GSMA

The Mobile Economy 2024

GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

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GSMA
Intelligence

GSMA Intelligence is the definitive source of global mobile operator data, analysis and forecasts, and publisher of authoritative industry reports and research. Our data covers every operator group, network and MVNO in every country worldwide – from Afghanistan to Zimbabwe. It is the most accurate and complete set of industry metrics available, comprising tens of millions of individual data points, updated daily.

GSMA Intelligence is relied on by leading operators, vendors, regulators, financial institutions and third-party industry players, to support strategic decision-making and long-term investment planning. The data is used as an industry reference point and is frequently cited by the media and by the industry itself.

Our team of analysts and experts produce regular thought-leading research reports across a range of industry topics.

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Executive summary

Transforming lives through mobile connectivity

Mobile connectivity remains pivotal in driving digital innovation. It empowers individuals and enterprises with a wide array of transformative technologies while also aiding governments in delivering positive societal impacts.

By the end of 2023, 5.6 billion people (69% of the global population) subscribed to a mobile service, representing an increase of 1.6 billion people since 2015. Growth in mobile internet penetration has been even faster. At the end of 2023, 58% of the world's population used mobile internet, equating to 4.7 billion users – an increase of 2.1 billion since 2015.

However, the usage gap remains: 3 billion people live in areas covered by mobile broadband networks but do not use mobile internet. Addressing the usage gap is crucial to closing the digital divide, thereby unlocking the benefits of life-enhancing applications beyond communication, including digital finance, health and clean energy.

The impact of mobile connectivity is evidenced by its contribution to the economy. In 2023, mobile technologies and services generated 5.4% of global GDP, a contribution that amounted to $5.7 trillion of economic value added, and supported around 35 million jobs.

Key trends shaping the mobile ecosystem

5G standalone and 5G-Advanced are the next phase

The mobile industry is increasingly moving to the 5G standalone (SA) and 5G-Advanced standards to unlock innovative 5G use cases and create new revenue streams. As of January 2024, 47 operators offered commercial 5G services on SA networks, while more than half of operators expect to deploy 5G-Advanced within a year after standards are released. Increased 5G SA and 5G-Advanced activities in 2024 will kick-start a new round of 5G investment, especially in pioneer markets. This has the potential to open up a wealth of opportunities to enable enhanced functionality and use cases for the enterprise market.

Network API initiatives gain traction

Although it has been possible to expose network APIs for a while, operators have struggled to adopt a standardised approach that achieves scale. However, recent efforts by the mobile industry to develop a common set of network APIs have provided new momentum to operator initiatives. The ultimate goal of network API exposure is to better monetise network assets and capabilities. While working with external developer teams to achieve this goal receives the most attention, the exposure of network capabilities via APIs should also assist internal teams within operators in creating new services.

As of January 2024, 47 operators offered commercial 5G services on SA networks, while more than half of operators expect to deploy 5G-Advanced within a year after standards are released

Telco-satellite partnerships set for take-off

Telecoms networks have driven voice and data connectivity to current levels (over 4.7 billion mobile internet subscribers today). Satellites and other non-terrestrial networks (NTNs) have also been providing connectivity but at a much lower scale. However, advances in various satellite and NTN solutions have resulted in performance improvements, lower deployment costs and more commercially viable business models, raising the prospects of greater participation in the connectivity landscape. In the last two years, the list of partnerships between telecoms operators and satellite companies has grown, with more deals expected in 2024 and beyond. Meanwhile, direct-to-device (D2D) solutions and partnerships are gaining traction following technical breakthroughs that have allowed satellites to connect to standard smartphones.

eSIM adoption to gather pace

The number of eSIM consumer devices launched has grown significantly over the last five years and the number of commercial eSIM services is also on the rise. This has set the foundation for eSIM adoption to gather pace over the course of the decade. GSMA Intelligence's baseline scenario predicts around 1 billion eSIM smartphone connections globally by the end of 2025, growing to 6.9 billion by 2030. This would account for around three quarters of the total number of smartphone connections by 2030. North America will be the region with the fastest rate of eSIM adoption due to Apple's launch of eSIM-only smartphones in the US in September 2022.

Operators explore the potential of generative AI

For mobile operators, the range of generative AI (genAI) applications is broad. Much of the early work has focused on using the technology to improve customer services and support sales and marketing activities. However, as genAI matures, there is potential for operators to not only support internal use cases but generate new revenues from AI investments. SK Telecom's bold AI pyramid strategy speaks to this opportunity, as do recent product announcements from the likes of KT, NTT and SoftBank. While there is clear potential to reap significant benefits from the application of genAI, ethical concerns around the technology still need to be addressed. The mobile industry is committed to the ethical use of AI in its operations and customer interactions.

Policies for growth and innovation

The World Radiocommunication Conference 2023 (WRC-23) has set the agenda for spectrum planning up to the end of the 2030s, with new spectrum harmonisation in low and mid-bands. The results at WRC-23 now need to be incorporated into national tables and plans before being effectively licensed at the correct time.

As part of this work, countries will benefit from the development of spectrum roadmaps that consider market dynamics and growth in demand for mobile data. Roadmaps are an important means of ensuring there is sufficient spectrum for future demand from consumers and new technologies. Information on spectrum releases is critical for mobile operators to prepare investment plans, secure financing and develop arrangements for deploying different technologies.

Spectrum roadmaps can help define when spectrum should be made available, but barriers still remain. Setting aside spectrum for specific uses, such as local or bespoke private networks, is a frequent – and unnecessary – barrier to meeting demand and should be avoided in priority 5G bands (i.e. 3.5, 26 and 28 GHz). Approaches such as leasing or sharing are typically better options in these situations, while private mobile networks are commonly provided by mobile network operators (MNOs) within licensed public mobile spectrum.

The cost of spectrum also has a major impact. Governments and regulators should assign 5G spectrum to support their digital connectivity goals rather than as a means of maximising state revenues. Effective spectrum pricing policies are vital to support better quality and more affordable 5G services.

The Mobile Economy

Unique mobile subscribers

2023 **5.6bn**
69% penetration rate*

2030 **6.3bn**
74% penetration rate*

CAGR 2023-2030 **1.7%**

*Percentage of population

Mobile internet users

2023 **4.7bn**
58% penetration rate*

2030 **5.5bn**
65% penetration rate*

CAGR 2023-2030 **2.3%**

*Percentage of population

SIM connections

(excluding licensed cellular IoT)

2023 **8.6bn**
107% penetration rate*

2030 **9.8bn**
114% penetration rate*

CAGR 2023-2030 **1.8%**

*Percentage of population

4G

Percentage of connections (excluding licensed cellular IoT)

2023 **59%**

2030 **35%** ↓

5G

Percentage of connections (excluding licensed cellular IoT)

2023 **18%**

2030 **56%** ↑

Smartphones

Percentage of connections

2023 **78%**

2030 **91%**

Licensed cellular IoT connections

2023 **3.5bn**

2030 **5.8bn**

Operator revenues and investment

2023 **$1.11tn**

Total revenues

2030 **$1.25tn**

Total revenues

Operator capex for the period 2023–2030: **$1.5tn**

Mobile's contribution to GDP

2023 **$5.7tn**

5.4% of GDP

2030 **$6.4tn**

Public funding

2023

$560bn

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)

