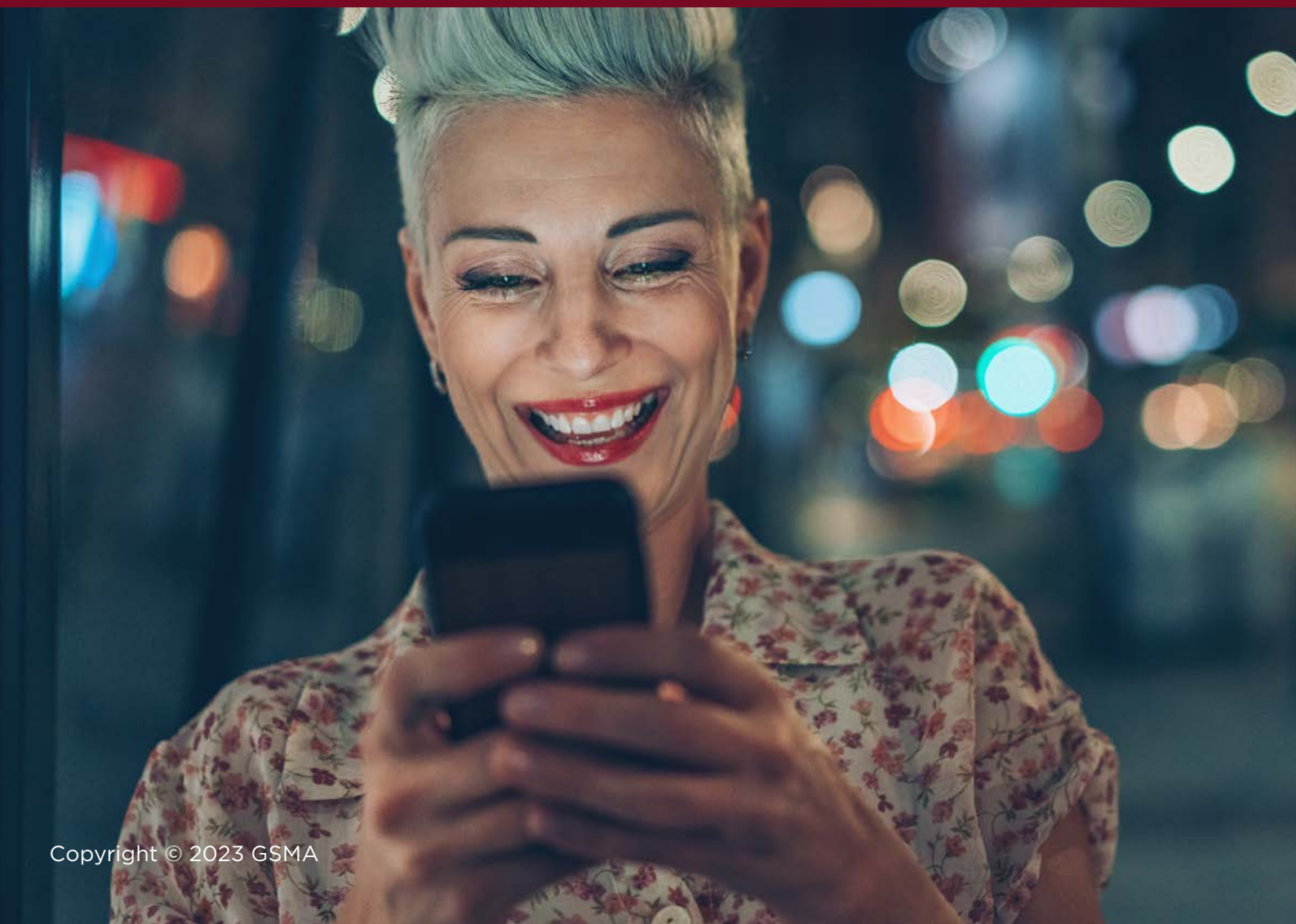
GSMA

# Spectrum Policy Trends 2023

February 2023



GSMA™

# Contents


| | |
|---|---|
| Foreword | 2 |
| WRC-23: a decisive year for 5G spectrum allocation | 4 |
| New spectrum for 5G: adding up the mid-band maths | 10 |
| Digital switchover: unlocking additional low bands in emerging markets | 14 |
| Spectrum assignments: balanced pricing and licence conditions to spur mobile growth | 18 |
| Private fashion: vertical set-asides versus spectrum capacity for operators | 22 |
| Setting the stage for 6G | 26 |

GSMA™

Spectrum Policy Trends

# Foreword

Those of us whose lives revolve around enabling new connectivity through the guidelines for radio spectrum are accustomed to the cyclical nature of our work. Such cycles are both generational - the new, bespoke spectrum needs of each mobile technology - and predictable - the four-yearly running of each World Radiocommunication Conference (WRC).

2023 will see both these cycles come together in a crucial year for new spectrum capacity. This year, at WRC-23, regulators will consider the needs of 5G-Advanced and 6G alongside the harmonisation of the 5G launch band at 3.5 GHz and further consideration of UHF. 2023 will also see continued pressure on spectrum in harmonised bands from mobile operators and other users.

The need to provide harmonised spectrum capacity comes not only with each generation of mobile but also with its development towards maturity. Technical agreements to support widely harmonised spectrum take years to finalise, and the ultimate goal of achieving global bands is not always met. WRCs, though, are successful at achieving broad consensus and, at times, have delivered worldwide harmonisation: 2.1 GHz, 3.5 GHz, and 700 MHz, to name a few.

The use of mobile as a tool for broader economic development has become widely accepted: this is notable in the trends we see emerging in the auction and licensing practice. 2023 is expected to see further emphasis on the use of spectrum as an economic enabler rather than a treasury fundraiser, but not all practices will be good. Policies that support long-term mobile broadband growth always win over short-term gains to treasury balances. Regulators know their own markets and, supported by regulatory impact analysis, can make local decisions backed by global knowledge.

We must continue planning for the future in 2023 and ensure that the global spectrum roadmap is clear and fair for everyone. We need to ensure spectrum policies harness digital equality and lower the usage gap as we move towards a 6G era that realises UN goals for universal, meaningful connectivity.

The GSMA's vision for mobile is truly aimed at the whole world, bringing everyone on a journey towards a better, more prosperous future. Ensuring that we leave no one behind in our digital age starts with spectrum policy.

