520 MHz to 5 GHz band pricing review
Consultation paper

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Executive summary

This consultation paper outlines the ACMA's review of apparatus licence tax settings in the 520 MHz to 5 GHz frequency range and presents proposed reforms to better align pricing with the efficient use of spectrum.

Following implementation of the Spectrum Pricing Review (SPR), we committed to periodically reviewing spectrum pricing to ensure it remains fit-for-purpose. We propose a congestion pricing model that links tax settings to a new 'congestion' metric, which attempts to unitise spectrum utilisation and capacity. Under this model, prices are calibrated against a target congestion range of 75–85%, with price adjustments applied where congestion falls outside this range. This approach is intended to better reflect the opportunity cost of spectrum by encouraging greater use where spectrum is underutilised and moderating demand where congestion increases the likelihood of spectrum denial.

Our analysis indicates that congestion varies significantly across bands and locations, with most locations exhibiting relatively low to moderate congestion. As a result, we propose a range of targeted reductions in apparatus licence tax rates via a proportional reduction in location weights across the 520 MHz to 5 GHz bands, with no increases proposed (see Table 1).[1] These adjustments are designed to improve price signals while maintaining consistency with our pricing principles, including efficiency, simplicity and transparency.

Table 1: Proposed percentage changes to location weights

Spectrum location	Geographic location			
	High density	Medium density	Low density	Remote density
520 MHz to 960 MHz	0%	-36%	-45%	-89%
960 MHz to 2.69 GHz	-13%	-10%	-14%	-39%
2.69 GHz to 5.0 GHz	-10%	-18%	-30%	-34%

In developing this model, we have considered stakeholder feedback on earlier work, particularly the need to move beyond demand-only metrics and to consider broader pricing relativities across bands. While some stakeholders supported more substantial or service-specific pricing changes, our proposal adopts a consistent and gradual approach, recognising uncertainty in how users respond to price changes and the potential for unintended consequences.

[1] Most apparatus licence tax rates are governed by the administrative pricing formula. A key part of this formula is the location weights, which are intended to reflect the density of services and demand for spectrum at different frequencies and geographic areas. More detail about the formula is found at Appendix C of the Apparatus licence fee schedule.

We are seeking stakeholder views on the proposed congestion pricing model, the underlying assumptions and methodology, and the resulting proposed price changes. Subject to consultation outcomes, we intend to implement any finalised changes and monitor their effects over time. This will allow us to refine the approach, assess whether congestion moves towards target levels, and consider its application to other spectrum bands in future reviews.

Issues for comment

We invite comments on the issues set out in this paper:

1. Do you consider the target congestion range is appropriately defined? If you consider a different target more appropriate, please present evidence and your reasoning to support your view.
2. Do you consider the congestion pricing formula is appropriately defined? If you consider a different formula more appropriate, please present evidence and your reasoning to support your view.
3. Do you have any feedback on how we have defined the key metrics and the scope of the analysis?
4. Is our approach to unitising congestion conservative enough? Is it too conservative? Are there aspects of the measurement that should be included that aren't?
5. Does the supplementary analysis appropriately incorporate broader pricing considerations beyond the primary congestion analysis?
6. Do our measurements of congestion correlate with your experiences of accessing spectrum in the selected bands and areas?
7. Have you experienced spectrum denial when applying for point to point (900 MHz STL) licences? Are there other areas/bands/use cases where you have experienced denial to help us validate our analysis?
8. Is there an economic justification for STLs to be taxed differently compared to other point-to-point licences (especially in the 845 MHz to 849 MHz range)? Can you provide reason why we may want to continue taxing STLs at a lower rate of tax than other fixed services?
9. Do you have any other feedback on the congestion analysis?
10. Given the congestion analysis presented in the previous section, do you consider the proposed price changes appropriate?
11. Is our local revenue benchmark approach a reasonable way to estimate opportunity cost and set Australia-wide prices? Do you have any other feedback on the potential Australia-wide pricing approach?
12. Do you have any views on the proposed approach to implementation, monitoring and future review of pricing in the 520 MHz to 5 GHz band? In particular, is the proposed monitoring period appropriate, and are there additional indicators the ACMA should consider?
13. Do you have any other feedback on the pricing models and the reforms we are proposing?

Introduction

Following the conclusion of our implementation of the Spectrum Pricing Review (SPR) in 2022, we committed to conducting periodic pricing reviews for frequency bands to assess whether apparatus licence tax rates remained appropriate and whether any changes would enhance efficiency of spectrum allocation and use.

Our first band pricing review since SPR implementation concluded was for the 2.69 GHz to 5 GHz band in 2025 (the October 2025 consultation paper). We reviewed this band by looking at licence and assignment trends, and bandwidth consumption. We noted that the analysis at the time indicated that increasing demand for spectrum had largely occurred in 3.4 GHz to 4.0 GHz, which is predominantly made up of spectrum licences and area-wide licences (AWLs), and therefore not subject to the pricing arrangements that we are reviewing. General apparatus licence and assignment trends that were apparent in our demand analysis of the 2.69 GHz to 5 GHz band did not provide compelling evidence to implement any price changes.

We subsequently broadened the review scope to 520 MHz to 5 GHz to better consider the relativities between location weightings across different spectrum locations.[2]

This consultation paper discusses and seeks feedback on the review of prices in the broadened 520 MHz to 5 GHz frequency range. We first discuss a new approach to adjusting prices – our proposed ‘congestion pricing model’, which explains why and how we might adjust prices based on measures of congestion. We define congestion (refined from the ‘spare bandwidth’ measure mentioned in the October 2025 consultation paper) and describe our congestion analysis methodology. We then explain the congestion analysis, which leads into the discussion about proposed pricing reforms in the band.

While we are not proposing pricing reforms for Australia-wide licences in this consultation paper, we have been considering how we could incorporate similar analytical principles in future. Australia-wide licences are not directly linked to specific geographic areas and therefore cannot be assessed using our location-based congestion metric. This paper outlines a potential approach that benchmarks the price of Australia-wide licences against the opportunity cost reflected in local-area licence pricing.

Background and policy objectives

The SPR was published in February 2018 and its implementation concluded in 2022. SPR implementation involved delivering a number of microeconomic reforms to address the SPR’s recommendations and to improve the efficient allocation of spectrum.

We implemented 2 tranches of pricing reforms following the SPR. The first tranche (July 2021) included reforms such as reducing taxes for apparatus licences above 5 GHz by 50% to 90%, while the second tranche (August 2022) included reforms such as lower tax rates for certain high-power open narrowcasting services.

Some of the SPR recommendations, including recommendations 7 and 8 outlined below, require ongoing implementation.

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2 See Appendix C of the Apparatus licence fee schedule.

SPR recommendations and guiding principles

Recommendations 7 and 8 of the SPR specify that:

- The ACMA should implement regular updates to the location and band weightings to reflect changes in density, demography and demand.
- We should apply opportunity cost pricing to a greater number of spectrum bands, especially where it is impractical to competitively allocate spectrum. This work should be identified in the ACMA's annual work program. We should consider more time-effective approaches to implement these, and review fees as market conditions change over time.

We address these recommendations in this band pricing review. We consider changes in density, demography and demand across multiple bands through our demand analysis, while we consider any pricing adjustments in the context of opportunity cost principles.

We also consider pricing arrangements and potential price changes with reference to 5 guiding pricing principles we established during SPR implementation, which are detailed further at Appendix A. These are:

- efficient allocation and use of the radiofrequency spectrum
- consistency and simplicity
- flexibility and adaptability to technology change
- transparency in process
- recovery of the costs of spectrum management.

We note that these principles are consistent with the way that the ACMA manages spectrum under the object of the *Radiocommunications Act 1992*:

> The object of this Act is to promote the long-term public interest derived from the use of the spectrum by providing for the management of the spectrum in a manner that:
>
> (a) facilitates the efficient planning, allocation and use of the spectrum; and
> (b) facilitates the use of the spectrum for:
>
> (i) commercial purposes; and
> (ii) defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes); and
>
> (c) supports the communications policy objectives of the Commonwealth Government.

In conducting this pricing review and developing pricing proposals, we have also considered the Radiocommunications (Ministerial Policy Statement – 3.4-4.0 GHz).

Scope of the 520 MHz to 5 GHz band pricing review

The 520 MHz to 5 GHz band is a wide range of spectrum authorised by spectrum licences and apparatus licences (including AWLs). The purpose of this band pricing review is to review the location weightings that feed into the administrative pricing formula for apparatus licence taxes, as outlined in Appendix C of the Apparatus licence fee schedule.

This means that prices for apparatus licences subject to $/kHz tax rates in high, medium, low and remote-density areas are *in scope*.[3] In contrast, the following licence tax arrangements are *out of scope*:

- **AWLs –** applications for AWLs in the 3.4 GHz to 4 GHz frequency range occurred during allocation window processes and would have been made on the basis of extant pricing arrangements. We do not consider it appropriate to propose any changes to AWL tax rates in this band within such short time after these application processes were completed. However, we may consider tax rate changes in the future.
- **Non-commercial broadcasting apparatus licences between 520 MHz to 700 MHz –** spectrum for these services is provisioned under the *Broadcasting Services Act 1992*, and the related transmitters are subject to the minimum annual apparatus licence tax (currently $44.75) per transmitter. Changes to the administrative pricing formula are therefore not relevant.
- **Commercial broadcasting services –** transmitter licences associated with a commercial broadcasting licence are not subject to apparatus licence tax. They are subject to the commercial broadcasting tax.
- **Most public mobile telecommunications service (PMTS) licences –** PMTS services that are subject to $/MHz/pop taxes are not subject to the administrative pricing formula.
- **Scientific licences –** we are excluding the scientific licence data from the analysis because these licences are short-lived and transitory, but any proposed changes to location weightings will still feed through to scientific licence taxes.
- **Television outside broadcast network or system –** we note that these TOB tax rates are fixed annual taxes that are derived from underlying inputs in the administrative pricing formula. However, these are out of scope given that this licence type is subject to the ACMA's preferred views on pricing for expiring spectrum licences.
- **Spectrum licences –** these are not apparatus licences and are not subject to this review.
- **Class licences –** these are not apparatus licences and are not subject to this review.

Preliminary considerations for Australia-wide licence pricing

Australia-wide prices are out of scope of this review. However, we are considering how we can incorporate opportunity cost principles into Australia-wide prices using the analytical approach set out in this paper. We seek comments on our preliminary thinking on this issue, set out later in this paper.

Updated approach to band analysis – measuring congestion

In the October 2025 consultation paper, we presented a demand analysis for the 2.69 GHz to 5 GHz band, which looked at how bandwidth consumption patterns changed over time. We have updated that analysis and present it in Appendix B.

Limitations of demand analysis

While stakeholders found the demand analysis to be useful, we concluded that we lacked sufficient evidence to propose price reforms based on these trends alone. The demand analysis was useful for determining market trends and highlighting areas for further

[3] The density areas are defined in Appendix F of the Apparatus licence fee schedule.

investigation. However, we also want to consider the relative availability of spectrum when determining appropriate price settings.

For example, we found overall demand for spectrum increased in remote-density areas in the 2.69 GHz to 5 GHz band. However, demand started from a low base, and spectrum use geographically separated over great distances does not necessarily reflect materially higher spectrum denial and therefore opportunity cost. There would not be sufficient evidence to propose a price change unless we also knew the geographic concentration of the demand and the relative availability of spectrum within those geographies.

We concluded the 2.69 GHz to 5 GHz band pricing review by considering measuring the level of ‘spare bandwidth’, which is a measurement of unallocated bandwidth in a specific geographic location, as a way for determining the relative supply of spectrum available in areas. However, we consider that we need to refine this further to provide better comparability of demand analysis between different spectrum bands.

Unitising spectrum supply and demand with a congestion metric

To gather further evidence, we continued to refine our analysis methodology into a general comprehensive measurement of supply and demand within different geographic locations, with the aim of taking into account:

- The utilisation and relative availability of spectrum.
- How spectrum is used within different locations and bands.
- The technical and regulatory limits of each use of spectrum.
- The goal of keeping an amount of spectrum available for new uses while also allowing for a high rate of spectrum utilisation.
- Real world market data for the purposes of monitoring use trends on an ongoing basis to keep prices relevant.

We have developed a ‘congestion’ metric to address each of these elements, which is an evolution of the spare bandwidth metrics discussed in the October 2025 consultation paper.

