# Reallocation of the 600 MHz band for mobile broadband in Brazil – Annex 1: International experiences

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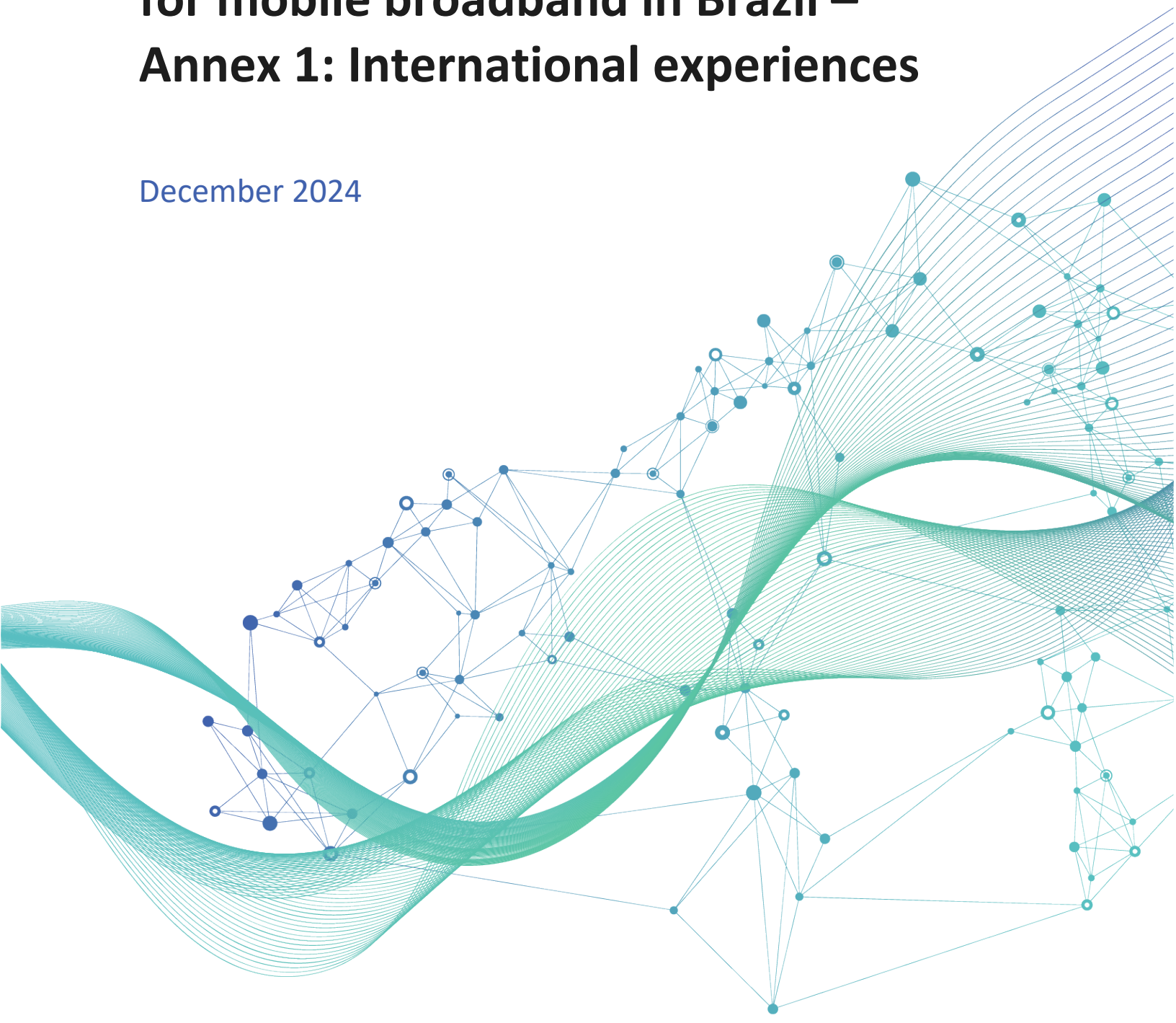

# Contents

# 1. International experiences

This annex discusses the reallocation process of the 600 MHz band and the associated lessons learned from several countries. In total, case studies from six different countries are presented including from Canada, Mexico, Saudi Arabia, the United States, Colombia, and Costa Rica.

