recurrently) have increased the IoT connection costs compared to countries that apply taxes or fees based on usage.³¹

In Brazil, all active lines must pay the Telecommunications Oversight Fund (Fundo de Fiscalização das Telecomunicações, FISTEL) – not only when the line is activated, but also annually. For low average revenue per user (ARPU) communication services, such as many IoT connections, this levy could make the service unprofitable or simply unviable.

Numbering is also a relevant issue. IoT devices are projected to grow exponentially, surpassing personal communications. Using the current numbering plan for mobile telephony (a scarce resource) may not be the appropriate solution. Establishing separate numbering plans and fostering deployment of the numbering protocol IPv6 could alleviate this issue.

The Brazilian government has taken several steps to promote deployment of the IoT. It created the IoT Chamber in 2014 (Decree No. 8 234 of 2 May 2014). This, in turn, elaborated the National IoT Plan published in June 2019 (Decree No. 9 854 of 25 June 2019). Prior to the IoT Plan, MCTIC launched two public consultations on the issue in December 2016 and March 2017. Permanent roaming and taxes have been two of the contentious issues at stake.

Following publication of the National IoT Plan, Anatel has accelerated the review of the regulation of IoT devices and services. It launched a public consultation in August 2019, focusing on licensing, taxation, numbering, QoS, spectrum and MVNO regulation.³² Anatel has stated it would not consider the IoT a new communication service and would exempt its connections and devices from QoS regulation. Additionally, Anatel is considering rendering MVNO regulation more flexible to help such operators to become IoT enablers. Decisions around changes on IoT regulation were expected by the end of 2020.

According to the National IoT Plan, the IoT is “the infrastructure that integrates the provision of value-added services with capabilities for physical or virtual connection of things with devices based on existing information and communication technologies and their developments” (Brazil, 2019_[54]). It follows from the plan that IoT services are value-added services inherently bundled with a communication service. This has created a definition problem that is still in debate. The definition is relevant not only because of varying degrees of regulation, but also because of taxation (Chapter 7). If IoT devices are exempt from certain taxes (i.e. ICMS and FISTEL), end-user prices would be substantially lower. This, in turn, could lead to higher adoption rates.

The National IoT Plan wants to reduce FISTEL for the IoT, but this depends on legal reform in the FISTEL law. Congress has been debating whether to eliminate FISTEL charges for IoT connections since 2016, but no agreement has been reached. The Executive Power is considering a provisional measure that would set this fee equal to zero for the IoT; however, the Ministry of Finance has requested an impact evaluation on foregone revenue.

Consumer protection

Two main institutions, Anatel and the National Consumers Secretariat (A Secretaria Nacional do Consumidor, Senacon), have a mandate over communications for consumer protection (Chapter 4). Anatel defines the rules and processes that govern consumer protection in the sector. It also enforces legal clauses that outline the rights and obligations of telecommunication providers (including pay TV providers, under the Brazilian definition of telecommunication services).

Anatel regulates consumer contracts indirectly, i.e. usually *ex post*, by monitoring and inspecting processes put in place by the regulated entities. The regulator verifies providers’

compliance with the Consumer Defence Code and other legal provisions. These include the LGT and the Regulatory Framework for Consumer Rights of Telecommunication Services (Regulamento Geral de Direitos do Consumidor de Serviços de Telecomunicações) (Anatel, 2014^[55]). Senacon is in charge of planning, elaborating, co-ordinating and executing the general policies of relationships between consumers and providers, including telecommunications. Both agencies share information on administrative actions and procedures regarding consumers' rights.

Fines imposed by Senacon – as well as those imposed by Anatel when related to consumer protection – are deposited in the Federal Fund for the Defence of Collective Rights (Fundo de Direitos Difusos), administered by the Ministry of Justice. Prior to 2012, all fines imposed by Anatel were deposited in FISTEL. In several cases, Anatel has also mandated compensations for incorrect billing or damages to be paid directly to end users.

In 2014, Anatel consolidated all consumer protection regulation in a single act, the Regulatory Framework for Consumer Rights of Telecommunication Services (Resolution No. 632 of 2014). This regulation brought together and updated all the norms that govern the relationship between providers and consumers. This included rules established by Anatel or general consumer rules established by Senacon.

The Regulatory Framework for Consumer Rights of Telecommunication Services applies to all services. The rules require providers to cancel a service automatically when requested (via a customer centre, call centre or web portal). It also states that billing complaints must be solved within 30 days; prepaid top-up balances should have a minimum validity of 30 days; and users must be notified in advance of their credit expiration. Operators must include standard service contracts on their websites, as well as past bills and historical usage (available upon request). Call centre support should be available free of charge at any time, and these calls must be recorded and stored for six months. Moreover, the act mandates that all promotional offers must be available to all consumers, not only to new subscribers. Furthermore, bundled offers should provide disaggregated prices for individual services and components.