Paper outline

The rest of this paper is structured as follows:

- Approach to reviewing formula-based apparatus licences prices: this section includes the proposed congestion pricing model, a discussion about why we want to calibrate prices using the proposed congestion metric, and how we propose to adjust prices using the congestion metric. It also discusses the methodology for measuring and analysing congestion, including how the primary analysis and supplementary analyses work.
- Congestion analysis: includes the congestion analysis for the 520 MHz to 5 GHz band, using the approach discussed in the previous section.

- Proposed pricing reform: brings together the proposed congestion pricing model and congestion analysis to form the pricing proposals for the 520 MHz to 5 GHz band. This section focuses on price reform proposals in the high, medium, low, and remote-density areas stemming from the congestion analysis. It also includes some preliminary thinking about how we could adjust Australia-wide prices in future.
- Next steps: discusses the expected timeframes for our response following the close of submissions. It also outlines how we might implement price reforms stemming from this consultation, and raises our intent to monitor and review the congestion pricing model in future.

Approach to reviewing formula-based apparatus licence pricing

Spectrum denial implies an opportunity cost imposed on a prospective licensee who must seek an alternative arrangement.[4] When we set apparatus licence tax rates, we seek to price in the opportunity cost imposed by spectrum denial so that spectrum is being put to its most efficient allocation and use. To determine the extent of spectrum denial, we calculate 'congestion', which effectively measures the relative risk that a prospective licensee will be denied access to spectrum.

Congestion pricing model

We have previously used demand analysis to help inform price. However, previous demand analysis did not incorporate the relative availability of spectrum (spectrum supply) to meet this demand. In this review, we integrate spectrum supply via a congestion metric to provide a holistic basis for making price changes. We describe the congestion metric in detail later in the congestion analysis methodology section.

Congestion is important for pricing because we can use it as a proxy for opportunity cost and inform how we can set more efficient prices. High congestion indicates a higher risk of spectrum denial and higher opportunity cost. Alternatively, when congestion is relatively low, we also expect opportunity cost to be low.

To adjust prices with respect to congestion findings, we are proposing a congestion pricing model that involves a 2-step process:

- A 75–85% 'target congestion' range within which we propose prices remain unchanged.
- A proportional increase (or decrease) in prices when congestion exceeds (or is below) the target congestion range, with proposed adjustments seeking to guide congestion towards 80% (the mid-point of the 75–85% range).

The goal of the congestion metric is to unitise spectrum utilisation and capacity to model spectrum demand and supply. The congestion metric allows us to propose pricing changes that lead toward a market clearing spectrum price at a set level of target congestion. This metric is not an attempt to perform an engineering scale assessment of spectrum usage, but a broader approximation of the relative difficulty of finding spectrum available for an assignment in representative locations.

Target congestion range

The goal of the 75–85% target congestion range is to promote spectrum use while limiting excessive risk of spectrum denial caused by high congestion. The target should be set at a rate just below the inflection point where denial will more readily materialise with further congestion. Observations in this review show congestion has risen as high as 78%.[5]

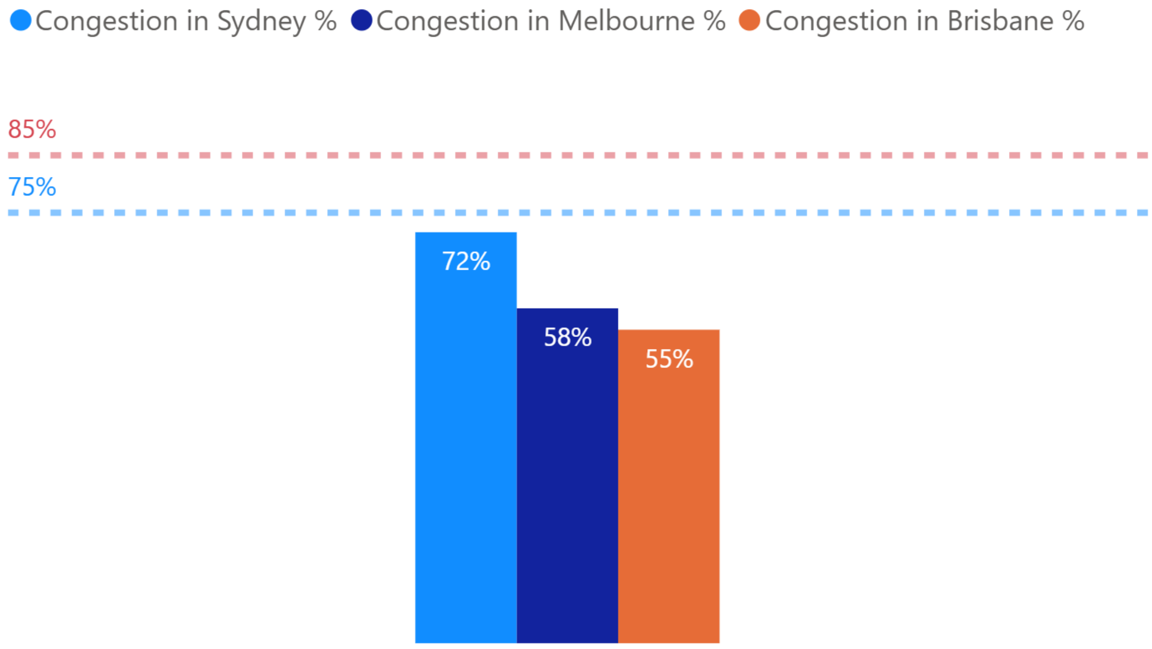
[4] Opportunity cost is the cost that is associated with the forgone benefit of the next best option. In the context of radiocommunications, the opportunity cost is the benefit of the next best use of that spectrum.
[5] Perth in the 2.69 GHz to 5 GHz band had reached 76% congestion in 2018.

The range has been adapted from a similar set of congestion parameters established by Hong Kong's Communications Authority (HKCA).[6] The HKCA has a 75% occupancy threshold for moving away from cost recovery charges and introducing price signals to help manage demand.[7] Our proposal of a 75–85% target congestion range differs from the HKCA's occupancy threshold to reflect local policy circumstances. We do not need a trigger to introduce price signals, as we already have price signals above cost recovery in place. Rather, we are seeking to fine tune existing prices, which makes proportional adjustments appropriate. The 75–85% range (rather than a single discrete target) recognises that benign fluctuations in congestion will occur from time to time without necessitating price changes.

We note that the target range can be broadened to make the congestion pricing model more tolerant of fluctuations in congestion around the target. Conversely, the range can also be narrowed to make the model more responsive to fluctuations in congestion, but may result in more price changes if congestion oscillates above and below the target range.

Figure 1 below shows how the target congestion range could be used in high-density areas in the 2.69 GHz to 5 GHz band (75% and 85% thresholds are illustrated). The highest level of congestion in high-density locations is 72% in Sydney. Because this sits below the target congestion range, we would propose a price decrease in line with the congestion pricing formula described below, subject to supplemental trend and use case analysis.

Figure 1: Congestion in high-density areas in the 2.69 GHz to 5 GHz band



[6] Joint Statement of the Communications Authority and the Secretary for Commerce and Economic Development, Review of Charging Scheme for Spectrum Utilization Fee for Spectrum Assigned Administratively, 8 December 2023, p 10.
[7] Incentive pricing of radio spectrum, often termed Administered Incentive Pricing (AIP), is a method for setting spectrum licence fees designed to promote economic efficiency (normally by reflecting the opportunity cost of the spectrum), rather than just recovering administrative costs.

Congestion pricing formula

When congestion is below 75% or above 85%, we intend to form pricing proposals as defined by the formula:

$$\boldsymbol{Price\ change}\ (\%) = \frac{\boldsymbol{Congestion - 80}}{\boldsymbol{80}}$$

In this formula, congestion is the highest congestion figure for the density area, and 80% is used as the desirable congestion target. The probability of spectrum denial increases exponentially as 100% congestion is approached, so the 80% target reasonably balances spectrum utilisation, and the need for spectrum being available for new licensees.

This congestion pricing formula adjusts the price proportionally based on the distance from 80% congestion. The midpoint of the 75–85% range (80%) is chosen as the point to adjust towards, to mitigate the risk of making an over or under-adjustment.

A price increase is intended to reduce congestion by shifting demand to other bands/locations with lower congestion, or alternative communication methods. In contrast, a price decrease is intended to stimulate the useful employment of spectrum that is otherwise unoccupied, thus allowing congestion to rise.

In the case of Figure 1, we would use the Sydney congestion measure of 72% in the formula:

$$Price\ Change\ (\%) = \frac{72 - 80}{80} = \frac{-8}{80} = -10\%$$

This means that we would consider a price *reduction* of 10% for high-density areas in 2.69 GHz to 5 GHz band.

In the case of congestion above the target congestion range, such as 90%, this formula would compute a tax rate *increase* of:

$$Price\ Change\ (\%) = \frac{90 - 80}{80} = \frac{10}{80} = 12.5\%$$

When constructing this formula, we have assumed that the price elasticity of demand (the responsiveness of licensees to price changes) is unit elastic, equal to -1. This means that reductions in price will have an equal increase in demand in percentage terms. This is unlikely to occur in practice, as it is more likely for spectrum demand to be relatively inelastic (meaning less responsiveness to price changes).[8] Assuming elasticity equals -1 allows for a sensible approach to price adjustments, as it is less likely for congestion to overshoot the target. Following initial implementation, we may adjust the sensitivity of the formula to make each price adjustment more effective towards reaching the 80% target if we observe the change to be insufficient.

[8] Elasticity is influenced by several factors including the availability of substitutable products, sunk costs of existing infrastructure and the proportion of annual tax compared to other costs. Due to annual licence fees being only a portion of the cost of operating radiocommunications equipment, we generally expect elasticity to be relatively low.

While our proposed method is novel in its proportional adjustment, there are other additional international precedents. Similar to the HKCA, the UK's Ofcom defaults to cost-recovery pricing and introduces incentive pricing when bands become congested, but without a defined congestion threshold.

You can find further details in the international approaches to administrative spectrum pricing paper found in the key documents section of this consultation.

Question 1

Do you consider the target congestion range is appropriately defined? If you consider a different target more appropriate, please present evidence and your reasoning to support your view.

Question 2

Do you consider the congestion pricing formula is appropriately defined? If you consider a different formula more appropriate, please present evidence and your reasoning to support your view.

Iteration of price adjustments

If we proceed with this pricing approach following consultation, we intend to continue to monitor congestion to determine if any further price changes may be needed based on the 75–85% target congestion range, with the potential to iterate this process until congestion is contained within the 75–85% range, or to potentially reduce annual tax to the minimum value should no congestion manifest in low congestion areas. Once congestion is within the target range, we expect our pricing structures to be a better approximation of opportunity cost.

We recognise that we would need to wait some time to allow for the market to react to price adjustments, and currently think that reviews/price iterations should occur every 2–3 years.

Congestion analysis methodology

This section defines key concepts regarding congestion in the 520 MHz to 5 GHz band before using this metric to propose pricing reforms.

Below we explain how we measure and analyse congestion in the 520 MHz to 5 GHz band, with inputs taken from assignment and licence data between 2018–2025 into a selection of indicators for key areas.

First, we define the following key metrics to measure the rate of congestion:

- *Occupation*, which is the amount of spectrum employed within a local area
- *Spectrum supply*, which is the amount of spectrum made available for assignment.

From these metrics, we can calculate *congestion* to be occupation as a percentage of spectrum supply. We use congestion as the main metric for 3 separate analyses:

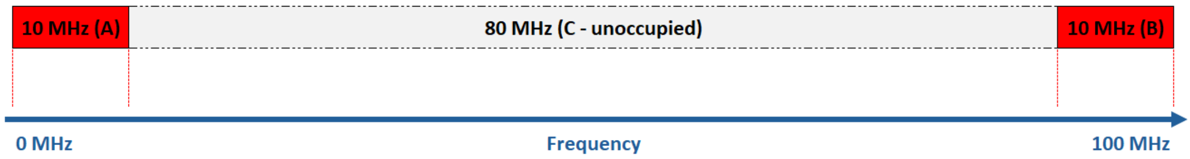
- Primary analysis: congestion in key locations
- Supplementary analysis: Congestion within use cases
- Supplementary analysis: Congestion trends.

Following this analysis, we use these findings to develop pricing reform proposals. We propose an approach that measures the gap between the current congestion rate and the target congestion rate, subject to various policy considerations, to reduce/increase tax rates proportionally to the size of the gap. Policy considerations should be incorporated alongside this assessment when forming pricing reform proposals.

Key metrics

The metrics used to calculate congestion are visualised in Figure 2.

