Draft Consultation Document on Spectrum Outlook

04 March 2022

Contents

1. Introduction

SENTECH thanks the Independent Communications Authority of South Africa ("Authority") for the opportunity to make a submission on the *Draft Consultant Document on Spectrum Outlook ("Spectrum Outlook")* as published in Government Gazette No. 45690 Notice 738 of 2021. SENTECH will be making a presentation during the oral hearings.

2. Principle Issues

SENTECH is concerned about the practicality of creating a spectrum outlook structure that looks 10 – 20 years ahead. Section 34 of the EC Act clearly state that South Africa's National Radio Frequency Plan is influenced by the outcomes or ITU-R Treaties (WRC). The ITU WRCs are held every four (4) years, it is therefore difficult to see how the Authority will manage the 10 – 20 year spectrum plan when global spectrum regulation issues are reviewed and revised every fourth (4^{th}) year. Section 4(3)(c) of the ICASA Act state that the Authority "must control, plan, administer and manage the use and licensing of the radio frequency spectrum in accordance with bilateral agreement or internal treaties entered into by the Republic".

Section 4(3)(i) further indicate that the Authority "may attend conferences convened by the relevant United Nations Specialised Agencies and any other bodies and, where applicable, must implement any decisions adopted by such Agencies and other bodies to which the Republic is a party". Section 4(3)(i) of the ICASA Act is enabled by section 30(2) of the Ec Act. In terms of section 34(1) of the EC Act, the Minister of Communications and Digital Technologies is the country's representative on WRC matters as the conference reviews and revises international treaty governing the global use of the radio-frequency spectrum. Section 34(1), (2), (7)(c) and (16), amongst others, outline the Minister's role and responsibilities with respect to spectrum planning.

SENTECH is concerned that the Spectrum Outlook indicates bias in favour of IMT. The number and type of questions indicates that the Spectrum Outlook inquiry is seeking to conceptualise scenario plans for IMT Long Term Spectrum Outlook for South Africa. Majority of other services are not receiving similar or equitable treatment of inquisition. It is also not clear on what basis the Authority is stating that "[m]obile spectrum needs will increase over 5 to 10".

The arguments presented by the Authority is section 4.3.1 are one-sided and also based on a traffic model whose sole purpose was spectrum requirement for IMT services towards the WRC-15. Discussions on additional spectrum requirements towards WRC-19 and WRC-23 do not reference the methodology the Authority is referring to. The Authority's arguments

ignore the fact that WRC-19 identified a total of 17.25 GHz of spectrum for IMT, and out of this number, 14.75 GHz of spectrum has been harmonized worldwide, reaching 85% of global harmonization. Additionally, there are five (5) WRC-23 agenda items dealing with spectrum issues for IMT services in the ITU Region 1. It is therefore not clear how the Authority has decided that there is insufficient spectrum for mobile services.

3. Regulatory Framework and Policy Objectives

3.1. Regulatory and policy: Long-term spectrum planning

1. Please comment on whether the above captures the relevant regulatory and policy aspects of long term spectrum planning.
Comment: <u>CRASA and ATU</u> SENTECH has noted in section 2 of the Spectrum Outlook the Authority indicated that there are a number of "government policies that inform radio frequency spectrum planning". What is of concern to the company is the mention of CRASA and ATU activities as part of government policies. SENTECH hopes that the Authority's statement was made in error. The company's understanding is that ATU, CRASA and SADC outputs based on best practice can and usually form part of inputs into policy formulation. This principle is also true with documentation from the ITU, academia, other Regulatory organisations, industry bodies, etc. Therefore, the organisations' output can never be automatically seen or assumed to be a structural part of policy and regulation formulation. Section 34(1) and (7) of the EC Act clearly outline the framework for the national radio frequency plan preparation, in particular on issues of international fora. <u>National Development Plan</u> In contemplating the "relevant regulatory and policy aspects of long term spectrum planning", the Authority must acknowledge the holistic intention of the NDP with respect to the public interest. As an SOE, SENTECH will like to bring to the attention of the Authority the NDP's role with respect to State intervention. The South African Government declared the intention to become a developmental state through an overarching policy, *National Development Plan 2030: Our Future-make it work* ("NDP"). The policy instrument is an expanded adaptation of Japan, Malaysia, Singapore, Taiwan, Vietnam, and South Korea developmental state models, thereby placing State-Owned Entity (SOE) as central interventionist

tools for the State. The NDP describes a scenario where the Government plays a central role in using state resources to ensure a balance between growth and development on socio-economic matters through interventionist strategies.

