



# Mid band spectrum requirements & developments

## 6 GHz emerging needs

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Asia Pacific

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IN  
**1987**

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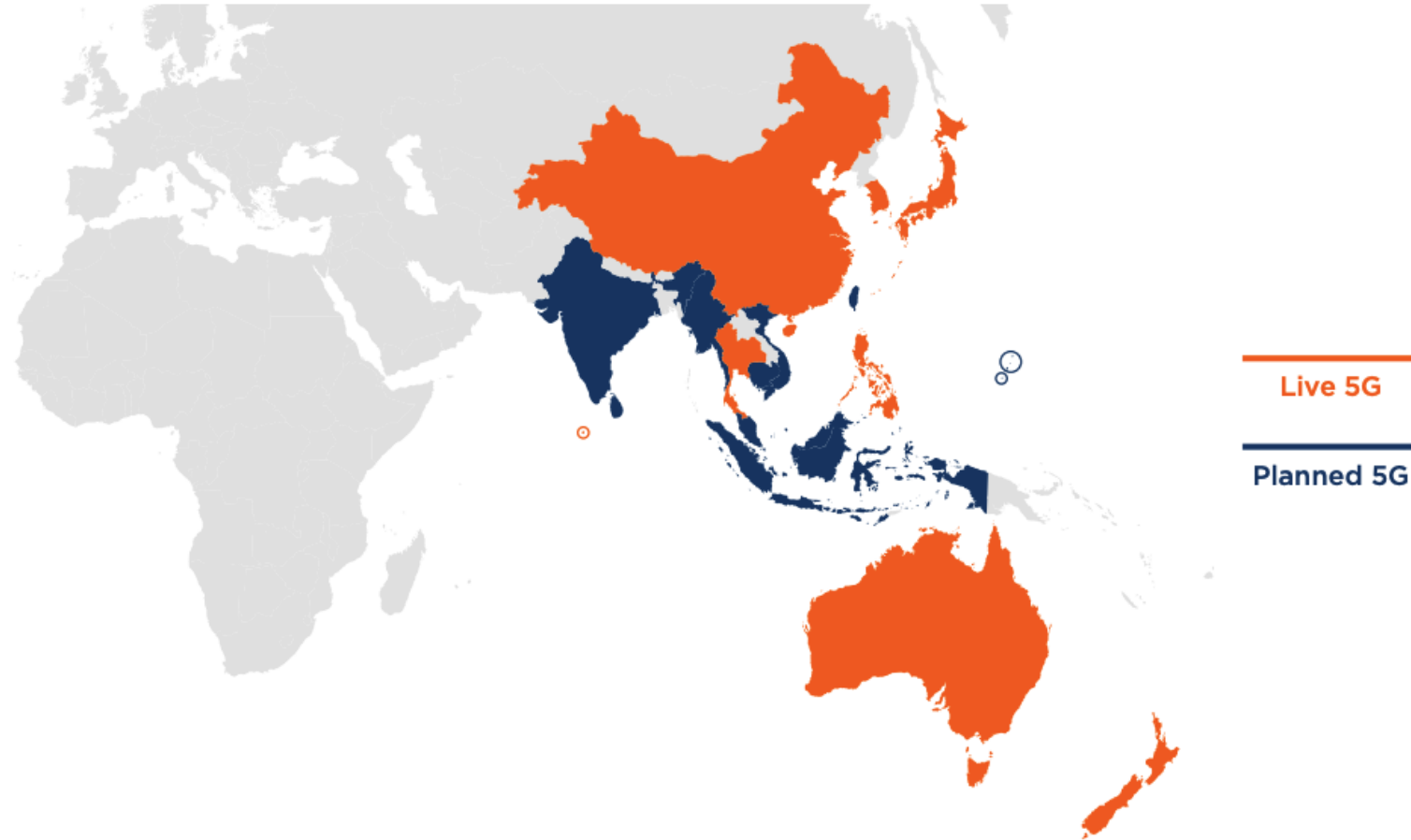
MOBILE CONNECTIONS  
WORLDWIDE





# APAC mobile market snapshot 5G

**Nine markets in Asia Pacific have launched commercial mobile 5G services; 12 more have officially announced plans to launch**