Figure 2: Visual representation of 3 key metrics – occupation, spectrum supply and congestion



The metrics include:

- **Occupation.** This is the bandwidth in use by the licensee(s) within a particular area and therefore made unavailable for other potential users. This is represented by the red bars 'A' and 'B' in Figure 2, resulting in a total of 20 MHz of spectrum being occupied.
- **Spectrum supply.** This is the frequency range made available by the ACMA that could be used by a set of use cases. In Figure 2, this represents the entire frequency shown, which is a total of 100 MHz.
- **Congestion.** This measures how 'crowded' a band is by measuring how much of the band is occupied relative to spectrum supply. In Figure 2, there is 20 MHz occupied out of a total spectrum supply of 100 MHz, so congestion equals 20% (20 MHz / 100 MHz). It is this metric that will help determine whether pricing adjustments are required.

Considerations when measuring spectrum supply

Spectrum supply is the amount of spectrum that could be available for use in an area. While we could simply measure the amount of spectrum in a band (e.g. 440 MHz in the 520 MHz to 960 MHz band), we believe this approach may not capture real world limitations on spectrum supply. For example, if spectrum has been purposefully made vacant for replanning or guard band purposes, then this spectrum would not be truly available.

We have taken the approach that spectrum is only available to use in a location if it is in use somewhere in Australia. When we aggregate the frequency ranges for all current assignments across all areas, this maps out an estimation of spectrum supply. We account for spectrum sharing by only counting each unit of bandwidth once when the same bandwidth is allocated to multiple use cases.

The key limitation of this approach is that we may not recognise spectrum that is available but not in use anywhere. However, we would expect this effect to be negligible in the context of this band pricing review, and consider that a measure of supply that has a slight bias towards a lower supply estimation is manageable and reduces risk of spectrum denial. We believe any completely unoccupied spectrum will be utilised if we iteratively adjust prices over time.

Scope of analysis adjustments

When measuring congestion, we only measure the congestion of assignments that are within scope of the apparatus licence tax. The licences in scope include:

- most transmitter licences (exclusions are mentioned below)
- receiver licences where apparatus licence taxes apply, including those authorised by the following receive licence types:
  - defence receive
  - earth receive
  - major coast receive
  - fixed receive
  - space receive.

We have 2 methods of adjusting licences outside of this scope depending on whether that licence shares spectrum with these in-scope uses or not.

For assignments that share spectrum[9] with apparatus licences but are not taxed on an administrative pricing formula basis, we need to:

- factor in the congestion impact these assignments have on shared spectrum
- recognise that the apparatus licence tax formula cannot affect demand for these licences.

We first measure occupation with them included, and then remove their impact by subtracting the occupation created in a local area by that service from the numerator (occupation) and the denominator (spectrum supply). These types of licences include:

- spectrum licence assignments
- AWL assignments
- PTS assignments.

For example, if in each area a spectrum licence occupied 60 MHz and an apparatus licence occupied 40 MHz out of a total supply of 200 MHz, then congestion would equal (100 MHz - 60 MHz) / (200 MHz - 60 MHz) = 40 MHz / 140 MHz = 28.6%. This result reflects the utilisation of the actual amount of spectrum available to apparatus licences.

We exclude assignments that do not create denial for apparatus licence use, or where the spectrum is not shared with apparatus licences, or where the use is typically transitory and not likely to be a sustained use. These licences are excluded entirely from the analysis as they are not relevant to the pricing of apparatus licences. We exclude:

- receivers that are not subject to apparatus licence tax
- scientific assignments
- class licensed devices
- broadcasting assignments below 700 MHz.

[9] 'Shared spectrum' in this sense means the use case in one geographic location operates on the same frequencies as a use case in another location separated by distance. It does not mean that the spectrum assigned for an exclusive use in one area is shared, such as spectrum licences that have exclusive use provided.

Question 3

Do you have any feedback on how we have defined the key metrics and the scope of the analysis?

Primary analysis – congestion in key locations

The key location analysis estimates the current congestion rate in 11 key locations, grouped by band and density, flagging the most congestion-prone locations in each group.

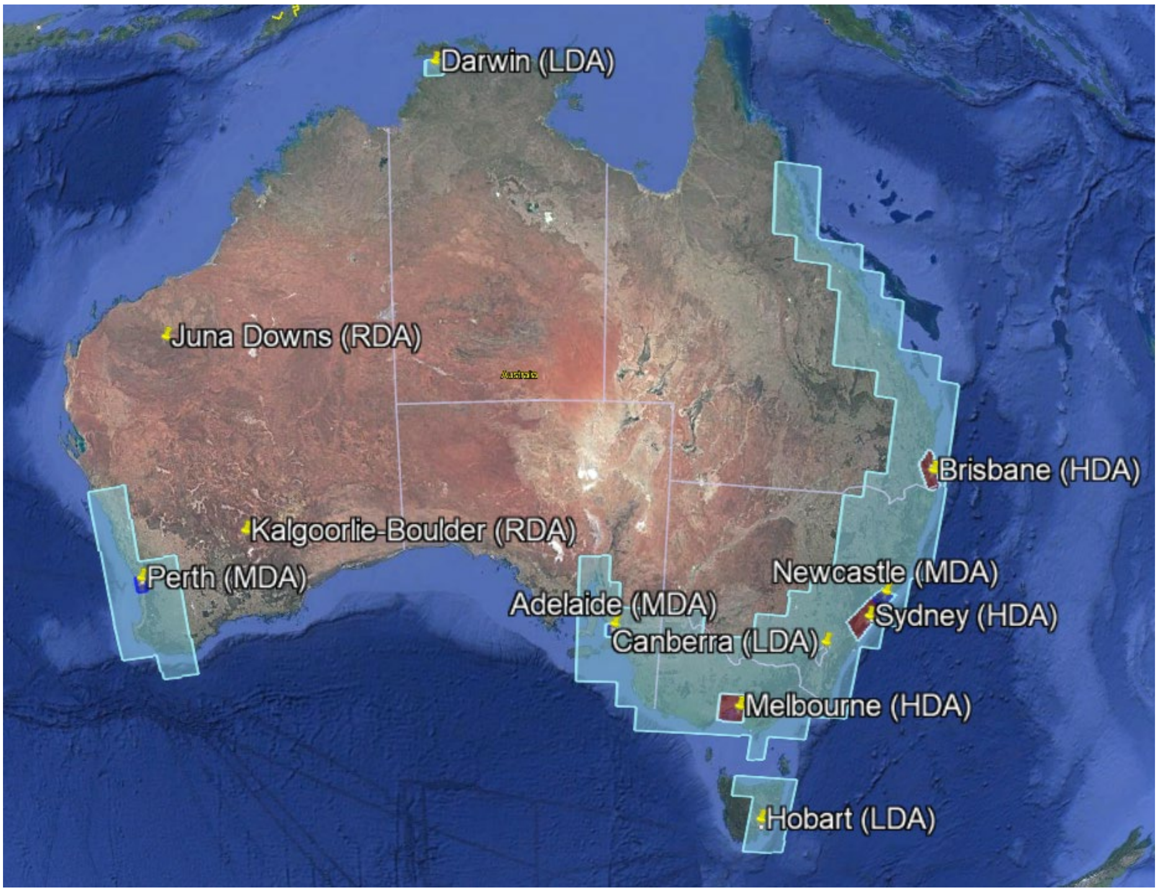
The key locations have been identified as the locations most likely to experience congestion within their respective density areas, comprising capital cities as well as significant industrial hubs. As the most congestion-prone locations within their respective density categories, these locations serve as early indicators of congestion in the broader density areas. The key locations are shown in Figure 3 and listed below:

- high density: Sydney, Melbourne and Brisbane
- medium density: Perth, Newcastle and Adelaide
- low density: Canberra, Hobart and Darwin
- remote density: Kalgoorlie-Boulder and Juna Downs (Pilbara)

Each location is defined by a 30 km radius from the centre point of the location. The size of the location determines which assignments are included in the metric. We have chosen to use a 30 km radius on the basis that a larger radius is more conservative with respect to pricing and a 30 km radius is roughly the size of smallest defined density area, which is the Adelaide medium density area. A larger location definition is a more conservative measure of congestion as it may include uses that do not have as wide of an interference profile, but a larger location than 30 km radius would include more low-density assignments in a medium density location (Adelaide). We have undertaken a sensitivity analysis, which indicated that expanding to a 60 km radius only marginally affected congestion results (between 0–3 percentage points greater) due to non-interfering uses of spectrum overlapping within the defined area not being double counted. We may revise the radius we use based on stakeholder feedback.

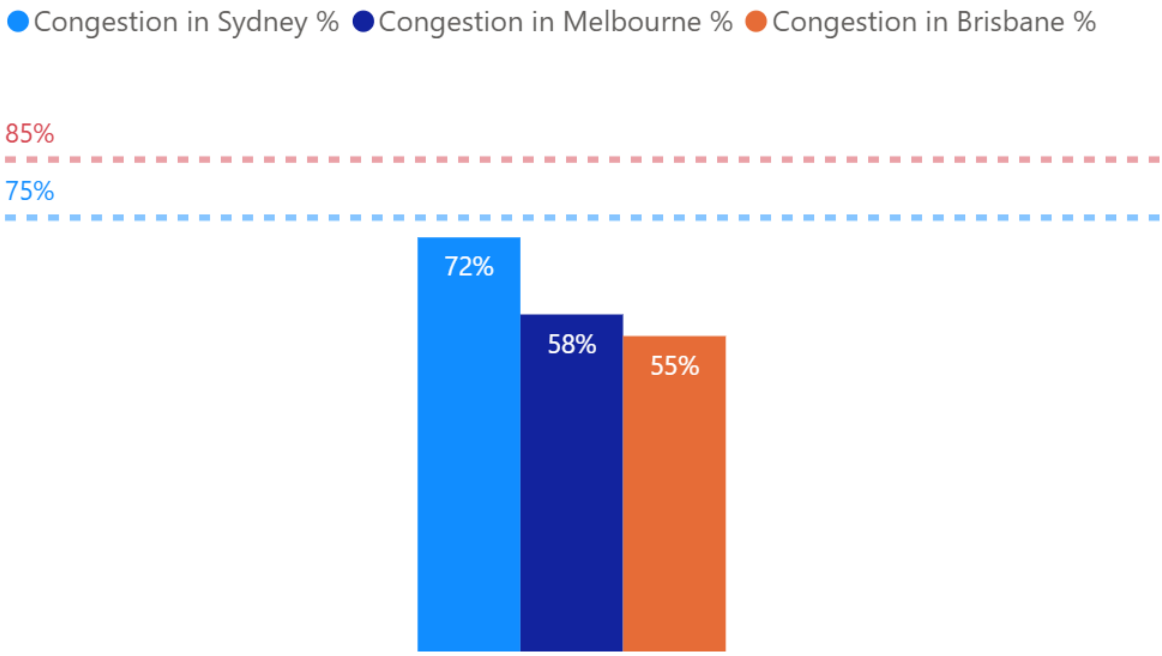
Australia-wide licence assignments are included in the occupation calculation for each area, as assignments within an Australia-wide licence may operate any area.

Figure 3: Key locations map



To establish benchmarks for each density area, we use the most congested location within the density area as the reference point. For example, in the 2.69 GHz to 5 GHz band, we have compared the relative levels of congestion across Sydney, Melbourne and Brisbane to inform us whether the tax rates set for high-density areas are at an appropriate level. These relative levels of congestion are illustrated in Figure 4, with the target congestion benchmarks of 75% and 85% marked for reference.

Figure 4: Congestion in high-density areas in the 2.69 GHz to 5 GHz band



Sydney is the most congested high-density area in Figure 4 at 72%. It is most at risk of experiencing spectrum denial, and we would use it to consider price reform proposals for high-density area prices. Our framework prices all high-density areas at the same $/kHz price, therefore we use the most congested area as the reference point. By using the most congested area within the density area as a baseline, we prevent higher levels of congestion and denial in the less congested high-density cities as well.

Question 4

Is our approach to unitising congestion conservative enough? Is it too conservative? Are there aspects of the measurement that should be included that are not?

Supplementary analysis

We believe that it is prudent to support our primary congestion analysis with additional supplementary analysis when assessing pricing proposals. This includes analysis of congestion within specific use cases; congestion trends; and changes in price relativities between different locations or bands or licence types. This supplementary analysis helps us verify whether the primary analysis appropriately reflects congestion and that proposed pricing adjustments are likely to be suitable, given these broader factors. If not, we can adjust the pricing proposals.