Historically, a substantial part of communication issues for consumers in Brazil relate to how services are priced and advertised. Most complaints frequently relate to billing, payments and contract clauses. Recently, though, new issues in consumer protection have emerged. In 2016, for example, fixed broadband operators began enforcing data caps on their offers. This resulted in an ongoing debate about allowing commercial offers to develop versus protecting consumer rights. Anatel has acted upon this, and partially suspended data caps by the largest ISPs.

Consumer protection issues in Brazil also relate to concerns about reducing counterfeited phones and re-use of stolen devices. These practices affect both consumers and local industries. Multiple entities in Brazil have co-ordinated their response to this issue. Anatel, the Department of Federal Revenue of Brazil, the federal police and the Ministry of Justice, for example, have implemented the Legal Mobile Phone initiative (Celular Legal). It promotes use of certified devices and information sharing among providers and the process required to deactivate stolen devices. This initiative also makes it easier for consumers to reactivate their number when using a different device.

Moreover, as in OECD countries, consumer issues have started to overlap with concerns around use of personal data. This is particularly true for consumer protection and information sharing among communication service providers. This issue will be further addressed in *Going Digital in Brazil* (OECD, forthcoming^[43]). It will include an evaluation of the

implementation of the Personal Data Protection Act (Lei Geral de Proteção de Dados Pessoais, Law No. 13 709 of 14 August 2018).

The standard process for consumer complaints about communication services in Brazil starts with users reaching out to their service provider. If consumers do not receive a satisfactory response, they can contact Anatel via the web portal, app or call centre. If the issue has not been resolved, Anatel can re-open the complaint ticket or users can contact their local departments for consumer protection (Procons) or Senacon's e-compliant portal.

Service providers must have an internal ombudsman by June 2020. If consumers are not satisfied with the provider's reply, they can contact the Ombudsman. If the issue is not solved by the Ombudsman, they can contact Anatel. These practices are established in the Telecommunication Quality of Service Guidelines (Regulamento de Qualidades dos Serviços de Telecomunicações, Resolution No. 717 of 23 December 2019).

Communication operators consistently rank at the top of consumer complaints, but in recent years have resolved complaints to greater satisfaction. These complaints, collected by several Procon offices and managed by Senacon, are published by the National Information System for Consumer Protection (Sistema Nacional de Informações de Defesa do Consumidor, Sindec). Since 2015, five of the top ten providers with the largest number of claims have consistently been communication operators (i.e. Claro, Oi, Vivo, Sky and TIM).

Overall, the total number of tickets reported by Sindec has been decreasing slightly since 2015. Until 2017, telecommunication ranked as the sector with the largest number of consumer issues, both as overall tickets and complaints across Procon offices. Since 2018, the financial sector has been leading Sindec's measures on numbers of tickets and complaints. Telecommunication operators, however, have performed better than the overall average in terms of resolution rates of complaints (Table 5.5).

Table 5.5. Consumer complaints and resolution in Brazil through consumidor.gov.br (2015-19)

Year	Total	Tickets			Average resolution rate (% of complaints)	
		Complaints (share of tickets [%])	Telecommunication (share of tickets [%])	Finance (share of tickets [%])	Telecommunications operators ¹	Total
2015	2 646 941	84.3	32.6	23.8	79.7	76.8
2016	2 457 167	83.6	29.1	25.3	81.6	77.6
2017	2 287 459	84.3	28.2	26.8	82.1	76.8
2018	2 274 395	85.1	25.9	29.8	85.8	80
2019	1 589 006	85.9	26.2	30.1	84.3	79.3

1. Resolution rates for telecommunication operators refer to telecommunication operators included in the top 60 companies with the largest number of complaints reported by Procon offices in Sindec.

Note: Data for 2019 were retrieved in October 2019.

Source: Senacon (2019^[56]), *Sistema Nacional de Informações de Defesa do Consumidor (Sindec)*, <https://sindecnacional.mj.gov.br/> (accessed on 15 March 2020).

Anatel also monitors the status and number of consumer complaints on service providers. The scale of complaints received by Anatel surpasses those filed through Procon offices by almost twofold (Table 5.6).