Source: GSMA Intelligence

# Spectrum is needed across three ranges

Coverage

**Sub-1 GHz**

Great Mix

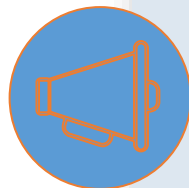
**1-6 GHz**

Capacity  
Lower Latency  
Backhaul

**AND ABOVE**

**6 GHz**

**5G**



**80-100 MHz per MNO**  
IN MID-BANDS AND  
**1 GHz per MNO**  
IN mmW

**Why?**



# WRC-23 IMT Agenda Items Overview



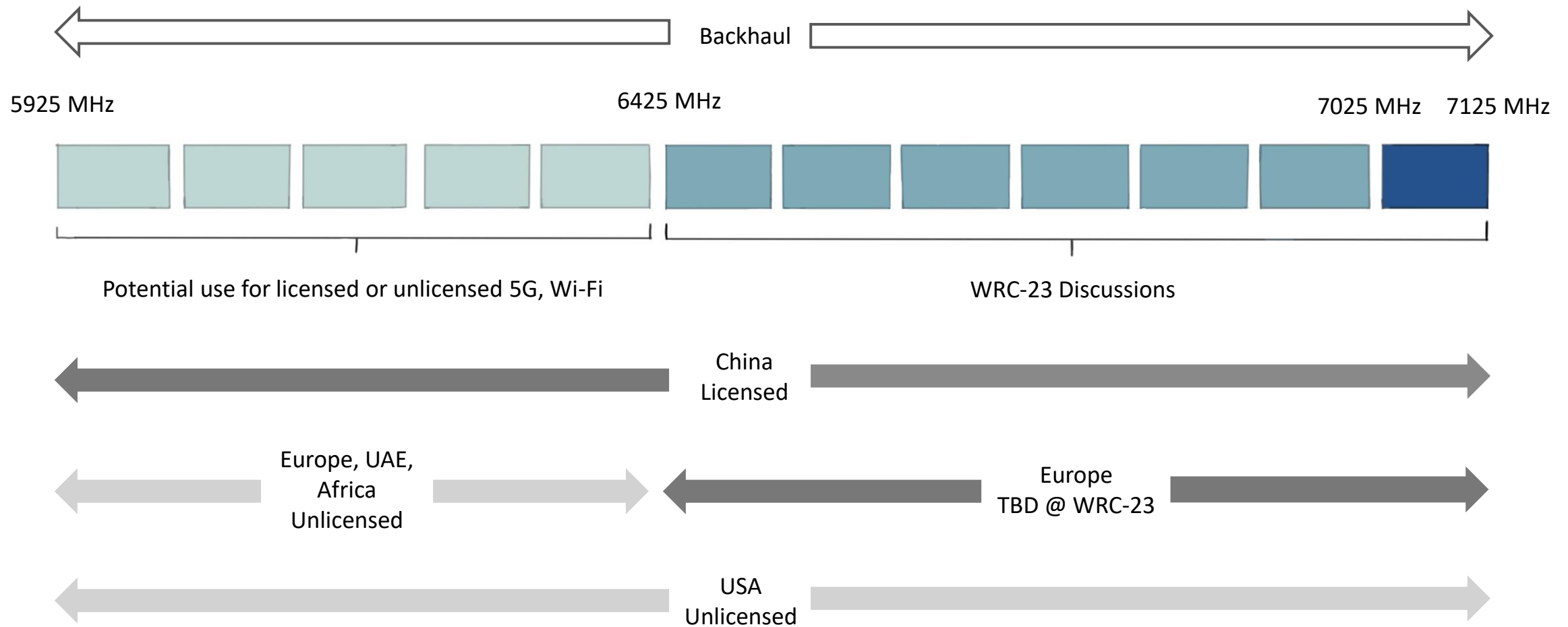
**Global Industry Analysis:**  
GSMA questionnaire responses show support for 6425-7125 MHz as **high priority for future IMT in all three Regions**

- **Harmonisation is key**
- **Economies of scale are expected**
- **WRC-23 can help towards this**

Bands	470-960 MHz	3300-3400MHz	3600-3800MHz	4800-4990 MHz	6425-7025 MHz	7025-7125 MHz	10-10.5 GHz
Region 1	AI 1.5 (IMT)	AI 1.2 (IMT)	AI 1.3 (MS)	AI 1.1 (IMT)	AI 1.2 (IMT)	AI 1.2 (IMT)	
Region 2		AI 1.2 (IMT)	AI 1.2 (IMT)	AI 1.1 (IMT)		AI 1.2 (IMT)	AI 1.2 (IMT)
Region 3				AI 1.1 (IMT)		AI 1.2 (IMT)	



