ITU-NBTC Asia-Pacific Regulator's Roundtable
" Setting out a Vision for 5G in Asia "

Soe Naing
Deputy Director General
Posts and Telecommunications Department
Myanmar

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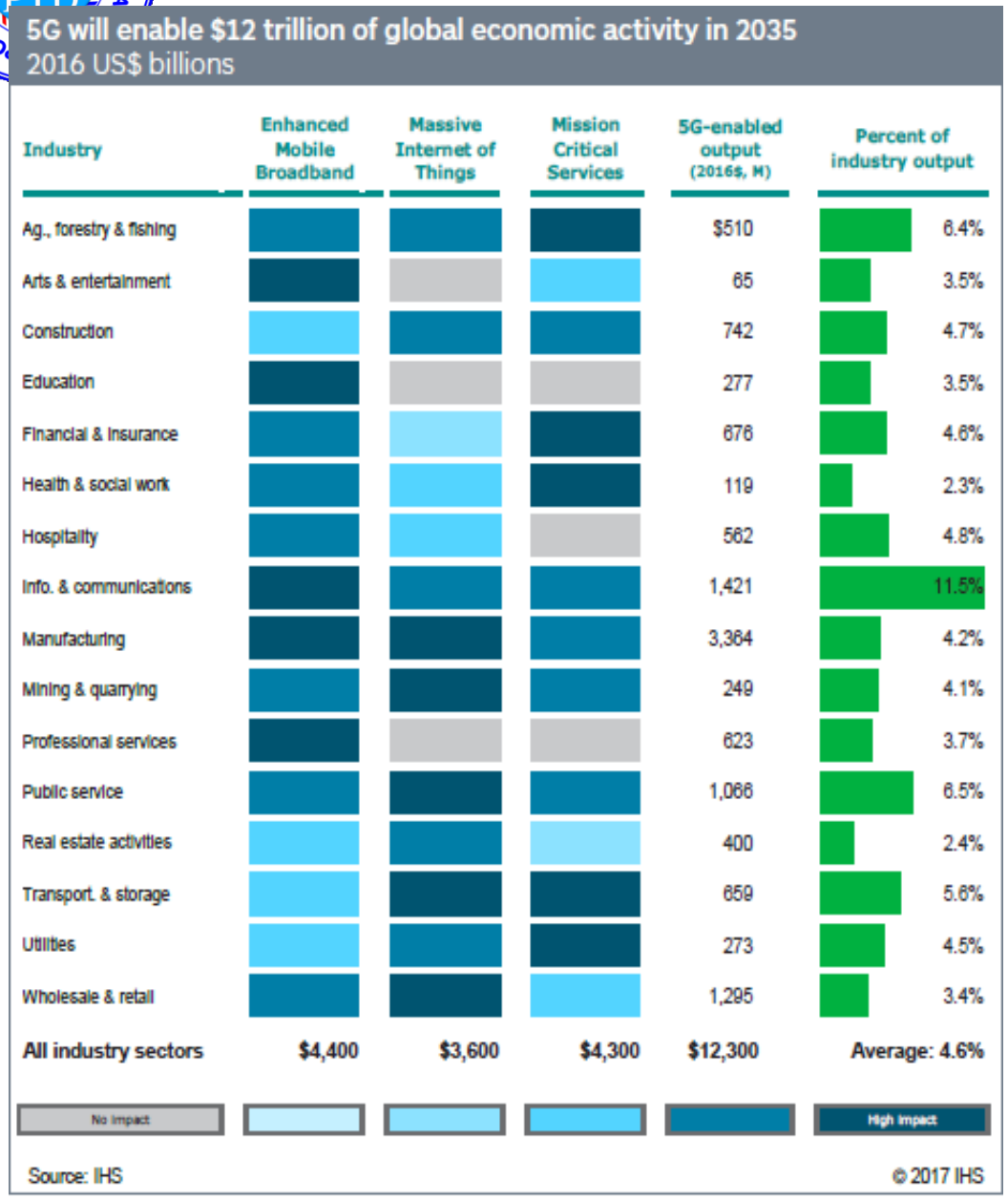
1. INTRODUCTION

(5G POTENTIAL SOCIO-ECONOMIC BENEFITS)

5G Potential Socio-Economic Benefits to Global Digital Transformation



IHS ECONOMICS & IHS TECHNOLOGY

The 5G economy: How 5G technology will contribute to the global economy

January 2017 ihs.com

- In 2035, 5G will enable **USD 12.3 trillion of global economic output**.
- Among them, five industries with contribution above USD 1 trillion are ICT industry, manufacturing industry, agriculture, public service (ex: Smart City, PPDR, eGovernment, etc.), and wholesale & retail
- The 5G value chain will support 22 million jobs.
- The 5G value chain will invest an average of $ 200 billion annually. **So, it is find out that;**