**Luciana Camargos,** Head of Spectrum, GSMA

GSMA

Spectrum Policy Trends

# WRC-23: a decisive year for 5G spectrum allocation

All eyes will be on Dubai at the end of 2023, when decisions will be made that are critical to the future of both mobile connectivity and the wider communications ecosystem. The ITU's quadrennial World Radiocommunication Conference (WRC), taking place from 20 November - 15 December, will gather national administrations and telecom industry members in Dubai to review and update the global use of radio frequencies.

The WRC defines how wireless communications providers, using services including mobile, satellite, Wi-Fi, radio astronomy and radars, ensure radio compatibility between each other across locations and frequency bands. As more devices and services come online, pressure on spectrum and the co-existence between services gets more and more intense.

## Why does it matter?

Historically, WRCs have played a critical role in the mobile industry connecting more than 5 billion people. WRC-23 is a chance to build on that achievement by identifying spectrum that will help expand the availability of affordable 5G services and ensure future growth and innovation. It is an opportunity to build a spectrum roadmap going into the 2030s, address the digital divide and ensure 5G can benefit billions.

For mobile users, two issues are at stake: both the expansion and the harmonisation of core 5G spectrum capacity. With the right spectrum, 5G rollout can continue to flourish and all parts of the world can have access to 5G technologies. Expanding and harmonising access to mobile spectrum can deliver scale while decreasing both network density and network capex. In doing so it can put affordable, next-generation mobile services into the hands of the whole world.

Spectrum in low and mid-bands is being discussed at WRC-23. On average, a total of 2 GHz of mid-band spectrum will be required per market to support the growth of 5G by 2030 while more low-band spectrum can deliver faster speeds in rural areas and lower the digital divide.

In mid-bands, further harmonisation of the 3.5 GHz band is expected but getting to the required 2 GHz of mid-band is challenging to reach without 6 GHz capacity as well. One of the measures of WRC-23's success will be in its ability to secure 5G's future in the identification of 6 GHz spectrum. With it, the conference can deliver fast, affordable mobile broadband to all parts of the world, lower the usage gap and narrow the digital divide.

## What are the policy considerations?

Through the Agenda Items (AIs) below, WRC-23 will look at both mid-band and low-band (sub-1 GHz) frequencies for mobile.

**AI 1.1: IMT in the band 4 800-4 990 MHz**
The 4800-4990 MHz band has the backing of a growing ecosystem, based on new assignments in China, nearby assignments in Japan and the ongoing activity for WRC-23. In short, it is backed by countries representing a large portion of the world's population. That makes it a strong option for adding more mid-band spectrum, which is needed to ensure future 5G growth.

**AI 1.2: IMT in a number of bands including in the 3.5 GHz, 6 GHz and 10-10.5 GHz ranges**
The 6 GHz range is a core component of the spectrum needed to realise universal 5G connectivity. 6425-7125 MHz is a priority band for MNOs on a global basis as they look to increase capacity and lower costs on the road towards 5G-Advanced. Further harmonisation of the 3.5 GHz range – the birthplace of 5G in most of the world – will increase scale, diversity and affordability. 10-10.5 GHz can provide valuable additional capacity in between mid-band and mmWave.

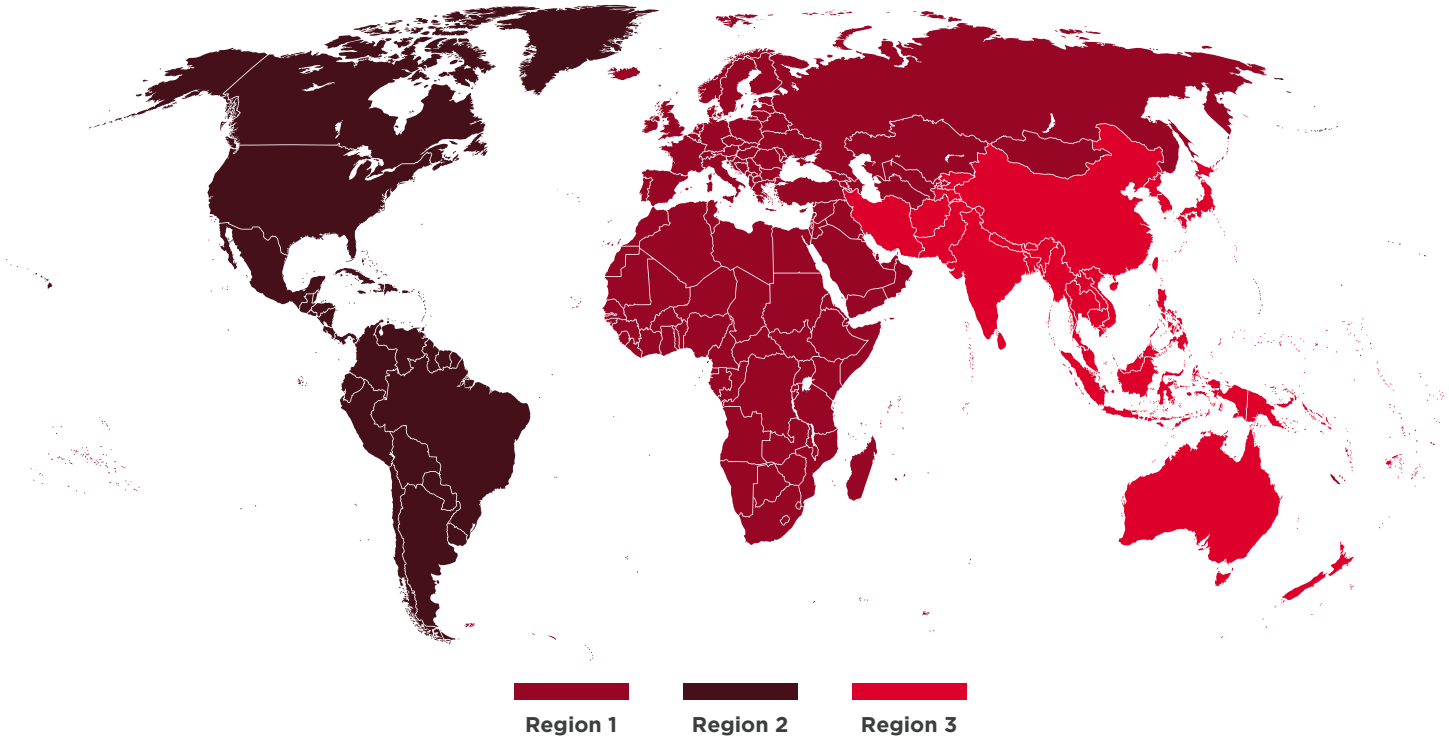
**AI 1.3: Mobile use of the 3 600-3 800 MHz in Region 1**
AI 1.2 and 1.3 are an opportunity to achieve greater harmonisation of the 3.5 GHz range. 3.3-3.4 GHz and 3.6-3.8 GHz are both being considered under these Agenda Items. The 3.5 GHz range is the 5G launch band in most countries and as such has the deepest ecosystem and most affordable devices. An IMT identification in both sub-bands will help support the mid-band capacity requirements of IMT-2020.