## 1.1. Detailed existing international experiences

### 1.1.1. Canada

In Canada, Industry Canada, now Innovation, Science and Economic Development Canada (ISED), published the decision to repurpose the 600 MHz band jointly with the United States in August 2015.[1] In 2016, ISED published the transition proposal to guide the process. Both countries decided to conduct the reallocation as TV broadcasting has historically been planned jointly to maximize coverage and minimize interference. The main motivation to repurpose the spectrum band was the process conducted in the United States and the increasing demand for mobile data. ISED expected mobile data traffic to grow 9-fold from 2013 to 2018.[2]

#### 1.1.1.1. Reallocation process

ISED decided to conduct the reallocation process of the 600 MHz band in collaboration with the United States in 2015, which included adopting the U.S. band plan for the repurpose of the band. Both parties decided to designate the spectrum for flexible use for commercial mobile, fixed, and TV broadcasting services. The decision to repurpose the 600 MHz band for broadband services had to be taken jointly to ensure the availability of channels to which displaced broadcast transmitters could be reassigned.[3] If Canada would have waited for the United States to finalize the reallocation of the 600 MHz band to reallocate, ISED would have to displace Canadian OTA TV transmitters to clear spectrum for mobile services,[4] making the process more complex.

[1] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.
[2] Cisco, Cisco Visual Networking Index Mobile Forecast Highlights, 2013-2018, June 2014, http://www.cisco.com/c/dam/assets/sol/sp/vni/forecast_highlights_mobile/index.html.
[3] ISED, Decision on Repurposing the 600 MHz Band, Discussion, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.
[4] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.

As part of the reallocation process, ISED had to deal with requests from broadcasters who suggested that the government provide reimbursements to spectrum users for costs incurred in transition to different frequencies.[5] Broadcasters also suggested that the government create a fund to support local television.[6]

A key consideration for ISED and broadcasters during the transition was the possibility of offering free over-the-air (OTA) TV services from community-owned TV broadcasting services. Some broadcasters were not supportive of the reallocation process due to fears of not having sufficient space in the new allotment plan for OTA TV.[7] Other concerns included imposing limitations for future Canadian technology innovation and economic development.[8]

In the reallocation process ISED and the FCC conducted interference studies to simulate repacking scenarios and guarantee the least possible interference due to the reallocation.[9] In April 2019, Canada concluded its 600 MHz auction.

#### 1.1.1.2. Lessons learned

- **Synchronized efforts with neighbouring country**: Countries looking at reallocating the 600 MHz band should take into consideration the usage of the band by neighbouring countries and coordinate efforts, where possible, to reduce the complexity of the process, especially in bordering regions. Canada completed the process jointly with the U.S., which ensure that both parties had enough space to reallocate their channels in lower frequencies. Synchronized efforts ensured a smoother transition and reduced frictions given the dependency that existed in the band between the U.S. and Canada.
- **Effective relationship management with TV broadcasters**: The government's management of the relationship with TV broadcasters, who demanded payments and incentives for local television, was key for the success of the process.
- **Spectrum availability for TV broadcasters in lower bands**: One of the main concerns of broadcasters was the availability of spectrum for OTA TV, in line with this, ISED ensure that enough spectrum was available for all existing Canadian OTA TV stations by conducting the transition with the U.S., which took into consideration broadcasters on both sides of the border, and by allocating guard bands to ensure that the mobile and OTA TV services could be deployed free of interference. ISED proposed to ensure available channels for all operating regular power TV stations in Canada in the design objective for the new allotment plan.[10]

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[5] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band and CAB, Written Submission for the Pre-Budget Consultations in Advance of the 2019 Budget, August 2, 2018, https://www.ourcommons.ca/Content/Committee/421/FINA/Brief/BR10006820/br-external/CanadianAssociationOfBroadcasters-e.pdf.

[6] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.

[7] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.

[8] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.

[9] FCC, Analysis of Potential Aggregate Interference, June 2014, https://docs.fcc.gov/public/attachments/DA-14-677A2.pdf.

[10] ISED, Decision on Repurposing the 600 MHz Band, August 14, 2015, https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/decision-repurposing-600-mhz-band.