The NDP supported by section 3(1A) of the EC Act (as amended) anticipates the use of SOEs to "ensure strategic ICT infrastructure investment", yet the EC Act (as amended) does not sanction the assignment of radio frequency infrastructure. The challenge of radio frequency infrastructure assignment limits the State's role in intervening in national developmental goals. Therefore, the development of a spectrum outlook document must consider the reservation of spectrum for public services used to achieve NDP goals, in terms of the Government's intervention strategies. The NDP states that "radio spectrum is a scarce resource that needs to be optimally allocated to meet both economic and social objectives".

SA Connect

Broadband infrastructure provision to the public sector as well as to under-serviced areas in South Africa is an important priority to the government. SA Connect is the primary programme for this initiative. The intention behind SA Connect is to provide a clear framework for the implementation of an open-access regime for the wireless and fibre networks planned for South Africa. Ultimately, its objective is to contribute to job creation and the growth of the knowledge economy in South Africa. SA Connect is South Africa's broadband policy and seeks to operationalize the National Development Plan (NDP), the New Growth Path (NGP) and provide practical expression to the Presidential Infrastructure Coordinating Commission (PICC) Strategic Integrated Project (SIP) 15. SIP 15 aims to ensure universal and access to reliable, affordable and secure broadband services by all South Africans, prioritizing rural and under-serviced areas and stimulating economic growth.'

In line with the State's developmental goals, the State Digital Infrastructure Company (SDIC) is an interventionist tool mandated to complement private sector investment by striving to accelerate digital infrastructure to underserved, underserviced and rural areas using public funding in compliance with Strategic Infrastructure Project 15 (SIP 15).

Infrastructure Development Act

The Infrastructure Development Act (2014) empowers government departments to intervene in infrastructure development through SIPs (strategic integrated projects). The Act seeks:

> *"To provide for the facilitation and co-ordination of public infrastructure development which is of significant economic or social importance to the Republic; to ensure that infrastructure development in the Republic is given priority in planning, approval and implementation; to ensure that the development goals of the State are promoted through infrastructure development; to improve the management of such infrastructure during all life-cycle phases, including planning, approval, implementation and operations; and to provide for matters incidental thereto*[1].

The formation of the State Digital Infrastructure Company (SDIC) occurs within the context of the rationalisation of SOEs to ensure the alignment of SOEs at all spheres of a government to achieve the developmental objectives and aspirations outlined in the NDP. The use of the SDIC as an interventionist tool to provide network connectivity complies with section 3(1A) of the EC Act (as amended). SENTECH argues for the need for the legislative framework to empower the assignment of radio frequency infrastructure for the purpose linked to *SIP 15: Expanding access to communication technology*, as envisioned in the Infrastructure Development Act.

The NDP supported by section 3(1A) of the EC Act (as amended) anticipates the use of SOEs to "ensure strategic ICT infrastructure investment", it is on this basis that there is a need for spectrum planning to ensure assignment for public use linked to State spending under SIP 15. The challenge of radiofrequency infrastructure assignment not accommodating State sponsored projects, limits the State's role in intervening in national developmental goals. Therefore, there is a need for the reservation of spectrum for public services used to achieve NDP goals. The NDP states that “radio spectrum is a scarce resource that needs to be optimally allocated to meet both economic and social objectives”.

