

## **Decisions on Recommendations (DORs) Matrix from the First of Two Rounds of Public Consultation on the Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services (January 2024)**

The following summarises the comments and recommendations received from the first round of public consultation on the *Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services* (the Plan) which took place from 1<sup>st</sup> March to 14<sup>th</sup> April 2023. The decisions made by the Telecommunications Authority of Trinidad and Tobago (the Authority) have been incorporated into the consultative document (Ver. 4.2), where applicable. The Authority wishes to express its appreciation for all comments and recommendations received from the following stakeholders:

1. Columbus Communications (Trinidad) Limited (CCTL)
2. Digicel (Trinidad & Tobago) Limited (Digicel)
3. The GSM Association (GSMA)
4. The Telecommunications Services of Trinidad and Tobago (TSTT)

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1	Introduction	CCTL	Columbus Communications Trinidad Limited ("CCTL") appreciates the opportunity provided by the Telecommunications Authority of Trinidad and Tobago (the Authority") to provide comments in this process. The views expressed herein are not exhaustive. Failure to address any issue in our response, does not in any way indicate acceptance, agreement or relinquishment of CCTL's rights.		The Authority thanks CCTL for its feedback on the Plan.

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2	2.2 National Considerations	CCTL	<p>CCTL notes the contents of Table 2: Frequency Allocations for Cellular Mobile Networks. We also note the Authority's intention to consider other international mobile telecommunications (IMT) bands for the provision of mobile telecommunications services as the demand changes over time.</p> <p>Advancements in technology such as current developments in fifth generation (5G) technology, and sixth generation (6G) technology in the future, will require new spectrum. Technology developments also impact spectrum usage techniques, for example, current trends in moving from frequency division duplex (FDD) to time division duplex (TDD) in the use of spectrum for different technologies, in addition to inter operator coordination, require intercountry coordination so as to avoid interference issues. This will become increasingly</p>	<p>We recommend the addition of the 600MHz frequency band to the frequencies assigned to cellular mobile networks, specifically the frequency ranges 617-652MHz paired with 663-698MHz.</p> <p>We also recommend that the 850MHz frequency band assigned, specifically 859-869MHz, paired with 814-824MHz, be assigned for mobile technology.</p>	<p>Currently, a licensed public subscription broadcasting network operates in the 600 MHz band. However, if a third mobile operator is authorised, the Authority will allocate the 600 MHz band for PMTS and has already commenced efforts to make this band available for PMTS.</p> <p>The Authority did consider the extended 850 MHz band (n26), to allow an additional 2 x 10 MHz for PMTS, but there are current assignments for trunked radio in the band. However, the Authority shall allocate this band for future PMTS use as needed.</p>

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			<p>necessary and become even more critical with future advancements in technology.</p> <p>In considering the Spectrum Allocation Plan, we encourage the Authority take account of the work of global standards organizations such as 3rd Generation Partnership Project (3GPP), an umbrella group comprising a number of standards organizations. Through their investigative work, 3Gpp develop protocols for mobile telecommunications, and define mobile technology standards as the industry evolves.</p> <p>Based on the work of the 3Gpp, the 600 MHz frequency band known as band-71 and covering frequency ranges 617-652 MHz paired with 663-698 MHz, as well as the 850 MHz frequency band assigned, specifically 859-869 MHz, paired with 814-824 MHz, which is aligned with the</p>		

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			extension of 3Gpp band-5 to band-26 are recommended for mobile technology.		
3	4.1.1 Selection of Frequency Assignment Plan	CCTL	The Authority indicated that it is giving consideration to allocate spectrum within the 694-894 frequency range for public protection and disaster relief (PPDR). This range is designated for international mobile telecommunications (IMT). The acknowledges that within this region (i.e. ITU-R Region 2 countries), careful planning of the 700 MHz band i.e., (698-806 MHz) is needed, given developments in mobile broadband technology and the availability of adequate spectrum to support these developments.	We recommend that the Authority re-evaluate and re-analyze the allocation of spectrum for public protection and disaster relief (PPDR) within the frequency range 694-895 MHz band, and instead, consider reserving the available 700 MHz spectrum within band-28 (703-708) MHz paired with 758-763) MHz for PPDR.	The Authority is constantly evaluating the allocation of spectrum in the PMTS bands to ensure that spectrum is efficiently utilised. In reviewing the allocation to public protection and disaster relief (PPDR), the Authority determined that 2 x 10 MHz represents an efficient use of the spectrum for multiple PPDR agencies such as the police, defence force and fire services, in accordance with ITU-R Resolution 646 and the findings of the ITU-R report on spectrum needs for PPDR (ITU-R M.2415), which concluded that 2 x 10 MHz of spectrum should be provided in the case of multiple PPDR agencies' operations.
4	4.2.2 Frequency Assignment Plan	CCTL	We note that the Frequency Assignment plan makes allowance for up to three mobile providers. The band covers the range 1.7/2.1 GHz and is divided into fourteen blocks. We consider that the	We recommend that the frequency assignment plan for IMT is extended to include 859-869MHz paired with 814-824MHz, which is aligned with the extension of 3Gpp band-5 to band-26.	The Authority considered the extended 850 MHz band (n26), to allow for the allocation of 2 x 10 MHz to PMTS, but there are current assignments for trunked radio in this band. However, the Authority will