3.5 GHz has been the 5G launch band for about 80% of networks and its city-wide capacity has created the perfect environment for much of the earliest 5G connectivity.

**AI 1.5: Consideration of sub-1 GHz spectrum in Region 1**
Agenda Item 1.5 looks at low-band frequencies below 1 GHz, which can be used to provide increased 5G capacity and performance in rural areas. Low band helps countries meet social goals, achieve digital parity between urban and rural, as well as helping networks reach deeper in-buildings, cover agricultural areas with IoT and develop transport communications.

Increased low band spectrum can give users in rural areas comparable IMT access to those in urban areas and help lower broadband prices, making access to communications services more inclusive and lowering the digital divide.

## WRC-23 IMT Agenda Item overview



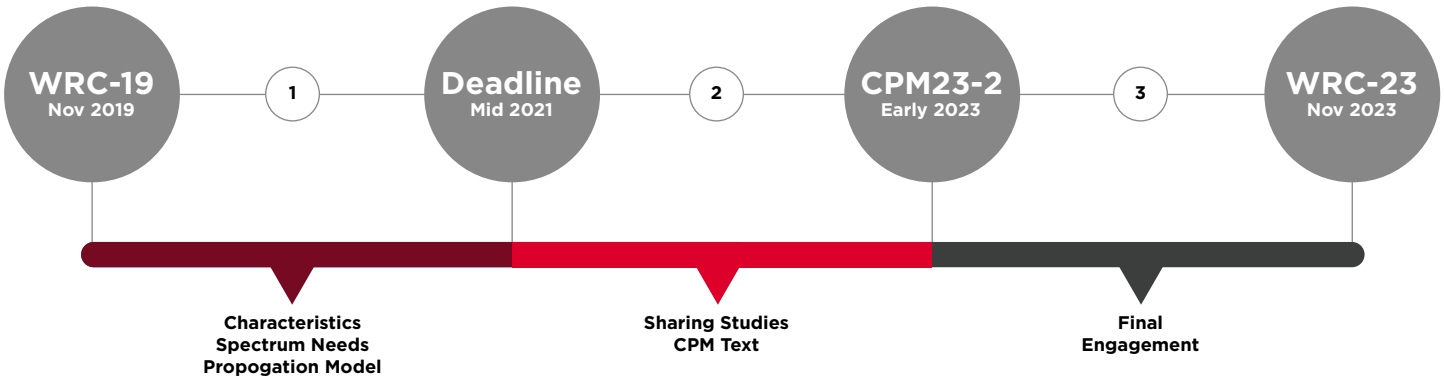

| Bands | 470-960 MHz | 3300-3400 MHz | 3600-3800 MHz | 4800-4990 MHz | 6425-7025 MHz | 7025-7125 MHz | 10-10.5 GHz |
|---|---|---|---|---|---|---|---|
| Region 1 | AI 1.5 (IMT) | AI 1.2 (IMT) | AI 1.2 (IMT) | AI 1.1 (IMT) | AI 1.2 (IMT) | AI 1.2 (IMT) | |
| Region 2 | | AI 1.2 (IMT) | AI 1.2 (IMT) |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

The study cycle between WRCs, where the ITU's Working Party structure is used to carry out analysis of the spectrum needs of different services and the sharing studies to ensure compatibility of spectrum, reaches its conclusion with the Conference Preparatory Meeting (CPM) in early 2023. This will finalise the CPM Report that summarises studies and gives options – or "Methods" to support at the WRC itself. The CPM will be held from 27 March – 6 April 2023 in Geneva.

Each regional group will meet at least once in 2023 to finalise their preparatory work and positions for WRC-23. These groups aim to harmonise their approaches ahead of WRCs and common positions will be sought by the Asia-Pacific Telecommunity (APT), Arab Spectrum Management Group (ASMG), African Telecommunications Union (ATU), European Conference of Postal and Telecommunications Administrations (CEPT), Inter-American Telecommunication Commission (CITEL) and Regional Commonwealth in the Field of Communications (RCC).

These common positions will be used as inputs to the WRC itself and individual countries, or groups of countries, will give inputs as well. Businesses and international organisations will all share their views in the regional groups and have a clear presence at the WRC.

## What we expect to see in the year ahead




## Policy Good Practice: WRC-19 strikes a good balance, sets stage for mmWave 5G

At WRC-19, countries supported a harmonised identification of high-band, or mmWave, frequencies in 26 GHz, 40 GHz, and 66 GHz for ultra-high-speed and ultra-low latency consumer, business and government services.

The global harmonisation of high-band frequencies was a step forward in the development of mmWave mobile. It has since led to national governments around the world making mobile assignments across the identified mmWave spectrum.

At WRC-23, 6 GHz is the new development band. Future-proof mid-band 5G and 5G-Advanced can become a reality with the backing of governments at WRC-23.

GSMA

Spectrum Policy Trends

# New spectrum for 5G: adding up the mid-band maths

Pressure on mid-band spectrum is increasing, and governments are looking for answers to satisfy demand for 5G and 5G-Advanced. 2 GHz of mid-band spectrum will be required per market, on average, by 2030 to ensure the speed and quality of mobile, but there is no easy decision to be made as to how to satisfy that demand.

The results of WRC-19 provided mobile with a new tranche of high-band spectrum to allow for the highest capacity installations. High bands will be used within small geographical areas to provide the highest speeds and lowest latencies, but the densification required means that these will not be used city-wide. Mid-band remains vital to securing consistent 5G user speeds for consumers, schools, and businesses across connected cities.

The 3.5 GHz 5G launch band will require expansion in the second half of the 2020s, and 2023, including the results of WRC-23, will be a crucial year. The roadmaps to deliver spectrum capacity and mobile development in the late 2020s – which serve as the starting pistol for the parallel development of mobile ecosystems in new bands – are already in place in governments focussed on competitive and agile digital markets.

