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22 June 2023

Attention: Shri Akhilesh Kumar Trivedi
Advisor (Networks, Spectrum and Licensing)
Telecommunications Regulatory Authority of India
New Delhi
Email: advmn@trai.gov.in

Counter comments: Consultation Paper on Assignment of Spectrum for Space-based Communication Services

Respected Sir,

Viasat appreciates the opportunity to provide comments on the *Consultation Paper on Assignment of Spectrum for Space-based Communication Services*. Viasat submits these comments to provide input on some of the responses received to the consultation paper ("consultation").

At a high level, proposals to auction exclusive spectrum rights for Fixed Satellite Service (FSS) geostationary (GSO) and non-geostationary (NGSO) is of concern to the wider ICT industry (nationally and internationally) and should also be of concern to the whole-of-government in India. Such proposal is unlikely to advance the satellite sector in India, on the contrary, it is likely to represent a regression because:

- It would undermine the open competition achieved through shared spectrum use over decades.
- It will not be conducive to investment certainty since spectrum access would move from open/shared use to a closed market with private spectrum gatekeepers.
- The total economic value of satellite spectrum is largely derived from its shared nature and the services it enables. This value is not derived from exclusivity.
- FSS (GSO and NGSO) networks are technically designed, deployed, and operated for a shared regional and global environment (unlike the design of terrestrial mobile networks which are contained within country borders)
- Local frequency access gained through an auction in India will still be subject to the international frequency coordination of ITU: owning access is one thing, but being able to use this access is still subject to global spectrum management processes beyond national licensing.
- Satellite frequency use cannot be delinked from its orbital component: the successful global coordination of both, as a shared resource, guarantees the recognition of their legitimate use internationally.

Specific comments on the responses received:

1) **Regarding the comments received from the two national terrestrial mobile operators proposing an auction process for satellite spectrum use:**

Terrestrial mobile spectrum is assigned exclusively to mobile operators. Mobile operators bidding at auction are paying to achieve the exclusion of others in the market where they wish to sell their services (striving for the lowest number of competing operators in a given market during the license term). Excluding others from the market is a primary incentive for them at auction (which translates to financial rewards), and that exclusivity for their sole spectrum use is priced through bidding. There are market dynamics at play which are shaped via that exclusion. Nevertheless, once mobile operators have gained exclusive spectrum access via the auction, and the license term comes to expiry, *mobile operators are opposed to auctions* from that point on, and strongly advocate in favour of administrative assignment instead (a.k.a., presumption of licence renewal).

When faced with the need to renew their spectrum use, mobile operators do not favour market mechanisms, because market mechanisms undermine their gained certainty in the market (market share). Excerpt from page 108 of the GSMA Mobile Policy Handbook[1]:

> *"The right approach to licence renewals is an important part of a successful spectrum management strategy.* ***Uncertainty over future rights to spectrum use may lead operators to cease investment*** *in their networks and compete less to grow their customer base until issues are resolved."*
>
> *"The* ***presumption of licence renewal and clear and timely renewal decisions are crucial*** *to mobile network development, as they provide mobile operators the certainty they need to make large, long-term investments in their network and mobile services".*

In short, mobile operators do not favour auctions as a mechanism for spectrum assignment. Mobile operators simply favour any ability or mechanism that ensures sole spectrum tenure and the exclusion of other potential spectrum users.

Satellite operators do not base their business model on exclusive spectrum access, nor their networks are designed for such purpose. Shared spectrum access in the satellite industry is built upon the need for internationally coordinated spectrum use.

[1] GSMA Mobile Policy Handbook found at: https://www.gsma.com/publicpolicy/wp-content/uploads/2022/03/Mobile-Policy-Handbook-2022.pdf

2) Regarding the comments received in support of auctions of satellite spectrum in isolation of international coordination requirements

Importantly, Viasat notes that satellite spectrum access is not independent of the associated – multi-laterally agreed – orbit parameters and planned service areas for FSS (GSO and NGSO). This is why it is referred to as the "spectrum-orbit resource." The management of these resources between nations falls under the auspices of the International Telecommunication Union (ITU). The nature of the use of the spectrum-orbit resource is multi-laterally governed by Member States in an international context, beyond India's sole jurisdiction. As a result of this multi-lateral process the use of orbital resources has a direct impact on the usability of the spectrum resource by any satellite operator.