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			allocation could be extended with the inclusion of 859-869MHz and paired with 814-824 MHz, which aligns with the extension of 3Gpp band-5 to band-26. With this adjustment the, spectrum caps should be recalculated in order to allow for fair spectrum assignments for three operators.		allocate the band for future PMTS use as needed.
5	Concluding Comments	CCTL	We believe that the recommendations provided above will serve to future proof spectrum allocation for IMT as well as support regional coordination in spectrum planning.		The Authority thanks CCTL for its feedback on the Plan and hopes the responses to CCTL's recommendations address its concerns. The Authority welcomes further contributions in the next round of public consultation.
6	Entire document	Digicel	<p>Digicel (Trinidad &amp; Tobago) Limited ("Digicel") commends the Authority on its proposals in this document and in particular, its expansion of the PMTS spectrum allocations.</p> <p>Digicel trusts that the Authority will continue to consider regular periodic revisions to this document as the industry continues to evolve.</p>	As the Authority has been made previously aware, unregulated Over-The-Top ("OTT") services continue to rapidly consume the network capacity of operators, with the cost of maintaining quality of service standards continuing to be an ongoing challenge. The overall telecommunications sector has been negatively impacted by the failure of the OTTs to contribute towards the costs of the very networks which	Over-the-top (OTT) services are being addressed via a <i>Consultative Framework for Over-the-Top (OTT) Services in Trinidad and Tobago</i> , which presents the Authority's proposed strategies for treating with these services. That framework was issued for the second of two rounds of consultation in August 2023. Digicel had the opportunity to submit comments and recommendations on the proposed

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				<p>generate their profits. Digicel wishes to re-iterate its position for the urgent need for OTT companies to pay their fair share towards network expansion costs. Investment in 5G may not be feasible without the necessary regulatory intervention to ensure that the OTTs are made to contribute towards the cost of these network investments.</p>	<p>strategies and recommendations for addressing OTT services in Trinidad and Tobago. Following the completion of that consultation, the Authority shall implement the approved strategies.</p>
7	<p>4.1 The 700 MHz Band (703–748/758–803 MHz)</p> <p>For national security reasons, the Authority will maintain an exclusive allotment of 700 MHz spectrum for PPDR. Consistent with the quantum of spectrum allotted in the</p>	Digicel	<p>Digicel understands the need for such a requirement and supports the initiative.</p> <p>We would like the Authority to confirm the PPDR allocation blocks and whether these blocks will remain fixed and will not affect the current allocation to operators.</p>	<p>Digicel requests that the Authority confirm the PPDR blocks and whether this assignment is expected to remain fixed and will not affect the current APT allocation to operators.</p>	<p>The Authority confirms that the PPDR allotment in the 700 MHz band shall remain the 2 x 10 MHz, identified as blocks A and B, 703–708 and 708–713 MHz paired with 758–763 MHz and 763–768 MHz. No additional spectrum will be allotted in the 700 MHz APT band for PPDR.</p>

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	US 700 MHz band plan and the allotment by other jurisdictions for broadband PPDR, the Authority shall identify an allotment of 2 x 10 MHz in the 700 MHz band for PPDR.				
8	<p>4.1 The 700 MHz Band (703–748/758–803 MHz)</p> <p>4.1.3 Licensing Process and Conditions</p> <p>9. The Authority shall reserve an allocation of at least 2 x 10 MHz of contiguous</p>	Digicel	<p>Digicel would like the Authority to confirm whether the 2x10MHz is additional to the 10MHz reserved in APT for PPDR and if so, what is the use that is planned for same?</p> <p>Will operators have access to this reservation of this 2x10MHz if it has not been assigned?</p>	<p>Digicel would like the Authority to clarify the uses of this reservation.</p> <p>It is Digicel's recommendation that the Authority allow operators to make use of this 2x10MHz during the time it is not allocated.</p>	<p>In light of Digicel's comments and recommendations that follow on increasing the caps, and the possible availability of alternative spectrum bands below 1 GHz, such as 600 MHz and the extended 850 MHz bands with an existing ecosystem of devices for a potential third mobile operator, this statement has been removed.</p>

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	spectrum in either the 700 MHz or 850 MHz band for future demand.				
9	<p>4.2 The 850 MHz Band (824–849/869–894 MHz)</p> <p>4.2.1 Selection of Frequency Assignment Plan</p> <p>6. Each licensee assigned spectrum blocks in the 700 MHz and 850 MHz bands shall not exceed a total spectrum cap of 50 MHz (i.e., 2 x 25 MHz). This allows for up to three cellular mobile</p>	Digicel	<p>The cap of 2x25MHz between the APT and 850 bands means for the current two operator market, we are not able to access the available resources.</p>	<p>As this is currently a two-operator market, the Authority is asked to consider raising the cap, in the interim, so that existing operators can benefit from the available spectrum.</p> <p>Digicel would recommend that, in the interim, the Authority allocate a maximum of 2x30MHz for the scenario where two existing operators can make use of the existing resources; if a third operator comes in, then the caps can be adjusted accordingly.</p> <p>This would allow the population to benefit from an existing resource and allow existing operators to continue to meet the increasing demand.</p>	<p>The Authority agrees with Digicel's recommendation and shall amend the cap to 2 x 30 MHz.</p> <p>In the event that a third mobile operator is authorised, the Authority will either re-consider the spectrum caps, based on spectrum assigned, or identify spectrum in other bands such as the 600 MHz and the extended 850 MHz bands, to ensure adequate spectrum is available to ensure parity.</p>