## Why does it matter?

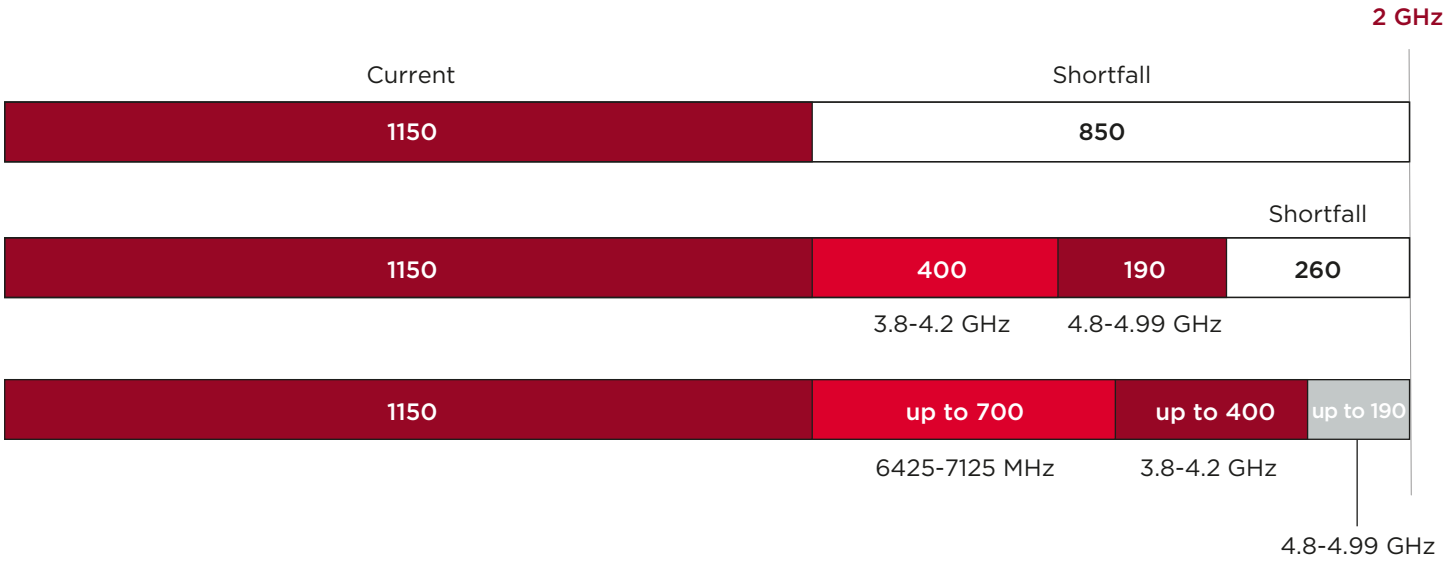
International agreements on mid-band spectrum have long since been outstripped by national decisions in 5G markets, and demand is growing. The World Radiocommunication Conference this year (WRC-23) can create parity between national spectrum needs and internationally harmonised bands, but excessive assignments to unlicensed technologies or private network carve outs all put pressure on 5G spectrum, lowering 5G speeds and raising prices. Spectrum solutions are still there to deliver the promise of 5G, but governments need to ensure that the maths adds up.

Assignment of mid-band spectrum was the starting point for 5G, in most cases using the 3.5 GHz launch range. Consistently, in the years since the first 5G networks, 3.5 GHz has been responsible for about 80% of 5G launches. However, by 2030 5G will be at the height of its impact on our businesses, economies, and livelihoods, and around half the world's mobile connections will be through 5G. Consequently, the greatest demand will be placed on mid-band spectrum by that time.

Demand will not come to a standstill as 5G develops into 5G-Advanced. As network quality improves throughout the decade, traffic volume will follow. Countries that have planned sufficient spectrum for 5G launch will require a roadmap for its expansion.

2 GHz of mid-band spectrum are required by 2030, on average, per market. Today, around 650-750 MHz of mobile spectrum is typically available between 1-3 GHz. In the more mature 5G markets, 400-500 MHz of 3.5 GHz spectrum usually supports city-wide 5G, meaning a total of around 1150 MHz is typically available today. While the size of the remaining shortfall varies, there is work to be done by all governments and regulators to meet long-term demand.

The 6 GHz band is an important tool in satisfying demand for mobile. As shown below, it is difficult to meet demand if without it. While governments can juggle the mid-band maths, certain bands give them a much easier task in getting the job done.



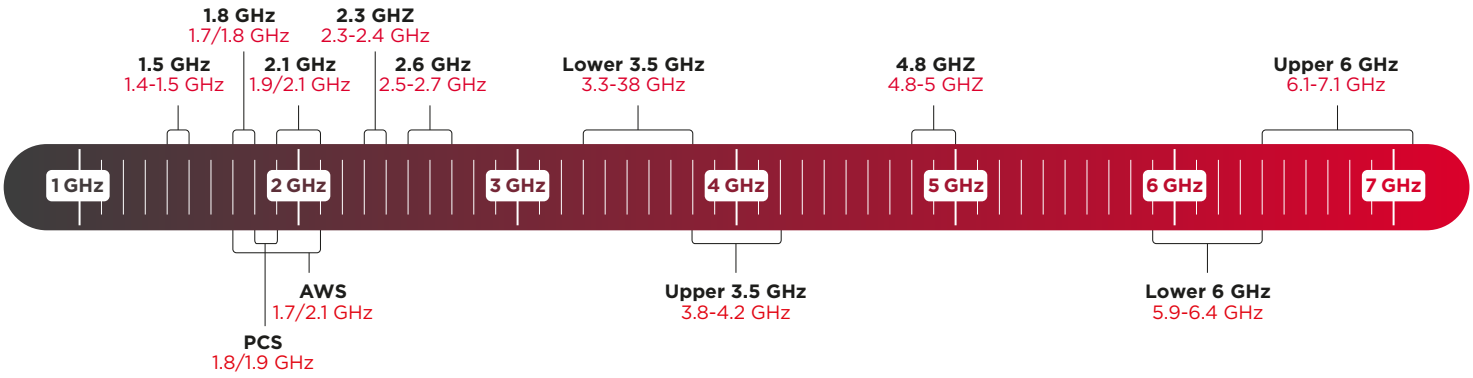
## What are the policy considerations?

The mobile industry is as agnostic as possible about how that 2 GHz mid-band demand can be met. In reality, countries are addressing this through a small number of bands:

- By using the 3.5 GHz range (3.3-4.2 GHz) up to 4.2 GHz or considering below 3.3 GHz (3GPP n77 and n78).
- By relying on adding more spectrum using 6 GHz (3GPP n104).
- By considering parts of the 4.5-4.99 GHz range for additional capacity (3GPP n79).