5G Oriented Mobile is fundamental to achieving socio-economic benefits

2. 5G IN MYANMAR CONTEXT

5G as Connectivity Driving tool for Myanmar Vision

Vision — **Mobile-First, Digitally Connected Nation**

Themes	Connect the people of Myanmar	Innovation and digital transformation	e-Government
2020 Ambition	• Over 95% population connected • Over 85% population with internet access • Over 50% population with high speed internet access	• Significant social impact • Scale in mHealth, mEducation and extend 5G into agriculture and industry • Connected and empower citizens through mobile and digital platform	• Government will have a powerful platform and supporting applications & infrastructure • Built capacity to e-serve Myanmar citizens • Managing cyber security
Myanmar 5G Position in near future	• Ubiquitous ultra broadband to person and to home • 10Mbps,50Mbps,100Mbps experience promotion	• e-MBB, FWA and IoT boost Digital Transformation • All things connected, sensing and intelligent into industry	• FWA synergy with fiber to provide government internet platform • Share public infrastructure • Trustworthiness and security E2E network

Setting out the Scene for 5G: Opportunities & Challenges in Myanmar

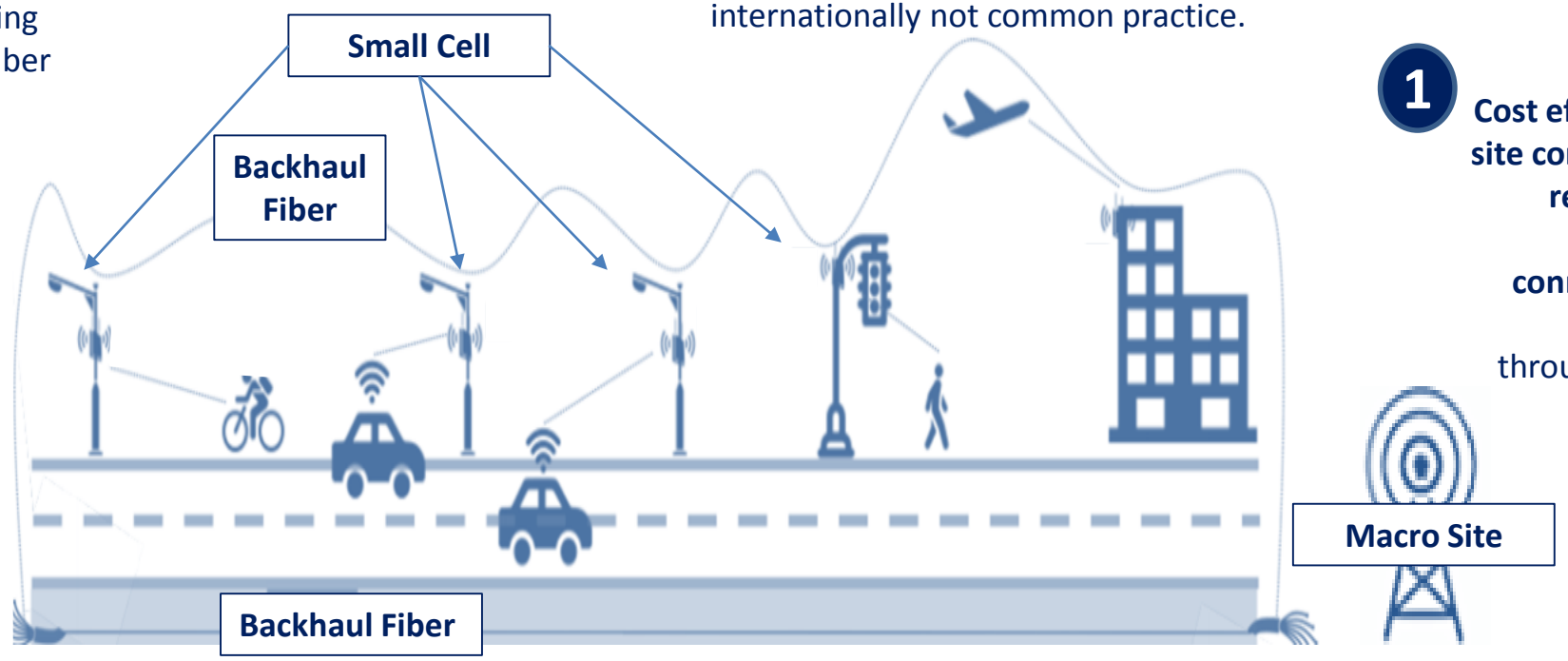
Investment case	• Need to Undertake Myanmar economic assessment of the commercial viability of deploying 5G networks • Need to Enhance the quality and availability of 4G networks for a smooth migration to 5G networks
Spectrum	• Need to Allocate globally harmonized 5G spectrum bands • Adopt spectrum roadmap and predictable renewal process • Selecting spectrum award procedures that favor investment • Supporting the use of affordable wireless coverage (e.g. 700MHz) to reduce the risk of digital divide
Infrastructure	• Access/sharing of government-owned passive infrastructure based on efficient approval processes and affordable prices • Infrastructure sharing of fixed and mobile deployments • A central data identifying key contacts, showing assets such as utility ducts, fiber networks, CCTV posts, lampposts;
Fiber & Backhaul	• To give Incentives to encourage fixed broadband deployment based on fiber or 5G FWA • Need to Support fiberization necessary for 4G/5G and suitable small cell spectrum for backhaul connectivity • Need to Elaborate existing duct access agreements and pole sharing agreements with focus on 5G

Site Fiberization – A necessary Step for 5G

Mobile operators are facing significant investments for fiber deployments in the upcoming years to cope with further exponentially growing data traffic.