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	operators to be assigned spectrum in these bands.				
10	<p>4.2 The 850 MHz Band (824–849/869–894 MHz)</p> <p>4.2.3 Licensing Process and Conditions</p> <p>9. The Authority shall reserve an allocation of at least 2 x 10 MHz of contiguous spectrum in either the 700 MHz or 850 MHz band for future demand.</p>	Digicel	<p>Digicel would like the Authority to confirm if extending of the 850MHz band is being considered at this time?</p> <p>This extension would be beneficial to the future 2x10MHz reservation planned.</p>	The Authority is asked to confirm whether it will be extending the 850MHz band.	The extended 850 MHz band (n26) was considered by the Authority, to allow for the allocation of 2 x 10 MHz to PMTS, but has current assignments for trunked radio in this band. However, the Authority shall allocate this band for future PMTS use as needed.
11	4.3 The 1900 MHz Band (1850–1915/1930–	Digicel	The cap of 2x45MHz between the AWS and 1900 bands means for the current two operator market,	As this is currently a two-operator market, the Authority is asked to consider raising the cap, in the interim, so that existing operators	The 2 x 45 MHz spectrum cap across the 1900 MHz and 1.7/2.1 GHz bands was set to ensure that at least three cellular mobile operators

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	<p>1995 MHz)</p> <p>4.3.1 Selection of a Frequency Assignment Plan</p> <p>6. Each licensee assigned spectrum blocks in the 1900 MHz and 1.7/2.1 GHz bands shall not exceed a total spectrum cap of 90 MHz (i.e., 2 x 45 MHz). This allows for up to three cellular mobile operators to be assigned spectrum in these bands.</p>		<p>we are not able to access the available resources.</p>	<p>can benefit from the available spectrum.</p> <p>Digicel would recommend that, in the interim, the Authority allocate a maximum of Digicel would recommend we allocate a maximum of 2x55MHz for the scenario where two existing operators can make use of the existing resources; if a third operator comes in, then the caps can be adjusted accordingly.</p> <p>This would allow the population to benefit from an existing resource and allow existing operators to continue to meet the increasing demand.</p>	<p>can be assigned spectrum in these bands.</p> <p>The Authority may allow temporary access to spectrum beyond the caps if existing operators demonstrate a need, considering the additional spectrum made available in this iteration of the Plan.</p> <p>The Authority agrees with Digicel's comments and shall amend the caps to 2 x 50 MHz, but will retain a portion of spectrum in these bands as similar alternative spectrum is not readily available. In the event that a third mobile operator is authorised, the Authority may re-consider the spectrum caps based on spectrum assigned to establish a level playing field.</p>
12	4.5 The 2.5 GHz Band (2496–2690 MHz)	Digicel	Would the Authority consider re-allocating the entire band n41 to PMTS in the future?	The Authority is asked to advise whether re-allocating the entire band n41 to PMTS is on its	BWA incumbents currently exist in this band, which will prevent reallocating the entire band n41 to

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	<p>4.5.3 Licensing Process and Conditions</p> <p>7. The assignment of spectrum shall be via a competitive licensing process which shall include an auction, as determined by the Authority. Any fee determined from this process will be applied to any other spectrum in the entire 2.5 GHz band used for public mobile telecommunications services by an operator with</p>			<p>roadmap.</p> <p>Digicel asks that the Authority provide its justification as to why it is proceeding with an auction to determine the spectrum fees for the 2.5 GHz band as opposed to the fee structure set out in the Telecommunications (Fees) Regulations, 2006.</p> <p>Digicel further asks that the Authority clarify the following</p>	<p>PMTS. However, if these incumbents are re-farmed to another BWA band or PMTS in the future, more of, or the entire, band n41 can be allocated for PMTS.</p> <p>The fee structure in the fee regulations does not cater to cellular mobile spectrum licences for frequency bands above 2200 MHz. Part I, Clause 19 (1) of the Telecommunications (Fee) Regulations states: "The Authority may select persons for the grant of licences for spectrum or frequency within certain bands through an auction or other competitive process."</p> <p>In keeping with Part I, Clause 19 (1), the Authority shall determine the licence fee for the PMTS licences granted for the use of band n41, via a competitive process, which may include an auction.</p> <p>This statement is meant to clarify that the licence fee determined by</p>

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	a concession for the provision of a public domestic mobile telecommunications network and public telecommunications services.			<p>statement:  <i>“Any fee determined from this process will be applied to any other spectrum in the entire 2.5 GHz band used for public mobile telecommunications services by an operator with a concession for the provision of a public domestic mobile telecommunications network and public telecommunications services.”</i></p> <p>Does this mean that the price of spectrum, that is already allocated, in the 2.5GHz band, will change?</p>	<p>the competitive process shall be applied to any spectrum in band n41 used for the provision of PMTS, including spectrum not made available via the Plan. This will ensure that if an existing licensee of 2.5 GHz spectrum uses this band for public mobile services, it will incur the same fee as those who were awarded spectrum via the competitive licensing process.</p> <p>Spectrum already assigned and used for BWA services only will maintain its current licence fee.</p>
13	<p>4.6 The Lower 3.5 GHz Band (3300–3800 MHz)</p> <p>4.6.1 Selection of Frequency Assignment Plan</p> <p>“Within the lower 3.5 GHz band, BWA</p>	Digicel	<p>This statement seems to contain many inconsistencies and also appears to be contradicting itself. Digicel would like to get clarification on the spectrum allocation and what is unused.</p> <p>Is it two blocks or 4 blocks being allocated?</p>	<p>The Authority is asked to clarify the current 3.5GHz assignments and what are the contiguous blocks of spectrum allocated for PMTS.</p>	<p>190 MHz of contiguous spectrum was identified as available in the lower 3.5 GHz band across two ranges i.e., 3.3–3.4 GHz and 3.55–3.64 GHz. For clarity, paragraph three in section 4.6.1 was updated and now reads: “Within the lower 3.5 GHz band, BWA network operators are assigned spectrum in the range 3.4–3.6 GHz, totalling 100 MHz. There are also assignments in 3.6–3.7 GHz for other services. A total of 200 MHz of spectrum in the</p>