[1] Infrastructure Development Act, 2014

4. Spectrum Management and Economic Impact

4.1. Impact of Broadband

2. Are there services, in addition to broadband, that ought to be considered as important for economic growth? If so, please explain what these services might be and what the trade-offs are between using spectrum for broadband and alternative services. Please provide any evidence from other countries that may be relevant.
Comment: The Authority must acknowledge that the challenge with this question is the absence of a definition for broadband adopted in the document, taking into consideration the various existing definitions. To ensure consistency in its response on the issues of broadband, SENTECH's opinion will be based on the SA Connect definition of broadband "as an ecosystem of high capacity, high speed and high quality electronic networks, services, applications and content that enhances the variety, uses and value of information and communications for different type of users". It is important to note that this definition accommodates fixed broadband (fibre, cable, wireless(terrestrial and satellite)) and mobile broadband (terrestrial and satellite, including high altitude platform stations). There are a number of services requiring spectrum allocation and assignment in the national interest in compliance with provisions of the Constitution, such as, *inter alia*: Bill of Rights, Security Services, etc. The Authority must acknoeldge the need to protect spectrum for the following, amongst others: 1) Safety of life (aircrafts, ships, emergency position indicators beacons), 2) Security services (defence, police and security services), 3) Public protection and disaster relief (fire services, ambulance, etc.), 4) Scientific research (meteorological services, radio astronomy, space research, earth exploration, and remote sensing). Taking into comsideration the definition os trade-off, SENTECH argues that is not an appropriate principle to consider is a number of cases. The services mentioned are crucial to a country's stability, ability to offer crucial services and protection of country borders and individuals. Spectrum free of interference is also crucial to ensure safety of life. These principles are catered for the EC Act, particularly sections 34(2), 34(7)(c) and 34(16).

4.2. Broadband Penetration in South Africa

3. Please comment on the above assessment of the status quo on broadband penetration in South Africa, and what role spectrum may play in addressing the gaps identified.

Comment:

SENTECH is concerned that majority of the documents referenced in the assessment are dated. The discussion on SMEs and use of websites does not take into consideration the increasing use of social media for business. There has been a lot of changes and innovations since 2012 and the assessment should have been cognizant of these developments, especially the global impact of digital transformation on how it has began to impact expectations of how business and life in general is conducted.

With respect to the link between infrastructure investment and job creation, the assessment failed to acknowledge the impact of the country's macroeconomic status quo on the expected job created in reference to Katz (2013) expectations. Prior to the pandemic, South Africa's macroeconomic status can best be described as being fragile and theoretically in recession. National Treasury indicated that the country's economic growth declined from 1.4% in 2017 to o.2% in 2019. It is also important to acknowledge that the country experienced challenges with the pandemic during a period of economic decline.

Understanding the country's macroeconomic status is crucial to the context relating to progress on broadband penetration. On the issue of pricing of data services, the Authority failed to acknowledge the positive impact of the interventions led by the Competition Commission. The Authority's assessment should have also acknowledged the Competition Commission's report (Data Service Market Inquiry Final Report) and it is recommendations. It is also clear from the Competition Commission's report and studies carried by orginations such as the UN/ITU (The State of Broadband:People-Centred Approachesfor Universal Broadband: September 2021, amongst many, that access to additional spectrum is one of many of the levers required to open the multiple sluices for universal broadband.

Taking into consideration the context of the UN SDGs, of which South Africa is signitory to, the Authority should consider the 2025 Advocacy Targets as outlined in the *The State of Broadband:People-Centred Approachesfor Universal Broadband: September 2021*. Some of the principles outlined in the UN report are discussed in the Competition Commission's *Data Service Market Inquiry Final Report*, the Department's *National Integrated ICT Policy White Paper* ,and the report and recommendations from the Presidential Commission on the Fourth Industrial Revolution.

There has been a number of legislative, policy and regulatory initiatives striving to address "universal connectivity, affordability, access, equality and use[2]", in terms of the

2025 Advocacy Targets stated in the *The State of Broadband:People-Centred Approachesfor Universal Broadband: September 2021.* The Advocacy Tartgets are the following: 1) Universal Broadband Policy, 2) Affordable Broadband, 3) Increase Internet Demand, 4) Digital Skills and Literacy, 5) Digital Financial Services, 6) Increasing business presence online, and 7) Inclusive Access to Broadband. South Africa's main initiatives to achieving the UN SDGs and the Advocacy Targets are the NDP, Infrastructure Development Act, National Infrastructure Plan, the Draft Data and Cloud Policy, SA Connect and the National Integrated ICT Policy White Paper.