ITU Radio Regulations states that the rights and obligations of spectrum use by an administration are derived directly from the recording of frequency assignments in the ITU Master International Frequency Register (MIFR). Frequency uses by satellite systems not recorded in the MIFR cannot be protected and are not recognised internationally. Therefore, TRAI's proposal to begin issuing national exclusive spectrum rights for FSS (GSO & NGSO), via auction or any other mechanism, would not be in conformity with the international requirement to coordinate frequency assignments for satellite spectrum. Those spectrum-orbit coordination procedures are required to be followed for the use of any space radiocommunication services, given the international recognition those services are required to obtain before they can be deployed, for the protection to and from other users of the same spectrum-orbit resources. This successful inclusion of these spectrum-orbital assignments in the MIFR, through which they gain international recognition, subject to the multilateral provisions of the ITU Radio Regulations, means that the ability to use any national-level frequency licensing of space-based communications will depend, unavoidably, on a multiplicity of stakeholders beyond India's jurisdiction.

Moreover, other significant uncertainties will impact investment in space-based communications in India if auctions are considered as a spectrum assignment mechanism. For example, operators and the administrations that make those filings on behalf of satellite operators will have to coordinate their spectrum-orbit resource use across the globally established and shared spectrum regime under the ITU treaty obligations, but then they will also have to find a way to coordinate with an operator under a newly created regime of private-exclusive domestic licensees, only adopted by India. In practical terms, having the exclusive rights to use such frequencies nationally and exclusively in India would not guarantee the ability to use them in India because of the ITU overlay of international rules.

Furthermore, any requirement to have exclusive frequency licensees in India coordinate amongst themselves, based only on spectrum licensing in India is likely to significantly complicate the use of satellite spectrum in India as it would be separate from the parallel ITU international coordination process. Having two parallel regimes for Indian licensees, one for exclusive licensees and another for existing operators under the ITU shared regime, as applies to ISRO, is likely to further complicate an already complex international frequency coordination process for space radiocommunications.

3) Regarding comments suggesting satellite networks are comparable to terrestrial network in the sense of their spectrum use

It is important to note that frequencies used by space-based communications networks are not implemented through the aggregation of standardised frequency carriers and waveforms, as is the case for terrestrial IMT standards such as 3GPP. In addition, satellite spectrum availability is directly proportional to the number of users than can be served by a satellite network (which is a fixed network design, hence the importance of making all the spectrum globally allocated to space services in the ITU Radio Regulations fully available to satellite systems).

Furthermore, any proposal to auction exclusive rights to frequency use for space-based communications on a national basis would not eliminate the multi-lateral nature of the spectrum-orbit resource management and would not qualify as a frequency assignment designed to serve space services. Such national assignment of exclusive frequency rights would in practice qualify as another terrestrial frequency assignment, unserviceable for space services, because FSS (GSO & NGSO) have orbital conditions that need to be met and managed in coordination with other jurisdictions. Space services would still be fully dependent on the international coordination and agreement of their frequency-orbit resource use in the MIFR and holding national and exclusive frequency rights in India would not guarantee those international rights through the ITU MIFR process, could be used. Not being able to guarantee the use of exclusive rights to an Indian licensee through a competitive market-based and revenue generating process for the State would represent a complex scenario.

4) Regarding statements suggesting terrestrial mobile spectrum still faces market demands in millimetre-wave spectrum bands

The consultation seeks information on the "quantum of spectrum needed to meet demand of space-based communication services" in Question 2. In different questions of the consultation, however, TRAI states that "27.5-28.5 GHz is identified for IMT in India" (*see* Questions 10 and 11).

Viasat notes that the Ka band uplink (27.5-30 GHz) is globally allocated to and used by the FSS for users at fixed locations and on the move by Earth Stations in Motion (ESIM). Innovative satellite broadband services that are offered using these frequency bands require access to and use of the entire Ka band throughout India and other countries. Any inference that the 27.5-30 GHz band is partially identified for terrestrial IMT in India, or that part of this band may not be fully available for satellite broadband services in India, would be inconsistent with the international identification of spectrum through the World Radiocommunication Conference decisions (WRCs), and it would also be inconsistent with providing an unconstrained supply of spectrum for satellite broadband services in India.