Employment

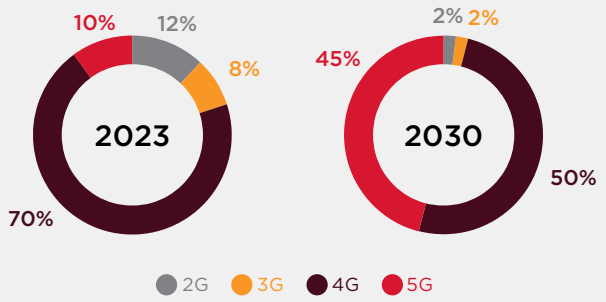
2023 **19m jobs**

Directly supported by the mobile ecosystem

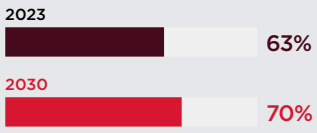
Plus 16m indirect jobs

Asia Pacific*

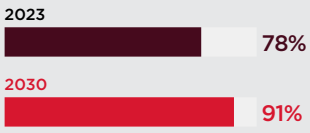
Technology mix



Subscriber penetration

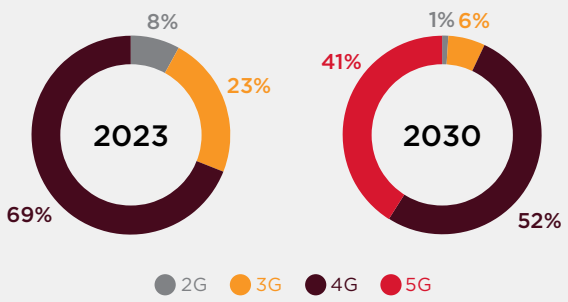


Smartphone adoption

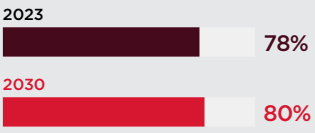


Eurasia**

Technology mix



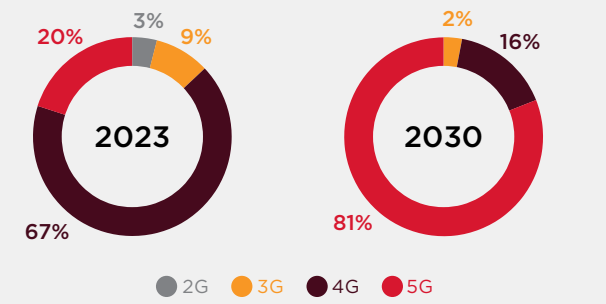
Subscriber penetration



Smartphone adoption

Europe

Technology mix

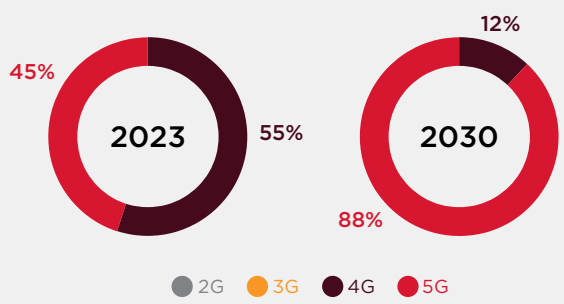


Subscriber penetration

Smartphone adoption

Greater China

Technology mix



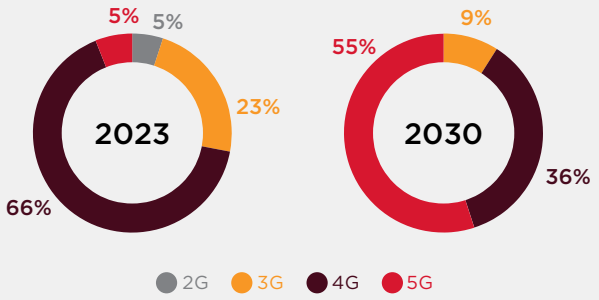
Subscriber penetration

Smartphone adoption

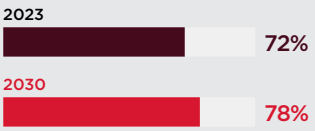
* Asia Pacific excludes Greater China
** Includes Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan and Uzbekistan

Latin America

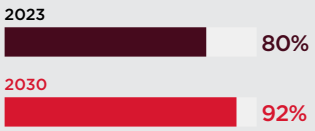
Technology mix



Subscriber penetration

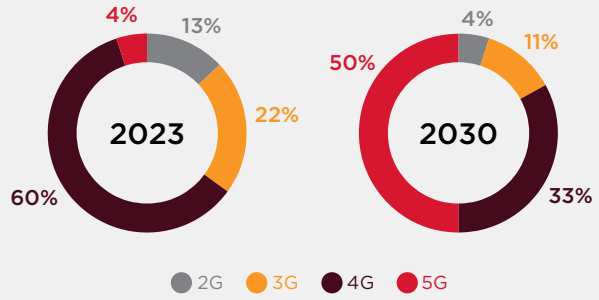


Smartphone adoption

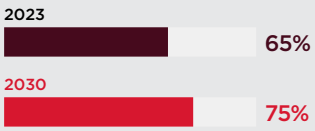


Middle East and North Africa

Technology mix



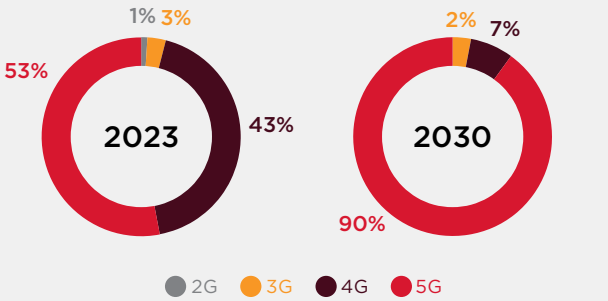
Subscriber penetration



Smartphone adoption

North America

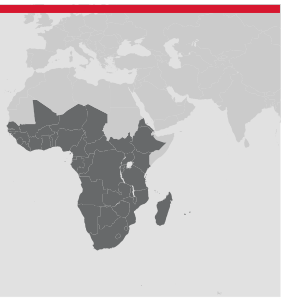
Technology mix



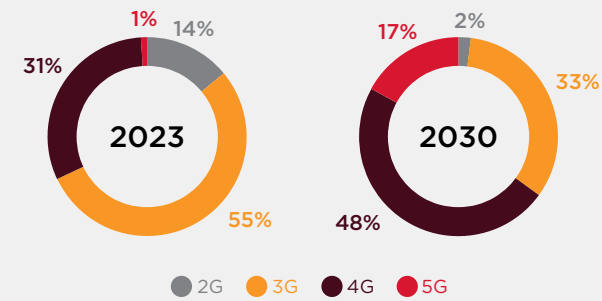
Subscriber penetration

Smartphone adoption

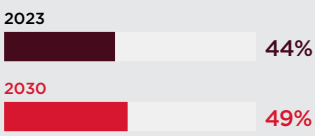
Sub-Saharan Africa



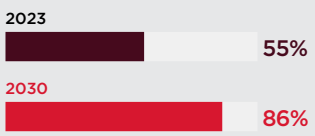
Technology mix



Subscriber penetration



Smartphone adoption



Note: Totals may not add up due to rounding

01

The mobile industry in numbers

More people than ever before are connecting to the mobile internet, but the rate of growth has slowed

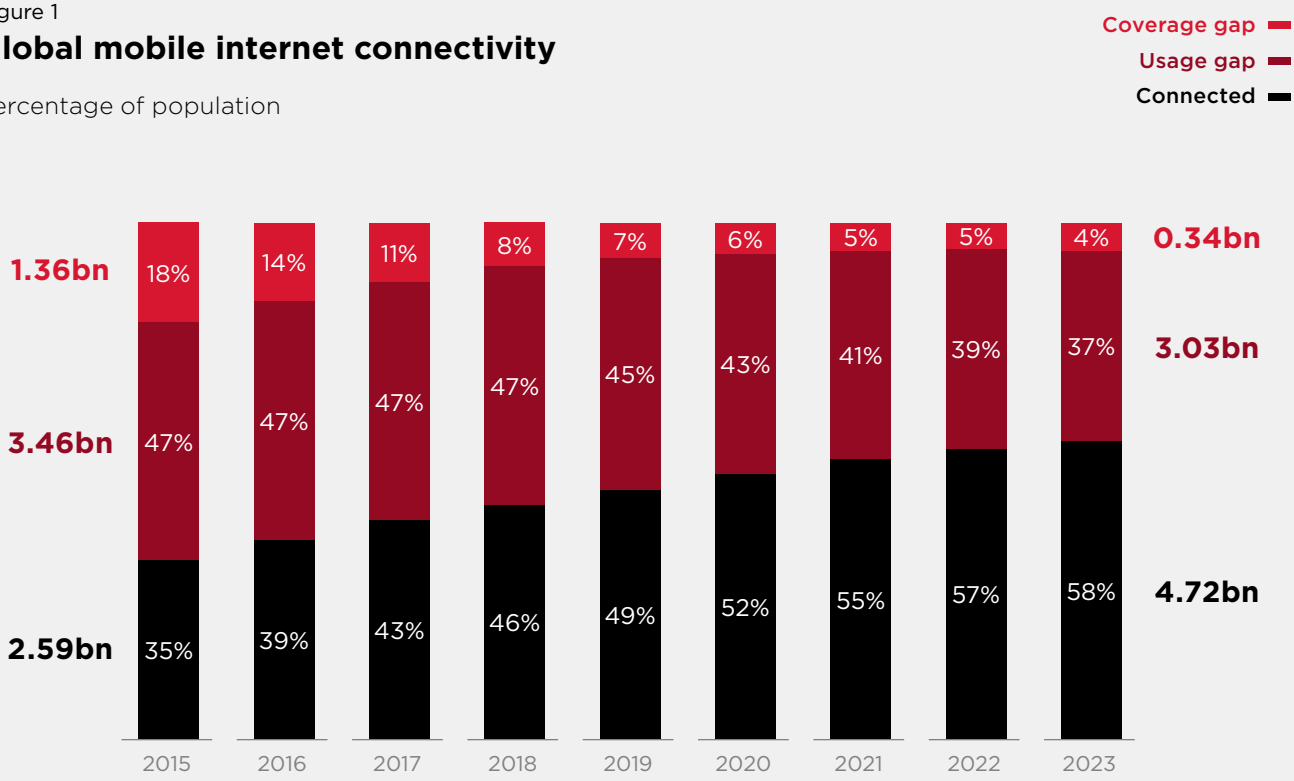
By the end of 2023, 5.6 billion people (69% of the global population) subscribed to a mobile service, representing an increase of 1.6 billion people since 2015. Despite saturation in high-income countries, there is still room for growth in many low- and middle-income countries (LMICs). Consequently, mobile penetration is projected to increase to 6.3 billion by 2030, encompassing 74% of the global population.