### 1.1.2. Mexico

In 2015, Mexico set plans to reallocate TV broadcasting services to broadband in the 600 MHz band. In October 2018, the Federal Institute of Telecommunications (IFT) announced that it had completed the release of the 600 MHz band for 5G mobile internet services.[11] According to the IFT, 151 television channels that operated in the 600 MHz band were relocated through various resolutions that were approved by the Plenary since 2015.[12] The reallocation of the 600 MHz opened up a second digital dividend in the country, allowing for mobile broadband services.

#### 1.1.2.1. Reallocation process

Mexico conducted steps since 2013 that resulted in an efficient and smooth transition of the 600 MHz band for broadband services. In 2013, Mexico started its analogue switch off and concluded the process in 2015. This first digital dividend liberated the 700 MHz band for broadband services.[13] With the reallocation process completed in the 700 MHz band, Mexico continued with its ambitions to liberate spectrum for IMT services. In 2015, Mexico started the process to reallocate TV broadcasting services in the 600 MHz band to lower frequencies. The process started with the approval of the National Frequency Allocation Plan (NFAP) in October 2015, which identified the second digital dividend in the 600 MHz band and did not include TV broadcasting among the assigned services for the band.[14] Since 2016 the IFT assigned new TV channels to the 470-608 MHz band, instead of assigning them to the 600 MHz band.[15] This early decision to license TV channels to lower bands allowed the IFT to focus on reallocating TV channels that operated in the band pre-2016. The IFT conducted the process by approving a series of resolutions to change bands for TV broadcasters.

#### 1.1.2.2. Lessons learned

- **Regulator's forward planning**: The vision of the Mexican regulator was crucial for starting and completing the reallocation process of the 600 MHz band. As early as 2012, the former Federal Telecommunications Commission (COFETEL) recognized the band's potential for IMT services. Additionally, since 2015, the IFT has taken steps, such as designating the 600 MHz band for mobile services in the NFAP, which facilitated the smooth transition of TV broadcasters to lower UHF frequency bands.
- **Streamlining the 600 MHz band reallocation through license suspension for TV broadcasting services in the band**: Once the IFT decided to initiate the reallocation process for the 600 MHz band, it chose to suspend licenses for new channels in that band. This decision enabled a faster

[11] IFT, El IFT culmina proceso de liberación de la banda de 600 MHz, October 7, 2018, https://www.ift.org.mx/sites/default/files/comunicacion-y-medios/comunicados-ift/comunicadoliberacionbanda600mhz.pdf.
[12] IFT, México se convertirá en el primer país del mundo en liberar la banda de 600 MHz para 5G, March 19, 2018, https://www.ift.org.mx/sites/default/files/comunicacion-y-medios/comunicados-ift//comunicadoift0252018.liberacionbanda600mhz.pdf.
[13] IFT, Estudio de Métricas de Eficiencia Espectral, November 3, 2015, https://www.ift.org.mx/sites/default/files/estudio_de_metricas_de_eficiencia_espectral.pdf.
[14] SEGOB, Acuerdo mediante el cual el Pleno del Instituto Federal de Telecomunicaciones aprueba el Cuadro Nacional de Atribución de Frecuencias, October 20, 2015, https://www.dof.gob.mx/nota_detalle.php?codigo=5412101&fecha=20/10/2015#gsc.tab=0.
[15] IFT, Estudio de Métricas de Eficiencia Espectral, November 3, 2015, https://www.ift.org.mx/sites/default/files/estudio_de_metricas_de_eficiencia_espectral.pdf.

transition, as only TV channels operating in the band before 2016 needed to transition, while new channels were assigned to lower UHF frequency bands.

### 1.1.3. Saudi Arabia

In 2020, the Communications, Space and Technology Commission (CST) published its National Spectrum Strategy 2020-2025, in which they included the monitoring of international discussions regarding the 600 MHz band and considering repacking ultra-high frequency (UHF) digital television (DTV) distribution to achieve more efficient spectrum use.[16] The CST set this objective considering the decreasing popularity of TV broadcasting services. By 2021, only 1% of all households viewed terrestrial broadcast signals.[17]