An important aspect of the 27.5-30 GHz band is the fact that it is allocated and licensed in the vast majority of countries around the world for these satellite broadband services. This allows for contiguous spectrum access for innovative and ubiquitous satellite network designs and operations. This also allows satellite operators to provide greater speed and capacity to users and devices. Reducing the available bandwidth for satellite broadband services in the Ka band by either (i) restricting its use to gateways only in the 27.5-28.5 GHz band or (ii) denying access to the entire band for the full range of FSS GSO and NGSO uses will deprive India of critical satellite broadband connectivity to users at fixed locations and on the move.

Separately, India needs to prioritise spectrum for terrestrial IMT consistent with the requirements for that service. Global research[2] demonstrates that the highest demand for terrestrial IMT spectrum is in the mid-bands, while there is little demand for terrestrial IMT in the mmWave spectrum. Therefore, Viasat respectfully recommends that spectrum requirements for terrestrial IMT prioritize spectrum that is best suited for IMT services, such as the mid-band for IMT, and not in bands where there is little or no global uptake.

The same studies demonstrate that terrestrial IMT in the 27.5-29.5 GHz (28 GHz) band has not seen significant deployment by terrestrial IMT operators. Offering frequency bands for terrestrial IMT with low demand poses the risk of spectrum being underutilised by terrestrial players and depriving other existing and innovative services from being offered using that spectrum. This outcome will result in a costly regulatory failure for India, through the loss of substantial economic opportunities that could be better achieved by allocating and licensing the 28 GHz spectrum band in full for satellite broadband services, and authorising terrestrial IMT in other globally harmonised bands. For example, Viasat notes that South Korea has not seen any material demand for terrestrial IMT services in the 28 GHz band[3]. Committing 28 GHz spectrum to terrestrial IMT will, therefore, risk the loss of GDP revenues per annum to India's economy on the order of USD72-184.6 billion[4]. India will be particularly vulnerable to demand constraints and higher costs if portions of the 28 GHz band are allocated to terrestrial IMT, because terrestrial IMT is being prioritised globally in spectrum below 6 GHz and because the 28 GHz band is not allocated globally for terrestrial IMT.

We note that the full 26 GHz band (25.25-27.5 GHz) has already been identified for terrestrial IMT, even though it is not fully utilized. This fact is in addition to multiple other existing bands that have been identified for IMT. There are also new potential terrestrial IMT bands under discussion at WRC-23. In the 2022 IMT spectrum auction in India, approximately 30% of the 26 GHz band was not licensed, and rollout of terrestrial services in the 26 GHz band remains negligible. This further confirms that the demand for terrestrial IMT services in millimeter-wave spectrum bands has been over-estimated.

Any suggestion or plan to use the 28 GHz band spectrum, in part, shared or in full, for terrestrial IMT is inconsistent with a spectrum policy oriented to achieve the necessary supply of spectrum for space-based services to satisfy the growing demand for connectivity using those services in India. It is therefore not appropriate to identify more spectrum for terrestrial IMT in spectrum that is internationally identified for satellite broadband services resulting in unnecessarily constrained spectrum resources for satellite services in India.

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2 ABI Research: *Emerging Markets Broadband Objectives: Spectrum Requirements* (2021), https://go.abiresearch.com/lp-emerging-markets-broadband-objectives-spectrum-requirements.

3 The Korea Herald, *Telecos lag in mmWave 5G equipment installation: lawmaker* (Sept. 10, 2021), http://www.koreaherald.com/view.php?ud=20210910000417.

4 Plum: *Expanding digital connectivity through satellite broadband in the 28 GHz band* (Oct. 2021), https://plumconsulting.co.uk/expanding-digital-connectivity-through-satellite-broadband-in-the-28-ghz-band/.

Meeting the globally agreed ITU process for frequency use is a fundamental building block for developing and deploying satellite communication networks, and hence, we urge TRAI to:

a) Assign IMT spectrum to terrestrial mobile services in the bands identified for that purpose in the ITU Radio Regulations (i.e., 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 GHz, 66-71 GHz and many others);

b) Assign the 27.5-30 GHz band for full use by FSS/ ESIM satellite services; and

c) Maintain the current administrative regime for spectrum used by satellite services, which is based on the globally shared spectrum-orbit resource managed by the ITU.