Growth in mobile internet penetration has been even faster. At the end of 2023, 58% of the world's population used mobile internet, equating to 4.7 billion users – an increase of 2.1 billion since 2015. Of the 3.4 billion people who remain unconnected to mobile internet, 90% (3 billion) live in an area already covered by mobile broadband but do not use mobile internet services. This underscores the urgency of addressing the primary barriers to mobile internet adoption, namely affordability (particularly of handsets) and literacy/digital skills.

Figure 1

Global mobile internet connectivity

Percentage of population



Note: Totals may not add up due to rounding. Every year, GSMA Intelligence updates its estimates of the number of mobile internet subscribers in each country, incorporating new (and/or updated) data from operators, regulators, national statistics agencies and consumer surveys where available. In some countries and regions, estimates of mobile internet adoption may therefore differ from what was presented in previous editions of The Mobile Economy and The State of Mobile Internet Connectivity reports. 2023 is based on estimated data and may be updated later in 2024.
Source: GSMA Intelligence

Over half of connections will be on 5G by 2029

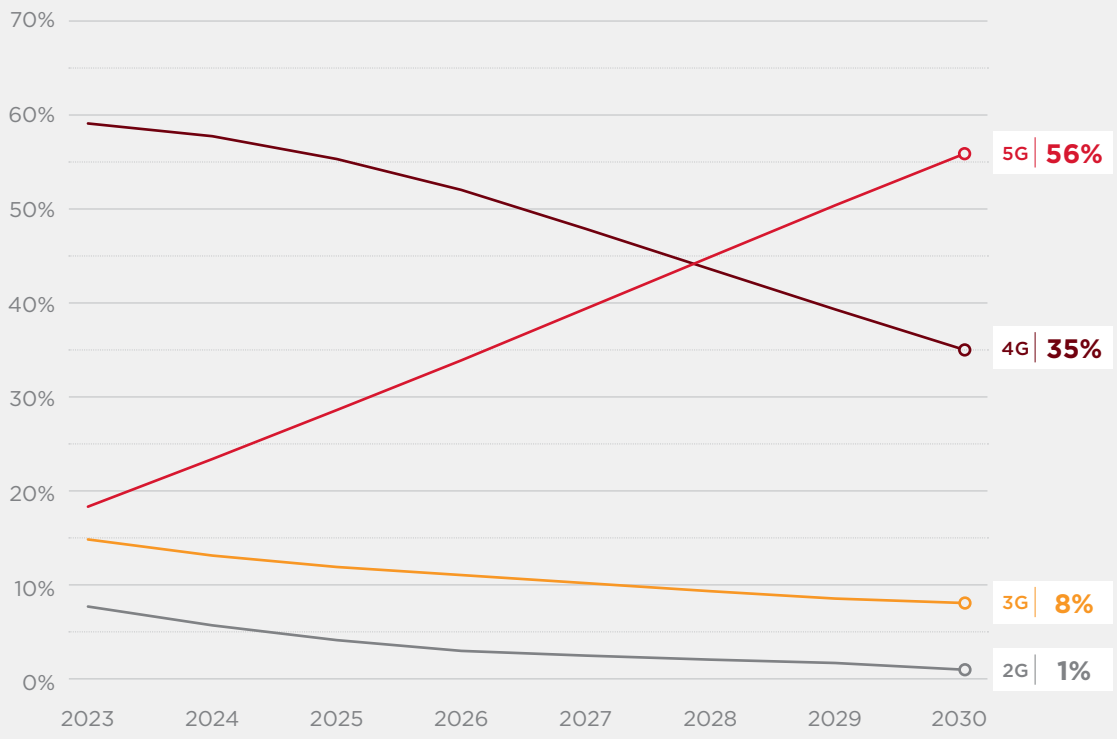
5G commercialisation continues to gather pace around the world. As of January 2024, 261 operators in 101 countries globally had launched commercial 5G mobile services. More markets are expected to follow, with more than 90 operators from 64 markets making a commitment to launch 5G in the coming years. There were 1.6 billion 5G connections at the end of 2023, which will rise to 5.5 billion by 2030.

The number of connections on legacy networks (2G and 3G) will continue to decline in the coming years as users migrate to 4G and 5G, leading to an increasing number of network sunsets. According to GSMA Intelligence, 143 networks (2G and 3G) are scheduled to be retired between the end of 2023 and 2030, with around 50% of these planned by the end of 2024.[1]

Figure 2

Mobile adoption by technology

Percentage of total connections



Source: GSMA Intelligence

1. Spectrum: five trends to watch in 2024, GSMA Intelligence, December 2023

The pace of 5G adoption will vary significantly around the world

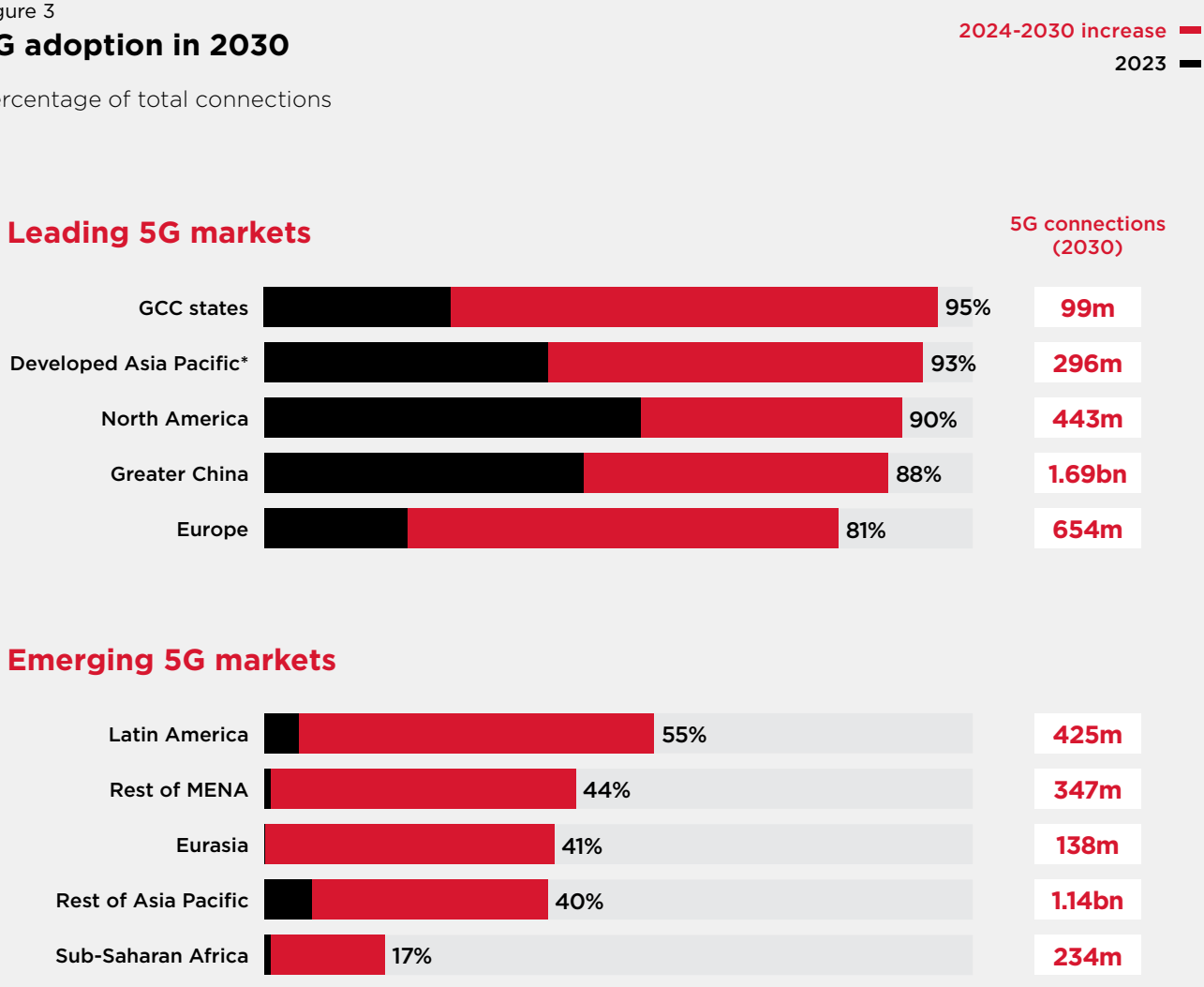
The GCC states, developed Asia Pacific, North America and Greater China will lead the way in terms of 5G adoption, driven by the expansion of network coverage, intensified 5G marketing efforts and the increasing prevalence of 5G devices. With 5G already established, leading operators in these markets are now rolling out 5G SA and making plans for 5G-Advanced.

However, in emerging 5G markets the pace of growth in connections and coverage will be slower due to challenges related to device affordability and spectrum availability. This highlights that 4G still has plenty of room to grow and will remain the dominant technology in many countries for the period to 2030.