3 **Small cells are gaining importance in 4G and 5G** due to further increasing traffic. Increasing number of small cells requires **increasing number of fiber backhaul connections.**

4 Municipalities in some countries and Myanmar as well further increasing **financial burden on mobile operators with Right of Way charges** which are internationally not common practice.



1 **Cost efficient microwave site connections must be replaced with more expensive fiber connections** over time reflecting higher throughput and latency requirements

2 More and more municipalities worldwide requesting **more expensive underground fiber deployment instead of cheap overhead fiber deployment** to minimize negative visual impacts.

5G Regulatory Framework in our View

Candidate 5G Spectrum

1. Must be all covered, across low band, middle band and high band
2. Consider harmonize issue in regional and global level
3. Must include all kinds of licensing scheme
4. Target the most optimum market value of spectrum

Access for Site (Outdoor & Indoor)

1. Streamline the processes to allow ease of access to street-side infrastructure, building permission , and outdoor facilities
2. Indoor Digitalization & coverage in advance
3. Fiber to site synergy

5G Business Model

1. Support future 5G mobile business models (e.g, network slicing, verticals…)_
2. Support new roles of MNOs: network developer, service enabler, or service creator.
3. Reflect changes of the value chain in regulatory practice

5G Candidate Spectrum Bands

Best Coverage	Coverage + Capacity	Super Capacity

- ✓900MHz
- ✓850MHz
- ✓700MHz

- ✓2.6 GHz
- ✓2.3 GHz
- ✓2.1 GHz
- ✓1.8 GHz
- ✓1.4 GHz
- √3.5 GHz
- √3.3 GHz
- √4.8 GHz

- ✓26GHz
- ✓28GHz
- ✓38GHz

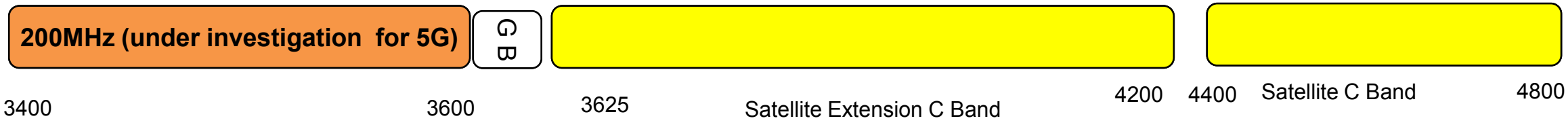
WRC-19:
50GHz
80GHz
…

Current Status of Allocation in Myanmar (low band and middle band)

MHz	MPT	telenor	ooredoo	mytel
2100	15+15 MHz (FDD) 3G/4G	15+15 MHz (FDD) 3G/4G	15+15 MHz (FDD) 3G/4G	15+15MHz (FDD)
1800	20+20 MHz (FDD) 4G	20+20 MHz (FDD) 4G	20+20 MHz (FDD) 4G	15 + 15 MHz (FDD)
900	10+10 MHz (FDD) 2G/3G	7.5+7.5 MHz (FDD) 2G/3G	7.5+7.5 MHz (FDD) 3G	5+5 MHz (FDD)
800	6.25 +6.25 MHz (FDD) 2G/3G			
450	3.75 + 3.75 MHz (FDD) 2G			
Total	110 MHz	85 MHz	85 MHz	70 MHz

Understanding of Current Middle Band Spectrum in Myanmar

Current Status of C - Band



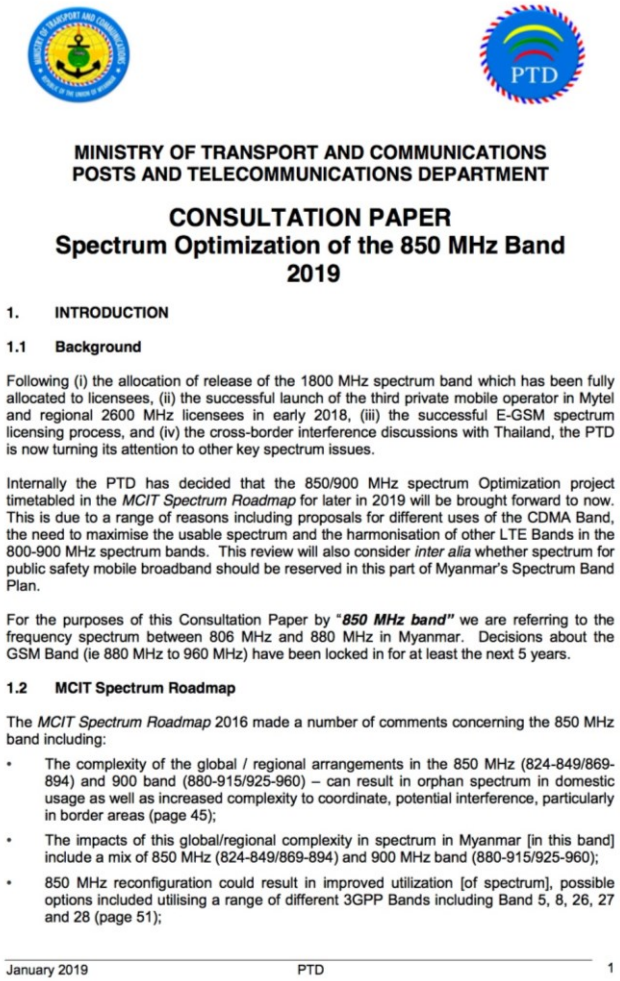
Current Status of 2.6 GHz Band: 150MHz reserved