Communication operators had the highest rates at resolving conflicts in a recently created e-complaint portal. In 2014, Senacon launched the e-complaint portal (www.consumidor.gov.br)

to help resolve conflicts between consumers and providers. Providers register voluntarily and must accept the terms of participation. All the largest communication operators actively participate in the portal. In 2014, the portal received 37 151 complaints.

Table 5.6. Consumer complaints filed through Anatel (2015-19)

Year	Number of telecommunication consumer complaints
2015	4 072 464
2016	3 891 209
2017	3 383 374
2018	2 920 737
2019	2 963 22

Source: Anatel's response to the questionnaire of the review.

By 2018, the number had reached 609 644, with 40.3% related to communication operators and 22.2% to financial institutions. Consistent with data from Sindec, complaints in the e-complaint portal also show that telecommunication operators had the highest conflict resolution rates (89.9%). They were followed by banks, at 76.9% (Brazil, 2019^[57]).

In November 2019, Anatel launched a new e-complaint portal, Anatel Consumidor (<https://apps.anatel.gov.br/AnatelConsumidor/>). Consumers can evaluate the providers' replies and see rankings related to various topics. These include average satisfaction with each provider, complaint resolution, average response time and other performance indicators.

An alternative approach to consumer rights and protection developed by Anatel has significantly reduced complaints related to value-added services. Since 2017, Anatel has been using a dialogue with telecommunication operators centred on solving issues that present potential or actual harm to end users. This responsive approach helped reduce the number of complaints related to contracts with value-added services. Between the end of 2016 (before Anatel's action) and the end of 2019, complaints dropped from 7 500 to just over 1 500 per month. This represents an 80% decrease in three years.

Regional and international issues

International and regional co-operation

As a result of globalisation, international co-operation has become a key part of the regulatory agenda. Regulatory institutions in Brazil have been investing in regional and international co-operation to avoid duplication, benefit from possible synergies and embrace best practices in regulation and competition policy.

The Brazilian Cooperation Agency (Agência Brasileira de Cooperação, ABC) is in charge of international co-operation between Brazil and other countries or international organisations. ABC is affiliated to the Ministry of Foreign Affairs (Ministério de Relações Exteriores). It negotiates, co-ordinates, implements and monitors technical co-operation projects and programmes that stem from agreements signed between Brazil and other countries and international organisations.³³

Regarding the communication sector, the Secretary of Telecommunications of MCTIC is responsible for the interaction with national and international bodies. It also manages participation in international fora focused on ICT development.³⁴ Anatel has the legal mandate to represent Brazil in international telecommunication organisations, under the co-ordination of the Executive branch (art. 19 of the LGT).³⁵ In this regard, Anatel has been

co-ordinating participation of the Brazilian delegation in international telecommunication discussions. This includes, among others, ITU, the Inter-American Telecommunications Commission (CITEL) and the LAC Forum of Telecommunication Regulators (Regulatel).

Brazil has adopted several OECD recommendations related to the digital economy. These include the 2016 *OECD Ministerial Declaration on the Digital Economy* (OECD, 2016^[58]), the 2012 *Recommendation of the Council on International Mobile Roaming Services* (OECD, 2012^[59]) and the 2004 *Recommendation of the Council on Broadband Development* (OECD, 2004^[60]). As one of its four main axes, Brazil's Digital Transformation Strategy of 2018 emphasised the international aspects for promotion of regional integration and the integration of Brazilian firms into global value chains.

For competition policy, in particular, Brazil has adhered to OECD recommendations. It has also adopted templates suggested by the International Competition Network for mergers and cartels. Additionally, CADE has established relevant co-operation agreements with other competition agencies to foster exchange of data and information, promote mutual learning and avoid conflicts over jurisdiction.³⁶

International mobile roaming

International mobile roaming allows mobile users to access communication services in foreign countries, extending the coverage of the consumer's operator. This coverage extension is usually possible through a wholesale agreement between the consumer's home operator and the foreign mobile operator. Although new technological developments are enabling alternatives, international mobile roaming charges remain a challenge. Many substitutes developed may require subscribers to change their mobile number or do not provide enough mobility (Bourassa et al., 2016^[61]).

As is the case in OECD countries, international roaming has been historically contentious in Brazil. As international mobile roaming is provided through commercial agreements with foreign operators, these services fall outside of Anatel's jurisdiction. Therefore, in the absence of a supra-national regulatory body, a top-down regulation of rates is hard to impose.

Such regulation depends on the conditions of the negotiation between national and foreign operators. In such a context, no operator usually has an incentive to reduce rates. In addition, double taxation is a concern: users end up paying taxes in the country of roaming, as well as in Brazil.