When planning mid-band capacity, governments should consider the following:

- Plan to make 2 GHz of mid-band spectrum available by 2030. This is the average value needed to guarantee the IMT- 2020 requirements for 5G.
- Carefully consider 5G spectrum demands when 5G usage will be reaching its peak, and advanced use cases will carry additional needs.
- Base spectrum decisions on real-world factors, including population density and extent of fibre rollout.
- Support harmonised mid-band 5G spectrum (e.g., within the 3.5 GHz, 4.8 GHz and 6 GHz ranges) and facilitate technology upgrades in existing bands.




## What to expect in the year ahead

GSMA Intelligence research shows that, at the end of November 2022, more than 225 operators from 87 countries had launched 5G services. The number of 5G mobile connections will rise by some 50% next year, hitting 1.5 billion by the end of 2023. This growth will require additional spectrum resources in all frequency bands. In 2022, mid-band spectrum (1–7 GHz) accounted for over 60% of total frequencies assigned. This trend is set to continue in 2023 based on the range of confirmed spectrum assignments for the year. The spectrum bands under consideration at WRC-23 also speak to the importance and potential of mid-band spectrum, alongside other bands, to put 5G services into the hands of more people and reduce the digital divide.

## Policy Good Practice: China focus on the 6 GHz band to satisfy the fast-rising demands for 5G

Since the awards of commercial 5G licences in 2019, China has become the largest 5G market globally both in scale of deployments and consumer take-up. Its award of mid-band frequencies across the 2.6 GHz and 3.5 GHz bands for 5G have played important roles in tackling the significant coverage and capacity challenges. Looking at the next stage of 5G expansion, China has put its focus on the 6 GHz band and expressed strong interest to utilise 6 GHz (5925-7125 MHz) for IMT to satisfy the fast-rising demands for 5G.

To facilitate a conducive environment for the global 6 GHz IMT ecosystem to thrive, China is actively participating in compatibility studies in the ITU and APT, including active contributions to the development of IMT characteristics such as RF and network deployment parameters for coexistence studies. The country is also contributing to important propagation measurement data for the revision of relevant ITU-R Recommendations on propagation models.

In parallel, China has also started the domestic coordination and preparation for the use of the  6 GHz band for IMT.

GSMA

Spectrum Policy Trends

# Digital switchover: unlocking additional low bands in emerging markets

Digital switchover (DSO) - the process of moving from analogue to digital terrestrial television (DTT) transmission - has been a long and challenging process in many markets. As it nears its global completion in 2023, its digital dividend of enhanced video content distribution and low-band spectrum for rural broadband development is taking hold. In December this year, at the World Radiocommunication Conference (WRC-23), countries in EMEA will decide how that dividend can be maximised for the decades to come.

Low-band spectrum in the sub-1 GHz range supports capacity for wide-area coverage. It promotes digital equality by giving greater access to mobile broadband services in all areas and is an important tool for delivering affordable connectivity to all consumers. In 2023, we expect some of the last countries in Africa, Asia and Latin America to complete a successful DSO as they seek to maximise the economic value of their national spectrum assets.

DSO allows countries to use less broadcasting spectrum due to the greater efficiency of DTT. By improving spectral efficiency, countries can make additional low-band spectrum available for mobile services, including 5G. At the same time, consumers can enjoy a broader array of content offerings and clearer image quality through DTT.

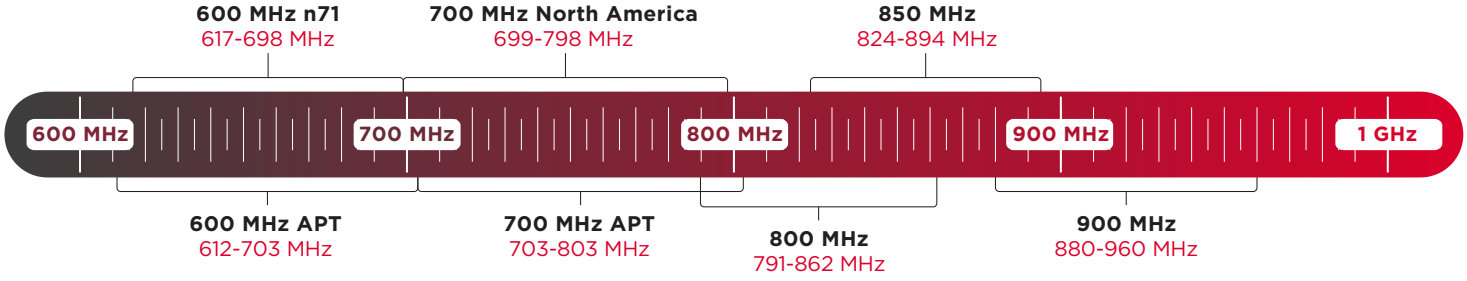
## Why does it matter?

DSO frees up more low-band spectrum for mobile. Lower frequencies have superior propagation characteristics than higher bands, determining how far a signal can travel and how well it can penetrate buildings. Sub-1 GHz spectrum is essential to build coverage in thinly populated areas and provide indoor coverage in built-up areas.

There is a direct link between spectrum capacity and download speeds, and increasing low-band spectrum will deliver faster 5G in areas – often rural communities – that are out of the reach of higher bands. The addition of spectrum in the 600 MHz band results in an improvement in rural and deep-indoor 5G speeds by between 30% and 50% and reduces the cost of extending 5G to rural populations by a third.

Low-band capacity is at the core of ensuring that high-quality 5G services are available to everyone, but demand for mobile spectrum in low bands always exceeds supply. Using this spectrum efficiently is important, and this efficiency is supported both by DSO and by considering future broadcast spectrum needs.

### Regional low-band variations



## What are the policy considerations?

Experience of DSO processes on a global level provides clear examples of best practice. The migration experiences of the countries analysed in the "Digital Switchover in Sub-Saharan Africa" report offer a range of valuable lessons for those still completing their digital switchovers. Botswana, Cameroon, Kenya, Senegal, and Tanzania all encountered challenges relating to funding, availability and cost of STBs, regulatory frameworks, consumer outreach, and legal and technical obstacles.

From these DSO experiences, three lessons stand out: the need for flexible approaches, strong consumer outreach and the need for speedy and successful assignment of digital dividends.