Band plan under investigation

Region 1	FORTUNE BROADBAND, Global Technology Group
Region 2	ananda
Region 3	ananda

Current Status of 2.3 GHz Band: 90MHz reserved

PTD Consultation Papers – 850 MHz band, IMT Spectrum Roadmap & IMT /5G position (1)



MINISTRY OF TRANSPORT AND COMMUNICATIONS
POSTS AND TELECOMMUNICATIONS DEPARTMENT

CONSULTATION PAPER
Spectrum Optimization of the 850 MHz Band
2019

1. INTRODUCTION

1.1 Background

Following (i) the allocation of release of the 1800 MHz spectrum band which has been fully allocated to licensees, (ii) the successful launch of the third private mobile operator in Mytel and regional 2600 MHz licensees in early 2018, (iii) the successful E-GSM spectrum licensing process, and (iv) the cross-border interference discussions with Thailand, the PTD is now turning its attention to other key spectrum issues.

Internally the PTD has decided that the 850/900 MHz spectrum Optimization project timetabled in the *MCIT Spectrum Roadmap* for later in 2019 will be brought forward to now. This is due to a range of reasons including proposals for different uses of the CDMA Band, the need to maximise the usable spectrum and the harmonisation of other LTE Bands in the 800-900 MHz spectrum bands. This review will also consider *inter alia* whether spectrum for public safety mobile broadband should be reserved in this part of Myanmar's Spectrum Band Plan.

For the purposes of this Consultation Paper by "***850 MHz band***" we are referring to the frequency spectrum between 806 MHz and 880 MHz in Myanmar. Decisions about the GSM Band (ie 880 MHz to 960 MHz) have been locked in for at least the next 5 years.

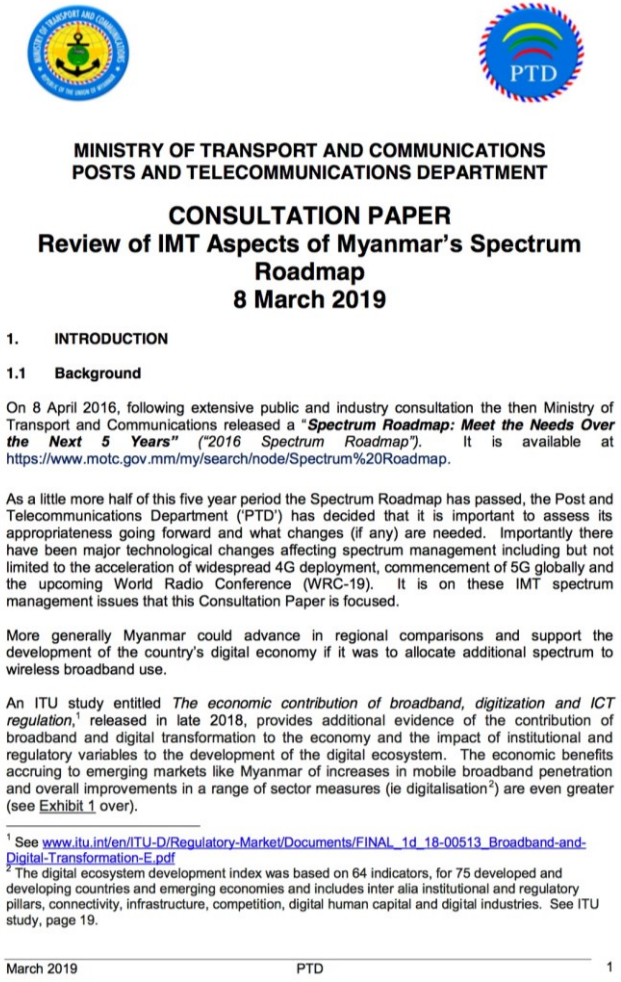
1.2 MCIT Spectrum Roadmap

The *MCIT Spectrum Roadmap* 2016 made a number of comments concerning the 850 MHz band including:

- The complexity of the global / regional arrangements in the 850 MHz (824-849/869-894) and 900 band (880-915/925-960) – can result in orphan spectrum in domestic usage as well as increased complexity to coordinate, potential interference, particularly in border areas (page 45);
- The impacts of this global/regional complexity in spectrum in Myanmar [in this band] include a mix of 850 MHz (824-849/869-894) and 900 MHz band (880-915/925-960);
- 850 MHz reconfiguration could result in improved utilization [of spectrum], possible options included utilising a range of different 3GPP Bands including Band 5, 8, 26, 27 and 28 (page 51);