In Brazil, international mobile roaming was not used as a significant lever to compete in the market until 2008. In 2008, Claro – whose rates varied by technology (GPRS, EDGE and 3G) and originating operator – reduced its price per MB to a flat fee. TIM followed, offering discounts up to 30% on its basic rate. This resulted in comparable prices between operators. In 2011, offers including international roaming services for both mobile voice and data started to be widespread, with discounts of up to 80% on retail prices. In 2012, Brazil launched unlimited voice and data international roaming packages for a daily fixed rate.

Though the price decrease responded mostly to competitive dynamics in Brazil, both Anatel and consumer associations had been exerting significant pressure. Anatel has already incorporated a bill shock rule concerning roaming within its Regulatory Framework for Consumer Rights of Telecommunication Services. It states that consumers should be informed before the expiration of the roaming packages or credit, preferably by text message. Moreover, in 2012, Brazilian operators, together with most operators in Latin America through the GSMA, launched an initiative to make data roaming more transparent and easier to understand for consumers.

Brazil adhered to an OECD recommendation in 2018 to balance the needs of different parties with an interest in international mobile roaming services. In 2012, the OECD Council adopted the *Recommendation of the Council on International Mobile Roaming Services*. The recommendation aims to ensure effective competition, consumer awareness and protection, and a fair price level in international mobile roaming services. Therefore, it sets out a number of measures – from the least to the most interventionist – that governments should consider to address challenges related to international mobile roaming markets (OECD, 2012^[59]).

Brazil has been participating in international discussions concerning international mobile roaming. Brazil proposed a more proactive regulation of international mobile roaming at the International Telecommunication Union’s 2012 World Congress on Information Technology in Dubai (WCIT-12). While Brazil’s proposal for full multilateral regulation was not successful, four provisions were included in the International Telecommunication Regulations in the conference agreements:

- Countries should take measures to ensure that the operators provide accurate, up to date, transparent and timely information to consumers on international roaming rates.
- Countries should promote competition in the provision of international roaming services and foster policies leading to competitive roaming rates.
- Satisfactory QoS should be provided to roaming consumers.
- Countries should take measures to mitigate any inadvertent roaming charges in border zones, where users could inadvertently get served by the operator on the other side of the border.

Brazil started taking advantage of these provisions soon after WCIT-12. By the end of 2013, Peru and Brazil agreed to consider calls between border towns as local. However, this agreement was not implemented until 2016. It was to be addressed in the 2020 Vice-Ministerial Commission for Border Integration Brazil-Peru.

Since WCIT-12, several developments on international mobile roaming have occurred. The European Union, after many years of discussions, agreed to fully eliminate international mobile roaming charges in 2017 (“Roam Like at Home” initiative). Due to the pressure of competition, roaming charges between the United States, Mexico and Canada have been rapidly disappearing. In 2016, the Study Group 3 of the Telecommunications Standardization Bureau of the ITU (ITU-T SG3) made an important recommendation. It proposed that countries reach agreements to build pricing models. At the same time, it said countries should establish price caps for wholesale and retail roaming prices. The 2016 World Telecommunication Standardization Assembly of the ITU held in Tunisia adopted these recommendations.³⁷

Brazil continues to negotiate international roaming agreements with its neighbours. Negotiations with Argentina, Uruguay and Paraguay started in 2017. In March 2018, CITEC signed the Declaration of Buenos Aires. In so doing, it agreed “to encourage measures to promote greater transparency, affordability and elimination of additional charges to the end user of international roaming services, focusing especially on the realities and needs in border areas” (OAS, 2018^[62]).

The region reached several milestones in reducing international roaming in 2019. In July 2019, Chile and Brazil signed a free trade agreement with the commitment to eliminate these charges at the 54th Mercosur Summit Meeting (54a Cúpula do Mercosul). The agreement, which involves Argentina, Paraguay and Uruguay, is still awaiting approval of the Brazilian Congress.

Annex 5.A. Upcoming 5G spectrum auction in Brazil

Table 5.A.1. Design of blocks for the upcoming 5G spectrum auction in Brazil

Frequency band	Block design by rounds	Coverage obligations
700 MHz	1st round	
	1 national block of 10 MHz paired (10+10 MHz)	Extending mobile coverage in localities without 4G and highways
	2nd round	
	2 national blocks of 5 MHz paired (5+5 MHz)	Extending mobile coverage in localities without 4G and highways
3.5 GHz	1st round	
	1 regional block of 60 MHz exclusive for small ISPs	Extending mobile coverage in municipalities up to 30 000 inhabitants, preferably without 4G (Note: Coverage obligations can be discounted from reserve price [up to 90%])
	2nd round	
	2 national blocks of 100 MHz and 1 national block of 80 MHz	Extending backhaul in municipalities without backhaul
	3rd round	
	1 regional block of 60 MHz (with restrictions to those operators who acquire national blocks in the band)	Extending backhaul in municipalities without backhaul
2.3 GHz	1st (and only) round	
	Regional block of 50 MHz and regional block of 40 MHz	Extending coverage in localities without 4G
26 GHz	1st round	
	5 national blocks and 3 regional blocks of 400 MHz	No coverage obligations
	2nd round	
	Up to 10 national blocks and 6 regional blocks of 200 MHz that were not sold in the previous round	No coverage obligations