It is also important to remember that freeing up spectrum for mobile from the DSO process is only one part of a successful low-band strategy. Meeting low-band needs requires long-term planning from policymakers, and other bands also need to be part of the equation to help meet capacity demands.

### Sub 1-GHz demand

**600 MHz**

**WRC-23** and development for **5G** in Americas and APAC

**700 MHz**

Heavy use for **4G** in some areas; development for **5G**

**800 MHz**

Widespread use for **LTE** providing **4G** connectivity

**850/900 MHz**

**2G** core bands; refarmed for **3G; 4G** and **5G** development

## What to expect in the year ahead

Low-band spectrum can accelerate global digital equality, and this year offers many opportunities for countries to build on this potential. Lessons learned from the growing number of countries that have successfully completed DSO set the stage for further progress in Sub-Saharan Africa, Latin America and Asia.

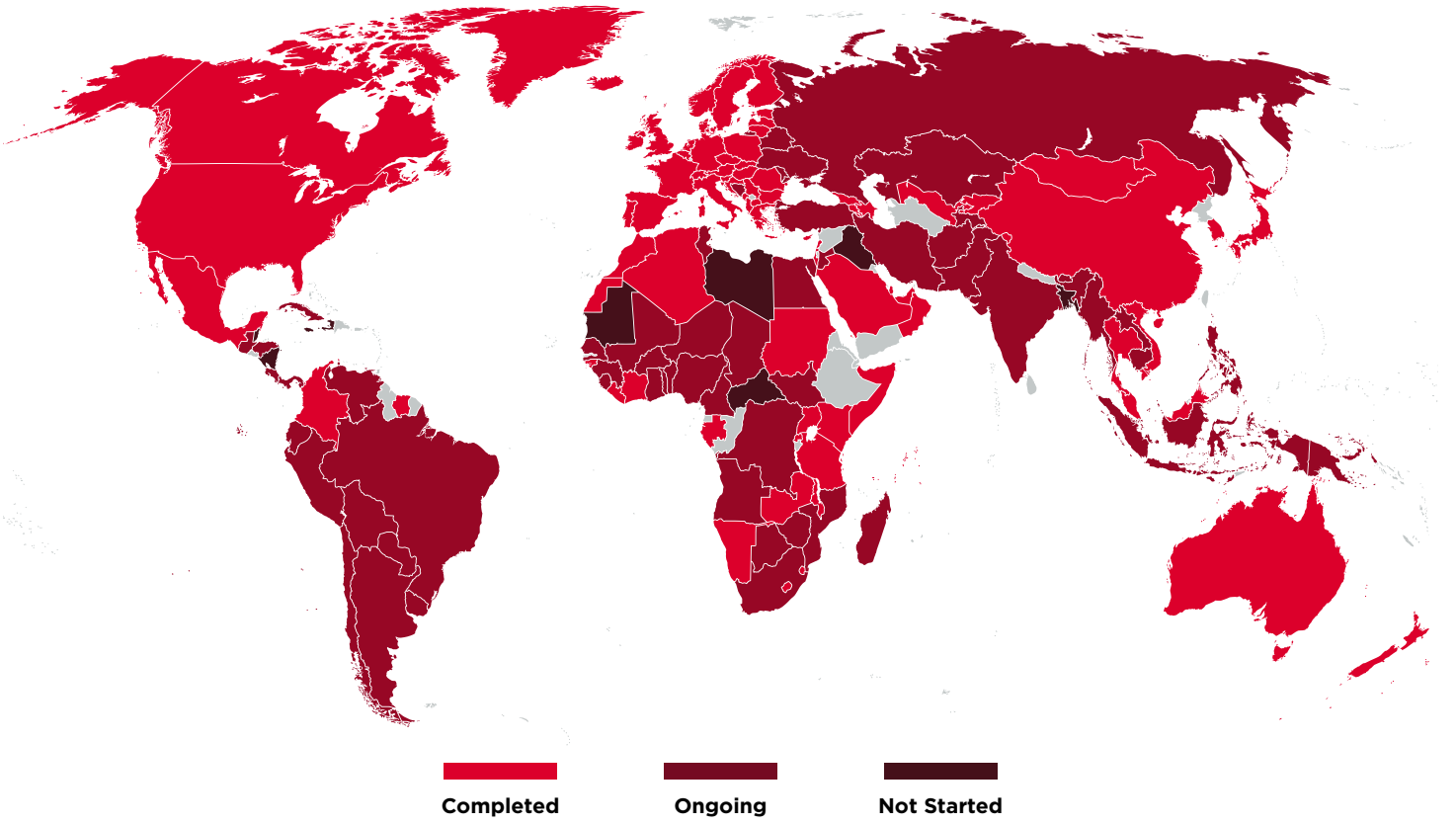
We expect to see technology upgrades and refarming in 800 MHz, 850 MHz and 900 MHz, more countries making 700 MHz available, as well as more deployments and assignments of 600 MHz – all focused on 5G.

At WRC-23, EMEA countries will have the opportunity to review the current use of the 470-694 MHz frequency range. This has the potential to deliver use of the 600 MHz band for mobile in EMEA which would be a significant boost to rural capacity and a driver of digital equality.

At WRC-23, a mobile allocation in 470-694 MHz, with the possibility of an IMT identification, is needed to allow:

- Long-term planning of spectrum below 1 GHz to help 5G lower the digital divide.
- Development of sub-1 GHz spectrum for better rural and in-building connectivity.
- Development of video content distribution mechanisms going into the 2030s.

## Global status of DSO




Source: TMG based on ITU data

## Policy Good Practice: Kenya successfully completed the DSO process

Kenya successfully completed its digital transition within the timeline established by the ITU of June 2015. This was accomplished despite notable challenges not seen in many countries, including disruptive legal challenges from the broadcasting industry. Its experience primarily highlights the need to maintain flexibility in the face of unexpected roadblocks. Following its successful migration, Kenya has succeeded in reassigning frequencies in the 800 MHz and 700 MHz bands to mobile operators.

GSMA

Spectrum Policy Trends

# Spectrum assignments: balanced pricing and licence conditions to spur mobile growth

While there is no one-size-fits-all, auctions have become the dominant mobile spectrum assignment mechanism over the past three decades. They are designed to provide a transparent, impartial and legally robust means of assigning spectrum to those who will use it most efficiently to support competitive, high-quality mobile services. Alternative approaches like administrative awards have also been gaining traction, especially when the COVID-19 pandemic required rapid spectrum assignment to support a surge in data usage.