The economic benefits estimated for India and the cost advantages available from the 28 GHz band for satellite broadband services are only possible if the entire 27.5 – 29.5 GHz band is allocated and authorized for satellite broadband services throughout India using an administrative licensing regime (global practice). Using auctions and assigning exclusive spectrum rights in India for space-based communications is impractical.

Viasat looks forward to further discussions on these important issues. In the attached annex we pose further comments for consideration.

Sincerely,

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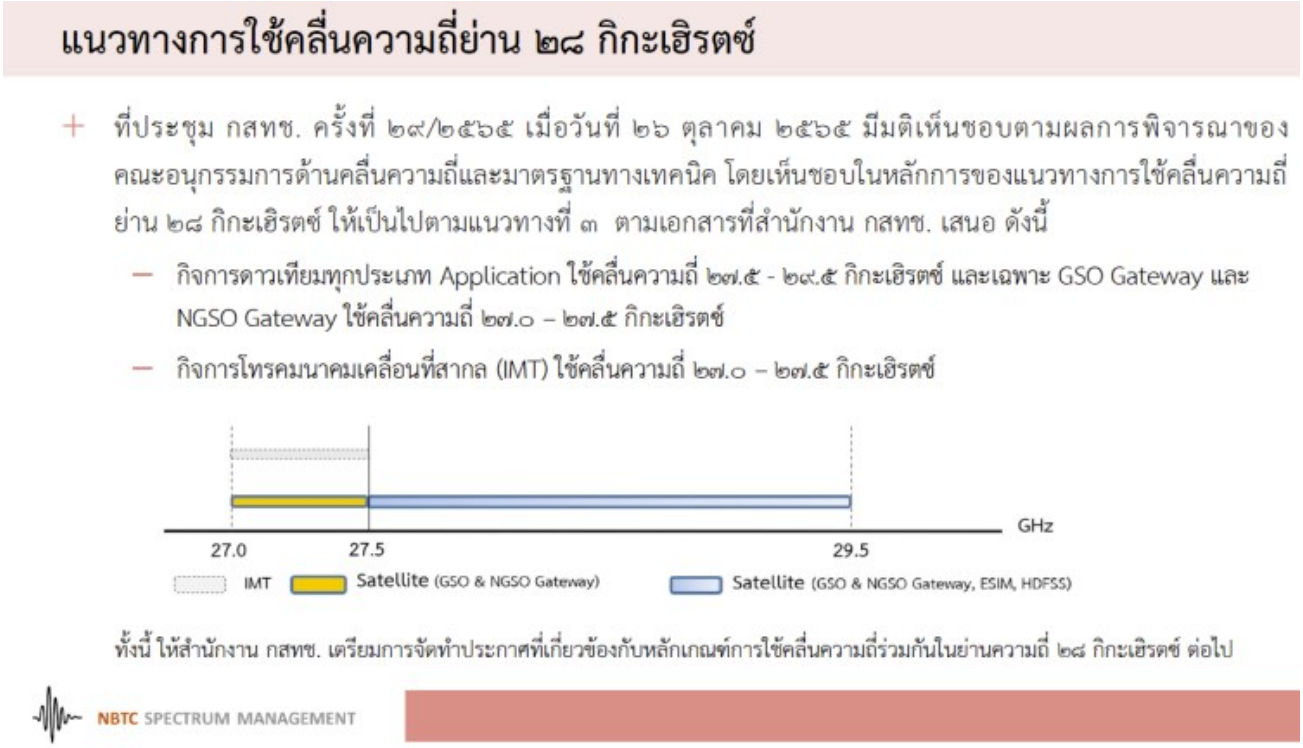
ANNEX: administrative assignment of the 28 GHz band (27.5-29.5 GHz)

Viasat supports assigning satellite frequency spectrum on a non-exclusive basis. The majority of the countries in the world rely on open regulatory regimes to allow competition of satellite broadband services under the ITU spectrum and orbital assignment process and national market access licensing. India will benefit from maintaining harmonised used of the Ka band with the rest of the world, as this band has emerged as the global choice for Ultra High Throughput Satellite systems, particularly for use by ubiquitous FSS for fixed users and on the move with ESIM. Over 100 countries have now adopted or are planning to use the Ka band, and the entire 28 GHz band (*i.e.*, 27.5-29.5 GHz), exclusively for FSS fixed users and on the move by ESIM.