Source: Anatel (2020^[11]), *Anatel aprova consulta pública para implementar o 5G*, <https://www.anatel.gov.br/institucional/component/content/article/171-manchete/2491-anatel-aprova-consulta-publica-para-licitar-faixas-de-frequencias-para-o-5g>.

Annex 5.B. Spectrum licence duration and renewal policy in OECD countries

Table 5.B.1. Typical duration of current spectrum licences in OECD countries

Country	Duration of current spectrum licences	Can licences be extended upon request?	General policy for licence renewal	How does the regulator calculate extension or renewal fees?
Australia	15 years	Yes (upon request)	Spectrum licences last up to 15 years, and do not renew automatically. Two years before the licence expires, the licence holder should express interest to renew it. ACMA decides whether to reissue the licence or allocate the frequency band for other purposes.	Renewal fee at an administratively determined price, or through a new auction.
Austria	16-20 years	No	New auction.	New licence fees determined by auction.
Belgium	15-20 years	No	New auction.	New licence fees determined by auction.
Canada	10 years with high expectation of renewal for 10 subsequent years (i.e. up to 20 years)	Yes (upon request for subsequent 10 years)	The Framework for Spectrum Auctions in Canada states that licencees will have a high expectation of renewal for an additional 10 years unless a breach of licence condition has occurred, a fundamental reallocation of spectrum to a new service is required or an overriding policy need arises.	Auction or licence renewal fee. For licences issued through a renewal process, a separate consultation determines the spectrum licence fee so they reflect market value.
Chile	30 years	No	New comparative selection procedure.	New comparative selection procedure.
Colombia	20 years	Yes ¹ (for current licences)	The ICT Modernisation Law extends the spectrum licence period from 10 to 20 years.	Auction.
Czech Republic	10-15 years	Yes	The regulator is obliged to renew the licence on request of the licence holder.	The regulator appoints an independent expert to determine the price of the renewal.
Denmark	15-23 years	No	New auction.	New licence fees determined by auction.
Finland	13-20 years	Unspecified	New comparative selection procedure.	No specific renewal fee.
France	12-20 years	No	Licence extension ² or auction.	Arcep, the French regulator, usually conducts auctions. No specific renewal fee.
Germany	15-19 years	No	New auction.	General policy: new licence fees determined by auction.
Hungary	15 years	Yes
Ireland	15 years	No	New auction.	New licence fees determined by both the auction and "annual spectrum fees".
Italy	15-20 years	Yes	..	No specific renewal fee; however, a revision of annual spectrum fees.
Japan	5 years with possibility of renewal	Yes	If examination by ministry (MIC) shows the application conforms to Radio Regulatory Laws, the licence will be renewed.	Fees determined by comparative selection.
Korea	5-10 years	Yes	Ministry (MSIT) and operators discuss renewal.	Usually price determined by auction.
Mexico	20 years	Yes ³ (if there is no interest in the band by other players, otherwise auction)	Auction or licence extension.	Renewal fee determined by the regulator (IFT) or through an auction.
Netherlands	20 years	No	New auction.	New licence fees determined by auction.
Poland	15 years (older licences up to 30 years)	Yes	Licence extension based on operator's application.	Calculated based on the price per megahertz applied in the latest previous award of a band, with an inflation adjustment.
Portugal	15 years	Yes	Licence extension.	ANACOM does not disclose amounts.