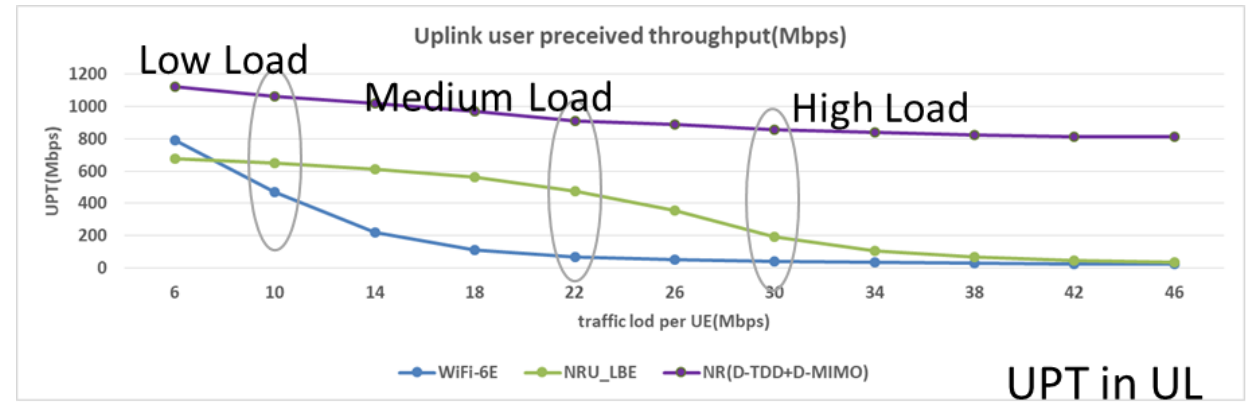
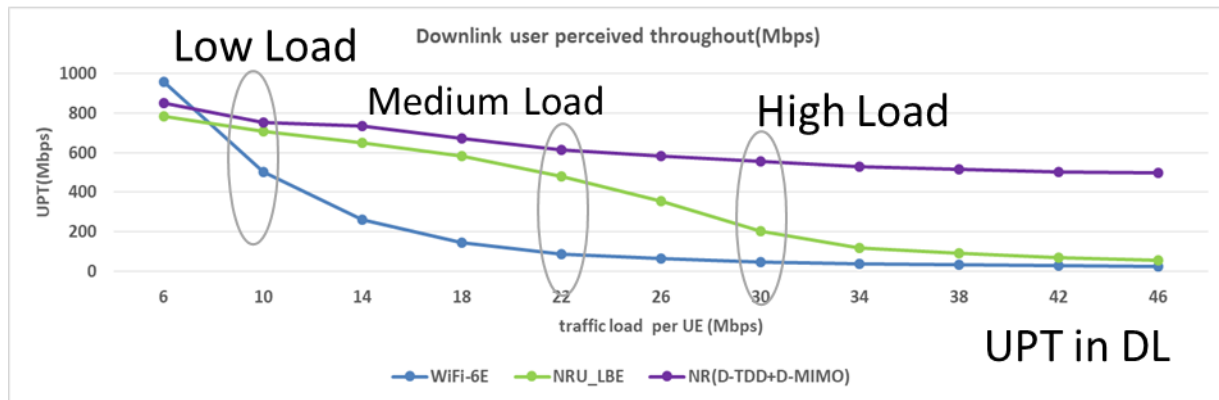
# Current plans for 6 GHz





# 5G-NR vs. 5G-NR-U vs. WiFi-6E

FEATURES	NR R15 / R16	NR-U R16
CF/BW	FR1 (<=7GHz) <= 100MHz x CC,	5/6GHz, <=100MHz x CC
PERFORMANCE	NR R15 / R16	NR-U R16
Target scenario	Citywide coverage	Outdoor / indoor hotspot
Peak throughput	DL: 18.48~19.28 Gbps (8SS/256QAM/100MHzx4CC) UL: 9.08~9.52 Gbps (4SS/256QAM/100MHzx4CC)	Same as NR R15/16
Coverage	Ca. 1000m with 67dBm EIRP (dense urban NLOS, 20MHz CC, PDSCH at 6.7Mbps)	ca. 160m with 36dBm EIRP (dense urban NLOS, 20MHz CC, PDSCH at 6.7Mbps)
Mobility	500km/h	Not target for high mobility scenario
Reliability	99.9999%	Reliability cannot be ensured with unlicensed spectrum → not suitable for URLLC