Therefore spectrum should be understood as one of the many ingredients required in addressing the gaps the Authority is referring to. It is therefore crucial for the Authority to resist the temptation of looking at spectrum in isolation.

4.3. Key Trends

4. What future changes, if any, should ICASA examine with regard to the existing licensing regime to better plan for innovative new technologies and applications and allow for benefits that new technology can offer, such as improved spectrum efficiency?
Comment: Taking into consideration that the EC Act is technology neutral, SENTECH does not advocate for a licensing based on technology. Technology development/innovations has and continue to impact on how business is conducted, including blurring the lines between previously unliked services. It is therefore important for the Authority to look at the impact of the current licensing regime on the type of services technology development enables. The Authority needs to also acknowledge that some of the services have existing regulatory bodies. It is also important to acknowledge that spectrum efficiency will have different meaning for dissimilar services. The ITU currently identifies the Authority as a third generations regulator[3], SENTECH therefore advocates for a concerted effort to transition into a fifth generation regulator in reference to the ITU Benchmark of Fifth Generation Collaborative Regulation (G5 Benchmark). G5 Regulation acknowledges the following four essentials, namely:

[2] https://broadbandcommission.org/publication/state-of-broadband-2021/

[3] https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-BB.REG_OUT01-2020-PDF-E.pdf

- Global impact of digital transformation;
- The new digital world needs a new take on regulation;
- Holistic and harmonized approach can deliver greater impact; and
- Development and inclusion have become a primary focus of regulation.

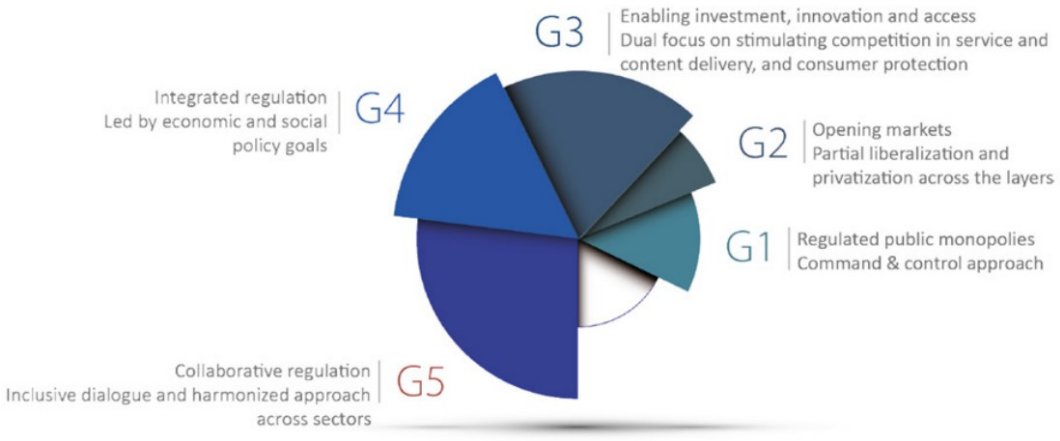

Figure 1:Generations of ICT regulation – conceptual framework (Source: ITU)

5. What future emerging technologies are to be taken into consideration and which technologies will have a significant impact? When are these technologies expected to become available?
Comment: As indicated earlier, the EC Act is a technology neutral legislation. SENTECH supports the principle of the Authority looking at the impact of technology innovations on how services are provisioned. The issue of technology adoption and impact are mainly driven by market forces and also national interests, e.g. the USA/EU challenges with China's progress on 5G and AI. The Authority is already addressing some of the aspects on technology through ITU WRC processes on spectrum allocation.

6. What and how will technology developments and/or usage trends aid in relieving traffic pressures? When are these technologies expected to become available?
Comment: The Authority should be concentrating on encouraging collaboration between different platforms to contribute to addressing issues of universal access, rather than making this predominately a technology matter. For example, the combination of a high fiber penetration and WiFi relieves traffic from the mobile networks. There is also an increasing deployment of satellite services to provide universal broadband. Technology developments and/or usage trends are influenced by new services offerings in the data - driven revolution.