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	network operators are assigned spectrum in the range 3.4– 3.6 GHz, totalling 100 MHz. There are also assignments in 3.6–3.7 GHz for other services. Two blocks totalling 190 MHz of contiguous spectrum in the ranges 3.3–3.4 GHz and from 3.55–3.64 GHz are available.”				<p>ranges 3.3–3.4 GHz and 3.55–3.65 GHz is available for PMTS.”</p> <p>The 200 MHz that is available for PMTS in the lower 3.5 GHz band is divided into four 50 MHz blocks.</p>
14	4.6 The Lower 3.5 GHz Band (3300–3800 MHz)  4.6.3 Licensing Process and Conditions	Digicel	The cap of 100 MHz between the 2.5GHz and lower 3.5GHz bands means for the current two-operator market, we are not able to access the available resources.	<p>As this is currently a two-operator market, the Authority is asked to consider raising the cap, in the interim, so that existing operators can benefit from the available spectrum.</p> <p>Digicel would recommend that, in</p>	<p>As there are no current assignments in these bands, the Authority will retain the caps at 100 MHz. This will enable a third operator, if authorised, to access this spectrum. These caps can be re-evaluated once spectrum has been assigned for PMTS in these bands.</p>

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	6. Each licensee assigned spectrum blocks in the 2.5 GHz and lower 3.5 GHz bands shall not exceed a total spectrum cap of 100 MHz. This allows for up to three cellular mobile operators to be assigned spectrum in these bands.			<p>the interim, the Authority allocate a maximum of 150MHz for the scenario where two existing operators can make use of the existing resources; if a third operator comes in, then the caps can be adjusted accordingly.</p> <p>This would allow the population to benefit from an existing resource and allow existing operators to continue to meet the increasing demand.</p>	
15	4.6.4 Technical Operating Conditions and Specifications  Base station maximum EIRP 1640 W/MHz No more than 1640 W EIRP in	Digicel	Digicel requests that the Authority provide the 3GPP reference document number that defines the base station/mobile station EIRP values as stated in the respective tables and bands.	The Authority is asked to share the 3GPP standard that references the EIRP values quoted.	The Authority adopts maximum technical operating specifications from other ITU-R Region 2 regulators, as this will take into consideration other factors such as radiation levels. In the case of the maximum technical operating specifications for the lower 3.5 GHz band, the Authority adopted the FCC's limits based on the band

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	<p>any 1 MHz band segment</p> <p>Mobile station maximum EIRP 1 W Mobile stations shall employ a means to limit power to the minimum necessary for successful communication.</p>				<p>plans employed, documented in the Code of Federal Regulations, Title 47 Part 27.</p>
16	General	GSMA	<p>The GSMA acknowledges the TATT consultation on the Spectrum Plan for the Accommodation of Public Mobile Telecommunications Services. Therefore, the GSMA is pleased to forward comments.</p> <p>5G supports significantly faster mobile broadband speeds and significantly improved latency. The technology will also help enable the full potential of the Internet of Things, from virtual reality and autonomous cars, to the</p>		<p>The Authority thanks the GSMA for its feedback on the Plan.</p> <p>The Authority recognises the importance of fifth-generation (5G) as the future of mobile broadband and fixed wireless access, and its role in ensuring the availability of suitable spectrum for mobile network operators. This version of</p>

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			<p>industrial internet and smart cities, 5G will be at the heart of the future of communications. Today's most popular mobile applications also benefit from 5G by ensuring continued growth and quality. Most notably, the speed, reach and quality of 5G services will be heavily dependent on governments and regulator support to provide timely access to the right amount and type of spectrum, and under the right conditions.</p> <p>5G is a pillar of digital transformation and has the potential to impact communities and economies, and as it delivers transformational services it can boost global GDP by US\$2.2 trillion. By 2024, the GDP contribution is predicted to increase to 4.9% of GDP. This can only happen, however, if sufficient spectrum resources are in place to provide the capacity for innovation and development.</p>		<p>the Plan optimises the channel assignment plans in the low-band spectrum and makes additional low-band and mid-band spectrum available for mobile broadband.</p>



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			<p>As 5G will require a higher amount of investment, governments and regulators should avoid inflating 5G spectrum prices as this may limit network investment and drive the cost of services up. This includes excessive reserve prices or annual fees, limiting spectrum supply, excessive obligations and inefficient auction design. It is desirable to adopt reasonable pricing by setting reserve prices below a conservative estimate of market value and treating annual fees as part of the reserve price.</p> <p>Given there is a limited supply of mobile spectrum, it is vital that regulators' primary goal is to ensure it is awarded to users who will use it most efficiently to support affordable, high quality mobile services. Spectrum is needed in low-, mid-and high-bands to fully realise the capabilities of 5G.</p>		<p>The Authority notes the GSMA's comments that inflating 5G spectrum prices may limit network investment and drive up the cost of services. The Authority shall consider these factors in its licensing of spectrum for 5G services.</p>