Country	Duration of current spectrum licences	Can licences be extended upon request?	General policy for licence renewal	How does the regulator calculate extension or renewal fees?
Slovak Republic	10 years	Yes	Licence extension.	Fee for licence renewal depends on regulator.
Slovenia	15 years	Yes	New auction.	New licence fees determined by auction.
Spain	16-30 years	Yes	..	No general policy on renewal fees.
Sweden	10-25 years	No	New auction.	New licence fees determined by auction.
Switzerland	12-16 years	No	New auction.	New licence fees determined by auction.
United Kingdom	Indefinite licence ⁴ (i.e. 20 years in the initial term, after which Ofcom can revoke licence for spectrum management reasons with 5-years' notice)	Yes	Renewal or auction.	In 2015, Ofcom calculated the renewal fee of the 900 MHz and 1.8 GHz bands by: i) analysing the sums paid in the 4G auction of February 2013; ii) comparing the amounts bid in foreign spectrum auctions; and iii) assessing the technical and commercial characteristics.
United States	10 years ⁵	Yes, (only if there is no mutually exclusive applications for initial licences)	The Balanced Budget Act of 1997 requires the FCC to use auctions to resolve mutually exclusive applications for initial licences unless certain exemptions apply (e.g. exemptions for public safety radio services, digital TV licences to replace analogue licences, and non-commercial educational and public broadcast stations).	Auction or renewal fees.

1. After changes brought about the ICT Modernisation Law, current licences may continue for one additional term.
 2. Exceptionally, the government agreed with MNO investment commitments to accelerate mobile coverage (i.e. 900 MHz, 1 800 MHz and 2 GHz bands) for a ten-year renewal period without an auction (i.e. “the new deal” of November 2018).

3. Spectrum licences can be renewed for an additional period. The licensee has to manifest interest in renewal a year before the licence term. The Federal Telecommunications Institute (IFT) has a year to resolve whether there is public interest in recuperation of the frequency band, and if so, it will notify the licensee of the licence revocation. If there is no public interest, then the IFT may grant the renewal (art. 114 in Chapter VI of the LFTR).
 4. Indefinite licences mean that Ofcom has limited rights of revocation during an initial term of 20 years, after which Ofcom can revoke the licence for spectrum management reasons, provided they have given the licensee at least five years' notice. The right to revoke licences on spectrum management grounds was retained because of the risk of specific market failures.

5. Licences for service areas will be granted for ten-year terms from the date of original issuance or renewal. In 1993, Congress passed the Omnibus Budget Reconciliation Act. This gave authority to the Federal Communications Commission (FCC) to use competitive bidding to choose from among two or more mutually exclusive applications for an initial licence.

Notes: .. = not available; ACMA = Australian Communications and Media Authority; FCC = Federal Communications Commission (United States).

Sources: Australia: Australian Government (1992^[63]), “Radiocommunications Act of 1992”, www.legislation.gov.au/Details/C2019C00262; ACMA (2020^[64]), *Modernising the Management of Spectrum*, www.communications.gov.au/departamental-news/modernising-management-spectrum. Canada: Government of Canada (2019^[65]), *Policy and Licensing Procedures for the Auction of Spectrum Licences in the 2 300 MHz and 3 500 MHz Bands*, www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08621.html. Chile: Subtel (2005^[66]), *Manual de Trámites de Autorizaciones*, www.subtel.gob.cl/manual_autorizacion/manual/manual_autorizaciones.pdf. Colombia: OECD (2019^[67]), *OECD Reviews of Digital Transformation: Going Digital in Colombia*, <https://doi.org/10.1787/781185b1-en>. European Union: Cullen International (2019^[68]), *Licence Extension and Renewal Policy*, www.cullen-international.com/radiospectrum.html. Japan: MIC (2019^[69]), *Process of Frequency Assignment*, www.tele.soumu.go.jp/e/adm/proc/type/again/index.htm. Korea: MSIT (2019^[70]), *A Public Notice for the 5G Frequency Auction*, www.msit.go.kr. Mexico: Government of Mexico (2014^[71]), *Ley Federal de Telecomunicaciones y Radiodifusión*, www.dof.gob.mx/nota_detalle.php?codigo=5352323&fecha=14/07/2014. United Kingdom: Ofcom (2017^[72]), *The Award of 2.3 and 3.4 GHz Spectrum Bands*, www.ofcom.org.uk/data/assets/pdf_file/0030/81579/info-memorandum.pdf. United States: FCC (2020^[73]), *About Auctions*, www.fcc.gov/auctions/about-auctions; FCC (2017^[74]), *Wireless Licence Renewal and Service Continuity Reform*, http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0713/DOC-345790A1.pdf. All sources were accessed on 12 February 2020.

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Notes

¹ The recent legal changes brought about with Law No. 13 879 on October 2019 allows concessionaires to anticipate the end of their contracts without returning the reversible assets, while nonetheless making investment commitments.

² Using the exchange rate of 3.65 BRL/USD for the year 2018 from OECD.stat (<https://stats.oecd.org/>).