Recent examples in the Asia Pacific region include China, Philippines, Australia, Thailand and many others. All these countries continue to maintain the globally-shared spectrum regime managed and coordinated by the ITU, and their frequency allocation is harmonised with the ITU Radio Regulations. Thailand for example – as a global tourism destination - has recognised the growing need for high-capacity broadband in mobility and has allocated the full 28 GHz for satellite connectivity to deploy ubiquitous FSS and ESIM for aviation, maritime and land users. The decision by the NBTC[5] is depicted below:



[5] The NBTC decision and related analysis can be found at: https://dpolit.com/2023/01/08/thailand-secures-next-generation-inflight-connectivity-nbtc-allocates-the-full-28-ghz-spectrum-band-for-satellite-broadband/.

Viasat strongly recommends that India consider a similar harmonised arrangement to the one adopted by Thailand, and to maintain the current non-exclusive spectrum regime managed through the ITU processes. Furthermore, the arrangements adopted by administrations such as Thailand, guarantee the global inter-operability and availability of ESIM services in a cost-effective manner, which is possible through the global economies of scale that exist in the 28 GHz band for satellite broadband services at fixed locations and on the move.

Viasat has previously explained in prior consultations before TRAI that terrestrial IMT/5G services are not designed to be compatible with satellite services. In order for India to be able to enjoy the benefits of both satellite broadband services and terrestrial IMT/5G, TRAI and DOT should allocate the entire 28 GHz band exclusively for satellite services and identify other frequency bands (*e.g.*, 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz), which have been globally harmonized by the ITU, for terrestrial IMT/5G.

The frequency range of the band identified for terrestrial 5G/IMT by the ITU at WRC-19 is 24.25-27.5 GHz (known as 26 GHz band), among other mmWave bands[6]. Spectrum above 27.5 GHz is not identified for terrestrial 5G/IMT by the ITU. In addition, the band 27.5-29.5 GHz has been protected by the ITU for satellite broadband services, including Earth Stations in Motion (ESIM) at WRC-19[7], and is under study for expanded satellite use in WRC-23 Agenda Items 1.16 (non-geostationary ESIM) and 1.17 (satellite-to-satellite links).

The ITU's Radio Regulations (RR), in accordance with No.31 of ITU's Constitution, is a binding international treaty. It identifies 41 Radio Services to which the spectrum - 8.3 kHz to 275 GHz - is allocated. India uses most of these radio services for terrestrial, maritime, aeronautical and space applications. Publications, including recommendations by the ITU, focus on optimizing and providing guidelines for spectrum use by its 193 member administrations. For example, the ITU adopted Recommendation ITU-R S. 2223 on "Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3-30 GHz" in 2011 and then updated it in 2016[8].

In the case of the 28 GHz band, satellite operators have made substantial investments based on the global validation of satellite broadband use of the band at both WRC-15 and WRC-19. The decisions of these Conferences provided confidence for those investments and the result is that satellite networks are being built

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6 *See* ITU Press Release, *WRC-19 identifies additional frequency bands for 5G*, (22 Nov. 2020) (those bands include the following: 24.25-27.5 GHz, 37-43.5 GHz, 45.5-47 GHz, 47.2-48.2 and 66-71 GHz), https://news.itu.int/wrc-19-agrees-to-identify-new-frequency-bands-for-5g/.

7 *See* ITU Radio Regulations, adopting Footnote 5.517A authorizing geostationary ESIM as a part of the Fixed Satellite Service in the 27.5-29.5 GHz and 17.7-19.7 GHz bands.

8 *See* ITU-R Recommendation S.2223, *Technical and operational requirements for GSO FSS earth stations on mobile platforms in bands from 17.3-30 GHz* (2011, revised 2016), https://www.itu.int/pub/R-REP-S.2223.

and deployed around the world for expansive use of the 28 GHz band, using the globally shared spectrum coordination process managed by the ITU.

WRC-19, during its lengthy deliberations, adopted an identification of the 24.25-27.5 GHz band for terrestrial 5G/IMT. The Conference did not include the 27.5-28.5 GHz band as part of the 5G/IMT identification. Use of spectrum for terrestrial 5G/IMT in the 27.5-28.5 GHz band would be inconsistent with the ITU Radio Regulations, which are internationally binding treaty obligations.