Supplementary analysis – congestion within use cases

While the key locations analysis provides a high-level picture of congestion across Australia, congestion may also manifest for a specific use case within the broader bands that we are analysing if there is limited spectrum planned for that use case. As a hypothetical, congestion for apparatus assignments may be low overall in the 520 MHz to 960 MHz band for Brisbane (17 MHz occupied / 34 MHz supply = 50%), but point-to-point studio to transmitter links (STLs) may occupy 3 MHz and only have 4 MHz planned for this use (representing 75% congestion for the STL use case). A price reduction may create undue congestion for STLs while the overall band may accommodate more use.

While this congestion for a single use case may be able to be addressed through replanning, pricing is a potentially more readily implementable policy response. We also draw on a use case analysis that examines spectrum utilisation at a more granular level to supplement the primary congestion analysis. By assessing the congestion levels experienced within each use case, this analysis offers additional insight into where congestion may develop in specific scenarios.

Supplementary analysis – congestion trends

As the previous 2 analyses provide a point-in-time view of congestion, we also examine longer-term congestion trends. The trend analysis allows us to validate or adjust our initial pricing proposals. As an example, congestion in Sydney in the 2.69 GHz to 5 GHz band has increased by 15 percentage points since 2018. The prevailing long-term trend suggests that demand may reach or exceed the congestion target soon. If we expect the trend in this case to reach our target range without intervention, holding off on a price reduction (as suggested by the congestion pricing formula) may be prudent since the underlying demand trend indicates current price levels are already effective in driving congestion towards the target range.

Question 5

Does the supplementary analysis appropriately incorporate broader pricing considerations beyond the primary congestion analysis?

Congestion analysis

This section goes through the congestion analysis that we have conducted, outlined in the previous section.

Primary analysis – congestion in key locations

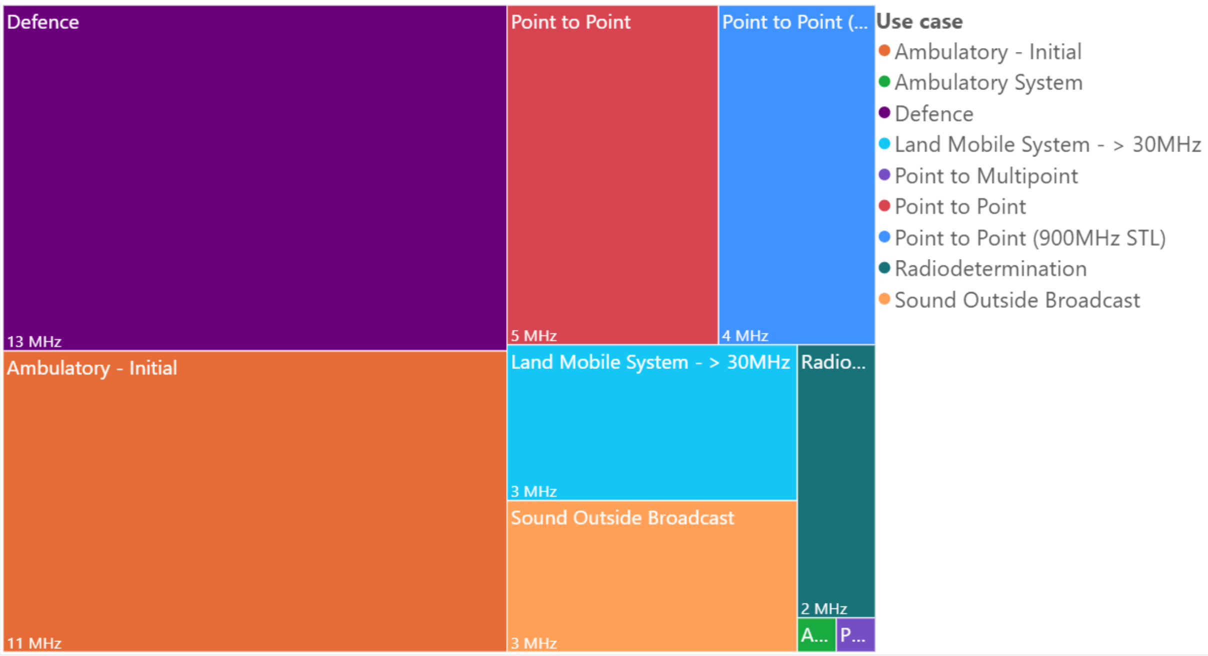
We have prepared congestion analysis of the 520 MHz to 960 MHz, 960 MHz to 2.69 GHz, and 2.69 GHz to 5 GHz bands using [Register of Radiocommunication Licences (RRL)]() data between April 2018 and April 2026.

Band composition

Before examining congestion, we present tile charts to show the composition of apparatus licences in each band measured by the bandwidth in MHz occupied. Larger tiles represent service types with larger occupation (MHz occupied).

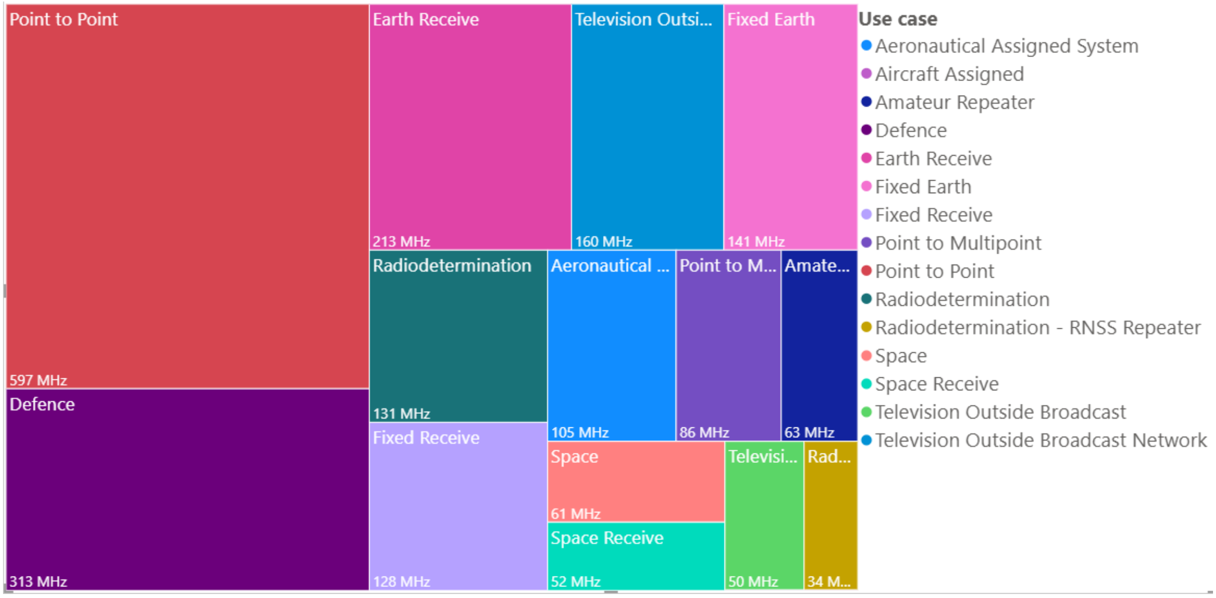
The 520 MHz to 960 MHz band is composed of a wide variety of service types, with defence and ambulatory being the predominant licence service types (see Figure 5).

Figure 5: 520 MHz to 960 MHz – composition by apparatus licence service type (MHz occupied)



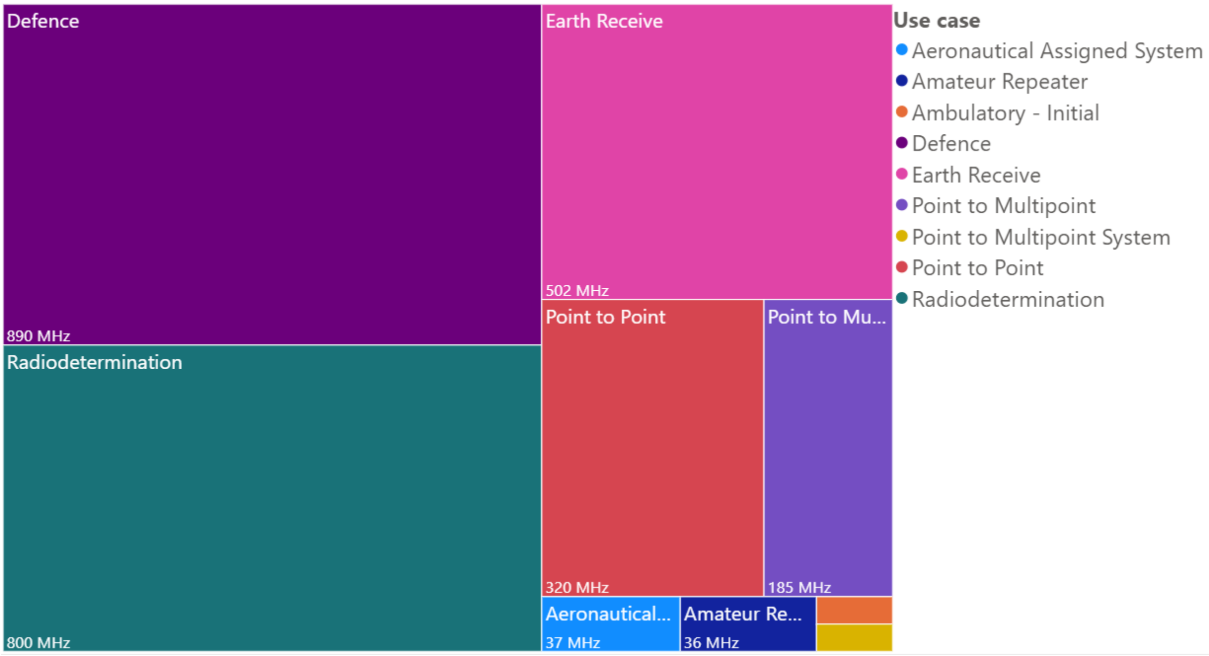
The predominant service types in the 960 MHz to 2.69 GHz band are point-to-point, defence and earth receive (see Figure 6).

Figure 6: 960 MHz to 2.69 GHz – composition by apparatus licence service type



The 2.69 GHz to 5 GHz band is dominated by defence, radiodetermination, earth receive and point-to-point service types (see Figure 7).

Figure 7: 2.69 GHz to 5 GHz – composition by apparatus licence service type



Appendix C includes a spectrum plot of MHz occupied for each of these bands to provide greater detail about where along the spectrum these bands are being used.

The tile charts and spectrum plots provide a picture of the what the spectrum is being used for (by bandwidth occupied, measured in MHz). However, they do not provide any information about spectrum supply or congestion. Congestion is discussed below.

Congestion in key locations

In Table 2, we present the highest congestion case for each combination of spectrum band and density area.

Table 2: Most congested key locations by band and density area

Spectrum location	Geographic location			
	High density	Medium density	Low density	Remote density
520 MHz to 960 MHz	76% (Sydney)	51% (Adelaide)	44% (Hobart)	9% (Juna Downs)
960 MHz to 2.69 GHz	70% (Melbourne)	72% (Perth)	69% (Hobart)	49% (Juna Downs)
2.69 GHz to 5.0 GHz	72% (Sydney)	66% (Perth)	56% (Hobart)	53% (Juna Downs)

Note: Congestion is presented as a percentage that ranges from 0% to 100%. We represent higher congestion with darker shades of red and lower congestion with darker shades of green, with lighter and more yellow shades in between. The most congested area is identified in brackets.

Overall, congestion varies considerably depending on the location. More populated locations tend to have higher congestion. These features are indicative of varying levels of demand within the available supply of spectrum within each band.

520 MHz to 960 MHz

In the 520 MHz to 960 MHz band, we observe congestion rates between 44% and 76% in key locations across high, medium and low-density areas, suggesting a relatively low-to-moderate level of congestion.[10] In contrast, remote-density area congestion is significantly lower (9% congestion measured in Juna Downs).

960 MHz to 2.69 GHz

In the 960 MHz to 2.69 GHz band, we observe congestion rates between 69% and 72% in key locations across high, medium and low-density areas.[11] Lower congestion in the higher-density areas may suggest that the higher tax rates that apply in these areas may be prohibiting greater employment of spectrum. Congestion in remote areas is relatively lower (43%).

2.69 GHz to 5 GHz

In the 2.69 GHz to 5 GHz band, within this band, there is a divergence between high-density areas compared with the other density areas, suggesting 2 different pricing approaches may be required. High-density areas, based on Sydney (72%), may warrant no changes if we expect congestion to naturally move to the congestion target, whereas low and remote-density areas have lower congestion levels, which may support a tax reduction.

Question 6

Do our measurements of congestion correlate with your experiences of accessing spectrum in the selected bands and areas?

[10] Based on an estimation of 235 MHz of spectrum supply.
[11] Based on an estimation of 1563 MHz of spectrum supply.