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			<p>Our comments are guided by international best practices, and we believe that the adoption and successful implementation of these will support the creation of an enabling regulatory environment that will support the implementation of 5G frequencies in Trinidad and Tobago.</p> <p>Below the GSMA has provided our policy positions on the bands discussed in the consultation document.</p> <p>We remain available in case other questions may arise and thanks again for the opportunity.</p>		<p>The Authority understands that the GSMA's comments are guided by international best practices and shall consider the same in its revision of the Plan. While the Authority has not allocated any high-bands at this time, the Authority has identified low- and mid-bands to meet the needs of the mobile operators.</p>
17	The 700 MHz Band (703-748 MHz/758-803 MHz)	GSMA	<p>Low bands: Due to the limited amount of spectrum available, bands that offer coverage for wide areas (such as 700 MHz and 850 MHz) will eventually exhaust their capacity. long-term planning without imposition of new obligations is necessary in countries that want to obtain the</p>		<p>The Authority is mindful of the benefits of low-band spectrum for PMTS. In Trinidad and Tobago, the 600 MHz band is currently used for wireless subscription broadcasting services but will be considered as needed for PMTS. The Authority has already commenced efforts to make this spectrum available.</p>

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			<p>flexibility of using the band for mobile services. Adding 600 MHz alone can contribute to a growth of up to 50% in speeds.</p> <p>The low frequencies will support extended coverage in urban, suburban and rural environments and will help support Internet of Things (IoT) services.</p> <p>lower frequencies have superior propagation characteristics, determining how far a signal can travel and how well it can penetrate buildings. For example, using 700 MHz instead of 1800 MHz produces a path loss gain of 13.4 dB, thus creating better indoor and wide-area coverage. The higher the path loss gain, the wider the coverage range and the better the in-building penetration.</p> <p>In rural areas, the cell range advantage makes it possible for operators to cover wide areas cost effectively. In an open</p>		<p>Regarding other low-band spectrum, the Authority has made additional spectrum available for PMTS operators in both the 700 and 850 MHz bands, particularly by increasing the spectrum caps of both bands and amending the channel assignment plan of the 850 MHz bands, to allow spectrum assignments in multiples of 5 MHz blocks.</p>

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			<p>environment, 700 MHz, for example, reaches 2.6 times further than 1800 MHz. To provide equivalent geographic 5G speed coverage with 1800 MHz spectrum as 700 MHz spectrum, around three to four times the number of cell sites would be required. 2 This considers differences in path loss and the fact that there is more 1800 MHz spectrum available than 700 MHz, which affects cell edge speed.</p> <p>Meanwhile, in built-up areas, including cities, small towns and villages, the propagation advantages of sub-1 GHz spectrum are essential to provide in-building coverage where mid-band spectrum cannot penetrate sufficiently.</p> <p>low-band spectrum is also a driver of digital equality, reducing the gap between urban and rural areas and delivering affordable connectivity. Without sufficient</p>		<p>The Authority appreciates the information shared on the economic impact of 5G using low-band spectrum.</p>

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			<p>low-band spectrum, the digital divide is likely to widen, and those living in rural areas will be excluded from the latest digital technologies.</p> <p>A new GSMA report shows, for the first time, the specific economic impact of 5G using low-band spectrum, set to generate \$130 billion in GDP in 2030. Half of the economic impact of low band will be driven by massive IoT (mIoT) and the use of more UHF spectrum for mobile will provide greater value than maintaining it for broadcasting - countries utilising the 600 and/or 700 MHz band for 5G have achieved faster rollout.</p>		
18		GSMA	<p>Mid bands: Research from Coleago Consulting on mid-band 5G spectrum needs shows that careful consideration of 5G spectrum demand in the 2025-2030 timeframe is crucial. This is due to the development of new use cases, the rapid take-up of 5G and</p>		<p>The Authority is aware of the benefits of mid-band spectrum to the deployment of 5G services, and has made 290 MHz of spectrum available in the 2.5 GHz and 3.5 GHz bands in this revision of the Plan. These revisions ensure each mobile network operator will have</p>

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			<p>the need to mitigate the risk of a challenging and costly environment in the near future. The research finds that regulators will need to make available, on average, 2 GHz of mid-bands for the development of 5G, including FWA. This has to be considered for the road map and the decade.</p> <p>Frequencies in the 3.5 GHz band (3.3-4.2 GHz) have in particular been used as the basis for the first roll-outs of 5G globally, driving the wider ecosystem, device diversity and competition. The range is at a balancing point between coverage and capacity that provides the perfect environment for the earliest 5G connectivity.</p> <p>To meet the IMT-2020 requirements, an initial 100 MHz per operator is needed in 5G-enabled midbands. Making less spectrum available will impact service quality, decrease peak data</p>		<p>access to the initial 100 MHz of mid-band spectrum recommended for the deployment of 5G.</p> <p>As outlined in the Plan, the 3.5 GHz band (3.3–4.2 GHz) consists of mid-band spectrum that complements the lower bands, to provide both capacity and coverage. The 3.5 GHz band is made up of the C-band that is now primarily used globally for cellular mobile services and fixed wireless access (FWA) services. The lower 3.5 GHz band is considered the prime mid-band spectrum for the deployment of 5G or IMT-2020 technology, and the Plan consists of a total of 200 MHz of spectrum in the ranges 3.3–3.4 GHz and 3.55–3.65 GHz.</p>

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			<p>rates and increase the necessary network investments. For example, moving from 40 MHz to 100 MHz in 5G mid-bands will result in double peak data rates, while decreasing channel sizes, will increase network density.</p> <p>However, this is just the first step towards building resilient connectivity. During this decade, it is therefore important that TATT releases around 2 GHz of mid-band spectrum for 5G going forward, including in the 3.5 GHz range.</p> <p>Having that in mind, the upper part of the 3.5 GHz range, i.e. the 3.3 to 4.2 GHz range is seen as a prime 5G spectrum range. which is expected to form the basis for many initial 5G services and the complementary 6 GHz band, currently under study by the ITU. While high frequencies are necessary to achieve the lowest latency for 5G, the 3.3 to 3.8 GHz</p>		<p>The use of spectrum in the 3.7–4.2 GHz range will be considered in future revisions of the Plan, mindful of existing licensees (Commercial Television Receive Only [TVRO] systems) in the band, and the need to mitigate interference with altimeters in the adjacent band.</p>