Figure 3

5G adoption in 2030

Percentage of total connections



* Australia, Japan, New Zealand, Singapore and South Korea
Source: GSMA Intelligence

Mobile data traffic will rise fourfold in the period to 2030

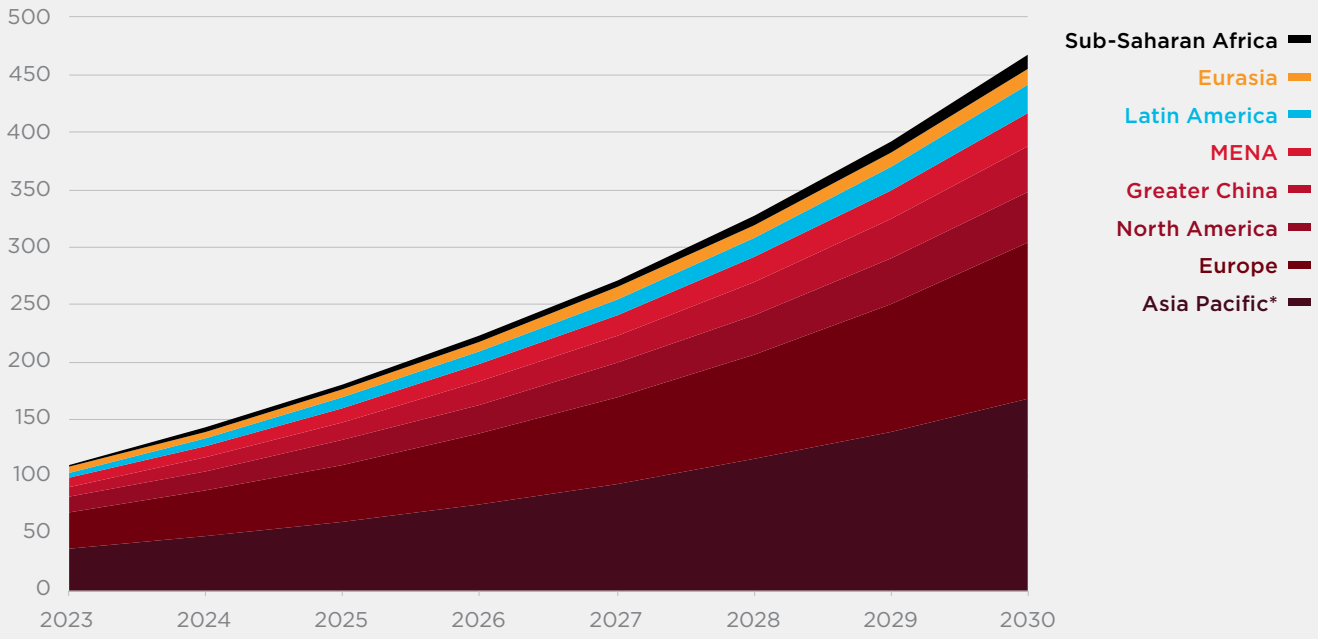
Despite talk of a slowdown in growth, monthly global mobile data traffic per connection surged from 10.2 GB in 2022 to 12.8 GB in 2023, marking the largest absolute increase since data tracking commenced in 2016. In line with previous years, a significant disparity persists between high-income regions and LMICs. One exception is India, where the average monthly data usage of 19 GB ranks among the highest worldwide.

Looking ahead, mobile data traffic is forecast to grow at a CAGR of 23% between 2023 and 2030, reaching more than 465 exabytes (EB) per month by the end of the decade.

Figure 4

Global mobile data traffic

EB per month



Mobile data traffic per connection (GB per month)

Region	2023	2030	CAGR 2023–2030
Asia Pacific*	14	53	21%
Eurasia	13	41	18%
Europe	17	71	22%
Greater China	13	54	23%
Latin America	7	32	23%
MENA	10	31	18%
North America	29	90	17%
Sub-Saharan Africa	2	9	23%

* Asia Pacific excludes Greater China
Source: GSMA Intelligence

5G adds impetus to licensed cellular IoT

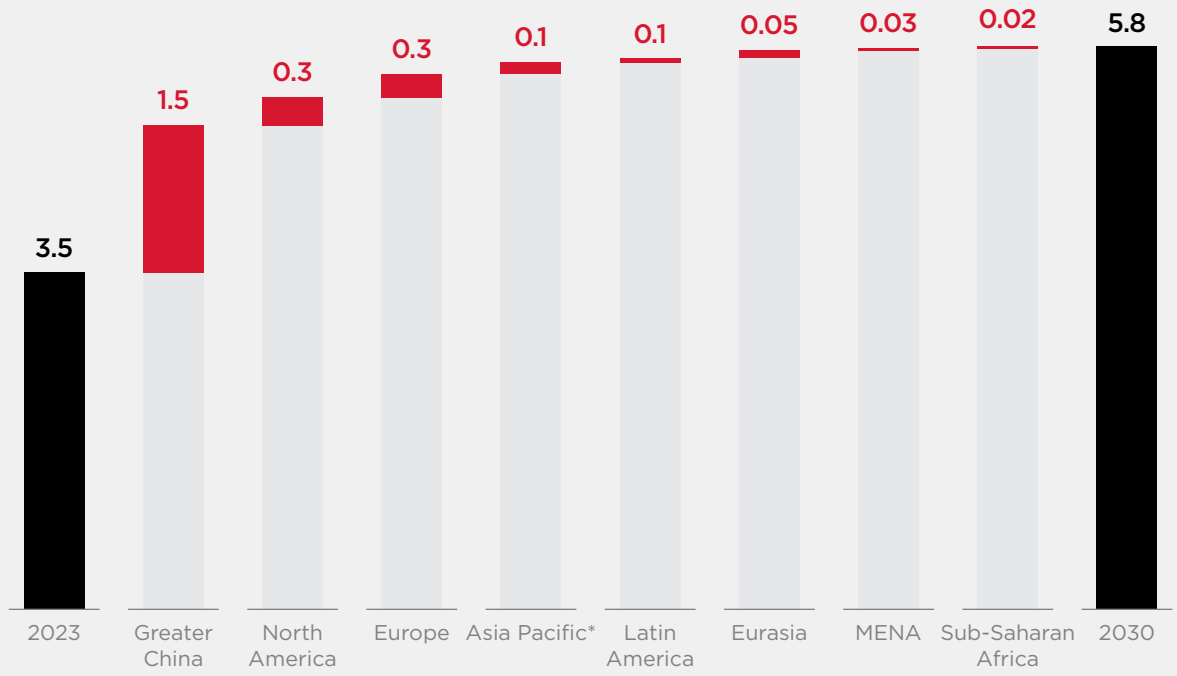
While cellular networks currently handle around 15% of total IoT connections, the rapid expansion of the IoT market provides significant room for growth in the cellular IoT space. Accordingly, the number of licensed cellular IoT connections is expected to reach 5.8 billion globally by 2030, up from 3.5 billion in 2023 (8% CAGR).

China is positioned at the forefront of IoT growth, with Chinese operators and vendors reporting progress with 5G LAN, 5G IoT, edge compute and 5G private networks, supported by ambitious timelines for further service launches.[2]

Figure 5

Licensed cellular IoT connections

Billion



* Asia Pacific excludes Greater China
Source: GSMA Intelligence

2. Should China be seen as a global benchmark for enterprise 5G?, GSMA Intelligence, October 2023

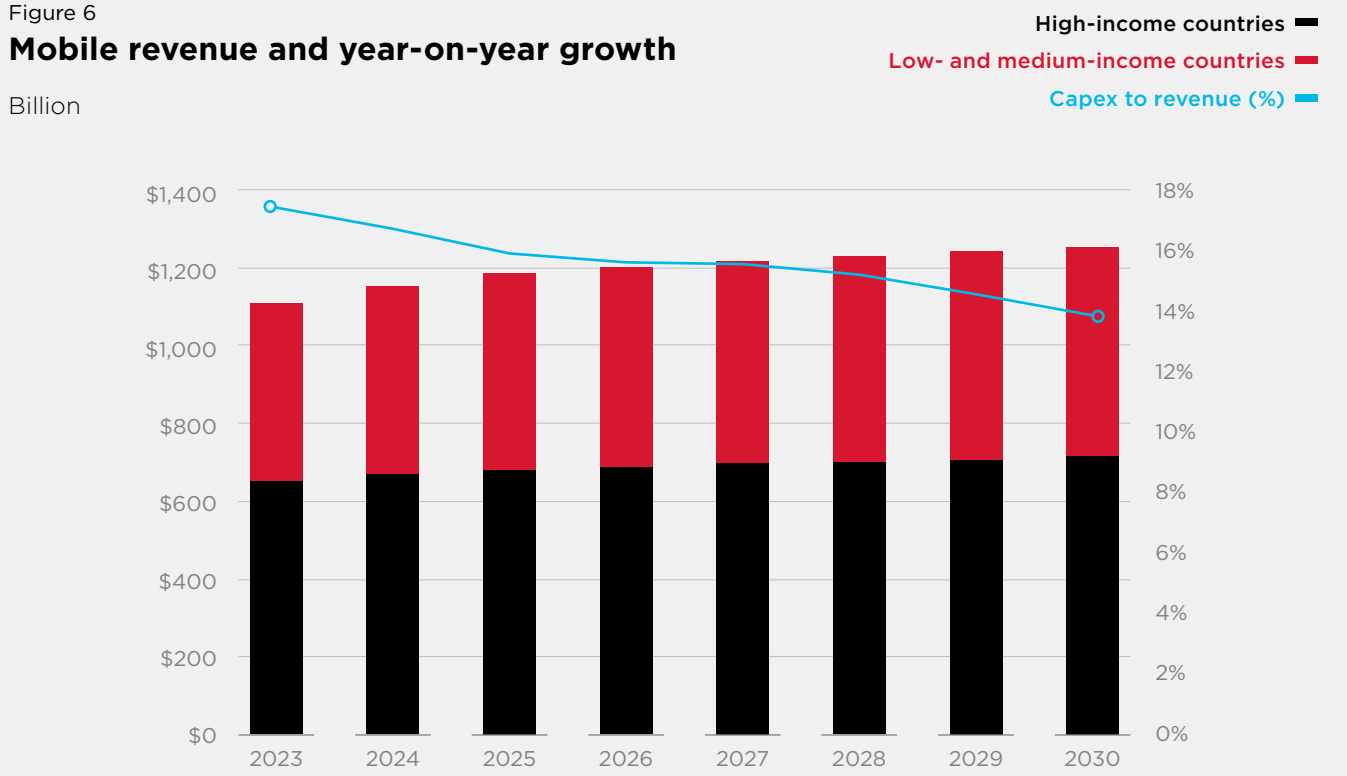
Global mobile revenues will exceed $1.2 trillion by 2030