# IMT spectrum demand

Additional mid-band spectrum needed for mobile operators in 2025-2030 timeframe

## IMT spectrum demand

Estimating the mid-bands spectrum needs in the 2025-2030 timeframe

A report by

**Coleago Consulting Ltd**

14<sup>th</sup> of December 2020



The GSMA endorses the findings and conclusions of this report

A total of around 2 GHz of mid-band spectrum would enable mobile operators to deliver the ITU-R IMT-2020 requirements in cities in an economically feasible manner

<http://www.coleago.com/imt-spectrum-demand/>





# Spectrum needs in mid-bands

City	1-3 GHz	3.3-4.99 GHz	Spectrum needs		
Lagos	460 MHz	400 MHz	600 MHz	1100 MHz	1700 MHz
Moscow	460 MHz	200 MHz	600 MHz	800 MHz	1200 MHz
Paris	460 MHz	600 MHz	200 MHz	700 MHz	1200 MHz
Sao Paulo	460 MHz	400 MHz	300 MHz	700 MHz	1200 MHz
Tokyo	460 MHz	800 MHz	0 MHz	100 MHz	600 MHz

Activity factor →

# 5G Licensing Mid-band “C-band” Asia-Pacific Status

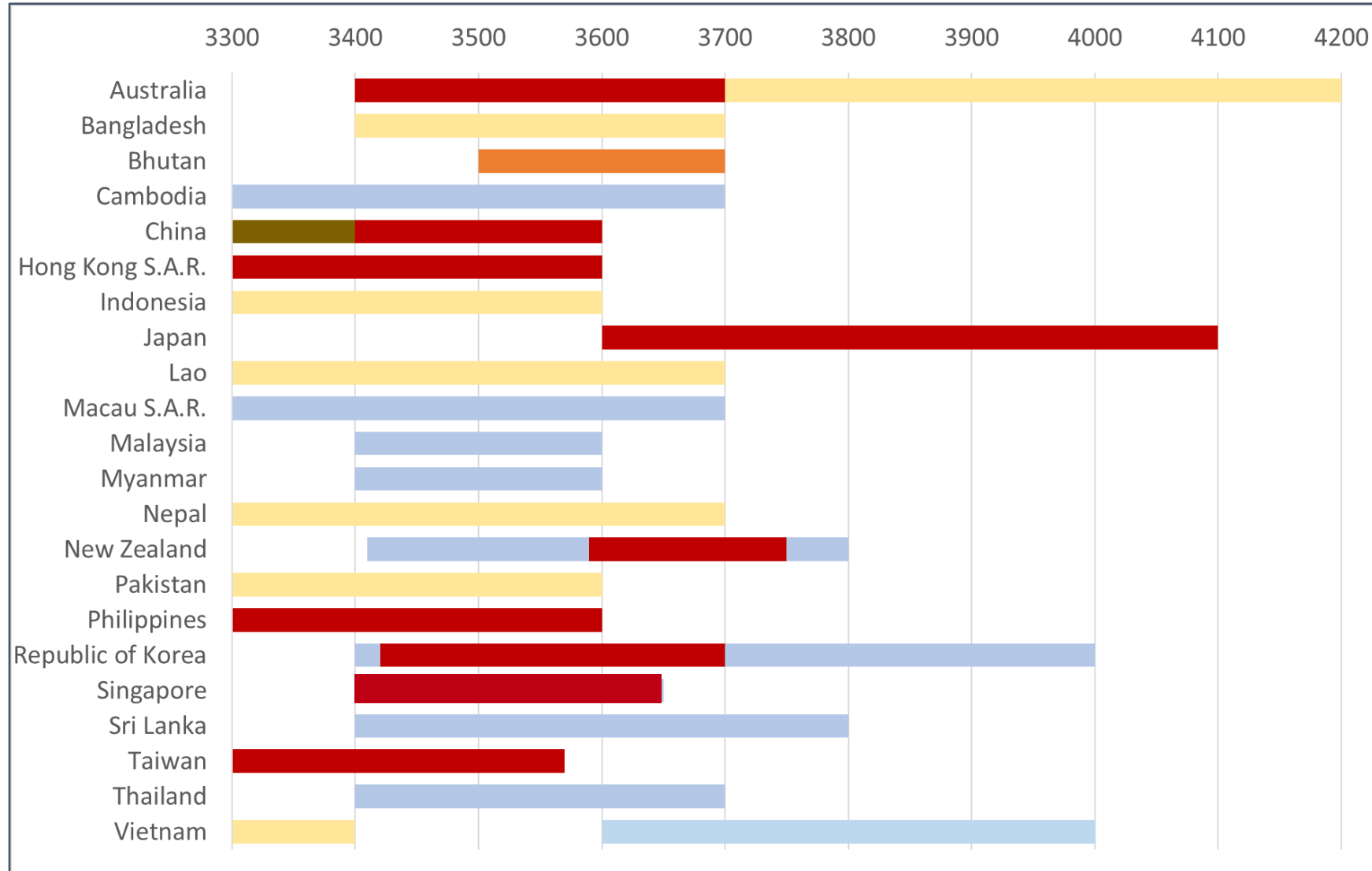


## Roadmap for C-band spectrum in ASEAN

August 2019



- Temporarily assigned to test/trial
- Assigned\*
- Ongoing assignment\*
- Planned assignment\*
- Ongoing consultation
- Considering the options
- Reserved
- Shared spectrum
- Planned assignment – local license \*\*
- Local licensing – multi tier \*\*\*
- Local licensing\*\*







# Possibilities initially considered in Brazil for the TVROs

for the mobile services in the 3.5 GHz Range

## >3.8 GHz

Moving TVROs to above 3.8 GHz. As this will create a temporary 100 MHz guard band until services are available in 3.7-3.8 GHz, filters, expected soon, will be used to cover interferences in 3.7 or 3.8 GHz up when necessary

A: 3.3-3.7 GHz

## Ku Band

Moving the TVRO base to the Ku band, which would be more expensive, and does not mean the release of up to 4.2 GHz eventually (other FSS will not migrate). This option does not consider the decrease of TVRO usage within the next years