#### 1.1.3.1. Reallocation process

The CST indicated in 2021 its plan to reallocate the 600 MHz band from TV broadcasting services to broadband services to auction the spectrum together with frequencies in the 700 MHz band. The CST took the decision to adopt the North American band plan (i.e. B71, n71) as it offered an established mobile ecosystem.[18] The CST coordinated efforts with the Ministry of Media, General Commission for Audiovisual Media and with the Saudi Broadcasting Authority (SBA) to conduct the reallocation as smoothly as possible. The CST also conducted discussions on cross-border interference with neighbouring countries, who continued to use the band for TV broadcasting services. Considering that spectrum in the 600 MHz band was not largely occupied by TV broadcasting services, the transition was smooth. CST considered adopting payment terms to clear the band. In October 2023, the CST conducted the 5$^{th}$ spectrum auction for IMT services, including spectrum in the 600 MHz band.[19]

#### 1.1.3.2. Lessons learned

- **Occupancy of the 600 MHz band:** By 2021, only 1% of households viewed terrestrial broadcast signals, indicating a low occupancy of the 600 MHz band. This benefited the reallocation process, making it smooth and quick as not many TV broadcasting services needed to be reallocated to lower bands. Although not all countries have the advantage of having low occupancy of the band, countries can take actions to avoid further occupancy of the band. Regulators could allocate new licenses for TV broadcasting services to the 470-608 MHz band.
- **Coordination with regulators:** CST conducted the reallocation process in close collaboration with other regulators in the sector, including the Ministry of Media, General Commission for Audiovisual Media and with the Saudi Broadcasting Authority (SBA). The coordination among all the regulators involved in the TV broadcasting and telecommunication sectors benefit the process and ensures close collaboration and synchrony among the different public actors.

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[16] CST, National Spectrum Strategy 2025, 2020, p.14, https://www.cst.gov.sa/ar/services/spectrum/Documents/National%20Spectrum%20Strategy_E.pdf.
[17] CST, Spectrum needs and usage for WRC-23 Agenda item 1.5, February 22, 2021, p.3, https://www.cst.gov.sa/ar/services/spectrum/Documents/spectrum_needs_and_usage_for_wrc-23_agenda_item_1.5.docx.
[18] CST, Spectrum Outlook for Commercial and Innovative Use 2021- 2023, March 2021, p. 40, https://www.cst.gov.sa/en/ntn/Documents/doc1.pdf.
[19] CST, CST announces the 5th Spectrum Auction for IMT Networks on the 16th of October 2023, September 16, 2023, https://www.cst.gov.sa/en/mediacenter/pressreleases/Pages/2023091602.aspx.

### 1.1.4. United States

In September 2012, the Federal Communications Commission (FCC) launched its incentive auction process to repurpose spectrum allocated for TV broadcasters in the 600 MHz band, for the use of mobile broadband. The auction was conducted in 2017. In July 2020, the FCC announced that its post incentive auction transition successfully met its deadline for TV broadcasters to move from their pre-auction channel assignments.

#### 1.1.4.1. Reallocation process

The FCC process to reallocate TV broadcasting services from the 600 MHz band to lower UHF bands included:

- A reverse auction where broadcast television licensees would submit bids to relinquish spectrum usage rights in exchange for payments;
- A reorganization of the bands to free up a portion of the ultra-high frequency (UHF) band for other uses; and
- a forward auction of initial licenses for flexible use of the newly available spectrum.

As of 2020, the 600 MHz band was being used to provide wireless services including 5G across the country. To make the 600 MHz band available for mobile broadband use, 987 full power and Class A TV stations were reassigned to new TV channels. The FCC created a 10-phase transition plan that helped with interference issues, limited resources and seasonal constraints amongst other factors that helped make the spectrum band available for broadband services. Accordingly, as per the FCC, 99% of the 987 repacked TV stations transitioned off their pre-auction channels.

#### 1.1.4.2. Lessons learned

- **Managing political resistance from TV broadcasters**: TV broadcasters initially rejected the option to move to lower UHF bands. In response to this pushback, the FCC passed a law allowing TV broadcasters to seek compensation through an auction for relinquishing their spectrum in the 600 MHz band. In the reverse auction, 175 broadcasters auctioned their 600 MHz spectrum for a total of USD 10 billion. Although an incentive auction is not a process that every country must conduct to free up the 600 MHz band, countries undertaking the transition should find effective ways to manage their relationships with TV broadcasters to ensure their commitment to the process. In this case, the U.S. had to develop a complex process, but other alternatives exist that countries should consider. Effectively managing relationships with TV broadcasters is key to the success of the reallocation process.
- **Auction complexity and administrative costs**: The reallocation process in the U.S., involving both a reverse and forward auction, was complex and costly. The FCC incurred significant administrative expenses and undertook a thorough design process for the auction rules. Additionally, the auction only succeeded in freeing 70 MHz out of the targeted 120 MHz. Countries should consider the complexity of the process and find the most effective approach to make the transition.