Throughout the current decade, annual mobile revenue growth is expected to stay in positive territory for both high-income countries and LMICs, albeit in the low-single-digit figures in percentage terms. New 5G network capabilities will be pivotal for generating new revenue streams by meeting specific customer demands and monetising 5G network investments in the process.

Global mobile capex/revenue was 19% at the end of 2022, likely marking the peak of the 5G investment cycle. However, mobile operator capex is still projected to reach $1.5 trillion between 2023 and 2030. Operators will also have to contend with stubborn opex costs, which are often around 4× capex costs. This is driving operators to accelerate network and service automation along with other opex-saving initiatives.[3]

Figure 6

Mobile revenue and year-on-year growth



Source: GSMA Intelligence

3. Network Transformation 2023, GSMA Intelligence, November 2023

In 2023, the mobile sector added $5.7 trillion of economic value to the global economy

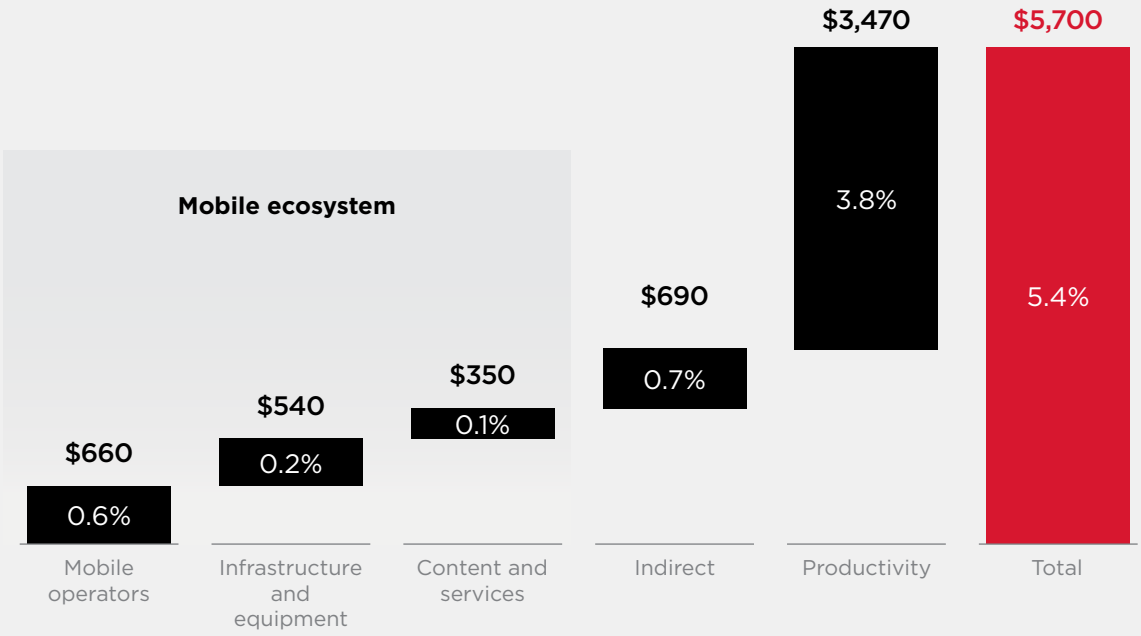
In 2023, mobile technologies and services generated 5.4% of global GDP, a contribution that amounted to $5.7 trillion of economic value added. The greatest benefits came from productivity effects reaching $3.5 billion, followed by the indirect contribution, which generated $690 billion.

The mobile ecosystem is formed of three categories: mobile operators; infrastructure and equipment; and content and services. 'Infrastructure and equipment' encompasses network equipment providers, device manufacturers and IoT companies. Meanwhile, 'content and services' encompasses content, mobile application and service providers, distributors and retailers, and mobile cloud services.

Figure 7

Total economic contribution of the mobile industry, 2023

Billion



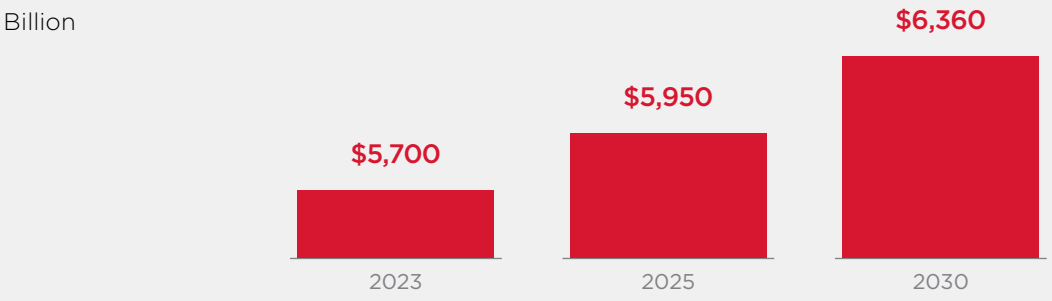
Source: GSMA Intelligence

At the end of the decade, mobile's economic contribution will reach $6.4 trillion

By 2025, mobile's contribution is expected to reach almost $6 trillion, rising to about $6.4 trillion by 2030 as countries around the world increasingly benefit from the improvements in productivity and efficiency brought about by the increased take-up of mobile services.

Figure 8

Economic impact of mobile



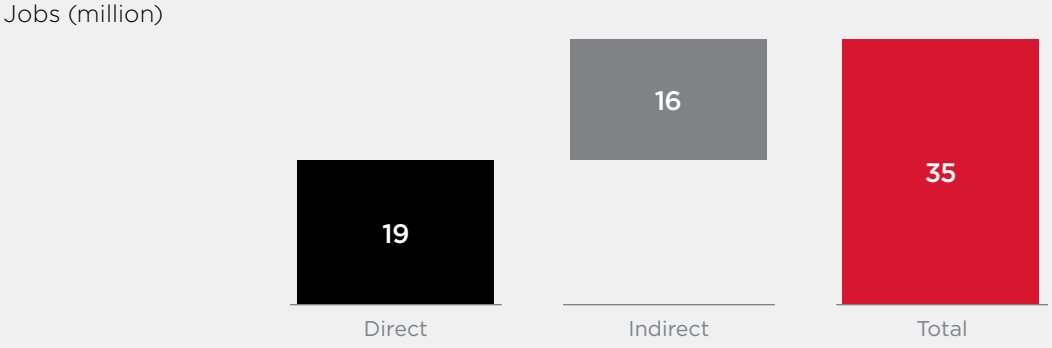
Source: GSMA Intelligence

The global mobile ecosystem supported around 35 million jobs in 2023

Mobile operators and the wider mobile ecosystem provided direct employment to more than 19 million people across the world. In addition, the economic activity in the ecosystem generated 16 million jobs in other sectors, meaning that around 35 million jobs were directly or indirectly supported.