7. Are there any IoT applications that will have a large impact on the existing licence-exempt bands? If so, what bands will see the most impact from these applications?
Comment: In principle SENTECH supports the assignment of spectrum for IoT within the current allocation of mobile. There is already an over-usage of licence-exempt bands. It is also important for the Authority to acknowledge that SMEs in the ICT sector are dependent on on the licence-exempt bands for sustainable business operations due to inability to afford spectrum fees. There is an increasing need for protected spectrum for IoT services such as in the transport, medical sectors, etc. It is important to note that reliability of data is crucial becuase IoTs are linked to data storage, processing and analytics.

5. Spectrum Demand Outlook

4.2 Spectrum outlook demand for commercial electronic communications network services

12. Provide your support or reasons for objections on the bands being considered internationally for 5G commercial mobile, fixed, satellite, or licence-exempt allocations
Comment: It is not clear what number 12 refers to. Seems to be a duplication of number 19.

13. Are the spectrum allocations comprehensive enough for spectrum demand projections for commercial mobile services in South Africa for the next 10 to 20 years?
Comment: Kindly refer to the comments on number 18. Future requirements for spectrum allocation and IMT identification are determined at WRCs for future consideration at competent conferences, held every four (4) years with the next conference to be held in 2023. The Authority is well aware that WRC processes strive for consensus to encourage global allocation where possible worldwide harmonization translate to positive economies of scale and faster maturity of ecosystems. It is currently not clear if there is a concerning and notable disparity between South African's spectrum allocation compared to ITU Region 1 countries. Therefore, what will be the basis of considering "spectrum demand projections for commercial mobile services in South Africa for the next 10 – 20 years?"

14. Is there a demand for more flexible frequency licensing and frequency assignment/allotments processes on a regional basis required to complement the national frequency licensing and frequency assignments/allotments in the next 10 to 20 years?
Comment: For immediate consideration, SENTECH requests the Authority to consider recommendations made by the Competition Commission in the *Data Service Market Inquiry Final Report.* SENTECH requests the Authority to initiate a public regulatory process to implement section 31(2A) of the EC Act, in particular the "control of a radio frequency spectrum licence".

15. Are there any other frequency bands that should be considered for release in the next 10 to 20 years for commercial mobile that are not discussed? Provide motivations for your proposal.
Comment: Kindly refer to the comments on number 18. Future requirements for spectrum allocation and IMT identification are determined at WRCs for future consideration at competent conferences, held every four (4) years with the next conference to be held in 2023. The Authority is well aware that WRC processes strive for consensus to encourage global allocation where possible worldwide harmonization translate to positive economies of scale and faster maturity of ecosystems. It is currently not clear if there is a concerning and notable disparity between South African's spectrum allocation compared to ITU Region 1 countries. Therefore, what will be the basis of considering "spectrum demand projections for commercial mobile services in South Africa for the next 10 – 20 years?"

17. Assuming that South Africa follows the ITU's recommendations to assign up to 1,940MHz of spectrum for IMT-2000 and IMT-advanced services, and that South Africa follows trends in Europe for potentially another 2,000 MHz of spectrum for IMT-2020, what bands would need to be freed up?

Comment:

The Authority must provide details leading to assuming higher density user density settings and how definitions of WRC-19 and considerations of WRC-23 were integrated into the assumption. It is also important to acknowledge that the ITU has indocated that each country can determine its cpectrum requirement by inputing relevant parameters indicated in Annex 1 of the Report ITU-R M.2290-0. It is also telling that there has been no update to the Report ITU-R M.2290 since WRC-15.