January 2019 PTD 1

On **850 MHz Consultation paper** responses received from MPT, Telenor, Ooredoo and Mytel



MINISTRY OF TRANSPORT AND COMMUNICATIONS
POSTS AND TELECOMMUNICATIONS DEPARTMENT

CONSULTATION PAPER
Review of IMT Aspects of Myanmar's Spectrum Roadmap
8 March 2019

1. INTRODUCTION

1.1 Background

On 8 April 2016, following extensive public and industry consultation the then Ministry of Transport and Communications released a "***Spectrum Roadmap: Meet the Needs Over the Next 5 Years***" *("2016 Spectrum Roadmap").* It is available at https://www.motc.gov.mm/my/search/node/Spectrum%20Roadmap.

As a little more half of this five year period the Spectrum Roadmap has passed, the Post and Telecommunications Department ('PTD') has decided that it is important to assess its appropriateness going forward and what changes (if any) are needed. Importantly there have been major technological changes affecting spectrum management including but not limited to the acceleration of widespread 4G deployment, commencement of 5G globally and the upcoming World Radio Conference (WRC-19). It is on these IMT spectrum management issues that this Consultation Paper is focused.

More generally Myanmar could advance in regional comparisons and support the development of the country's digital economy if it was to allocate additional spectrum to wireless broadband use.

An ITU study entitled *The economic contribution of broadband, digitization and ICT regulation*,[1] released in late 2018, provides additional evidence of the contribution of broadband and digital transformation to the economy and the impact of institutional and regulatory variables to the development of the digital ecosystem. The economic benefits accruing to emerging markets like Myanmar of increases in mobile broadband penetration and overall improvements in a range of sector measures (ie digitalisation[2]) are even greater (see Exhibit 1 over).

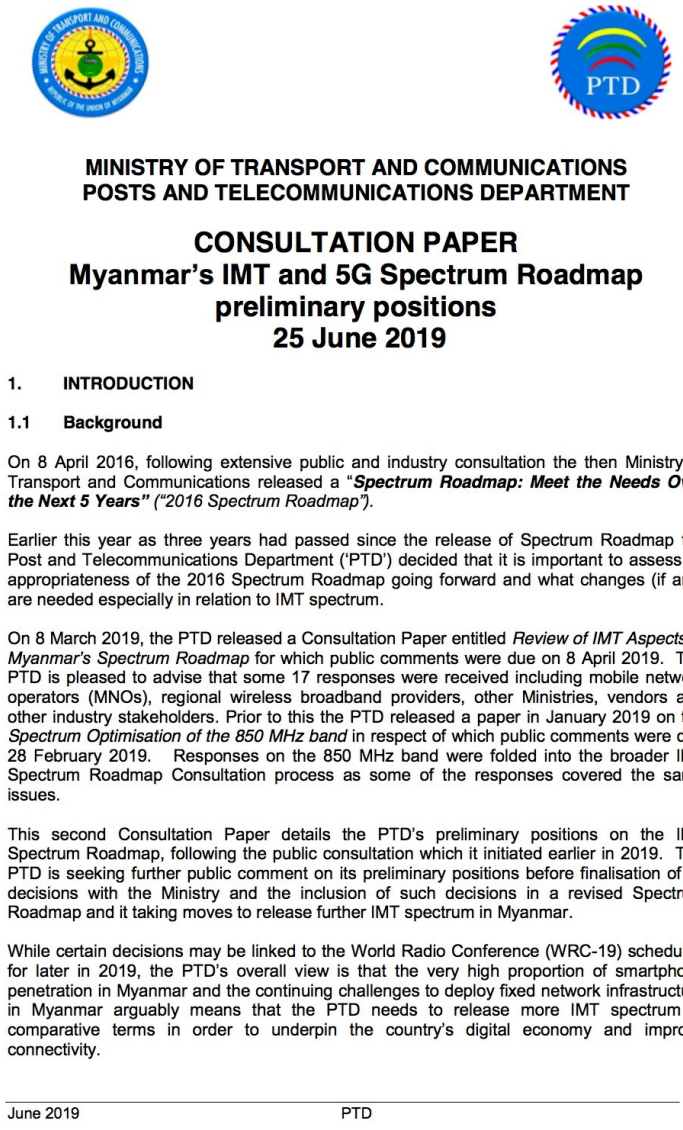
[1] See www.itu.int/en/ITU-D/Regulatory-Market/Documents/FINAL_1d_18-00513_Broadband-and-Digital-Transformation-E.pdf
[2] The digital ecosystem development index was based on 64 indicators, for 75 developed and developing countries and emerging economies and includes inter alia institutional and regulatory pillars, connectivity, infrastructure, competition, digital human capital and digital industries. See ITU study, page 19.