³ Both concepts are laid out in Law No. 9 472 of 1997, Articles 60 and 61: “Art. 60. Telecommunication services is the set of activities that enables the offer of telecommunication. §1° Telecommunication is the transmission or reception of symbols, characters, signs, writings, images, sounds or information of any nature, by wire, radio-electricity, optical means or any other electromagnetic process [...].

Art. 61. Added value service is the activity that adds to a telecommunication service that supports its utilities related to access, storage, presentation, movement or retrieval of information, but shall not be confused with the telecommunication service itself. §1° Added value service does not constitute telecommunication service and its provider can be classified as a user of the telecommunications service that supports it, with the rights and obligations inherent to this condition.”

⁴ Decree No. 2 617 of 1998.

⁵ Constitution art. 222, § 1°.

⁶ According to the ITU-R: “Spectrum monitoring is one of the essential tools of spectrum management. Spectrum monitoring techniques are developed to ensure that technical parameters and standards for radiocommunication systems are adhered to. In addition, spectrum monitoring assists in promoting the efficient utilisation of the radio frequency spectrum and the satellite orbit.” (ITU, 2011^[77])

⁷ The history of mobile telephony in Brazil began on 30 December 1990, when the first concessions of Cellular Mobile System (Serviço Móvel Celular, SMC) began operations in the city of Rio de Janeiro, with a capacity for 10 000 terminals. The A-band (i.e. 850 MHz and 900 MHz) was first assigned to the Brazilian public fixed incumbent, Embratel (GSMA and Deloitte, 2012^[76]).

⁸ Art. 14 of the resolution mentions: “The charge referred to in this Regulation shall apply, when applicable, upon the issuance or extension of the term of validity of the authorization to use radio frequency and may be paid in up to 3 (three) equal half-yearly instalments, provided that the value of the instalments is equal to or higher than R \$ 500.00 (500 reais) and the authorization term is greater than the term granted for the payment of the last instalment.”

⁹ According to Brazil’s 2015 document submitted to CITELE, the 700 MHz auction included “proceedings established that investments to build 4G networks need to include a minimal percentage of technology developed in Brazil (15% until 2016 and 20% until 2022) and a minimal percentage of equipment produced by Brazilian companies (50%)”.

¹⁰ Anatel Resolution No. 625/2013. Available at <http://legislacao.anatel.gov.br/resolucoes/2013/644-resolucao-625>.

¹¹ The spectrum auctions No. 002/2007/SPV – ANATEL (“3G”), and No. 002/2010/PVCP/SPV – ANATEL (“H Band”).

¹² In 2017, when the Body of European Regulators for Electronic Communications (BEREC) reviewed the European Commission’s initial proposal to set a minimum spectrum licence duration of 25 years, (which later was amended to 15 years with a 5-year extension), it highlighted the importance of spectrum auctions as tools to enhance competition. Namely, regarding Article 50 on licence duration, BEREC mentioned: “setting a minimum licence duration may result in entrenching market structures and limit the potential for market entry. For example, the process of re-awarding spectrum at regular intervals can allow for the possibility of new entrants to enter the market, which is particularly important if markets across the Union face structural competition problems. Even the ‘threat’ of new market entry has positive impacts on competition. This is especially the case in markets where the number of operators is limited or where there is no longer effective competition.” (BEREC, 2017^[78])

¹³ Paul Milgrom, an economist specialised in auction design, has made a strong case against using administrative selection. He points out that if the good is initially allocated to the “wrong hands” in the primary market, there is no way of designing a private bargaining process (i.e. secondary market) without delays or failures (Milgrom, 2000^[14]; Hazlett, Muñoz and Avanzini, 2011^[15]).

¹⁴ Article 167 of Law No 9 472 of 1997 amended through Article 2 of Law 13 879 of 2019: “In the case of authorized services, the term will be up to 20 (twenty) years, extendable for equal periods, being necessary that the authorized party has fulfilled the obligations already assumed and expresses prior and express interest.”

§ 1 The extension, always onerous, may be requested up to three years before the expiration of the original term, and the application must be decided in a maximum of twelve months.

§ 2 The rejection will only occur if the interested party is not making rational and adequate use of the radio frequency, if there have been repeated violations in regulatory compliance or if it is necessary to modify the allocated use of the radio frequency.

§ 3 In the extension provided for in the caput, investment commitments must be established, according to Executive Power guidelines, alternatively to the payment of all or part of the public price amount due for the extension. (Included by Law No. 13 879, of 2019).” See http://www.planalto.gov.br/Ccivil_03/leis/L9472.htm.

¹⁵ Administrative Act SEI 53500.025122/2014-48.