Pricing implications of primary analysis

Overall, our findings have determined that congestion is relatively low in most locations but meets the 75–85% threshold in one location. For high-density areas in the 520 MHz to 960 MHz band, Sydney is the most congested area with 76% congestion. We would therefore not propose any price change in high-density areas in this band based on our congestion pricing model. All other density area and band combinations exhibit congestion levels below the target range, so we would consider price reductions consistent with the congestion pricing formula. However, we first conduct use case and trend analyses as additional checks before proposing final price reforms.

Supplementary analysis – congestion within use cases

In practice, spectrum available to specific use cases is typically a limited portion of the overall band. It may not be sensible to propose price reductions where there may be highly congested parts of the band, such as where there is a planning limitation on available spectrum for already congested use cases. This may limit our ability to make price adjustments unless there is capacity for that use case in adjacent or other bands or alternative planning arrangements are considered. It would be prudent for us to consider the relationship between planning arrangements and pricing for specific use cases before proposing price changes.

In this congestion pricing model, we do this by measuring the congestion metric within each use case in the band (i.e. the proportion of the available spectrum for a specific use case that is being used) and compare that to whole band congestion. Due to the conservative estimation of spectrum supply,[12] this first pass does not take into account spectrum that may be available but is not currently being utilised by the service in question. We perform a second pass analysis to double check our analysis which factors in how spectrum is shared with other local area use cases.

We consider use case congestion above the baseline level of congestion as potential bottlenecks to further price reduction. While we found most cases were not highly congested on an individual basis, we flagged use cases with congestion that exceeded the congestion of its band and location (see Table 3).

[12] See Considerations when measuring spectrum supply section earlier in this paper.

Table 3: High congestion use cases

Use case	Band and location	Congestion within use case (first pass)	Adjusted congestion within use case (2nd pass)	Congestion of band and density area
Fixed receive	960 MHz to 2.69 GHz, Adelaide	96%	49%	72% (MDA)
Ambulatory (initial)	520 MHz to 960 MHz, Sydney	89%	74%	76% (HDA)
Point to point (900 MHz STL)	520 MHz to 960 MHz, Brisbane	70%*	94%	76% (HDA)

**Note: While the 70% figure is below the overall congestion figure, we include STLs based on supplemental findings that indicate congestion is closer to 94% when considering spectrum sharing.*

The higher congestion within these use cases suggests further consideration is needed before proposing price reductions in these areas to avoid additional potential denial for these use cases. If we find that there is limited additional spectrum available for these services, we may consider moderating our policy proposals if they may cause additional congestion for these use cases.

After reviewing fixed receive licences in Adelaide in the 960 MHz to 2.69 GHz band, we determined that there is additional spectrum available that is shared with other fixed services that was not picked up in the first pass assessment, meaning there is much more spectrum available than this metric would otherwise indicate (49% congestion based on our second pass analysis). This use case analysis suggests we would not need to alter our proposals for this use case or medium-density areas in the 960 MHz to 2.69 GHz band.

In the 520 MHz to 960 MHz band in Sydney, ambulatory licences occupy the small gap between 700 MHz band spectrum licences (between 748 MHz to 758 MHz), and this range appears congested for this use. However, after looking at this use-case more closely, there is more spectrum available for ambulatory service than our first pass indicates (in frequencies above 916 MHz), although this spectrum is also shared with radiodetermination use. After adjusting for these factors, our second pass analysis shows congestion is closer to 74% for this use case, which is in line with the overall congestion rate for the band.

There is 4 MHz available for point-to-point (900 MHz STL) licences in the 520 MHz to 960 MHz band (845 MHz to 849 MHz), which exhibits relatively high congestion (70%) without alternative spectrum available in other bands. But looking more closely, our second pass analysis reveals the spectrum available for STLs is shared with other fixed uses like point-to-point stations, which adds to occupation and congestion. This means that, in Brisbane the shared total occupation is 94% when considering these other assignments in the 4 MHz of spectrum supply planned for 900 MHz STL use.

Pricing implications of supplementary use case analysis

Our findings in the use case analysis indicates that congestion measured at the first pass for fixed receive ambulatory services was high, however, further analysis revealed more spectrum available for those services bringing congestion rates down. Consequently, we do not propose changing prices for these identified cases.

In contrast, in the case of STLs there is no further spectrum available for these services. Our congestion pricing model would normally lead us to propose a price increase given the measured congestion of 94%. However, in this case we would like to explore whether users are experiencing spectrum denial in applying for point-to-point (900 MHz STL) licences, the reasons for high congestion within the band, and what options may exist for addressing it. We note that STLs are taxed as a Division 1 licence (adjustment factor = 1), resulting in a much lower rate than other fixed use licences like point-to-point licences, which have an adjustment factor of 18.484115 in most density areas and 11.737205 in remote areas in the 520 MHz to 960 MHz band.

Question 7

Have you experienced spectrum denial when applying for point to point (900 MHz STL) licences? Are there other areas/bands/use cases where you have experienced denial to help us validate our analysis?

Question 8

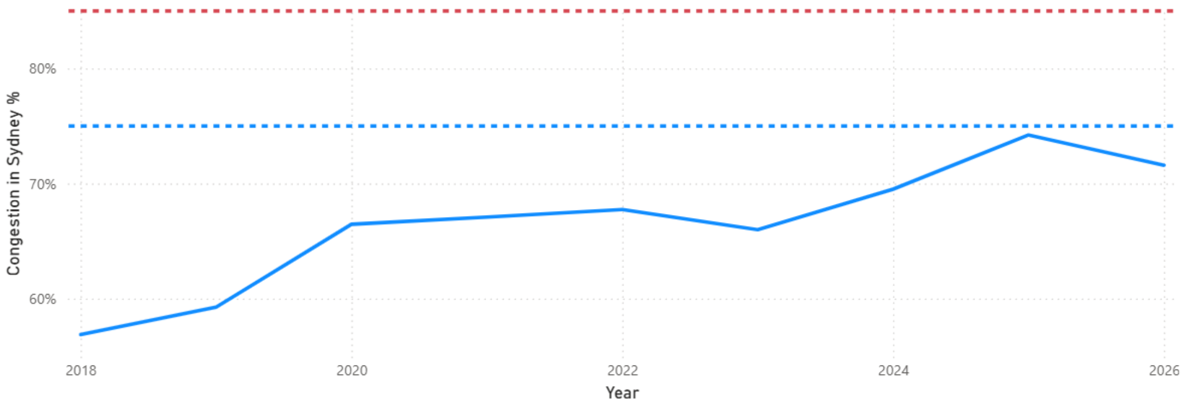
Is there an economic justification for STLs to be taxed differently compared to other point-to-point licences (especially in the 845 MHz to 849 MHz range)? Can you provide reason why we may want to continue taxing STLs at a lower rate of tax than other fixed services?

Supplementary analysis – congestion trends

To add further insight to our analysis, we have examined how congestion has changed over time. With 11 locations across 3 different bands, there are 33 trends available to be examined. For brevity, we only present cases with some potential for us to deviate from the price implications from the primary analysis. These cases include Sydney in the 2.69 GHz to 5 GHz band and Perth in the 960 MHz to 2.69 GHz band as an example of this analysis.

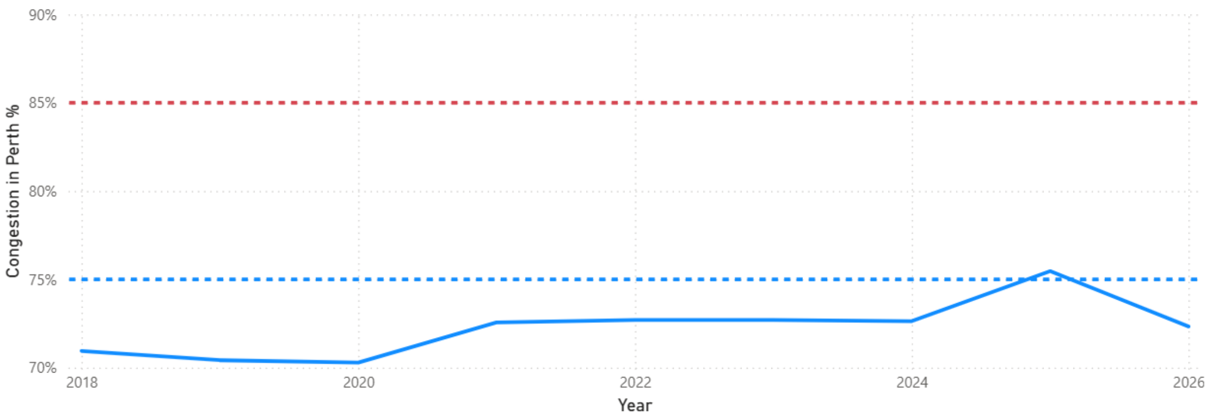
Figure 8 and Figure 9 measure congestion over time in Sydney in the 2.69 GHz to 5 GHz band and Perth in the 960 MHz to 2.69 GHz band. The 75–85% target threshold lines are provided in each diagram for reference. From these trends, we have determined that congestion may not approach or stay within the target threshold without price intervention. We provide our reasoning based on each trend as set out below.

Figure 8: Sydney congestion over time (2.69 GHz to 5 GHz band)



The 2.69 GHz to 5 GHz band in Sydney has become increasingly congested over time, recently driven by an uptake in earth receivers. It may be appropriate to keep tax rates stable if we expect congestion to reach the target level in the near term without further intervention. However, the otherwise consistent increase in congestion has recently reversed. We believe that this indicates the band may not reach the lower bound target of 75% without further intervention.

Figure 9: Perth congestion over time (960 MHz to 2.69 GHz)



The 960 MHz to 2.69 GHz band in Perth has shown a similar increase in congestion up to 2025 before dropping in 2026. Congestion in this band met our target range in 2025 but fell in 2026, suggesting that congestion may not stay in the target range without intervention, supporting our proposal to reduce tax rates.

Pricing implications of supplementary congestion trend analysis

Based on our findings from the above trend analysis, we believe it would not be appropriate to change or delay the price reductions for high-density areas in 2.69 GHz to 5 GHz or medium density areas in 960 MHz to 2.69 GHz as presented in the primary analysis (see Table 2), given that congestion is unlikely to reach the target within the next year without intervention.

Question 9
Do you have any other feedback on the congestion analysis?

Proposed pricing reforms

Density area proposals

Based on the congestion analysis above, we are proposing a set of tax rate amendments using the congestion pricing formula discussed earlier in the paper. Table 4 below shows pricing proposals for each band and density area. The colour scale denotes degree of price change: dark red representing no price change, and dark green representing the largest price reduction. Colours between these bookends represent proposed price reductions of a lesser extent.

As well as using the target congestion range to preclude certain price changes, we also validate the pricing proposals by incorporating findings from the trend analysis and the use case analysis to determine cases where a tax rate change may be less effective. While we have identified individual use cases displaying high congestion, these findings have not impacted the pricing proposals from the primary congestion analysis.

Table 4: Proposed percentage changes to location weights

Spectrum location	Geographic location			
	High density	Medium density	Low density	Remote density
520 MHz to 960 MHz	0%	-36%	-45%	-89%
960 MHz to 2.69 GHz	-13%	-10%	-14%	-39%
2.69 GHz to 5.0 GHz	-10%	-18%	-30%	-34%

Note: The colours represent the relative degree of congestion from 0% to 100%. We represent higher congestion with darker shades of red and lower congestion with darker shades of green, with lighter and more yellow shades in between.

To apply these tax rate changes, we multiply the percentage reductions to our location weighting table. Below is the current location weightings table (Table 5) and the proposed location-weighting table (Table 6).

Table 5: Location weighting table (before changes)

Spectrum location	Geographic location			
	High density	Medium density	Low density	Remote density
520 MHz to 960 MHz	5.6000	2.5620	0.4370	0.2180
960 MHz to 2.69 GHz	2.2410	1.0360	0.5210	0.2600
2.69 GHz to 5.0 GHz	1.8530	0.7510	0.6220	0.3110

Table 6: Location weighting table (after changes)

Spectrum location	Geographic location			
	High density	Medium density	Low density	Remote density
520 MHz to 960 MHz	5.6000	1.6333	0.2404	0.0245
960 MHz to 2.69 GHz	1.9609	0.9324	0.4494	0.1593
2.69 GHz to 5.0 GHz	1.6677	0.6196	0.4354	0.2060

Note: The colours represent the relative degree of congestion from 0% to 100%. We represent higher congestion with darker shades of red and lower congestion with darker shades of green, with lighter and more yellow shades in between.