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			<p>band will be the most important band for 5G in the short term as it offers a perfect combination of capacity (the amount of traffic it can handle) and optimal coverage (the distance the signal travels). The use of the 3.3-4.2 GHz band for mobile broadband has been harmonised at various points in the last fifteen years in both the ITU and regional groups. Without those 400 MHz available to IMT, the ITU requirements would not be met, nor new 5G use cases would be fully unlocked.</p> <p>6 GHz 5G spectrum can play a central role in sustainable social and industrial development. As enhanced broadband, IoT, data, analytics, and insight permeate every aspect of society, smartphones deliver connectivity into our work and play, and enterprises transition from manufacturing or commerce to also becoming industrial data platforms, mobile networks will</p>		<p>Currently, 500 MHz of spectrum in the lower 6 GHz band (5925–6425 MHz) is proposed for class-licensed use in Trinidad and Tobago, given the consensus internationally on the use of the lower 6 GHz band for unlicensed use such as radio local area networks. The outcome of the WRC-23 conference will inform the Authority's position on the use of</p>



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			<p>require spectrum capacity plans that are integrated into a long term vision of each nation's industrial future. The race to net zero will be one of the most important features of the industrial landscape for decades to come and intelligent innovation and automation is now happening everywhere. Heavy industry and infrastructure must stay at the cutting edge of sustainable technology while enhanced consumer connectivity can enable smarter, cleaner ways of living.</p> <p>Another important band is the 2.3 GHz band, strategically located between the low bands of 700, 850,900 MHz, the AWS and the 2,600, 3,500 and 4,800 MHz bands. It has been forming a vital addition to mobile broadband service and is identified for IMT, providing an excellent combination of capacity and coverage, as well as being a vital mean to achieve high bandwidth</p>		<p>the upper 6 GHz (6425–7125 MHz) band.</p> <p>The 2.3 GHz band is currently allocated to fixed wireless services in Trinidad and Tobago, with a portion of the spectrum assigned. Given the total amount of spectrum in this band (60 MHz from 2300–2360 MHz), it does not seem feasible to accommodate the larger bandwidths being proposed for 5G.</p>

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			<p>consumption.</p> <p>Therefore, 5G requires spectrum within these frequency ranges to deliver coverage and support all use cases: low (sub-1 GHz), mid- (such as 2.3, 3.5,4.8 &amp; 6 GHz) and high bands (mmWaves). Therefore, it is important to make available 100 MHz of contiguous spectrum per operator in midbands initially and focus on achieving 2 GHz during the decade. And to work on bridging the digital gap, low bands are crucial.</p>		
19	General	TSTT	<p>Telecommunications Services of Trinidad and Tobago Limited ("TSIT") appreciates that the Telecommunications Authority of Trinidad and Tobago ("the Authority") has allowed stakeholders the opportunity to comment on these matters. It should be noted that TSTT's comments on this document do not preclude TSIT from making further comments in the future.</p>		<p>The Authority acknowledges TSTT's appreciation for the opportunity to comment on the Plan, and its position relating to future comments.</p>

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20	2.2 National Considerations	TSTT	TSTI notes the Authority's statement that " <i>The Authority will be conducting monitoring exercises to verify that the additional spectrum in both the 1900 MHz and 1.7/2.1 GHz bands, and the spectrum in the 2.5 GHz and lower 3.5 GHz bands are free from harmful interference.</i> " Due to the importance of this activity, the Authority is asked to provide an estimated timeframe for the completion of this verification exercise.	The Authority is asked to provide an estimated timeframe for the completion of this verification exercise.	This verification exercise will be completed during the 2023/2024 financial year (October 2023 to September 2024). Section 2.2 has been amended to reflect this timeframe.
21	3 Frequency Assignment Principles	TSTT	Point three (3) states: "Both frequency division duplexing (FDD) and time division duplexing (TDD) modes of operation will be supported and the frequency assignment plan shall specify the mode of operation". This is a significant departure from the previous policy, which stated the FDD operation would be the focus of Mobile Spectrum Allocation, whereas TDD operation would be		The rise of new technologies has been the defining factor in the adoption of new policies for the management of PMTS spectrum. The use of the 2.5 and lower 3.5 GHz bands for PMTS globally is based primarily on a time division duplexing (TDD) mode of operation. The 5G device ecosystem shows that the majority of mobile phones operating in these bands are based on TDD plans. Therefore, as these bands are being added in the Plan, the Authority thinks it prudent