> *The Report provides a global perspective on the future spectrum requirement estimate for terrestrial IMT. The input parameters in this Report represent a possible set of global scenarios of the future mobile traffic growth. In some countries, the calculated spectrum requirements may depend on the specific market circumstances and the regulatory conditions hence spectrum requirements can be lower than the estimate derived by lower user density settings and in some other countries, spectrum requirement can be higher than the estimate derived by higher user density settings. The methodology utilized in the Report can be used to estimate the total IMT spectrum requirements of a given country only if all the current input parameter values used in this report are replaced by the values which apply to that specific country (as described in the methodology itself)[4].*

[4] https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2290-2014-PDF-E.pdf

18. What are your views on reallocating the following bands for IMT over the next years?**44** Table 3: List of possible future IMT bands (please supplement or delete as your organisation considers reasonable) • 450-470 (20MHz) • 617-698 (70MHz) • 1 427-1 518 (91MHz) • 1 710-2 025 (315MHz) • 3 300-3 400 (100MHz) • 3 400-3 600 (200MHz) • 3 600-3 800 (200MHz) • 4 800-4 990 (190MHz) • 24 250-27 500 (3250MHz) • 37 000-43 500 (6500MHz) • 45 500-47 000 (1500MHz) • 47 200-48 200 (1000MHz) • 66 000-71 000 (5000MHz)
Comment: There is great concern regarding the Authority's proposal of including radio frequency bands that are currently under consideration in compliance with the outcomes of World Radiocommunications Conference 2019 (WRC-19) on Agenda Items for WRC-23. It is also important to note the Republic of South Africa's policy position on the radio frequency band 3800 – 4200 MHz at the WRC-15. The country's policy position did not support the allocation of mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) in the radio frequency band 3700 – 3800 MHz. With respect to WRC-23 Agenda Items, the country will only consider policy position on the radio frequency band 3600 – 3800 MHz in terms of Agenda Items 1.2 and 1.3. The Authority is quite aware that the following radio frequency bands 470 – 960 MHz (Agenda Item 1.5) / 3600 – 3800 MHz (Agenda Items 1.2 and 1.2) / 4800 – 4990 MHz (Agenda Item 1.1) / 6425 – 7125 MHz (Agenda Item 1.2) are currently under discussion as part of World Radiocommunication Conference 2023 (WRC-23). The general understanding is that all country positions for WRC-23 are subject to Cabinet approval post Conference Preparatory Meeting 2, 2023 (CPM2-23) and

before official submission to WRC-23 for consideration. Taking into consideration that the ITU Task Group 6/1 is yet to agree and let alone undertake compatibility studies for Agenda Item 1.5, it is not clear on what basis the Authority is considering the bands for IMT.

In terms of section 34(1) of the EC Act, the Minister of Communications and Digital Technologies is the country's representative on WRC matters as the conference reviews and revises international treaty governing the global use of the radio-frequency spectrum. The inclusion of bands currently under discussion at the ITU WRC-23 in the Inquiry is beyond the scope of the Authority. The Authority has no legislative mandate to determine country policy on behalf of Parliament. The Authority must refer to section 231 of the Constitution of the Republic of South Africa, *International agreements*, read together with sections 30(2)(a) and sections 34(1), (2) and (3) of the EC Act.

Taking into consideration that the bands below were incorporated in the previous NRFPs and some of the bands are awaiting Ministerial approval to be incorporated into the latest NRFP post WRC-19, is the Authority implying that these bands are now open for further discussion regarding allocation in the National Allocation frequency table?

- 1 427-1 518 (91MHz)
- 1 710-2 025 (315MHz)
- 3 300-3 400 (100MHz)
- 3 400-3 600 (200MHz)
- 24 250-27 500 (3250MHz)
- 37 000-43 500 (6500MHz)
- 45 500-47 000 (1500MHz)
- 47 200-48 200 (1000MHz)
- 66 000-71 000 (5000MHz)

19. Provide your support or reasons for objections on the bands being considered internationally for 5G commercial mobile, fixed, satellite, or licence-exempt allocations.
Comment: Please refer to comments on number 18.

4.3 Spectrum outlook demand for specialised applications

4.3.2 Broadcasting

30. What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequate spectrum allocations for Broadcasting services in South Africa?