Price relativities

If a band becomes relatively cheaper to utilise for a service that has the option to substitute spectrum, licensees may shift their demand from the occupied band to the relatively cheaper band. Below we discuss the impact that price changes can have on neighbouring bands.

Price relativities amongst the 3 bands

Based on the above pricing reform proposals, low-density prices become cheaper in the 2.69 GHz to 5 GHz band compared to 960 MHz to 2.69 GHz. This shift in price relativities means demand will be incentivised to move from the 960 MHz to 2.69 GHz band to the relatively less congested 2.69 GHz to 5 GHz band, which would be a desirable outcome in principle. However, we will monitor whether the shift in demand changes congestion conditions in a way that requires us to re-evaluate prices.

Price relativities amongst adjacent bands

Based on our proposals, the relative values between 520 MHz to 5 GHz and surrounding bands show some notable shifts. However, most density areas maintain their previous ranking in order of cost. From Table 7 we see price relativity shifts as follows:

- Remote-density weightings see a considerable reduction across our 3 target bands, placing 520 MHz to 960 MHz, and 960 MHz to 2.69 GHz below 30 MHz to 403 MHz, where it had previously been more expensive. However, 2.69 GHz to 5 GHz maintains its position as more costly compared to nearby bands.
- Medium and low-density weightings for 403 MHz to 520 MHz have now become relatively higher than 520 MHz to 960 MHz. As mentioned above, the price reductions may shift demand to cheaper bands, however this will need to be monitored following implementation of these price changes.

Table 7: Location weightings including adjacent bands

Spectrum location	Geographic location			
	High density	Medium density	Low density	Remote density
>30 MHz to 403 MHz	3.8070	1.8780	0.4210	0.2100
>403 MHz to 520 MHz	7.4114	2.5620	0.4370	0.0000
>520 MHz to 960 MHz	5.6000	1.6333	0.2404	0.0245
>960 MHz to 2.69 GHz	1.9609	0.9324	0.4494	0.1593
>2.69 GHz to 5.0 GHz	1.6677	0.6196	0.4354	0.2060
>5.0 GHz to 8.5 GHz	0.7785	0.3625	0.1650	0.0800
>8.5 GHz to 14.5 GHz	0.1336	0.0316	0.0023	0.0011

Note: The colours represent the relative degree of congestion from 0% to 100%. We represent higher congestion with darker shades of red and lower congestion with darker shades of green, with lighter and more yellow shades in between.

Question 10

Given the congestion analysis presented in the previous section, do you consider the proposed price changes appropriate?

Australia-wide density area – potential pricing approach

We are not proposing changes to Australia-wide prices in this consultation paper. However, we are sharing our thinking about how Australia-wide prices relate to prices for local use, with the view to potentially adjusting Australia-wide prices in future.

Australia wide licences authorise spectrum use nationwide, as opposed to licences in other density areas that typically assign devices at specific, fixed locations. They are often used for shared or 'nomadic' applications, meaning usage may shift across locations and overlap with other users (with interference managed by the licensees) and generally operate on non-interference and non-protection (NINP) conditions, meaning they have an obligation to avoid interfering with other licensees and are not afforded the same protections that other assignments are typically provided.

Unlike other density areas, Australia-wide licences do not occupy any specific geographic location, but rather they may create occupation in all areas across the country. For example, an earth receive licence in a low-density area is assigned a frequency in a specific area, whereas an Australia-wide earth receiver licence permits use of spectrum without a specific geographic boundary. Because our proposed congestion metric relies on spectrum utilisation in specific locations, the congestion metric is not directly applicable to Australia-wide pricing.

We instead are exploring options for setting the Australia-wide price with reference to local use cases (i.e. in high, medium, low and remote-density areas) as a benchmark, given that spectrum used to facilitate Australia-wide use may be reallocated to local use cases in the same frequency ranges. Local uses are therefore the opportunity cost of Australia-wide licenced spectrum.

Determining that opportunity cost has unique challenges. For instance, we could use a starting point of summing the location weights of each local density area (high, medium, low and remote density) to set the Australia-wide location weight.

$$Australia\text{-}wide\ price = lw_{HDA} + lw_{MDA} + lw_{LDA} + lw_{RDA}$$

However, this approach does not account for spectrum re-use by multiple local uses within a density area, which means that conceptualisation of an Australia-wide price does not fully incorporate the opportunity cost of that spectrum.

Another approach we considered was to incorporate reuse of spectrum by introducing the bandwidth of local uses (via the bandwidth (kHz) occupied measure) into the calculation:

$$Australia\text{-}wide\ price = \sum (density\ area\ location\ weights \times band\ use)$$

However, different use cases can have varying and complex pricing signals which influence band use, such as different adjustment factors, normalisation factors and power factors in the administrative pricing formula.[13] This means that this approach does not adequately account for varied opportunity cost between use cases.

[13] See Appendix C of the Apparatus licence fee schedule for details of the different factors.

We also need to consider how spectrum is shared among Australia-wide licences and what the opportunity cost an individual licensee is responsible for. For example, if 50 MHz is allocated to 100 different Australia-wide uses, the total opportunity cost imposed by that 50 MHz allocation is shared among all 100 Australia-wide licensees and the Australia-wide licence tax paid on an individual licensee basis should reflect this.

Use of revenue per MHz occupied

To factor in bandwidth use, and varying adjustment factors for different uses, we found that using aggregate revenue per MHz is a simpler way to conceptualise opportunity costs:

$$Australia\text{-}wide\ price = \frac{local\ use\ revenue}{local\ use\ bandwidth\ occupied\ (MHz)}$$ [14]

This equation finds the total opportunity cost of all Australia-wide assignments, but not the opportunity cost of an individual assignment.

We can apply the same revenue per kHz construct for Australia-wide licences to determine the opportunity cost (and thus price) of an individual assignment.

$$\frac{Australia\text{-}wide\ revenue}{Australia\text{-}wide\ MHz\ occupied} = \frac{local\ revenue}{local\ MHz\ occupied}$$

This formula represents the equality of revenue per the amount of MHz that has been occupied, which holds that licensees should collectively pay a similar amount for a similar imposition of occupation. Provided that local revenue is equal to the sum of opportunity costs, this equality implies that the Australia-wide price is set efficiently.

Revenue per MHz occupied is a useful way to account for opportunity cost because:

- It creates a nexus between other density areas and Australia-wide tax rates in a coherent and consistent manner. The revenue per MHz occupied equivalence ensures that licensees pay a similar amount of tax for a similar imposition of denial irrespective of whether it is due to Australia-wide or other density area use cases.
- Revenue per MHz occupied incorporates pricing policy and spectrum demand in the same metric.
- When other density area tax rates are individually set at their rate of opportunity cost, it means Australia-wide licences will also be set at their rate of opportunity cost.
- Revenue takes differences in willingness to pay into account among different licence types, which is a reasonable estimation of opportunity cost for different use cases. For example, a land mobile service demonstrates a higher willingness to pay than an ambulatory licence based on the land mobile services paying a higher rate of tax.[15]
- By using MHz occupied as the denominator, we account for spectrum re-use in local areas and the potential for that to result in higher denial. For example, if 15 kHz is used for a point-to-point assignment in Brisbane and the same 15 kHz is used for a fixed receiver assignment in Melbourne, then revenue accounts each of these potential forgone opportunities.

[14] Local bandwidth occupied measures the parts of the spectrum that are used anywhere by a use case in the high, medium, low and remote density areas. It is calculated to the nearest 100 kHz.
[15] Land mobile services pay a higher tax rate of tax due to a higher adjustment factor applied to land mobile services.

- Revenue per MHz also accounts for spectrum re-use on the Australia-wide side, as more Australia-wide licensees share costs.
- This approach is agnostic about how a band is occupied between Australia-wide and other density area licences, assuming similar denial characteristics.[16]

If the revenue per kHz equality in the equation above does not hold, we can apply a change to the Australia-wide tax rate to reach that equality:

$$\textit{Australia-wide tax rate change} \times \frac{\textit{Australia-wide revenue}}{\textit{Australia-wide MHz occupied}} = \frac{\textit{local revenue}}{\textit{local MHz occupied}}$$

We can then rearrange the formula to show how we calculate the required tax rate change to achieve revenue per MHz equality:

$$\textit{Australia-wide tax rate change} = \frac{\textit{local revenue}}{\textit{local MHz occupied}} / \frac{\textit{Australia-wide revenue}}{\textit{Australia-wide MHz occupied}}$$

At current tax rates, Table 8 shows the share of revenue generated by Australia-wide licences compared to existing allocations of Australia-wide licences.

Table 8: Annual revenue share compared with occupation share[17]

Band	Australia-wide occupation	Local area occupation	Australia wide revenue	Local area revenue
520 MHz to 960 MHz	13.1 MHz	44.2 MHz	$38,786	$445,764
960 MHz to 2.69 GHz	511.1 MHz	888.2 MHz	$1,535,980	$2,179,929
2.69 GHz to 5.0 GHz	890.2 MHz	1427.8 MHz	$2,648,462	$1,166,394

Based on values in Table 8 we can determine the relevant ratios (Table 9) to determine the required tax rate change (Table 10).

Table 9: Annual revenue and occupation ratios

Band	Local revenue per MHz occupied	Australia-wide revenue per MHz occupied	Local – Australia-wide ratio
520 MHz to 960 MHz	$10,085.17	$2,960.73	3.41
960 MHz to 2.69 GHz	$2,454.32	$3,005.24	0.82
2.69 GHz to 5.0 GHz	$817.49	$2,975.13	0.27

[16] Denial characteristics are covered by adjustment factors

[17] Annual revenue is calculated by applying the apparatus licence fee formula as found in the April 2026 licence fee schedule to existing apparatus licence holdings. Actual revenue received would be less accounting for multi-year licences which have been prepaid and licences that haven't renewed or issue after April 2026. Calculations exclude the revenue and occupation of licences that are not charged tax on a $/bandwidth basis for a more equivalent comparison.

Based on this table, and the preceding logic we could adjust the Australia-wide tax rates such that the revenue share is proportionate with the occupation. Following the Australia-wide tax change formula, we would change the Australia-wide rates as follows:

Table 10: Revenue benchmarked Australia-wide location weighting at existing prices

Band	% change in Australia-wide location weighting*	Original location weighting	New location weighting
520 MHz to 960 MHz	241%	10	34.1
960 MHz to 2.69 GHz	-18%	9.985	8.155
2.69 GHz to 5.0 GHz	-73%	9.974	2.741

**Calculated by taking the local – Australia-wide ratios in Table 9 and subtracting 1.*

The benchmark indicates that Australia-wide prices should be higher in 520 MHz to 960 MHz, slightly lower in 960 MHz to 2.69 GHz and much lower in 2.69 GHz to 5.0 GHz, and each of these cases is discussed further below.

520 MHz to 960 MHz

Australia-wide licences in this band are mainly defence, with some scientific licences. The substantial revenue per MHz occupied of local areas relative to the revenue per MHz of Australia-wide use cases is evidence of the Australia-wide price being too low. The reason the benchmark indicates that 520 MHz to 960 MHz is underpriced is primarily due to a high adjustment factor that applies to the average use case for local areas (which are mostly fixed link and land mobile services).[18]

960 MHz to 2.69 GHz

A lack of demand for 960 MHz to 2.69 GHz in local areas point towards reductions in the Australia-wide price. The high demand of space uses is of note in this band, whereas the other bands in this review only have defence usage. Despite this, the revenues from local areas are relatively strong compared to the 2.69 GHz to 5 GHz band which is evidence that the opportunity cost of Australia-wide licences is higher in this band than 2.69 GHz to 5 GHz.

2.69 GHz to 5 GHz

The only Australia-wide user in this band is Defence. Despite the relatively high occupation of Australia-wide uses, revenue from local area use cases is substantially lower than what Australia-wide licensees pay for an equivalent contribution to spectrum denial. This suggests that the demand for alternative apparatus use cases in this band at these prices settings are very low. We believe that the Australia-wide price is set at a rate well above the potential denial impact for local uses, with the Australia-wide tax rate change formula calculating a tax rate reduction of 73% to rebalance Australia-wide and local use prices.

[18] See Appendix C of the Apparatus licence fee schedule for details of the adjustment factors.

Question 11

Is our local revenue benchmark approach a reasonable way to estimate opportunity cost and set Australia-wide prices? Do you have any other feedback on the potential Australia-wide pricing approach?

Response to pricing feedback

We have considered stakeholder feedback provided in response to our earlier consultation on pricing in the 2.69 GHz to 5 GHz band. Submissions from Optus and the Australian Telecommunications Alliance (ATA) Satellite Services Working Group (SSWG) raised several common themes regarding the role of demand analysis, the appropriateness of existing pricing relativities and the scope of any pricing reforms.