In addition, the Parliamentary "Standing Committee on Information Technology (2020-21)" by the Seventeenth Lok Sabha in its report on "India's Preparedness for 5G" was presented to the Indian Parliament on 08 Feb. 2021 referred to the use of the spectrum for 5G IMT only up to 27.5 GHz and not up to 28.5 GHz (*see* page 143, para 29). Moreover, on page 141 of the report, paragraph 23, the Cellular Operators' Association of India (COAI) provided a recommendation of a spectrum block size of 400 MHz per 5G operator in the mmWave bands, which can be easily met within the 3.25 GHz of globally harmonized 5G/IMT spectrum in the 26 GHz band (*i.e.*, 24.25 to 27.5 GHz), identified by WRC-19. We note that the 26 GHz band was sold in India to mobile operators in 2022, who decided not to buy the full band (almost one-third of the spectrum blocks available were left unsold[9]).

Further, we note that there is a global lack of demand for terrestrial 5G IMT in the 28 GHz band (and in mmWave bands in general) given its high cost of deployment and reduced coverage (hundred metres) this spectrum can provide for terrestrial broadband. Demand studies support this view. Today there are examples of underutilisation and under-investment in South Korea, a failure to sell this spectrum for terrestrial 5G IMT in Brazil at auction, the United States pivot from mmWave to low- and mid-bands, the commitment of Europe to preserve the full 28 GHz band for FSS satellite and ESIM. In addition, China, Russia, Australia, Philippines, Thailand and dozens of other countries have all reject terrestrial 5G IMT in the 28 GHz band and instead authorized satellite broadband services across the entire 28 GHz band.

In addition, infrastructure costs for India will be significantly lower if the full 28 GHz band is assigned to satellite-powered broadband while rapidly deploying connectivity using Ultra-High Throughput satellite broadband that can cover the entire country. For example, the PM WANI initiative ise particularly well suited for expanding internet access rapidly and at lower cost across India. Recent infrastructure Total Cost of Ownership (TCO) studies confirm that satellite broadband is more cost effective when deployed as part of broadband solutions and even more cost effective when combined with Wi-Fi. The following snapshot displays a TCO comparison in one recent study[10]:

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[9] Summary of spectrum sales, 2022: https://telecomtalk.info/india-5g-spectrum-auction2022-spectrum-acquisitions-details/539161/.

[10] Dedicating 28 GHz for satellite: benefits from Total Cost of Ownership: http://www.strategies.nzl.com/industry-comment/dedicating-28ghz-spectrum-band-to-satellite-services/.

The lowest cost alternative is scenario 3, followed by scenario 4. Both scenarios are more cost effective than the other two scenarios which include access over 5G technologies (Exhibit 4.2).