Comment:
 	
SENTECH will like to refer the Authority to the ITU REPORT ITU-R BT.2302-1: *Spectrum requirements for terrestrial television broadcasting in the UHF frequency band in Region 1 and the Islamic Republic of Iran*. In preparation for WRC-23 Agenda Item 1.5, Working Paty 6A circulated a questionnaire to member states in Region 1 to update "spectrum use and needs of the broadcasting services in the band 470 – 960 MHz in Region 1 and the Islamic Republic of Iran[5]". The report included a number of trends identified to influence future demands for the broadcast spectrum. The following services/applications have been listed, inter alia:
 	
• High Definition (HD) and Ultra High Definition (UHD);
• Interactive Broadcast Broadband (IBB);
• IBB services encompass the following:
  • Service Portal (to access all available services)
  • Enhanced Electronic programme Guide (EPG)
  • Catch-Up and Video-On-Demand
  • Start-Over service (example Start-over TV for catching up on the start of a program already broadcasting)
  • Rating/Voting - Get feedback from viewers
  • Games
  • Social Networks
  • E-Commerce
  • News, weather, sports.
  • Regional and Local TV
  • E-Government
  • E Learning
  • E-Payment
  • E-Health
  • Games

[5] ITU REPORT ITU-R BT.2302-1*

- Music
- Radio

- Time-shifted services;
- Local, regional and community services;
- Pay-TV programme services;
- 5G Broadcast;

The broadcasting industry, post DD1 and DD2, has consistently advocated for keeping the remaining spectrum allocation for terrestrial broadcasting, audio and audiovisual. The current allocation is sufficient to ensure the future of terrestrial broadcasting.

31. How much spectrum should be maintained for terrestrial broadcasting in the band 470MHz to 694MHz in the next 10 to 20 years?
Comment: Consistent with the Republic's submission to the ITU revision of the Report ITU-R BT.2302, SENTECH advocates for the allocation of the band 470 – 694 MHz to remain unchanged.

4.3.8 Satellite systems

39. What will impact on the demand for these services/applications in the coming 10-20 years? What is the realistic demand for these services in the next 10 to 20 years? Are there adequate spectrum allocations for Satellite services in South Africa?
Comment: The satellite ecosystem has drastically changed for the last few years, mainly due to technological developments that have radically reduced the cost of launching satellites lead by the likes of Space X, Amazon and OneWeb. It is reasonable to surmise that companies like Amazon are likely looking for vertical integration of their services and product offering and looking to reduce dependency on mobile network operators' infrastructure for connectivity. The current space race currently led by billionaires, in contrast to previous races lead by superpower nations, is expected to create a satellite

broadband market estimated to increase to US$400 billion in the year 2040[6]. The business model seems to be based on increasing profit margins by connecting the unconnected, unserved and underserved at a cost similar or cheaper than terrestrial telecommunications services, thereby increasing demand for existing services and creating new customers.

Due to satellite launches for low earth orbits (LEO), there is a need for the creation of mega-constellations and coupled with the desire to provide satellite broadband at speeds similar to fibre has increased the demand for spectrum in the Ku-band, Ka-band and V-band.

Spectrum Allocation

The question of whether there are enough spectrum allocations for satellite services in South Africa infers that issues of allocation in the National Radio Frequency Plan (NRFP) are uniform. The Authority is aware that the ITU has in place procedures and provisions in the Radio Regulations for the registration, coordination and operation of satellite networks in order o ensure the efficient use of satellite orbital slots and to avoid harmful interference between satellite networks utilizing the orbital slots[7]. Effectively the Authority's responsibilities in terms of aspects of spectrum management are mainly limited to satellite receivers.

SENTECH concedes that the operations of the satellite receivers are governed by the NRFP. The challenge is primarily the lack of adequate protection for satellite receivers mainly in the C-band and Ku-band.

[6] https://www2.deloitte.com/us/en/insights/industry/technology/technology-media-and-telecom-predictions/2020/satellite-broadband-internet.html

[7] https://www.imda.gov.sg/-/media/Imda/Files/Regulation-Licensing-and-Consultations/Frameworks-and-Policies/Spectrum-Management-and-Coordination/Spectrum-Rights-Auctions-Assigment/GuideSatelliteOrbitalSlotLic.pdf

40. Which applications and allocations will require the most frequency spectrum demand in the following frequency bands? • C-band • Ku-band • Ka-band
Comment: The nature of spectrum demand for satellites is a function of the availability of orbital slots and the type of orbit at which the satellite will operate. The creation of the mega-constellations for nanosatellites in the low earth orbit is a result of the need for low latency and small coverage from the satellites in comparison to GEO satellites. It takes three (3) GEO satellites to cover the entire earth, whilst it takes up to 80 LEO satellites for similar coverage. A lot of the nanosatellites are targeted to operate in the Ka-band and Ku-band.