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			<p>the focus of Fixed Wireless Spectrum Allocation.</p> <p>the Authority has not identified a rationale for this departure, or a revised overarching policy with respect to the distinction between TDD and FDD spectrum allocations.</p> <p>Consider: if there is no philosophical distinction between TDD and FDD spectrum allocations, there stands to be no reason why there is a distinct BWA spectrum plan from the Mobile Spectrum Plan. Accordingly, the Authority would then have to move with alacrity to remove the distinction between Fixed Wireless and Mobile allocations immediately, and address strategies for possible interference concerns.</p> <p>Point six (6) states, " ... The spectrum caps shall ensure sufficient spectrum is available for</p>	<p>Pursuant to the finalisation of this consultation, the Authority is to clarify that there will be no philosophical distinction between TDD and FDD spectrum allocations. Thus, there is no reason for a distinct BWA spectrum plan from the Mobile Spectrum Plan. Additionally, the Authority is to move with alacrity to remove the distinction between Fixed Wireless and Mobile allocations immediately and address strategies for possible interference concerns.</p>	<p>that the selected frequency assignment plans should cater to the prevailing IMT technology used in these bands, including the device ecosystem.</p> <p>The Authority recognizes that FDD assignments are not for mobile services only and TDD assignments only for FWA. It is very possible for mobile systems to have TDD spectrum assignments and for FWA assignments to use FDD. The choice of TDD versus FDD is based on the prevailing technology and not on whether the service is for mobile or fixed.</p> <p>The nature of the services, i.e., fixed only in the case of BWA, and mobile in the case of PMTS, warrants a demarcation, given the enhanced commercial proposition presented by PMTS, hence the separate spectrum values and plans. Therefore the demarcation is still necessary at this time and supported by most Region 2 administrations.</p>

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			<p>assignment to up to three cellular mobile operators."</p> <p>However, because we do not yet have a third mobile operator, the spectrum is unutilised and should be put to better use until such time that there is a third mobile operator. As the Authority is aware, more contiguous spectrum across all bands and in the higher bands, in particular, is necessary for use in the 5G era.</p> <p>Notwithstanding this concern, TSTT notes that the Authority seems to be proposing a philosophy of "cross-band" equity in the determination of spectrum caps across the proposed three (3) mobile operators. In that regard, we note that the aggregation of spectrum caps across bands does NOT seem to establish the level playing field the Authority would hope for.</p>	<p>TSTT recommends that the Authority allocates more spectrum to the existing operators to benefit the people of Trinidad and Tobago immediately.</p> <p>The Authority to advise on how it will address the failure of spectrum cap aggregation across bands to establish a level playing field for operators.</p>	<p>The Authority agrees with TSTT's recommendation on allocating more spectrum to existing operators and has amended the cap to 2 x 30 MHz in these bands, mindful that existing operators have invested in equipment in these bands.</p> <p>In the event that a third mobile operator is authorised, the Authority will either re-consider the spectrum caps, based on spectrum assigned, or identify spectrum in other bands such as the 600 MHz and the extended 850 MHz bands, to ensure adequate spectrum is available to ensure parity.</p>

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22	4.1.2 Frequency Assignment Plan	TSTT	<p>TSTT notes the Authority's statement that "<i>Blocks A and B (i.e., 2 x 10 MHz) shall be allotted for the provision of PPDR. This allows blocks C -I (i.e., 2x 5 MHz each) for assignment to up to three cellular mobile operators.</i>"</p> <p>TSTT, cognizant of the spectrum assignment plans proposed, notes that there are only 2 x 60 MHz being made available for mobile operators between the 700 MHz and 850 MHz bands to be shared among three (3) operators. This suggests that each operator can equally share 2 x 20 MHz of spectrum between these bands. Strangely the Authority has established a cap of 2x25 MHz between these bands. This creates a situation of spectrum inequity: at worst, two operators would share 2 x 50 MHz between these bands, and the third operator would have access to only 2 x 10 MHz in this band, with the potential of only 2 x 10 MHz of expansion. As these</p>	<p>TSTT, cognizant of the current spectrum assignment, would like the authority to confirm that it is not expected to be an equal assignment to each operator and clarify how parity will be guaranteed, with no operator being placed in a disadvantaged position.</p> <p>Additionally, if the Authority's underlying philosophy is to increase the spectrum available, and there has not been any use of blocks A &amp;</p>	<p>The Authority has proposed allocations that best suit the spectrum bands available to satisfy the policy of the Government of the Republic of Trinidad and Tobago of maintaining three mobile operators, and will endeavour to maintain effectively equitable allotments among operators while maximising the use of the available resources.</p> <p>The Authority will maintain parity either by revising the spectrum caps if a third mobile operator is authorised, based on assignments, or by allocating other bands for PMTS, such as the 600 MHz band or the extended 850 MHz band (band n26).</p> <p>The Authority has confirmed that there are plans to utilise the PPDR allotment.</p>

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			<p>bands have the most efficient propagation characteristics, this inequity seems glaring.</p> <p>TSTT would like the Authority to confirm that it is not expected to be an equal assignment to each operator.</p> <p>If the Authority's underlying philosophy is to increase the spectrum available, TSTT notes that the Authority has not confirmed if there has been any use of blocks A &amp; B for PPDR. In that regard, if there is no use of these resources for PPDR TSTT recommends that these Blocks be reallocated and made available to Mobile operators.</p>	<p>B for PPDR, TSTT recommends that these Blocks be reallocated and made available to Mobile operators.</p>	
23	4.2.3 Licensing Process and Conditions	TSTT	<p>TSTT notes the Authority's statement that <i>"Each licensee assigned spectrum blocks in the 700 MHz and 850 MHz bands shall not exceed a total spectrum cap of 50 MHz (i.e., 2 x 25 MHz). This allows for up to three cellular mobile operators to be assigned</i></p>	<p>TSTT, cognizant of the current spectrum assignment, would like the authority to confirm that it is not expected to be an equal assignment to each operator and clarify how parity will be guaranteed, with no operator being placed in a disadvantaged position</p>	<p>The Authority will maintain parity either by revising the spectrum caps if a third mobile operator is authorised, based on assignments, or by allocating other bands for PMTS use, such as the 600 MHz band or the extended 850 MHz band (band n26).</p>