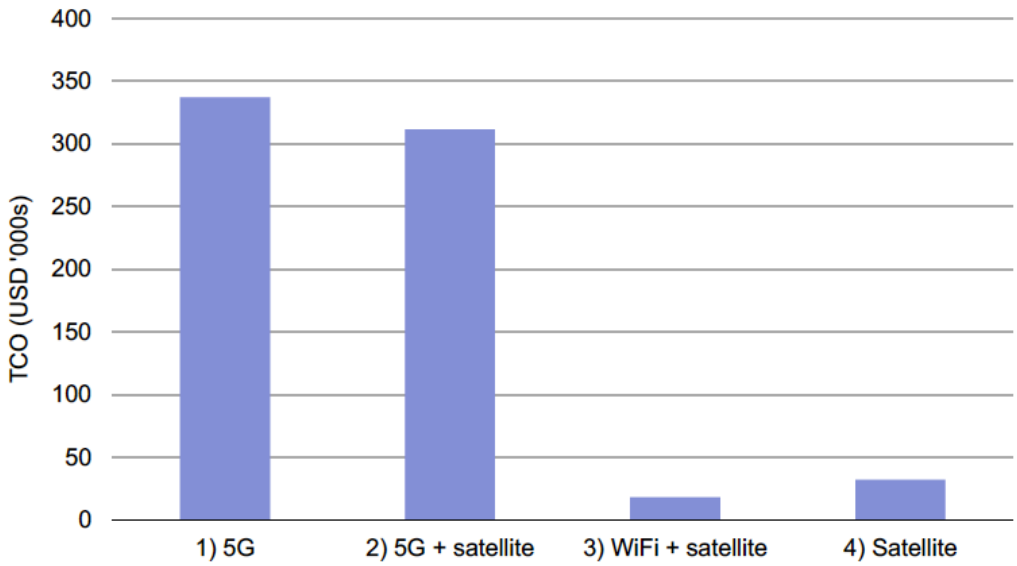

Exhibit 4.2: *Model results [Source: Network Strategies]*

India's vast territory, population density and demand for ubiquitous and reliable ultra-fast broadband requires careful allocation of spectrum resources to incentivize cost-effective deployment of broadband across India, with increased choices and solutions for consumers, businesses and government uses.

Spectrum access should be **prioritised according to demand** to those services that can realise the highest economic benefit for the citizens of India. For example, recent studies[11] indicate that countries are prioritising

[11] ABI Research: *Emerging Markets Broadband Objectives: Spectrum Requirements (2021)* https://go.abiresearch.com/lp-emerging-markets-broadband-objectives-spectrum-requirements.

spectrum in the mid-bands (below 6 GHz) for the deployment of terrestrial 5G networks, with the majority of 5G deployments using the 3.5 GHz band.

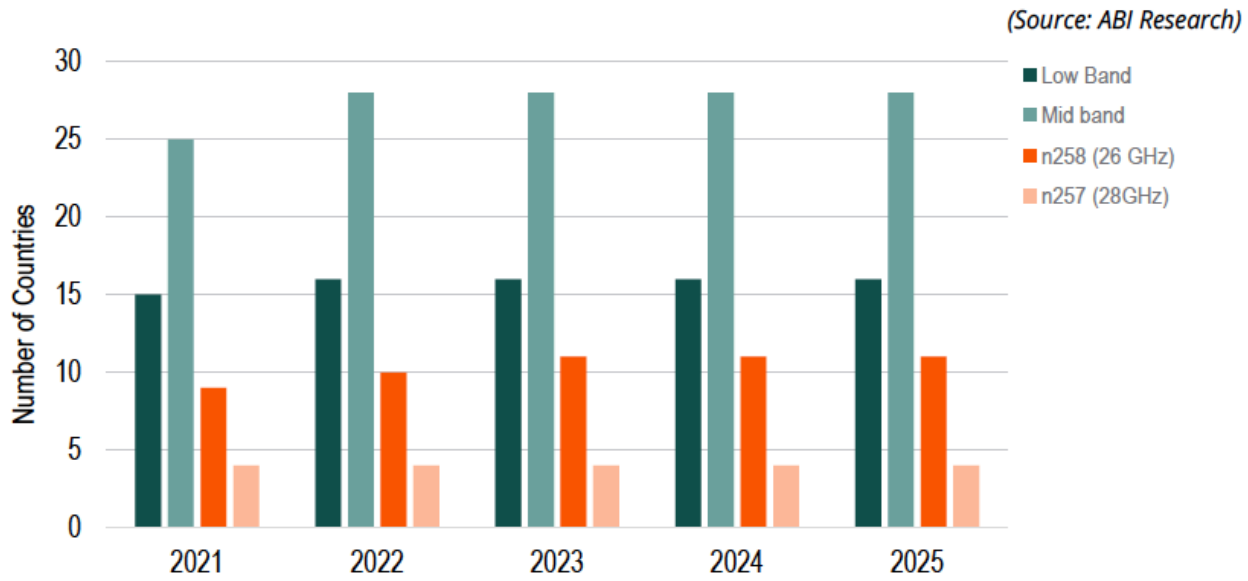

Figure 1. Current and expected spectrum allocation for terrestrial 5G in emerging markets, 2021-2025

In contrast, high bands in the mmWave spectrum **(26 & 28 GHz) are not being prioritised for terrestrial 5G/IMT** because of their high cost of deployment, greatly reduced coverage and limited ecosystem that can serve only niche applications, leading to a lack of demand. For India, the challenge to deploy terrestrial 5G/IMT is even greater, considering that 5G/IMT mobile networks must have access to fibre infrastructure (fibre availability in India represents only about 8% of the territory). The 26 GHz band (24.25 – 27.5 GHz) was globally harmonised for 5G (IMT) by the ITU at WRC-19 and Viasat supports use of the 26 GHz band for 5G/IMT in India. However, the **28 GHz band (27.5 – 29.5 GHz) is not a designated band for 5G/IMT by the ITU. The 28 GHz band is a critical band for advanced Ultra High Throughput Satellite networks, including for ubiquitous satellite ESIM[12] (maritime, aviation and land based) on a global basis, which has been validated by the ITU at WRC-19**.