41. What and how will technology developments and/or usage trends aid in relieving traffic pressures and addressing spectrum demand for satellite services? When are these technologies expected to become available?
Comment: The most significant technological innovations regarding satellite trends include small satellites, e.g. NanoSats, that have become the driving force behind the next generation of satellite capabilities[8]. As indicated previously, the enormous decline in the manufacturing cost of small satellites is enabling the mass production of satellites. The low manufacturing costs are supported by the decreasing cost of launching satellites due to technological developments that have enabled the reusability/"recycling" of the most expensive components of the launch vehicles. Nanosatellite technology has been identified as the most cost-effective alternative to mobile communications in the provisioning of affordable communication services to the unconnected, unserved and underserved. Small satellites are expected to revolutionise the telecommunications sector due to their low cost of manufacturing, lightweight and

[8] https://www.startus-insights.com/innovators-guide/satellite-trends-innovation/

high capabilities[9]. Another interesting development, related to WRC-23 agenda item 1.4, is the potential use of high altitude platform stations as IMT base stations (HIBS) to provide broadband connectivity. Though the recent advances in battery and solar-panel technologies including spectrum allocation are central to the success of HIBS, nanosatellites will play an important role in the value chain by providing low latency backhaul channels.

There is an increasing interest and investment from governments and the private regarding lunar landings as a "good testbed for many technologies that will eventually help…make our way to Mars[10]". Innovations linked to these projects benefit the entire satellite ecosystem.

> *Something of a holy grail for space travel at the moment, reusable launch systems for orbital vehicles are set to dramatically lower the cost of leaving Earth's atmosphere, opening the doors to many exciting space initiatives which, while theoretically possible, are currently too expensive to be practical. It will also make routine space missions, such as launching satellites and resupplying the International Space Station, far more economical. SpaceX's SN20 will attempt to launch the first successful orbital flight using a reusable rocket in early 2022, pending approval from the US FAA. SN20 is the most powerful rocket ever built, and is the craft that SpaceX hope will eventually take humans to Mars*

Another important trend is the satellite Internet of Things (IoT) that enables unparalleled connectivity across industries, including empowering 5G capabilities. Ground stations have also benefited from technological developments, e.g. requiring smaller dishes. Satellite technology development includes digitized payloads and propulsion systems, with Artificial Intelligence (AI) as an enabler for satellites to perform more complex functions autonomously.

> *Satellite launches make up the majority of commercial space activity, and that won't change as we go into 2022. The big drivers of increased activity in this field are the ever-falling cost of putting satellites into orbit and the growing number of use cases for the data they can provide. GPS and satellite imagery is an essential tool for many aspects of day-to-day life, and new uses – for example, tackling pandemics – are emerging all the time.*

[9] https://cordis.europa.eu/article/id/415777-nanosatellites-set-to-provide-internet-coverage-to-developing-world

[10] https://www.forbes.com/sites/bernardmarr/2021/12/10/the-five-biggest-space-technology-trends-for-2022/?sh=478297471bf4

Satellites are becoming smaller and lighter, meaning that even start-ups can now take advantage of the technological capabilities. In fact, reports in recent years have found that the cost to a business of launching a satellite is becoming comparable to launching an app. China's Galaxy Space has developed and launched 1,000 small satellites into space for its customers in industries including aviation, marine, and vehicle manufacturing. Meanwhile, another Chinese company, ADA Space, is planning a network of 192 satellites that will use artificial intelligence (AI) technology to provide live streaming satellite imagery of the Earth[11].

[11] https://www.forbes.com/sites/bernardmarr/2021/12/10/the-five-biggest-space-technology-trends-for-2022/?sh=478297471bf4