### 1.1.5. Colombia and Costa Rica

During WRC-15, Colombia was the only country in South America that identified the 614-698 MHz frequency range for IMT. After this identification, the Colombian administration conducted technical studies of the parameters and measurement techniques required to identify possible interference cases between IMT networks and TV broadcasting. Seven years after Colombia identified the 614-698 MHz

frequency range for IMT, Costa Rica started the process to reallocate the 600 MHz band for broadband services.

#### 1.1.5.1. Reallocation process

In 2017, in Colombia, through Resolution 450, the National Spectrum Agency (ANE) incorporated mobile services in the 600 MHz band along with TV broadcasting services.[20] Regardless of the early identification of the potential of the 600 MHz for broadband services, Colombia has not completed the reallocation of the 600 MHz band from TV broadcasting services to mobile broadband services due to delays on the analogue switch off process.

In Costa Rica in November 21, the Superintendency of Telecommunications (SUTEL) made recommendations to allocate the 174 to 216 MHz bands for TV broadcasting services and to eliminate the assignment of the 614 to 698 MHz band for TV broadcasting services. It also recommended the modification of regulation to define the second digital dividend to assign the 614 to 698 MHz band for IMT services.[21] In August 2024, the Ministry of Science, Innovation, Technology, and Telecommunications (MICITT) published an analysis of SUTEL's proposal to modify the NFAP, to amendment the allocation of bands for TV broadcasting services and IMT services. In this document the MICITT incorporated the recommendations made by the SUTEL for the 600 MHz band and proposed changes to the regulation to allocate the band for broadband services.[22] The next step in the process is for the Presidency to promulgate the decree to amend the NFAP.[23]

#### 1.1.5.2. Lessons learned

Even though Colombia and Costa Rica have not finalized the reallocation of the 600 MHz band from TV broadcasting services to broadband services, their case studies offer a couple of lessons for countries that are planning to conduct the reallocation.

- **Analogue switch off**: Countries that are looking at conducting the reallocation process of the 600 MHz band for broadband services need to consider previous steps that are required to guarantee the success of the reallocation. Delays in the analogue switch off have an impact on the reallocation process of the 600 MHz band. Brazil has completed the analogue switch off which offers an advantage in the reallocation process of the 600 MHz band.
- **Amendments to the NFAP**: The NFAP is the roadmap for spectrum allocation in a country. To guarantee the deployment of IMT services in the 600 MHz band, regulators need to conduct consultations and amend the NFAP. This step is mandatory in the process and ensures clarity and consistency in the spectrum management process.

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[20] ANE, Resolución 450, July 27, 2017, https://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=70272&dt=S and ANE, Documento de Consulta Pública sobre las Bandas De Frecuencia para 5G en Colombia, April 2019, p. 28, https://www.ane.gov.co/Documentos%20compartidos/ArchivosNoticias/20190401_Consulta_Publica_5G_ANE_Colombia.pdf.

[21] SUTEL, Resultado de consulta pública y propuesta de dictamen técnico de necesidad y factibilidad para un eventual proceso concursal para servicios de radiodifusión sonora y televisiva, November 21, 2023, p. 31, https://www.sutel.go.cr/sites/default/files/09904-SUTEL-DGC-2023%20CONSEJO%20Estudios%20previos%20subasta%20radiodifusio%CC%81n.pdf.

[22] MICITT, Análisis de la propuesta de la SUTEL para la modificación parcial del PNAF, en los servicios de radiodifusión sonora, televisiva e IMT, August 1, 2024, p. 18, https://www.micitt.go.cr/sites/default/files/transparencia/consulta-publica/MICITT-DERRT-DAER-INF-168-2024%20Propuesta%20modificacio%CC%81n%20parcial%20PNAF%20-%20firmado.pdf.

[23] MICITT, Decreto Ejecutivo para reforma parcial del PNAF, August 23, 2024, https://www.crhoy.com/wp-content/uploads/2024/08/Decreto_Ejecutivo_Reforma_Parcial_PNAF_Radiodifusion_vFinal.pdf.