Figure 9

Employment impact of the mobile industry, 2023



Source: GSMA Intelligence

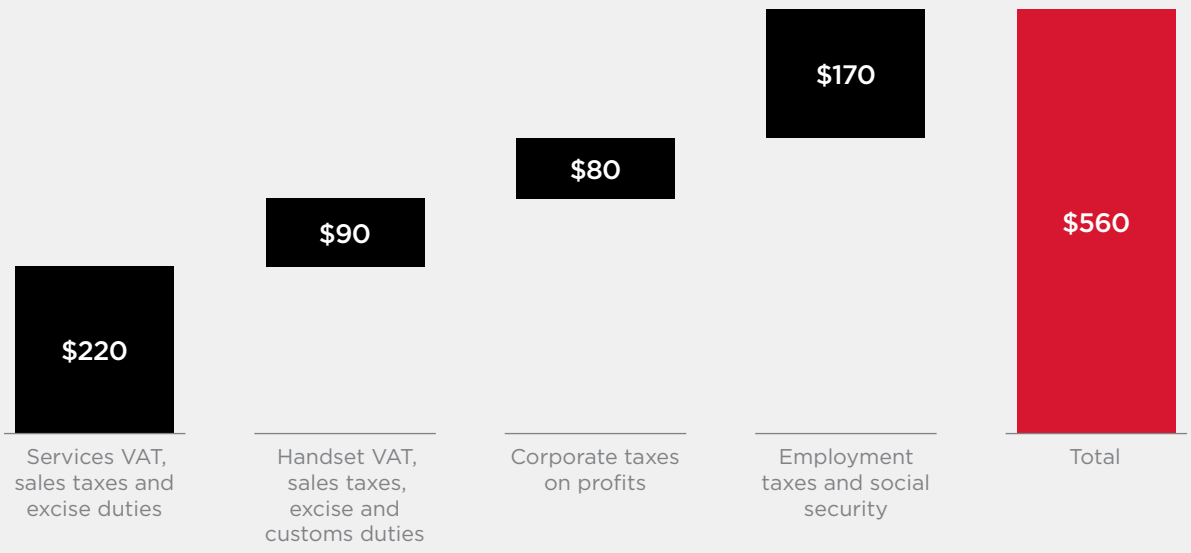
In 2023, the fiscal contribution of the mobile ecosystem reached $560 billion

In 2023, the mobile sector made a substantial contribution to the funding of the public sector, with around $560 billion raised through taxes on the sector. The major contribution was driven by services VAT, sales taxes and excise duties, which generated $220 billion, followed by employment taxes and social security at $170 billion.

Figure 10

Fiscal contribution of the mobile ecosystem, 2023

Billion



Source: GSMA Intelligence

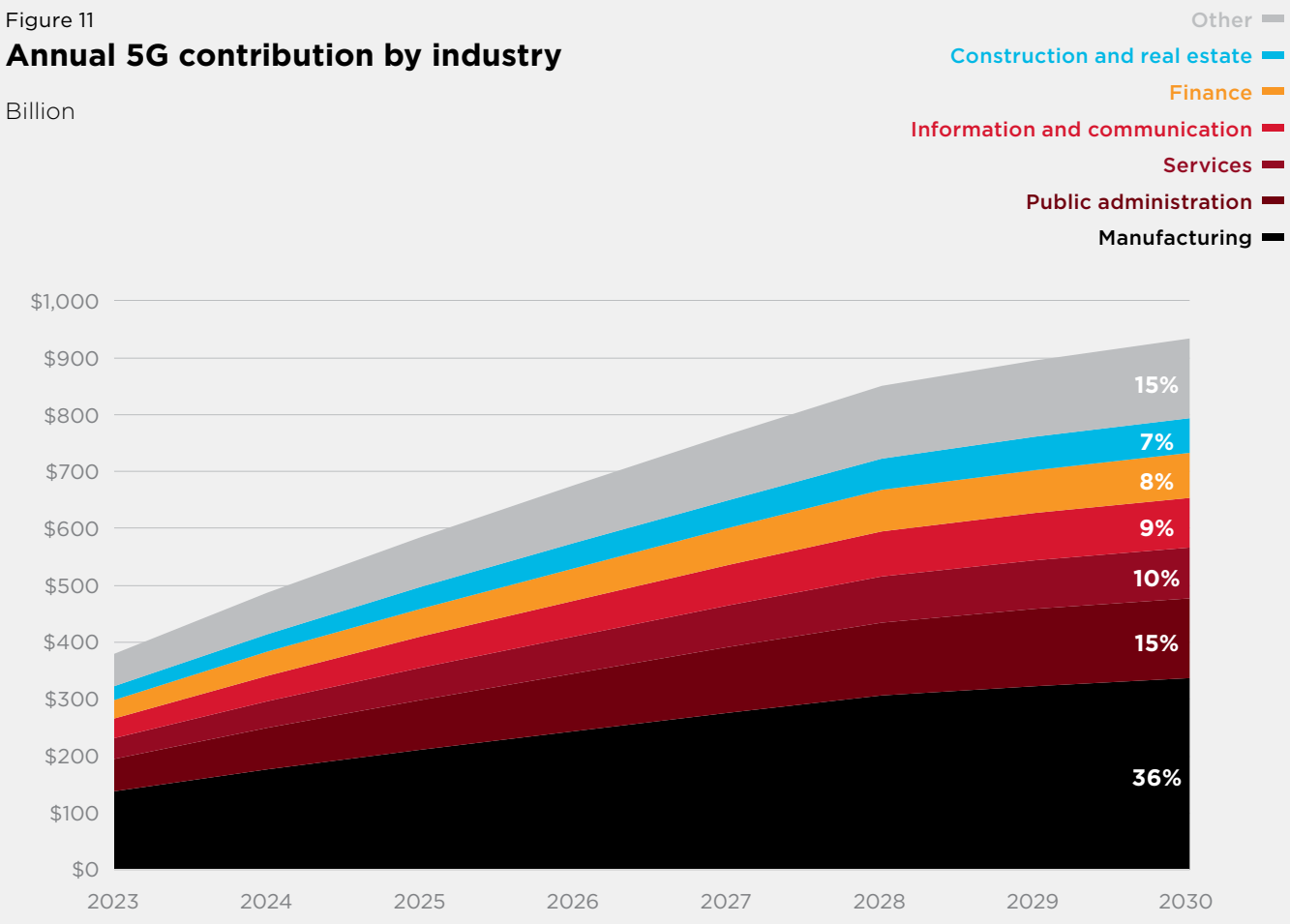
5G will add more than $930 billion to the global economy in 2030

5G is expected to benefit the global economy by more than $930 billion in 2030, or around 15% of the overall economic impact of mobile. Much of this will materialise in developed regions, including Asia Pacific, North America and Europe, which are expected to see strong growth in the next five years. Towards the end of the decade, LMICs are expected to realise an increasing proportion of 5G economic benefits, as the technology starts to achieve scale and widespread adoption.

5G is expected to benefit all economic sectors of the global economy, although some industries will benefit more than others due to their ability to incorporate 5G use cases in their business. Over the next seven years, 36% of benefits are expected to originate from the manufacturing sector, 15% from public administration and 10% from services, driven by applications in smart factories, smart cities and smart grids.

Figure 11

Annual 5G contribution by industry



Source: GSMA Intelligence

02

Mobile industry trends

2.1
5G: 5G standalone and 5G-Advanced come into focus

5G technology is now available in more than 100 countries around the world. As of January 2024, 261 operators in 101 countries globally had launched commercial 5G mobile services. In advanced and emerging markets alike, fixed wireless access (FWA) has proven to be an important use case for 5G technology, with many operators prioritising the solution in their overall 5G rollout strategy. As of January 2024, 117 operators in 57 markets had launched 5G FWA. This means that 5G FWA has been launched in more than half of the countries where 5G is present.

The majority of 5G networks have been built on the non-standalone (NSA) architecture, with the focus on enabling the basics of connectivity: wide-area coverage, capacity and solution reliability. 5G NSA has allowed operators to use 5G new radio over existing 4G infrastructure and has been instrumental to 5G's rapid rollout and adoption by reducing the capital requirement and time to market for operators. However, the mobile industry is increasingly moving to the 5G standalone (SA) architecture and other new standards that could unlock innovative 5G use cases and create new revenue streams.