The benefits of any type of assignment will be lost without proper planning. Some processes have failed to assign spectrum despite it being in demand, while others have been contested for artificially inflating prices, which risk harm to consumers. Getting the assignment design right is of utmost importance.

In 2023, we expect to see a growing realisation among regulators and policymakers that spectrum pricing is key to unlocking the digital growth of nations. In return for more rational prices, there will be licence obligations demanding coverage of networks and quality of services. Governments will maximise the benefit to society rather than zoning solely on short-term state revenue creation.

## Why does it matter?

Effective spectrum pricing is critical to encourage the investment required to expand mobile access. An enduring interest for the media, and national treasuries, is how much money a spectrum auction will raise. However, the truth is that the most successful assignments aren't the ones that bring in the most revenue.

Research shows just the opposite. High spectrum prices have a significant impact on network rollouts and speeds. For example, in developing countries, high spectrum costs slowed the rollout of 3G and 4G networks and drove long-term reductions in overall network quality. Other decisions that can have negative impacts include artificially restricting the amount of spectrum operators can access through set-asides, poorly chosen lot sizes, or hoarding spectrum to encourage unsustainable auction bidding prices.

## What are the policy considerations?

Mobile networks require predictable access to spectrum in low, mid- and high bands. Predictability is the result of national broadband plans and spectrum roadmaps. Auctions are a proven means of awarding spectrum to those most likely to put it to the best use. However, poor auction design can lead to inefficient or failed assignments that undermine competition.

Spectrum resources and network infrastructure rollouts entail heavy capital investments. The speed of rollouts, quality of service and coverage levels will all be compromised by high spectrum prices. Regulators and policymakers should encourage these investments by designing policies that provide certainty to the licensing process. Clarity on licence renewals, conditions and obligations, and offering a clear spectrum roadmap, enables operators to plan for the long term.

On the other hand, access to adequate and affordable spectrum resources increasingly comes with associated obligations, most of which involve commitments and targets related to network rollout, coverage and base stations/cell sites. It is, therefore, imperative for operators to have a detailed network rollout and evolution roadmap that considers the licensing obligations and future requirements from networks to align with the spectrum roadmap. Robust network infrastructure not only improves spectral efficiency but also helps unlock monetisation opportunities for operators.

Evaluate and adjust the real costs of licenses, with particular attention to the evolution of the exchange rate and the long-term impacts on investment incentives, to avoid negative effects on the market and consumers.

Consider coverage obligations as part of the total cost of spectrum to reflect the real value of the resource.

Identify and assign idle spectrum to ensure its efficient use in the provision of mobile broadband services.

## What to expect in the year ahead

There is growing realisation among regulators and policymakers that spectrum auctions are more than just a means to maximise state revenues and are also key to unlocking the digital growth of nations. The GSMA expects governments and policymakers to continue with rational spectrum prices in 2023. There were already positive signs in 2022 in countries such as India, Panama, Bangladesh, Colombia, and Ecuador.

In exchange for more rational prices, there will be licence obligations demanding coverage of networks and quality of services. Brazil is a notable example of a country that has adopted this approach. Such obligations are best used with caution and should always be deducted from spectrum prices.

So, while there is a reason for optimism, further and wider change is needed so everyone can benefit from the socio-economic benefits of well-designed assignments sooner.

## Policy Good Practice: Brazil multi-band auction: one of the largest in mobile history

Brazil's multi-band auction in December 2021 was one of the largest in history. With 91% of spectrum costs going into investments, Brazil showed that it is serious about ensuring that its citizens are ready to embrace the benefits of mobile.

The successful spectrum assignment process focussed on balancing government objectives, operators' requirements and consumer welfare. This process began several years ago with the modernisation of various Brazilian regulatory policies designed to support investment. In 2019, an updated telecommunications law was introduced with three crucial aspects:  longer licence terms, secondary spectrum market and unlimited renewal terms.

These decisions were crucial to support current networks, attract new players and guarantee better services to end users. Certain auction policies also focused on long-term network investment. New payment terms were introduced, including yearly instalments for the duration of the licence, the exchange of the premium for investments and deduction of obligation costs from reserve prices.

GSMA

Spectrum Policy Trends

# Private fashion: vertical set-asides versus spectrum capacity for operators

As hyper-automation connects factory robots and data networks to marketing and business systems, connected technology has become a business imperative. Connected enterprises need to be agile and open to the challenges and opportunities of this era of digitalisation that 5G is delivering.

Private networks are an integral part of 5G, enabling industrial applications, logistics hubs, local campus networks and many more. However, private networks do not equal private spectrum. Asymmetric carve-outs are an aggressive regulatory tool that has a huge economic cost.

With best-practice licensing, it is a cost that can be avoided entirely.

## Why does it matter?

In 2019 the German regulator BNetzA laid out plans for its 3.5 GHz auction with the aim of creating a new flexible use of spectrum in the 3.7-3.8 GHz band. A set-aside was created to look after requests from its large manufacturing community, carving out 100 MHz of spectrum for private networks in the 3.7-3.8 GHz band and leaving 300 MHz for the mobile operators to bid for. In the same year, the UK regulator Ofcom laid out plans to allow flexible use of the 3.8-4.2 GHz band – 400 MHz this time – to "enable wireless innovation through local licensing" known as shared access licences.

The German carve out inflicted a surcharge estimated at €3bn on the German mobile market and, three years on, has resulted in less than 300 licences. In the UK, only 100 users have applied for licences and for a maximum of half the spectrum available, despite the huge difference in licence terms and regulatory burden compared to MNOs.

Meanwhile, in 2018, Finland showed that such regulatory intervention could have been avoided entirely. In its 3.5 GHz auction, Finnish regulator Traficom stipulated that mobile operators must, where requested by tender, deploy a private network that meets the specified customer needs in a localised area. If operators consider the tender requirements overly onerous, they must sub-licence 3500 MHz spectrum within the specified area instead. Problem solved, and no carve-out required.

In India, the appetite for private networks was shown by the Adani Group's participation in its recent mmWave auction. No carve out, no asymmetric regulation, just an industry player (Adani is focussed on transport logistics and energy utilities) competing for spectrum at the same table as everyone else.

## What are the policy considerations?

1. Commercial mobile operators support the needs of a wide variety of private networks in the 5G era.
2. Spectrum that is set-aside exclusively for private networks, verticals or local licences in core mobile bands risks being underused and can undermine fair spectrum awards.
3. Spectrum that is set-aside in core mobile bands threatens the wider success of 5G – including slower rollouts, lower performance, and reduced coverage.
4. Network slicing provides private network solutions; voluntary spectrum leasing can also support private networks.
5. Policymakers should carefully consider their options and consult stakeholders to ensure they most efficiently support the needs of private networks without undermining other spectrum users.