March 2019 PTD 1

On **IMT Spectrum Roadmap** responses from:

- MPT, Telenor, Ooredoo and Mytel
- Frontiir and Global Technology
- Intelsat, Asiasat and AVIVA
- Ericsson and Huawei
- Others

PTD Consultation Papers – 850 MHz band, IMT Spectrum Roadmap & IMT /5G position (2)



MINISTRY OF TRANSPORT AND COMMUNICATIONS
POSTS AND TELECOMMUNICATIONS DEPARTMENT

CONSULTATION PAPER
Myanmar's IMT and 5G Spectrum Roadmap preliminary positions
25 June 2019

1. INTRODUCTION

1.1 Background

On 8 April 2016, following extensive public and industry consultation the then Ministry of Transport and Communications released a "***Spectrum Roadmap: Meet the Needs Over the Next 5 Years***" *("2016 Spectrum Roadmap").*

Earlier this year as three years had passed since the release of Spectrum Roadmap the Post and Telecommunications Department ('PTD') decided that it is important to assess its appropriateness of the 2016 Spectrum Roadmap going forward and what changes (if any) are needed especially in relation to IMT spectrum.

On 8 March 2019, the PTD released a Consultation Paper entitled *Review of IMT Aspects of Myanmar's Spectrum Roadmap* for which public comments were due on 8 April 2019. The PTD is pleased to advise that some 17 responses were received including mobile network operators (MNOs), regional wireless broadband providers, other Ministries, vendors and other industry stakeholders. Prior to this the PTD released a paper in January 2019 on the *Spectrum Optimisation of the 850 MHz band* in respect of which public comments were due 28 February 2019. Responses on the 850 MHz band were folded into the broader IMT Spectrum Roadmap Consultation process as some of the responses covered the same issues.

This second Consultation Paper details the PTD's preliminary positions on the IMT Spectrum Roadmap, following the public consultation which it initiated earlier in 2019. The PTD is seeking further public comment on its preliminary positions before finalisation of its decisions with the Ministry and the inclusion of such decisions in a revised Spectrum Roadmap and it taking moves to release further IMT spectrum in Myanmar.

While certain decisions may be linked to the World Radio Conference (WRC-19) scheduled for later in 2019, the PTD's overall view is that the very high proportion of smartphone penetration in Myanmar and the continuing challenges to deploy fixed network infrastructure in Myanmar arguably means that the PTD needs to release more IMT spectrum in comparative terms in order to underpin the country's digital economy and improve connectivity.

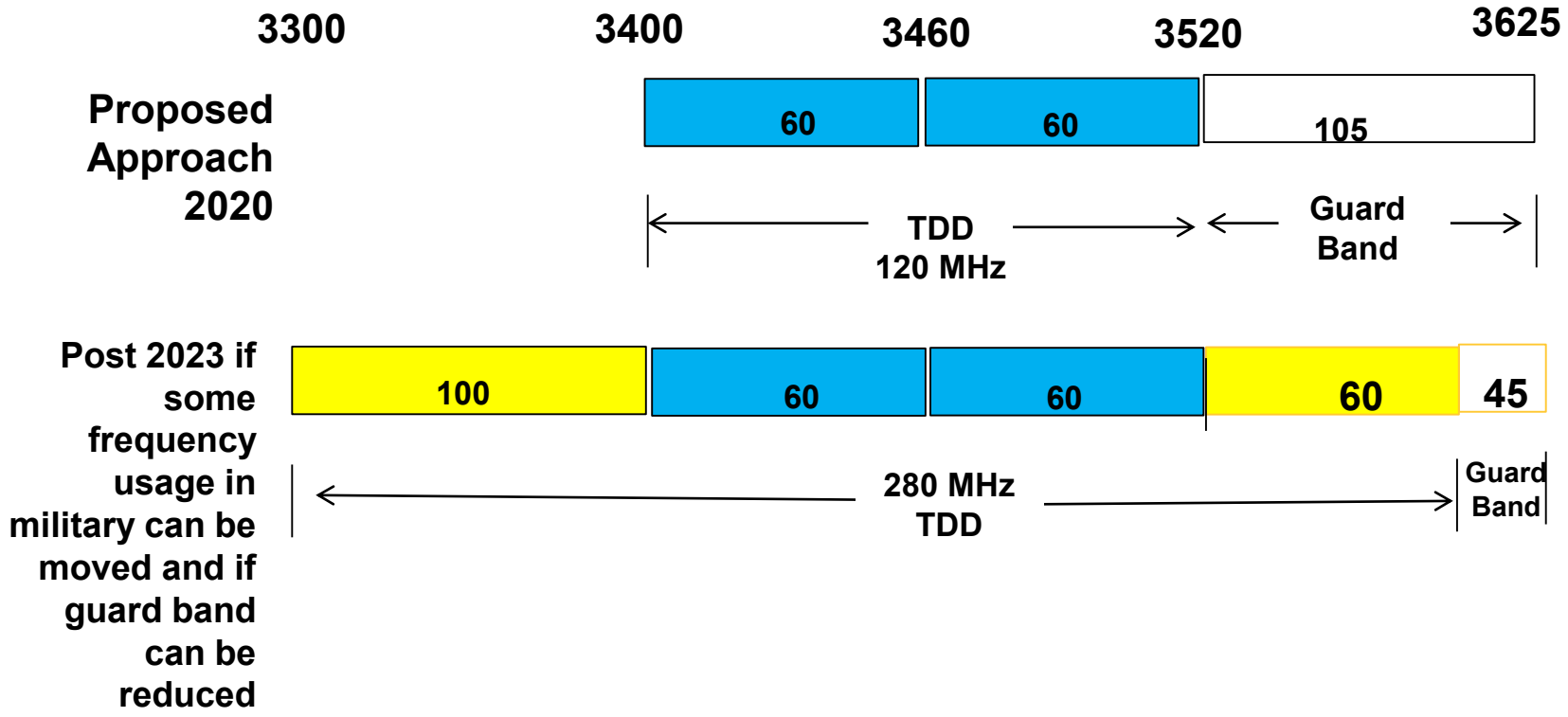
On **IMT and 5G Spectrum Roadmap preliminary positions** responses from:

- MPT, Telenor, Ooredoo and Mytel
- Frontiir, Global Technology & Amara
- MSTEA
- Huawei
- US-ICT Council
- Others

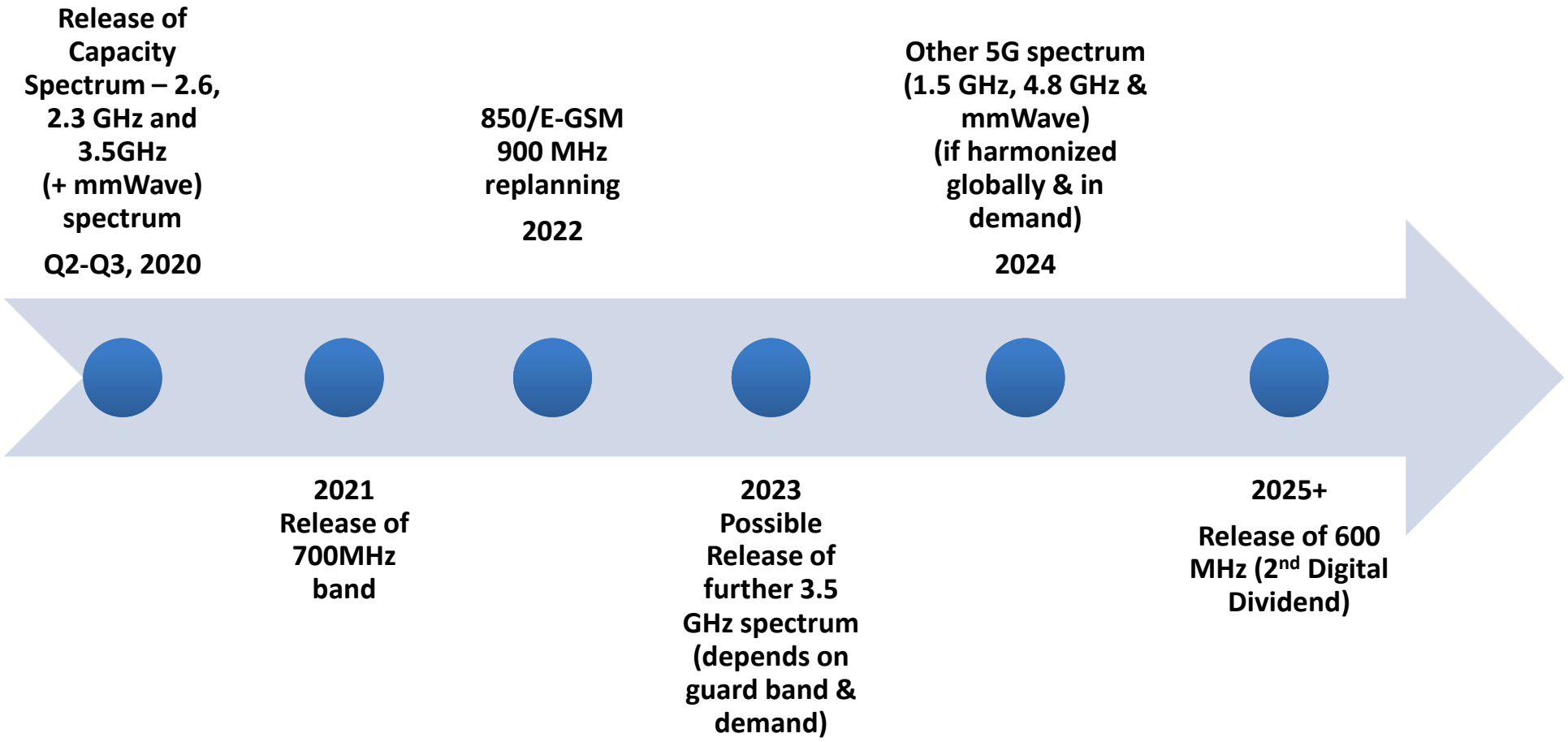
1. Starting Point: Future C-Band issues(Myanmar's approach)

- If after ASEAN/GSMA/GSA studies the guard band need not be 100 MHz then post 2023 a further 60 MHz can be licensed (leaving the guard band at 45 MHz) and if the military radar can be moved then a further 100 MHz of spectrum from 3.3 to 3.4 GHz can be made available).