Deployment of 5G SA gains traction

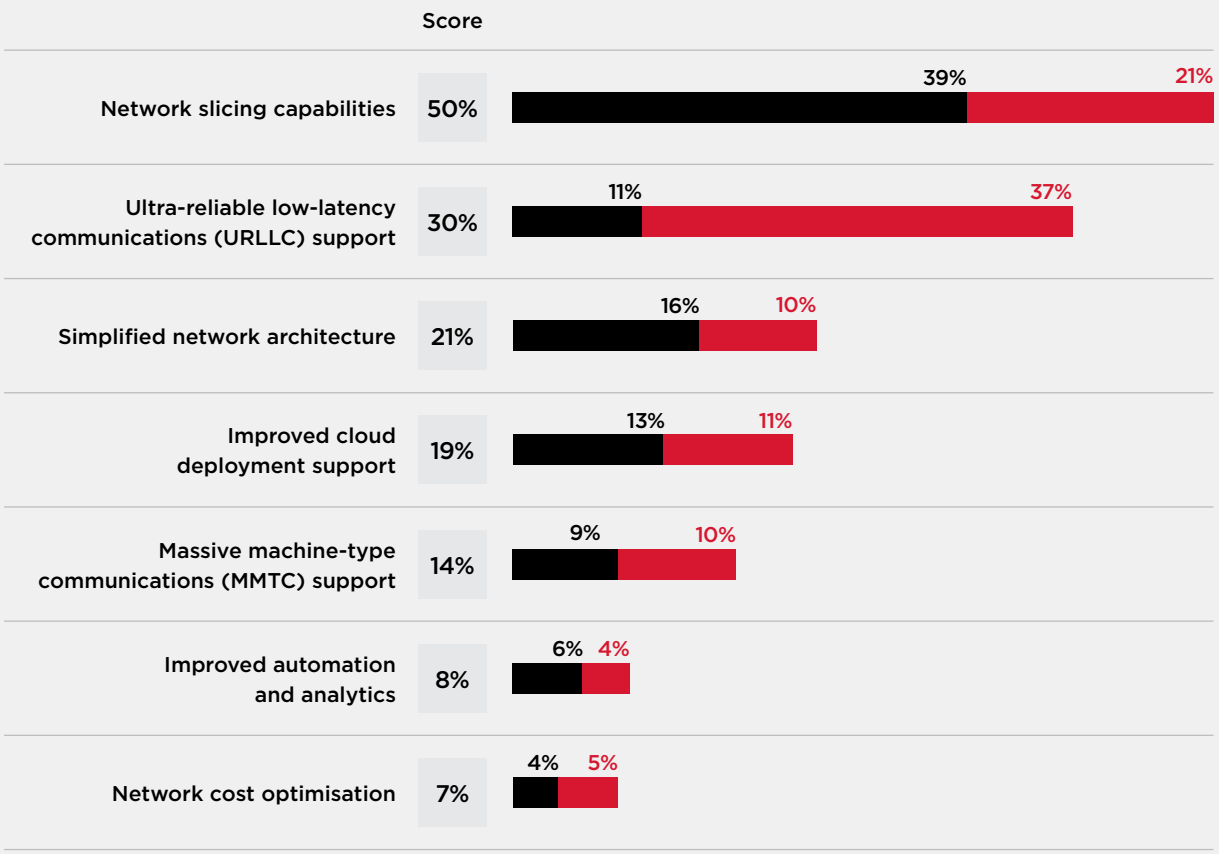
As of January 2024, 47 operators globally offered commercial 5G services on SA networks, with Asia Pacific and Europe accounting for more than half of these. 5G SA networks, built on 5G equipment from end to end, promise to deliver new capabilities and address the limitations of NSA architecture arising from the use of a 4G core. These capabilities, notably network slicing, ultra-low-latency communication and massive machine-type communications, are expected to drive enterprise digitalisation and enable new use cases for consumers.

For example, Vodafone and Ericsson completed a live network trial in the UK, which successfully demonstrated the positive impact an optimised 5G SA network slice could have on enhancing the mobile cloud gaming experience for consumers. Meanwhile, T-Mobile's 5G slicing beta participants in the US already include major tech companies, such as Dialpad, Google, Webex by Cisco and Zoom. In India, Jio has developed 5G SA–powered modular IoT gateways to deliver precision agriculture solutions to monitor livestock, climate, pest control, crop health and soil moisture.

Figure 12

Operator ranking of the top benefits of 5G SA

Rank the following benefits of deploying 5G standalone in your network (Percentage of operators, top two choices)



N = 100

Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2023

Operators explore new opportunities with 5G-Advanced and 5G RedCap

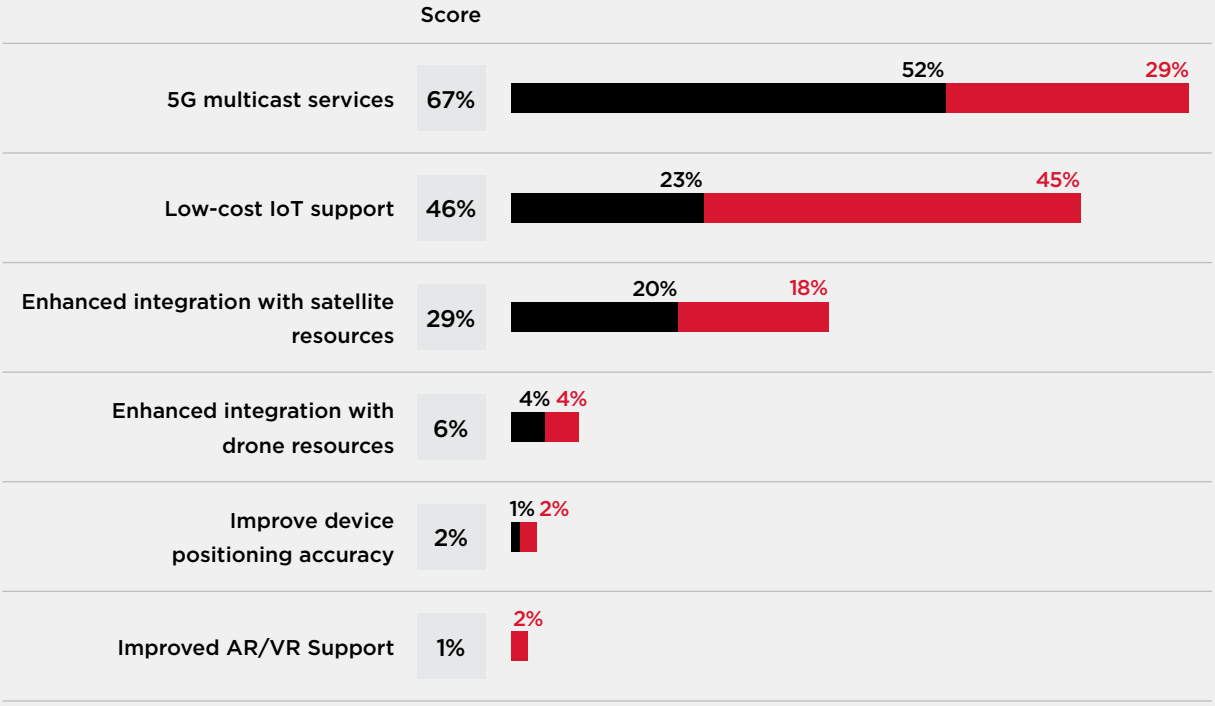
5G-Advanced, as part of 3GPP Release 18 in 2024, is the next milestone in the 5G era. 5G-Advanced brings in new wireless technology innovations, strengthening the 5G system foundation, which includes improving speed, maximising coverage and enhancing mobility and power efficiency. This has the potential to open up a wealth of opportunities to enable enhanced functionality and use cases for the enterprise market. For example, 5G-Advanced will support the development of extended reality (XR) applications by lowering uplink latencies while enabling industrial automation use cases by improving cellular-based positioning accuracy. It will also increase sustainability through the use of AI/machine-learning data-driven insights.

Insights from the GSMA Intelligence Network Transformation Survey 2023 show that more than half of operators expect to deploy 5G-Advanced within a year after standards are released. As a result, increased 5G SA and 5G-Advanced activities will kick-start a new round of 5G investment in 2024, especially in pioneer markets. Additionally, 5G multicast and low-cost IoT top the list of 5G-Advanced use cases for operators (see Figure 13). At the 2023 Asian Games, China Telecom, in collaboration with ZTE, demonstrated the capabilities of 5G-Advanced, including immersive viewing experiences and multiple simultaneous 8K video live broadcasts and streaming.

Figure 13

Operator ranking of priority use cases for 5G-Advanced

Which 5G-Advanced use cases and applications are most important to your network transformation priorities? (Percentage of operators, top two choices)



N = 100
Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2023

3GPP Release 17 introduced the reduced capability (RedCap) user equipment category for energy- and cost-efficient 5G IoT connectivity (also known as 5G NR-Light). RedCap will evolve as part of 5G-Advanced to further strengthen support for cost-efficient devices and/or power-sensitive applications. In recent months, several operators – including AT&T, BT Group, China Mobile, China Telecom, China Unicom, Optus, SK Telecom and Verizon – have been exploring the capabilities of 5G RedCap, in collaboration with leading equipment suppliers. Focus areas include smart grid applications, XR, health-monitoring wearables and advanced sensors for smart cities.

2.2
Network APIs: the mobile ecosystem rallies to support 5G monetisation

Although it has been possible to expose network APIs for a while, operators have struggled to adopt a standardised approach that achieves scale. However, recent initiatives by the mobile industry to develop a common set of network APIs have provided new momentum to operator initiatives. This began when Telefónica officially launched CAMARA (Telco Global API Alliance) at MWC Barcelona 2022 in collaboration with the Linux Foundation, hyperscalers and other operators. At MWC Barcelona 2023, this work was extended with the GSMA's Open Gateway initiative, with 21 operators committing to expose network APIs via CAMARA. By the start of February 2024, that number had increased to 42 operator groups, representing 237 mobile networks and accounting for 65% of global mobile connections.

Operator commitments are beginning to translate into commercially available network APIs. In September 2023, Deutsche Telekom and Ericsson announced an agreement to sell network APIs through Ericsson's Vonage platform under the banner MagentaBusiness API. A month later, Sri Lanka's four mobile operators – Bharti Airtel, Dialog Axiata, Hutchison and SLT-Mobitel – also launched a set of network APIs. This was followed in November by Brazil's three largest mobile operators – Claro, TIM and Vivo – announcing the launch of three network APIs focused on improving digital security. Additionally, Spain's leading mobile operators – Orange, Telefónica and Vodafone – announced the launch of two network API services in February 2024.