B: 3.3-3.7 GHz

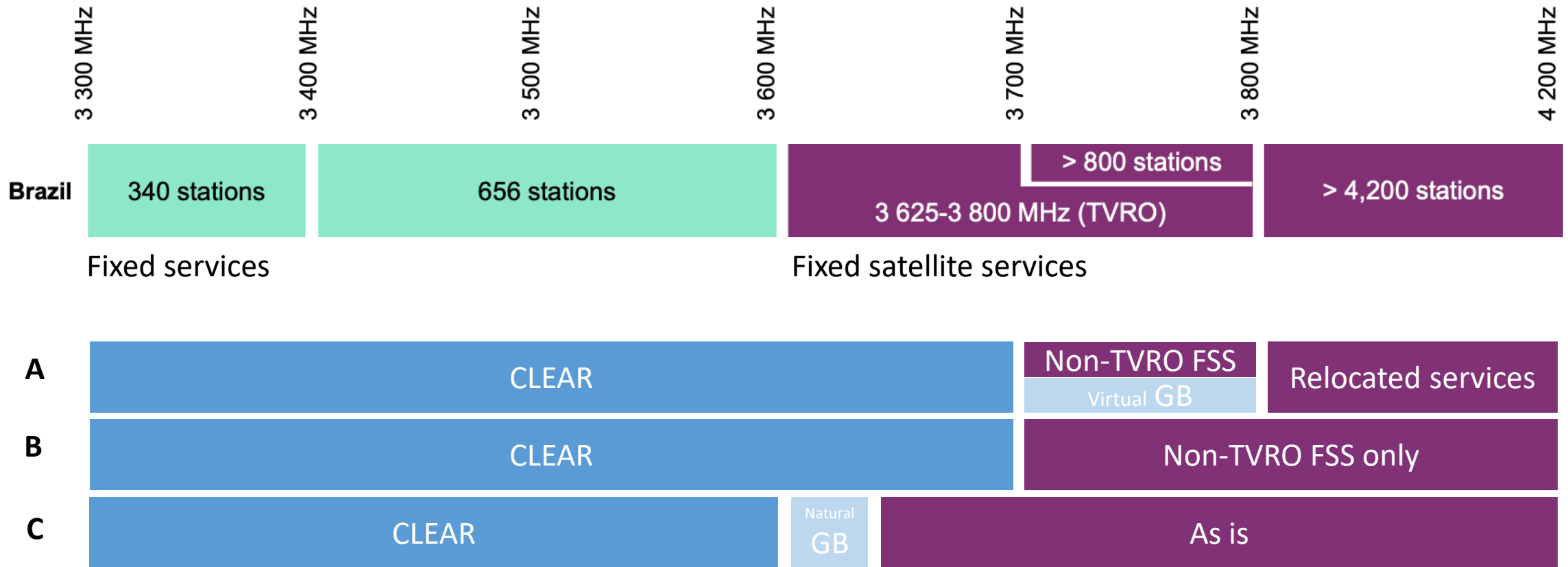
## As is

Keeping the TVROs in 3.625 GHz+ and adding filters if any interference happens – TVRO-dependant households are normally rural, where 5G won't reach as a first approach. When that happens, even better filters will be available

C: 3.3-3.6 GHz



# The range and the “natural/virtual” guard bands





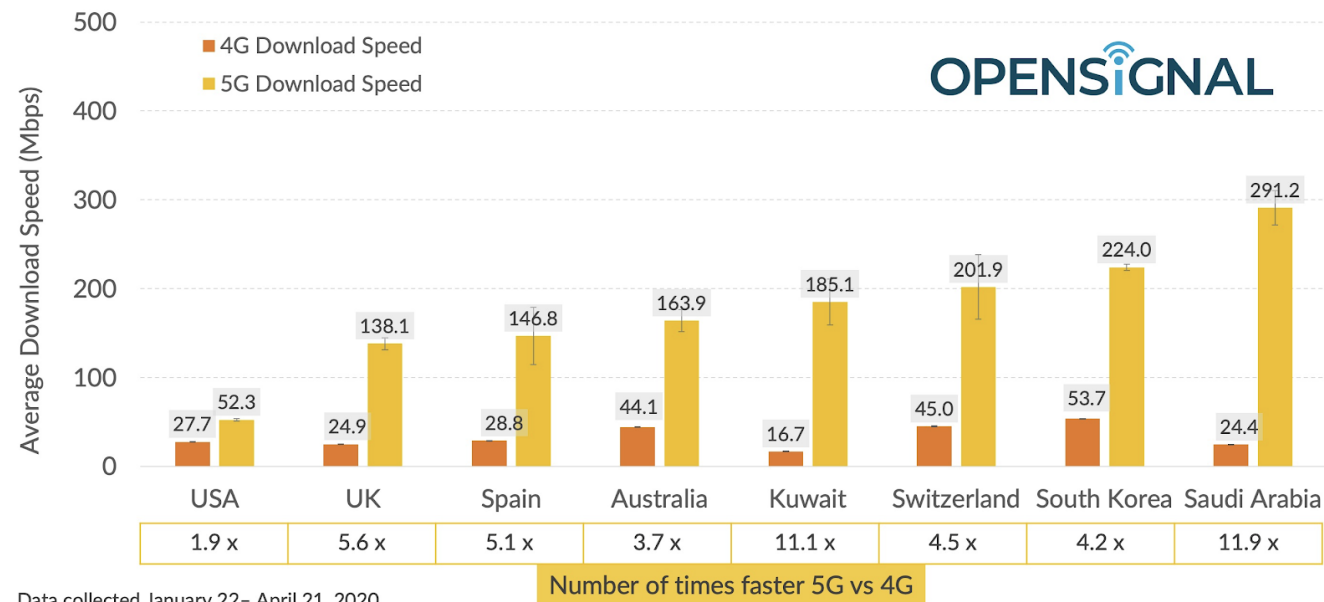


# Case study: Saudi Arabia

- One of the KSA’s strategic objectives in the National Transformation Program (NTP) 2020 was to make available more spectrum for the provision of mobile broadband or IMT services.
- In the last three years the Communications and Information Technology Commission (CITC) has carried out four auctions including existing and new IMT bands, namely:
  - June 2017: 700 MHz and 1800 MHz
  - February 2018: 800 MHz, residual spectrum in 700 MHz and 1800 MHz bands
  - January 2019: 2.3 GHz and 2.6 GHz (290MHz)
  - **March 2019: 3.5 GHz (400MHz)**