Countries have prioritised the entire 28 GHz band (27.5 – 29.5 GHz) without fragmenting it or splitting it with 5G/IMT services, because 5G/IMT has vast amounts of spectrum available already (as seen in figure 1). For example, to fully benefit from the economics and national coverage of satellite-powered broadband, the

[12] ESIM: Earth Stations in Motion. Satellite broadband connectivity for applications requiring mobility (*i.e.*, maritime routes and ports, aviation routes and airports, and ground-based mobility such as trains, trucks and government uses).

entire European Union, most of the Americas, Africa, Middle East, China, Australia, and increasingly across ASEAN, have protected the band 27.5 – 29.5 GHz for its ongoing use for satellite broadband services.

Satellite networks are dependent on the amount of spectrum available to deliver services, and any reduction of the available spectrum will impact the capacity available to users being served. The prioritisation of the full 28 GHz band for satellite broadband will have a significant impact for India in terms of the potential economic benefits India can achieve from the use of this spectrum[13]. Splitting or reducing the amount of spectrum available to satellite broadband services in the 28 GHz band will leave India unable to enjoy these benefits and will impair India's ability to successfully plan and accommodate emerging demands that only satellite-powered connectivity can achieve.

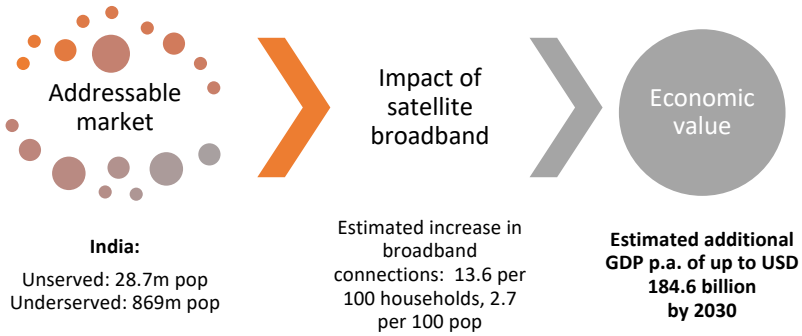

Figure 2. Estimated economic benefits of allocating the full 28 GHz band (27.5 – 29.5 GHz) for satellite broadband in India (Source: Plum Consulting, 2021)

In India, satellite-powered broadband deployment in the full 28 GHz band will contribute to economic benefits from:

- improved broadband service quality and ubiquitous access across urban and suburban areas,
- broadband connectivity for unserved and underserved communities,
- wider choice of broadband and pricing options, and
- new applications and connectivity services for expanding market segments, such as land, aeronautical and maritime transport routes, through ESIM.

This is particularly important in fulfilling India's commitments to connect 1.5 billion people in the next two years through the government led BharatNet and PM WANI projects.

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[13] Plum: *Expanding digital connectivity through satellite broadband in the 28 GHz band,* (Oct. 2021), https://plumconsulting.co.uk/expanding-digital-connectivity-through-satellite-broadband-in-the-28-ghz-band/.

The wider bandwidth which is possible through the use of the 27.5 – 29.5 GHz band for satellite means that satellite operators are able to deliver higher throughputs. Furthermore, new Ultra High Throughput Satellite systems operate multiple narrow spot beams that facilitate high frequency reuse, and these can be dynamically configured to adapt to traffic demand and user density. These advantages translate into lower cost-per-bit.

In summary, there is substantial evidence that the benefits of assigning the full 28 GHz band for satellite broadband services and using the existing administrative assignment approach (global practice) will bring the most benefit to India for this spectrum. TRAI should consider this evidence and allocate the full 27.5 – 29.5 GHz for satellite broadband, using the current administrative regime, while at the same time recognising that terrestrial 5G IMT is not designed to share spectrum with space-based communications, co-frequency and co-coverage.

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