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			<p><i>Spectrum in these bands."</i></p> <p>TSTT, cognizant of the current spectrum assignment, would like the Authority to confirm that it is not expected to be an equal assignment to each operator.</p>		
24	4.3.1 Selection of a Frequency Assignment Plan	TSTT	<p>TSTT notes the Authority's statement that "The 1900 MHz band, called the personal communications services (PCS) block in North America, is used throughout the region for the provision of mobile voice and data services. The North American allocation comprises two sub-bands the lower sub-band and the upper sub-band. The sub-bands are divided into seven paired blocks, three 15 MHz blocks and four 5 MHz blocks." However, Table 7 shows only two (2) 15MHz blocks and seven (7) 5MHz blocks and not three (3 ) 15MHz and four (4) 5MHz blocks as stated. The Authority to provide clarity and/or make the necessary corrections.</p>	TSTT requests that the Authority provides clarity and/or makes the necessary corrections.	<p>Block B is a 2 x 15 MHz block. Even though the block was split into three sub-blocks of 2 x 5 MHz each i.e., B1, B2 and B3, the text quoted referred to blocks A, B and C as the 15 MHz blocks. Section 4.3.1 has been amended accordingly to clarify.</p>



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25	4.3.3, 4.4.3, 4.13, 4.23 Licensing Process and Condition	TSTT	<p>TSTT notes that there are no provisions made for future expansions in the 1900MHz and AWS Bands.</p> <p>Given this approach to total allocation of spectrum in these bands, TSTT queries why provisions for future expansion persists in the 700 and 850MHz bands</p>	<p>The Authority to clarify why provisions for future expansion persists in the 700 and 850MHz bands.</p>	<p>Given that the Authority has agreed to increase the spectrum caps for these bands, this statement is now removed, as additional spectrum for a third mobile operator may be allocated and assigned from the 600 MHz or the extended 850 MHz bands, if spectrum in the 700 MHz or standard 850 MHz bands are assigned and cannot be made available.</p>
26	4.5.1 Selection of Frequency Assignment Plan	TSTT	<p>The 2.5 GHz band is currently allocated to the BWA service. There are assignments to two operators in the band, totalling 100 MHz. The BWA assignments are based on a TDD band plan.</p> <p>TSTT notes that the Authority is proposing that a single operator can access the entire 2.5 GHz band for assignment to mobile use. While this comes with the caveat that there will be constraints in accessing the 3.5 GHz band, the question arises as to the rationale of this approach where there are only two allocations available, in a</p>	<p>the Authority to clarify:</p> <p>(i) why in this instance it proposes two spectrum allocations instead of three allocations of 30MHz.</p> <p>(ii) that it is not expected for there to be equal assignments available to each operator and</p> <p>(iii) how parity will be guaranteed, with no operator being placed in a disadvantaged position.</p>	<p>The channel plans and spectrum caps of the 2.5 and 3.5 GHz bands were selected to allow assignments of larger spectrum blocks of contiguous spectrum, which is optimal for 5G cellular mobile technology. An allocation of 30 MHz per operator in the 2.5 GHz band would be sub-optimal and not provide the large bandwidths of contiguous spectrum for which TSTT advocates in its own recommendation to section 4.6.3. As the accommodation of three mobile operators is across both spectrum bands, it was not necessary to ensure that the number</p>

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			<p>context where the Authority has identified spectrum caps based on three users prior. In that paradigm, can the Authority clarify why in this instance it proposes two spectrum allocations instead of three allocations of 30MHz?</p>		<p>of spectrum blocks in each of the bands can accommodate three operators. If a third mobile operator is authorised, the Authority can reconsider the spectrum caps based on spectrum assigned, or identify spectrum in other ranges in these bands to ensure parity.</p>
27	4.6.3 Licensing Process and Conditions	TSTT	<p>TSTT notes the Authority's statement that "Each licensee assigned spectrum blocks in the 2.5 GHz and lower 3.5 GHz bands shall not exceed a total spectrum cap of 100MHz. This allows for up to three cellular mobile operators to be assigned spectrum in these bands." As such, TSTT recommends increasing the cap for 2.5GHz and 3.5GHz since the minimum bandwidth requirement for 5G is 100MHz in the C-Band. Also, that contiguous spectrum be considered in the assignment.</p> <p>TSTT also notes that the combination of spectrum allocation between the 2.5GHz and 3.5GHz bands does not</p>	<p>TSTT recommends increasing the cap for 2.5GHz and 3.5GHz since the minimum bandwidth requirement for 5G is 100 MHz in the C-Band. TSTT also recommends that contiguous spectrum be considered in the assignment.</p> <p>the Authority to clarify that it is not expected for there to be equal assignments available to each operator between the 2.5GHz and 3.5GHz bands, and how parity will be guaranteed, with no operator</p>	<p>With 290 MHz of PMTS spectrum presently available in the 2.5 and 3.5 GHz bands, as there are no current assignments for PMTS in these bands, the Authority will retain the caps of 100 MHz to ensure a third mobile operator if authorised has access to this spectrum. The Authority also agrees that contiguous spectrum should be assigned, for which the Plan has made provision, which addresses TSTT's comment to section 4.5.1.</p> <p>The Plan ensures that operators seeking to deploy 5G can access contiguous spectrum of 90–100 MHz in either the 2.5 GHz or 3.5 GHz band, or a mix if they prefer.</p>

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			provide a combination where three operators would share 100MHz assignments. Can the Authority clarify that it is not expected for there to be equal assignments available to each operator and whether parity will be guaranteed, with no operator being placed in a disadvantaged position?	being placed in a disadvantaged position.	