- In the region, 3.5 GHz (C-band) is primarily allocated to satellite services across ASEAN including Myanmar (this is also the case in id, my, vn, sg, th, etc) and unless sharing regimes can be determined, then 5G deployment in this band will be difficult, if not possible, in the short to medium term. Myanmar is in very good shape compared with other ASEAN members in this position.

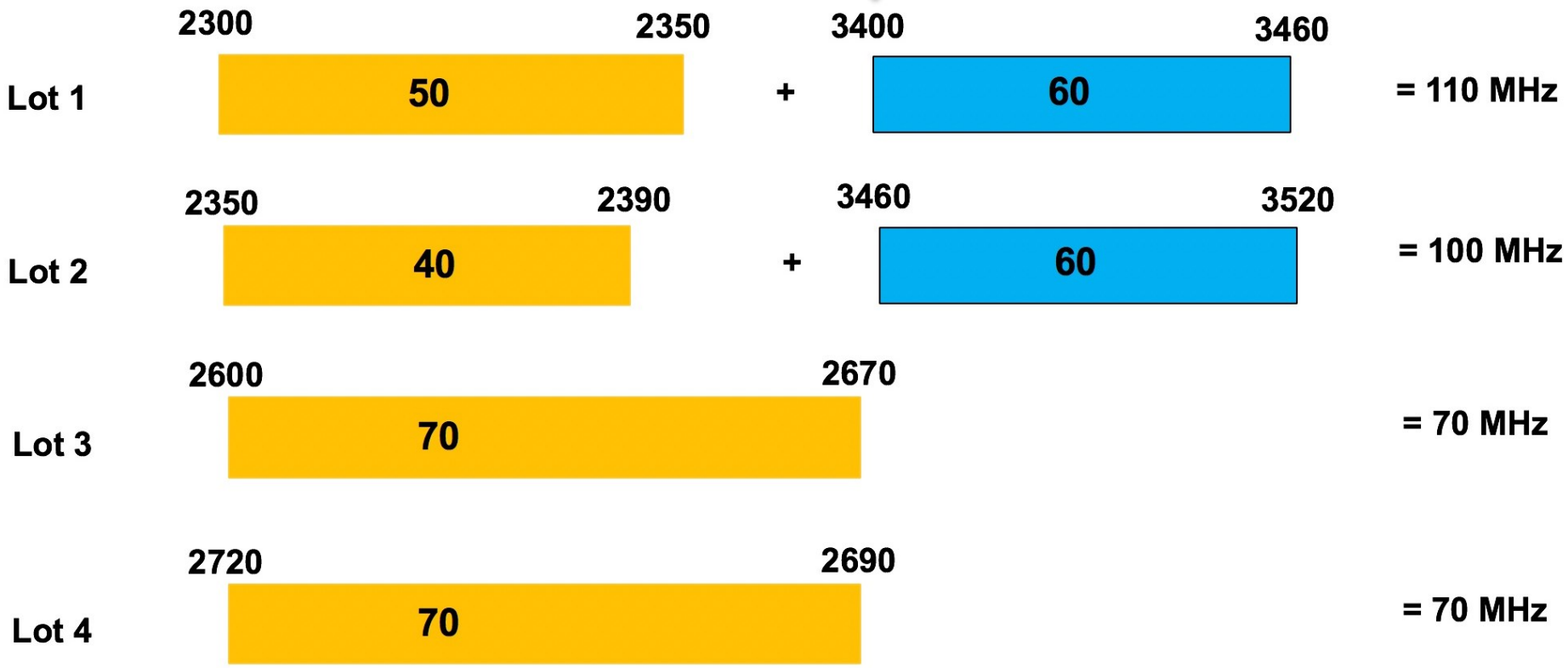


2. Responses received to the Consultation Papers – Summary of key recommendations (Draft timeline to release the 5G Spectrum)



3. Responses received to the Consultation Papers – Summary of key recommendations

Recommended release of spectrum – which creates larger block sizes compatible with 5G NR and facilitates competition. It is not sensible to give one MNO the 3.5 GHz – 2 lots ensures competition and there is no 4G equipment for 3.5 GHz.



Future auctions/ allocations: **+ 700 MHz (2 x 45 MHz) + 60 MHz @ 3.5 GHz + 4.8-4.9 GHz**

+ 100 MHz @ 3.5 GHz if some military frequency can be moved

3. CONCLUSIONS

A shared Social Responsibility Together To Create 5G Era(Myanmar View)

Government

- **Supportive Policy**

  - *National ICT Policy*
  - *Spectrum harmonize and fair price*
  - *Infra. Alliance (site, fiber) , ROW*
  - *MBB QoS Benchmarking*

Operator

- **Responsibility & Obligation**

  - *Efficient Supply (99% population coverage)*
  - *Best QOS guarantee (Voice & Data & VAS)*
  - *Better Affordability*
  - *Business innovation*

Vendor & Partner

- **Effective & Innovation**

  - *E2E Cost Effective & Technical Innovation*
  - *Fiber ready network for households and enterprise*
  - *Unlocking vertical market*

Thank You.