We have adopted a more gradual approach to price adjustment than suggested in some submissions. Our proposed changes are calibrated to move congestion towards a defined target range, rather than fully adjusting price relativities in a single step such as the linear interpolation between the 520 MHz to 5 GHz price approach the ATA has suggested. This reflects our uncertainty around the responsiveness of demand to price changes, as well as the risk that larger adjustments could lead to unintended outcomes, including shifts in demand that may create congestion in other bands or locations. We also have the opportunity to fine tune pricing further by confirming the effect of the price reductions once the market has responded to the tax rate changes.

While some stakeholders questioned the comparability of different bands and the appropriateness of extending the review across a wide frequency range, we consider this broader scope necessary to assess pricing relativities within a unified and coherent administrative pricing framework. Differences across bands are accounted for through band-specific congestion measurement and supplementary analysis, allowing pricing outcomes to reflect underlying utilisation conditions without assuming direct equivalence between bands.

Overall, stakeholder feedback has informed the development of a more comprehensive pricing framework. Our proposed approach seeks to balance concerns about pricing relativities and service-specific impacts with the need for a consistent, transparent and evidence-based methodology that can be iteratively refined over time.

Next steps

We intend to publish outcomes of this consultation after considering feedback.

Implementation of pricing changes

If we decide to implement the proposed changes, we will update the tax settings by amending the Radiocommunications (Transmitter Licence Tax) Determination 2025 and the Radiocommunications (Receiver Licence Tax) Determination 2025.

Review and monitoring

We propose to monitor and review the congestion pricing model 2 years after price changes have been implemented, allowing time for the market to adjust. The review will allow us to test the effectiveness of the proposed congestion pricing model and, in particular, whether congestion levels move towards the target range of 75–85%.

We expect the monitoring and review to:

- track changes in the congestion metric across bands, density areas and key locations
- assess trends in licence assignments, spectrum utilisation and evidence of spectrum denial
- consider stakeholder feedback, including evidence on access to spectrum and operational impacts
- review supplementary evidence, including use case–specific congestion and longer-term trends.
- assess whether:
  - congestion levels have moved towards, or are tracking within, the target range
  - pricing adjustments have resulted in unintended consequences for particular use cases or locations
  - further refinements to the congestion pricing model (including target thresholds or responsiveness of the formula) are warranted.

Further adjustments

Where evidence indicates that congestion is persistently outside the target range, or that pricing is no longer consistent with opportunity cost, we may propose further adjustments to apparatus licence tax settings.

Any such adjustments would be subject to consultation, consistent with our standard regulatory approach.

Question 12

Do you have any views on the proposed approach to implementation, monitoring and future review of pricing in the 520 MHz to 5 GHz band? In particular, is the proposed monitoring period appropriate, and are there additional indicators the ACMA should consider?

Question 13

Do you have any other feedback on the pricing models and the reforms we are proposing?

Invitation to comment

Making a submission

We invite comments on the issues set out in this discussion paper.

- Online submissions can be made by uploading a document. Submissions in PDF, Microsoft Word or Rich Text Format are preferred.
- Submissions by post can be sent to:

  The Manager
  Economics Advisory Section
  Australian Communications and Media Authority
  PO Box 13112 Law Courts
  Melbourne Victoria 8010

The closing date for submissions is **COB, Monday 24 August 2026**.

Consultation enquiries can be emailed to spectrumpricing@acma.gov.au.

Publication of submissions

We publish submissions on our website, including personal information (such as names and contact details), except for information that you have claimed (and we have accepted) is confidential.

Confidential information will not be published or otherwise released unless required or authorised by law.

Privacy

View information about our policy on the publication of submissions, including collection of personal information during consultation and how we handle that information.

Information on the Privacy Act 1988, how to access or correct personal information, how to make a privacy complaint and how we will deal with any complaints, is available in our privacy policy.

Appendix A: Spectrum Pricing Review implementation guidelines

Efficient allocation and use of the radiofrequency spectrum

The primary economic objective for managing public resources is to maximise the benefit that resource provides to society. This occurs when spectrum is allocated and used efficiently. This is achieved where spectrum is allocated to the highest value use or uses – that is, the use or uses that maximise the value derived from the spectrum by licensees, consumers and the wider community. This is most likely to occur when prices are set in a way that reflects the opportunity cost associated with spectrum denial. Opportunity cost can reflect both the commercial value and the public benefit of services and therefore promote the efficient allocation of spectrum.

Consistency and simplicity

A simplified framework should enable licensees to understand and navigate their regulatory requirements, thereby minimising regulatory burden. It should use the least restrictive approach to reduce regulatory burdens, allowing licensees to focus on optimising their use of spectrum.

Flexibility and adaptability to technology change

The highest value use of spectrum will change over time as technology develops, consumer and social preferences evolve, and as the circumstances of licensees change. These changes will also result in a change in the value of spectrum. The spectrum pricing regime should be flexible enough to reflect these changes to enable licensees to adapt spectrum usage to both market requirements and technological advances and promote the use of spectrum by providers of different sizes and business models.

Transparency in process

A principle of good governance is transparency. Stakeholders should be able to understand the basis for the pricing arrangements associated with their use of spectrum. This in turn ensures that the ACMA is accountable for the decisions being made about spectrum pricing.

Recovery of the costs of spectrum management

The ACMA incurs costs for spectrum regulatory activities such as planning, interference management and coordination, and these costs should be recovered from those using spectrum. The Radiocommunications (Charges) Determination 2022 sets out the cost recovery charges that can be directly attributed to a licensee, such as the consideration and issue of an apparatus licence. Indirect costs are those that cannot be easily attributed to a licensee. Spectrum licence tax enables the recovery of the indirect costs of spectrum management from spectrum licensees. The recovery of costs should be consistent with the Australian Government Charging Framework.

Appendix B: Updated demand analysis

We indicated that we would expand our demand analysis to include the 520 MHz to 960 MHz and 960 MHz to 2.69 GHz bands. The following updated figures show these demand trends for each band.