¹⁶ That is, the requirement of communication service providers to make their networks available for interconnection on a non-discriminatory basis if it is technically feasible.

¹⁷ Following the B band spectrum auction in 1997, there were ten mobile service areas in Brazil.

¹⁸ Using the exchange rate of 2.160 BRL/USD for the year 2013 from OECD.stat (<https://stats.oecd.org/>).

¹⁹ Using the exchange rate of 3.330 BRL/USD for the year 2015 from OECD.stat (<https://stats.oecd.org/>).

²⁰ Further details in: <https://www.anatel.gov.br/setorregulado/snoa>.

²¹ Agreement No. 371 – regarding process number 53500.078714/2017-13 of 17 July 2019.

²² Anatel has also collaborated with private sector stakeholders to promote responsive regulation. One example is ABR Telecom (Associação Brasileira de Recursos em Telecomunicações), the association of operators in charge of managing the technical aspects of portability, fraud, lists for consumers to block telemarketing and consultation if their identity numbers have been associated with a prepaid account (Cadastro de Pessoa Física).

²³ For more information on the survey framework, see Resolution 654 of 13 July 2015. See also: www.anatel.gov.br/paineis/consumidor/pesquisa-de-satisfacao.

²⁴ MCTIC estimated the number of such communities at 30 000 in 2017, although the criteria used for this estimate are not clearly defined in the legal act establishing the programme.

²⁵ Article 5 paragraph 1 (a) of the Ministerial Ordinance No. 7 154 of 2017.

²⁶ Two programmes support telecentres throughout the country: Telecentros.BR, launched in 2009, and the Community Telecentres programme, which started in 2014 (Decree 6 991 of 2009).

²⁷ TCU Agreement AC-1796-28/19-P.

²⁸ The seven projects include: i) high-capacity fibre backhaul networks to cover unserved municipalities; ii) high-capacity backhaul network, with any technology, where fibre optic is not financially viable; iii) 3G or more recent technology in underserved districts (i.e. 2 012 out of 4 929 municipalities, not including capitals); iv) 4G or higher infrastructure in all underserved municipalities with fewer than 30 000 inhabitants; v) expansion of last mile fibre optic infrastructure in municipalities commercially unattractive and in peripheral areas of large cities with low average internet access speeds; vi) deployment of “essential public networks”, referring to networks that serve public interest services (e.g. education, research, health, public security and defence); and vii) deployment of 3G networks or higher in motorways and underserved rural areas.

²⁹ Embedded universal integrated circuit card (EUICC). eSIMs represent the next generation of SIM technology, replacing physical cards with software capable of remotely switching a device between operators. The technology allows one device to host multiple connectivity providers and is designed for use across the whole spectrum of wireless devices, including smartphones and IoT modules.

³⁰ Some advantages of eSIMs include the simplification of global deployment logistics. A single programmable eSIM can be embedded into all IoT devices and shipped to any market in which the eSIM has a home agreement with the MNO, which would mitigate the need to use permanent roaming (Rehak and Freire, 2019^[75]).

³¹ Other countries that apply taxes and fees on activation are the Dominican Republic, Egypt, Italy, Nicaragua, and Turkey. Some – such as Italy – have made exceptions for IoT devices (GSMA, 2019^[79]).

³² The public consultation submitted in August 2019 can be found here:

<https://www.anatel.gov.br/institucional/noticias-destaque/2333-anatel-aprova-consulta-publica-para-diminuir-barreiras-a-expansao-de-iot-e-m2m-no-brasil>.

³³ http://www.abc.gov.br/training/informacoes/abc_en.aspx.

³⁴ Decree No. 9 677 of 2019.

³⁵ Art. 19 Lei Geral de Telecomunicações (LGT), Law No. 9 472/1997: “The Agency is responsible for adopting the necessary measures to serve the public interest and for the development of Brazilian telecommunications, acting with independence, impartiality, legality, impersonality and publicity, and especially:

I - implement, within its sphere of competence, the national telecommunications policy;

II - represent Brazil in international telecommunications organizations, under the coordination of the Executive Branch; [...].”

³⁶ These agreements have been signed with different countries and institutions: Russian Federation (hereafter “Russia”), Argentina, United States, Portugal, Canada, Chile, the European Commission, France, Peru, Colombia, People’s Republic of China (hereafter “China”), Ecuador, Japan, International Development Bank, The World Bank and BRICS (Brazil, Russia, India, China and South Africa).

³⁷ Recommendation D.97 of the ITU Study Group 3 of the Telecommunication Standardization Bureau of the ITU (ITU-T SG3).



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