## What to expect in the year ahead

2023 will continue to see demand from private networks, and MNOs are delivering a huge phase of private 5G network growth. The 5G era is one of industrial connectivity, and private networks will continue to be in demand. Carve outs may still be considered as regulators look at historic policies from high-income countries without considering their subsequent success or failure. Lessons need to be learned not just from the German auction or the UK licensing process, but what happened after. The billions of euros in potential network investment that Germany has lost could have been saved by best-practice licencing policies.

In 2023, regulators and policymakers will continue to follow both good and bad practice with regard to the needs of industry verticals or local networks. Spectrum is a limited resource, and set-asides for verticals in prime 5G bands can jeopardise the ability of 5G to meet its potential. Nevertheless, regulators continue to follow a practice of set-asides, making regulatory-led rather than market-led approaches and picking “winners”, leading to economic harm to their markets and inefficient spectrum use.

In recent years, licensing obligations, including sub-licencing spectrum, have been used to provide spectrum for private or local networks. This trend is expected to continue in 2023 to avoid carve-outs. Sub-licencing allows verticals to access spectrum while creating opportunities for operators to provide customised 5G services. Finland and Sweden are examples where policymakers have provided spectrum to verticals by routing through operators.

## Policy Good Practice: Finland delivers private 5G through licence terms

As part of a policy to promote Finland as a 5G innovator and testbed, national regulator Traficom included licence conditions in the 3.5 GHz spectrum auction in 2018 to promote the deployment of private networks without a dedicated set-aside.

The licence conditions stipulate that mobile operators must, where requested by tender, deploy a private network that meets the specified customer needs in a localised area, such as a hospital, port, or industrial facility. Operators can charge reasonable, non-discriminatory fees for these deployments. Alternatively, if they consider the tender requirements overly onerous, they must sub-licence 3500 MHz spectrum within the specified area instead.

Finland met the spectrum needs of nationwide and private networks without a set-aside in any core bands. In doing so, Traficom created an efficient compromise that has preserved spectrum usability and created incentives to invest in mobile connectivity.

GSMA

Spectrum Policy Trends

# Setting the stage for 6G

5G is being rolled out at scale, and the development maturity of 5G-Advanced has given a clear vision of the social, economic and business opportunities of the next phase of 5G development. At the same time, the mobile industry is already studying how 6G will shape the future of mobile. For regulators, ministries, operators, vendors and researchers, spectrum policy for 6G is becoming increasingly important. 2023 will mark the beginning of a long journey for as new studies initiate.

## Why does it matter?

6G is expected to become the primary mobile technology in the 2030s and will offer an enhanced user experience compared to previous generations. Mainly, it will enable SDGs through global coverage, sustainability and security; all features that will lead to an era of universal meaningful connectivity. 6G promises ultra-fast data rates with lower latency, significant energy efficiency, and greater reliability. While 6G applications are yet to be defined, this new generation aims to reach global connectivity, sensing connectivity, immersive communications, and critical services, among several other potential use cases throughout a hybrid and diverse technology approach.

## What are the policy considerations?

6G comes with additional spectrum considerations. Among these are additional capacity and frequency ranges needed, from low to very high bands, to support these next-gen services. A new frequency range being considered for 6G is 7-24 GHz with a special focus in 7-15 GHz, which is supported by the GSMA following discussions with the mobile community and represents a potential solution for the 2023-2027 WRC study cycle at the ITU.

## What do we expect to see in the year ahead?

The upcoming World Radiocommunication Conference 2023 (WRC-23) in November will set the spectrum foundations for 6G. WRC-23 will discuss the agenda for WRC-27, thereby defining the likely roadmap for spectrum bands supporting future networks. There have been previous discussions and some prototype demonstrations on the use of THz spectrum for 6G, and the use of 7–15 GHz for future networks. The WRC-27 agenda will also act as a blueprint for discussions outside the ITU and for regional harmonisation agreements.

Ahead of WRC-23, ITU-R Working Party 5D (WP 5D), which focuses on IMT systems, has started to develop a Draft New Recommendation, expected to be finalised in the summer of 2023, called "IMT Framework for 2030 and Beyond".

Outside the ITU, different organisations and groups have started their research on 6G. ETSI launched a study group for 6G standards. The group called Specification Group on Terahertz (ISG THz) aims to define the scenarios and the potential frequency bands for THz communications. It will initially focus on two categories of use cases: mobile applications with high data rate requirements and applications requiring communication and sensing functionalities, such as holographic experience. Also, the 6G Industry Association (6GIA) was created as the voice of European industry and research for next-generation networks; similarly, the 6G Flagship was created as a Finnish government programme on 6G research. In North America, ATIS has launched the Next G Alliance, an industry collaboration between MNOs and vendors, to develop industry guidelines on the spectrum needs, as well as research on the potential socioeconomic and climate benefits from this novel technology.

Ultimately, 6G spectrum work in 2023 will be driven by industry research and collaboration.

## Planning today for a 6G future

In every mobile generation, countries must agree on additional spectrum allocations for mobile services, IMT identifications and harmonisation. Countries should identify their needs, participate in the international regulatory process and plan their roadmaps, allowing their citizens and economic sectors to get full value from new technologies. MNOs must stay abreast of any developments related to 6G policy, ensuring ongoing access to reliable service levels once these policies are implemented in their countries or regions of operation.

Understanding the 6G development process gives governments, MNOs and the wider digital ecosystem the critical tools required to ensure success when it comes time to roll out 6G services in the 2030s.

## Policy Good Practice: ITU's Vision for IMT-2030

Ahead of WRC-23, the ITU-R is expected to finalise a Draft New Recommendation, "IMT Framework for 2030 and Beyond" in the summer of 2023. The aim of the Recommendation is to drive further development of IMT by defining the framework, and overall objectives of IMT-2030, including the role 6G could play in meeting the needs of future societies.

The industry and research community will be conducting research to develop requirements and concepts on:

- Trends of IMT-2030 and beyond: applications, technology and spectrum needs
- Views on the future role of IMT in serving users and the society
- Usage scenarios for IMT-2030
- Capabilities of IMT-2030

GSMA

1 Angel Lane, London, EC4R 3AB, UK
Tel: +44 (0)207 356 0600
Email: info@gsma.com