Figure 10: 520 MHz to 960 MHz band

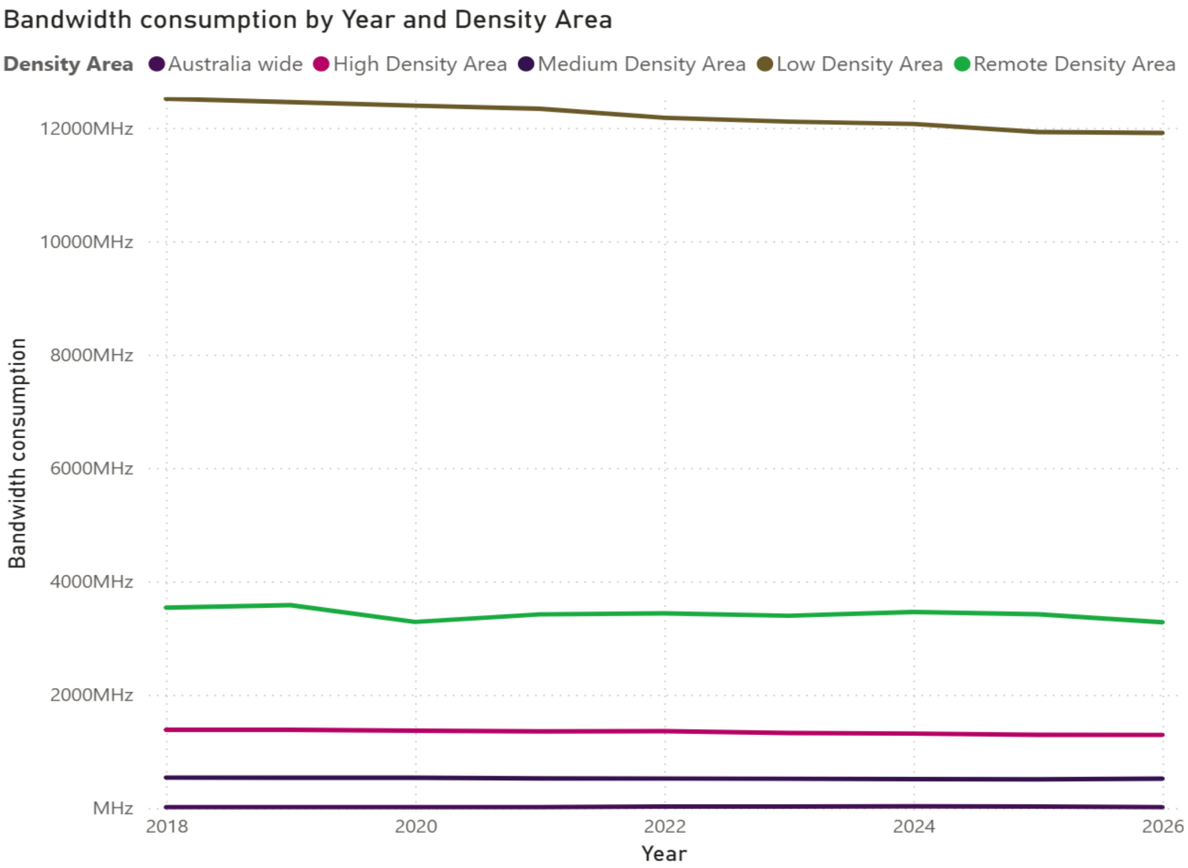


Figure 11: 960 MHz to 2.69 GHz band

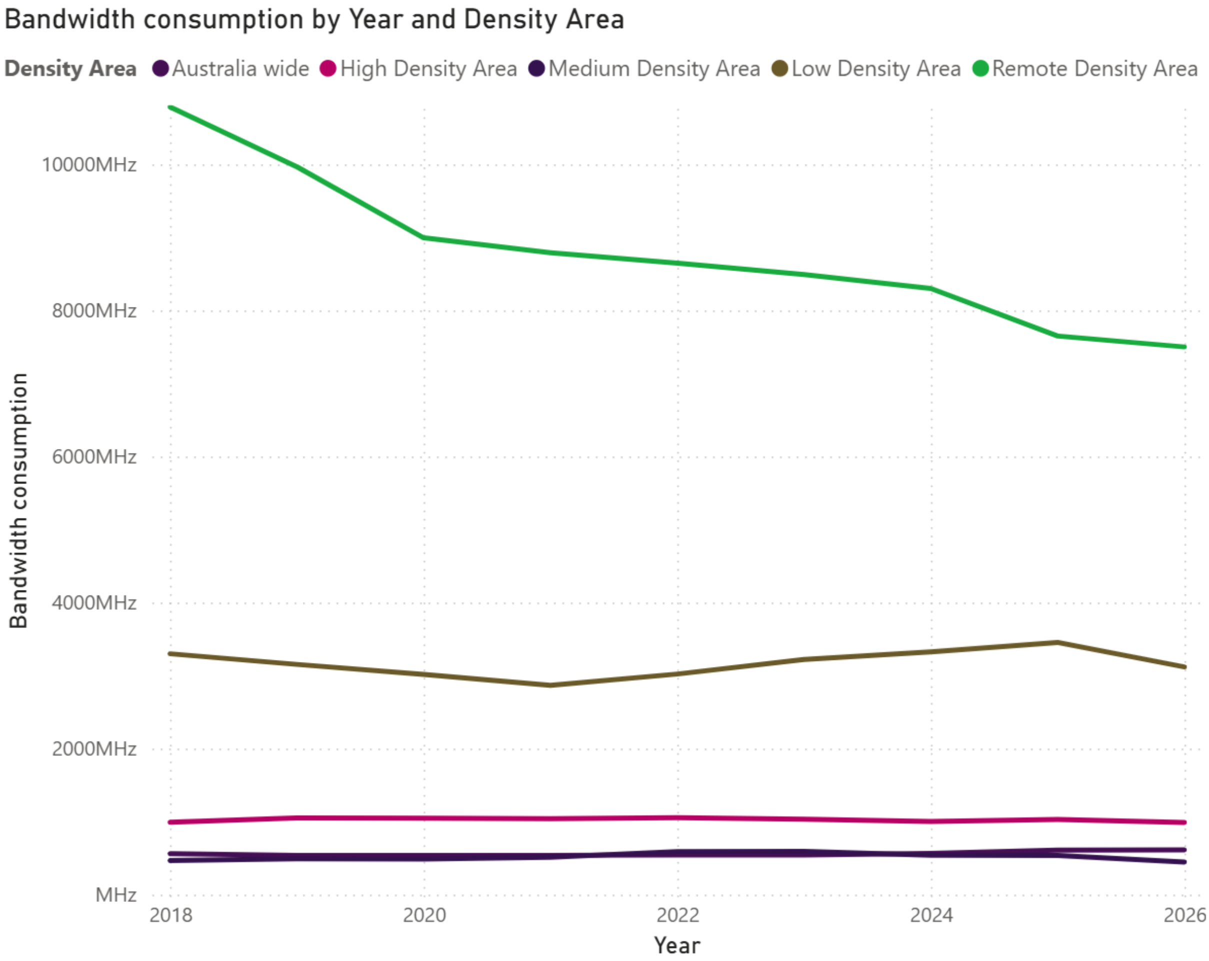
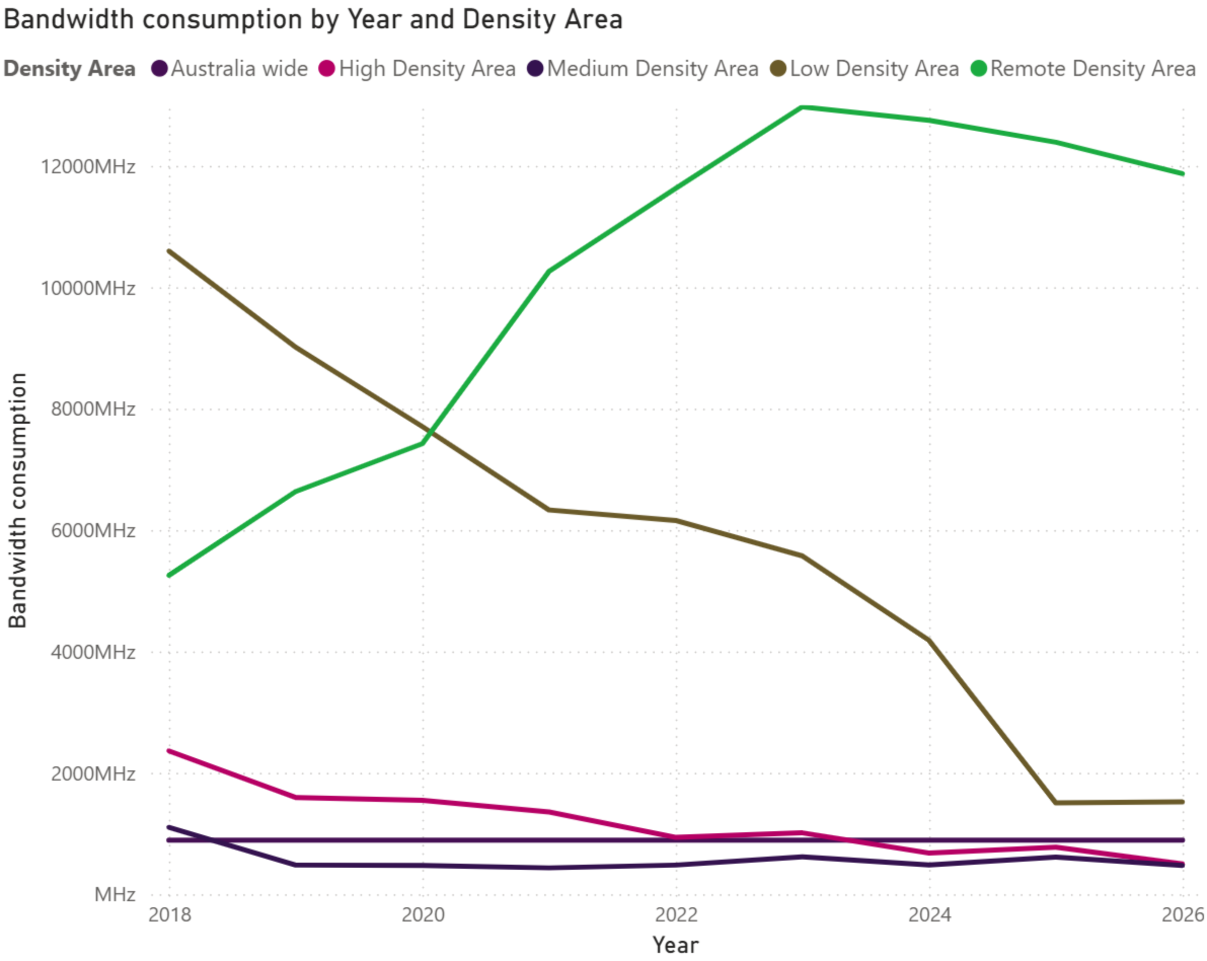


Figure 12: 2.69 GHz to 5 GHz band



For both the 520 MHz to 960 MHz and 960 MHz to 2.69 GHz bands, the trends in demand have slightly decreased or remained the same in every density area. In the 2.69 GHz to 5 GHz band, we have seen a slight reversal in remote demand between 2023 and 2026, while other trends have gradually declined or stabilised in line with the trends identified in our 2.69 GHz to 5 GHz band review.

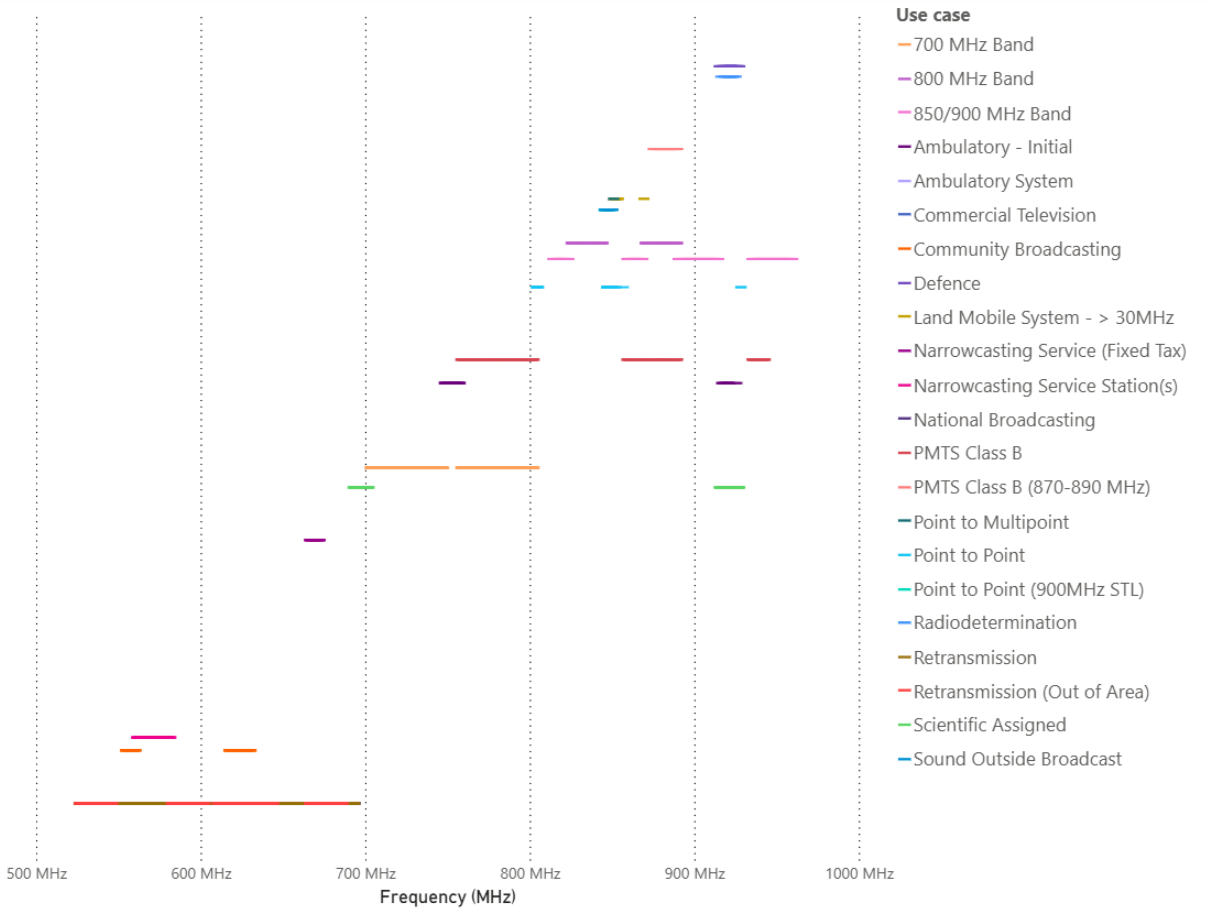
Appendix C: Spectrum plots of MHz occupied

The spectrum plots in this appendix attempt to extend the band composition information presented in the tile charts in the main paper, by showing a high-level picture of where along the spectrum each service type is being used/occupied.

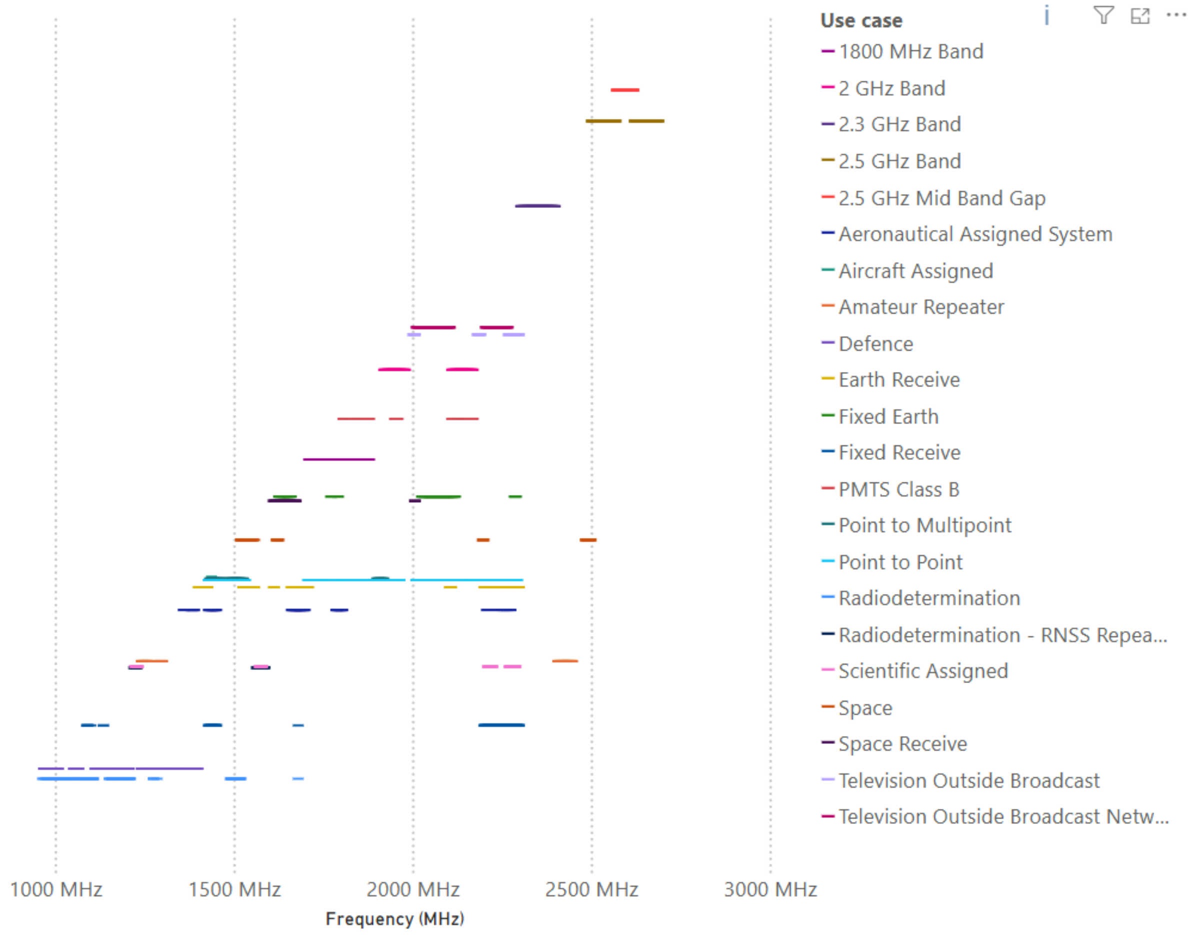
For example, in the 520 MHz to 960 MHz spectrum plot below the occupation of scientific assigned licences is shown at the bottom of the plot in pink. It shows that this licence type occupies the 2 parts of the band:

- 693 MHz to 703 MHz
- 915 MHz to 930 MHz.

520 MHz to 960 MHz



960 MHz to 2.69 GHz



2.69 GHz to 5 GHz