As a result, operators in Saudi Arabia today have **access to more than 1100 MHz of licensed spectrum for IMT use in the sub-6 GHz range.**  
**Result: high performance 5G networks**

Real-world 5G download speeds are many times faster than those seen on 4G





# Conclusions

Market assessment should lead approach

5 925-6 425 MHz

- Follow developments and protect backhaul
- Consider market conditions and developments
- If there is market need and FTTH, consider for unlicensed use

6 425-7 125 MHz

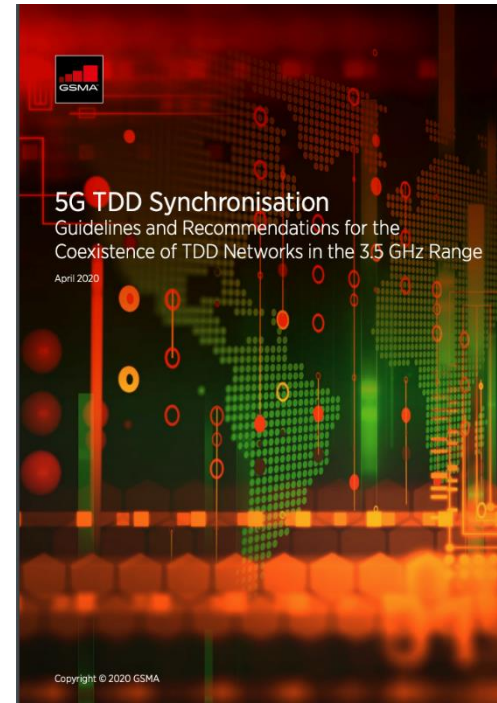
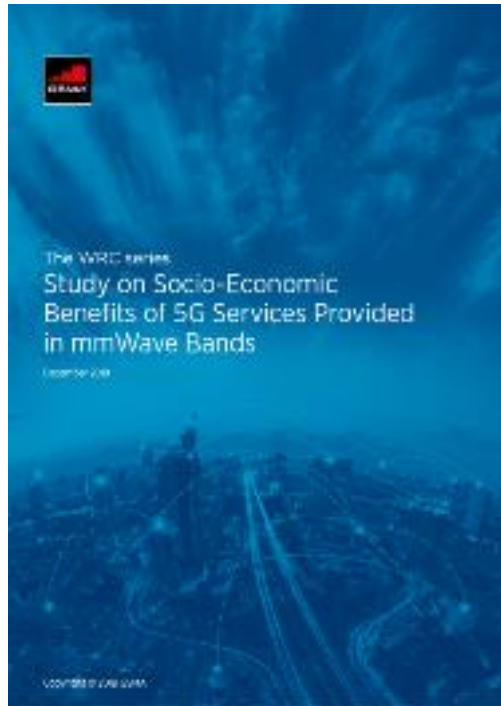
- Ensure 5G has sufficient bandwidth for lower network density/costs
- Look at market metrics: development of 5G means +6 GHz will be needed
- Consider options for 5G expansion spectrum: 3.5 GHz and 6 GHz

Approach

- Consider the protection of backhaul for any way forward
- Avoid decisions that cannot be reversed
- Look at core network availability and 3.5 GHz availability
- Safeguard the top 700 MHz for 5G; consider the lower band



# GSMA Studies

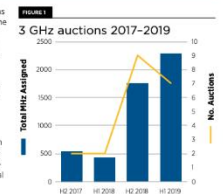


## Introduction

Frequencies in the range 3.3-4.2 GHz are being used as the basis for the first implementations of 5G all over the world. This spectrum is at a balancing point between coverage and capacity that has provided the perfect environment for much of the earliest 5G connectivity.

The planning of these frequencies has taken place over multiple WRC cycles and work on harmonisation continues today, but over the last two years there has been significant growth in the number of auctions assigning 3 GHz spectrum around the world.

5G networks are also reaching into mmWave for much higher capacity and use lower frequencies to provide greater coverage, but the equilibrium provided by 3.3-4.2 GHz has seen these frequencies become the global birthplace of 5G.



<https://www.gsma.com/spectrum>