Figure 14

CAMARA and GSMA Open Gateway APIs launched by mobile operators

API name	Explanation	Operators launched
Carrier Billing	Enables the customer to make purchases by charging the cost to their mobile phone bill or deducting it from their prepaid balance	Sri Lankan MNOs
Device Location	Checks the location of a device	Brazilian MNOs; Deutsche Telekom; Sri Lankan MNOs
Device Status	Checks if a device loses connection to the network or becomes reachable again and checks a device's roaming status	Deutsche Telekom
Number Verify	Verifies the phone number associated with the SIM in the device connected to the mobile network	Brazilian MNOs; Spanish MNOs
One-Time Password (OTP) SMS	Verifies possession of a device by delivering a OTP through SMS and validating it afterwards	Sri Lankan MNOs
Quality on Demand	Sets a specific quality level for a mobile connection (e.g. required latency) and receives a notification if the network does not meet this standard	Deutsche Telekom
SIM Swap	Obtains information on any recent SIM pairing change related to the user's account	Brazilian MNOs; Spanish MNOs

Note: Table is not exhaustive. Information displayed is based on publicly available information as of 12 February 2024.
Source: GSMA Intelligence

The business logic behind exposing network capabilities via APIs is easy to understand: by allowing developers to tap into network capabilities without directly engaging the operator, developers can innovate more easily and quickly, delivering high-value use cases with more value than undifferentiated connectivity.

Operators view network API exposure as crucial for maximising returns on their 5G network investments, enabling them to generate higher returns compared to the traditional approach of selling standard connectivity services. This shift empowers operators to harness the full potential of new capabilities built into 5G networks while enabling developers to create new services beyond those based on previous network generations.

Operators consider their routes to market

According to the GSMA Intelligence Network Transformation Survey 2023, operators expect their own internal teams (e.g. network engineers and internal developers) to be the main consumers of network APIs. These internal teams can use network APIs to build new services for end users while also delivering internal efficiencies by leveraging network APIs for purposes such as network monitoring and management.

Most operators also see an opportunity to expose network APIs for the purpose of working with external developers. Some operators have focused their initial efforts on building direct relationships with developers. For example, T-Mobile announced in September 2023 that it would extend its network slicing beta program to developers across the US via its DevEdge developer platform. In the first iteration, developers will be able to use the platform to monitor network conditions and adjust video-calling quality to ensure clear and reliable communication.

In addition to strategies focused on direct engagement with developers, many operators will also likely collaborate with aggregators to reach a broader base of developers. This explains the rationale behind Deutsche Telekom's partnership with Ericsson. Verizon also announced a partnership with Ericsson's Vonage platform in February 2024, while BT and Dish Wireless are among the mobile operators to have forged agreements with Nokia's Network as Code platform.

The list of partnership agreements on network APIs between operators and network vendors will likely grow in 2024. Over the coming year, operators may also begin to work more closely with cloud providers, which are already engaged with developers to facilitate access to operator network capabilities. It will be important for these partnerships to yield concrete examples of how federation and agreement on common APIs can create new monetisation opportunities in order to sustain the momentum behind network APIs.

2.3
Satellite: emerging solutions and partnerships reshape the connectivity landscape

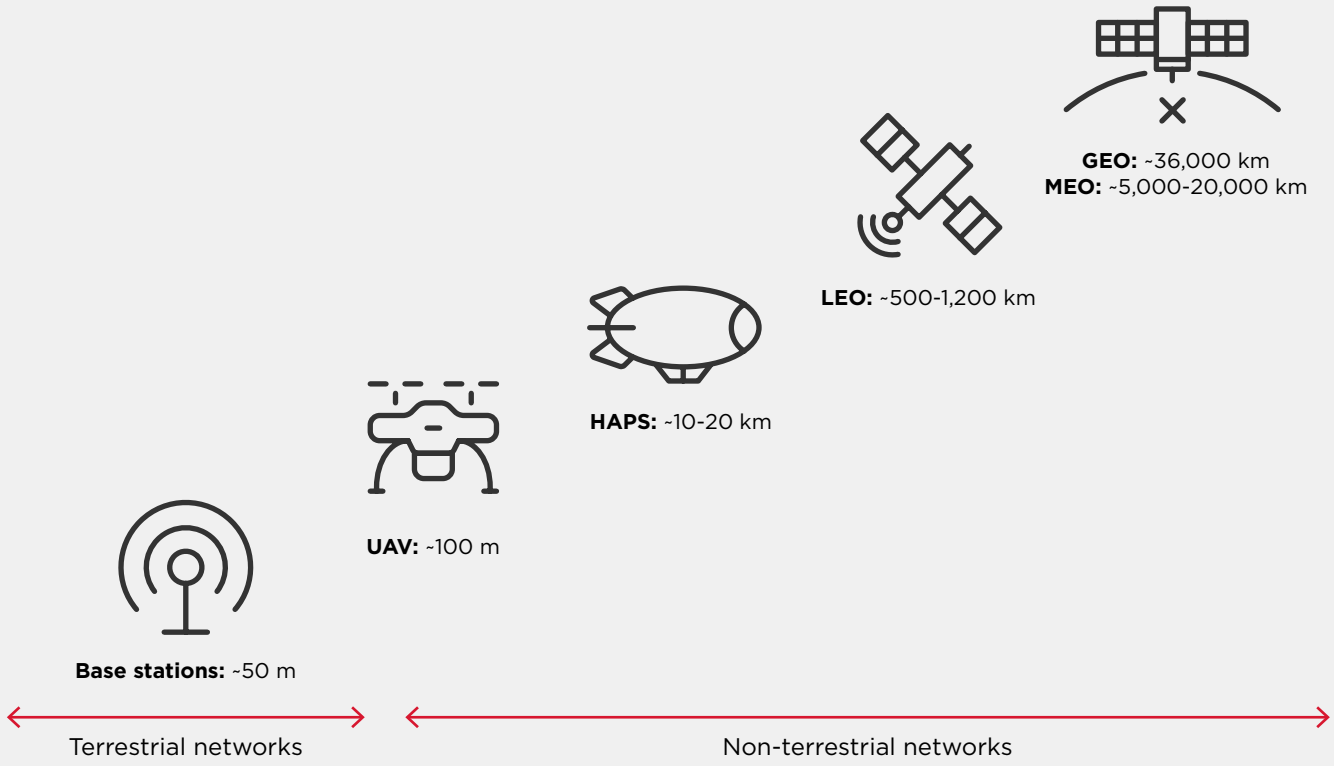
Telecoms networks have driven voice and data connectivity to current levels (over 4.7 billion mobile internet subscribers today), supported by the wide area coverage of wireless networks and the mass production and adoption of mobile devices. Satellites and other non-terrestrial networks (NTNs), such as unmanned aerial vehicles (UAVs), have also been providing connectivity but at a much lower scale due to several limitations, including uncompetitive costs, limited ecosystem support and high latency.

However, advances in various satellite and NTN solutions have resulted in performance improvements, lower deployment costs and more commercially viable business models. This is driving new partnerships with telecoms operators in ways that could reshape the connectivity landscape. Importantly, satellites and NTNs have the potential to provide ubiquitous coverage all over the globe. Telecoms networks now cover more than 95% of the world's population but less than 45% of the world's landmass. Satellites and NTNs are well suited to deliver connectivity in maritime, remote and polar areas where deploying conventional terrestrial networks could be costly and challenging.

In recent years, low Earth orbit (LEO) satellite and high-altitude platform station (HAPS) providers have attracted much attention on the back of significant investments and technical breakthroughs that have improved the business case for delivering connectivity at scale. For example, SpaceX has launched nearly 5,300 LEO Starlink satellites as of January 2024, with over 6,000 more to follow. Meanwhile, AALTO has said that its Zephyr HAPS solution can cover up to 7,500 sqkm (equivalent to up to 250 towers in the most challenging and demanding of terrains) over 64 days of continuous flight – the latest flight-time record of AALTO's Zephyr platform.

Figure 15

Examples of satellite and NTN technologies in the connectivity space



Source: GSMA Intelligence

The 3GPP has laid the foundation for satellite-based connectivity through standardisation to extend the reach of 5G to regions lacking terrestrial infrastructure. Four broad use cases have been identified:

- **Service continuity:** For coverage where it is not feasible with terrestrial networks, such as maritime or remote areas.
- **Service ubiquity:** For mission-critical communications, such as for disaster relief during outage of terrestrial networks.
- **Service scalability:** For offloading traffic from terrestrial networks to NTNs for better system efficiency.
- **Backhaul services:** For transport for sites with weak or no backhaul capacity.

Telecoms and satellites: a new era of partnerships

Over the last two years, there has been a growing number of partnerships between telecoms operators and satellite companies, spanning several continents and use cases, including rural coverage and disaster relief. This trend will likely continue in 2024 as the value of satellite connectivity becomes clearer. Figure 16 shows some prominent examples, along with the mobile customer footprint of the participating operators. Several trials have been conducted in recent years, with commercial satellite-enabled services expected to ramp up in the next 12 months. This will drive demand for additional capacity to ensure high performance.

Figure 16

Examples of partnerships between telecoms operators and satellite/NTN companies

Telecoms operator	Satellite/NTN company	Market	Number of mobile connections (million)
Bharti Airtel	OneWeb	India	**351**
Vodafone	Project Kuiper	Europe, Africa	**341**
Telefónica	OneWeb and Starlink	Europe, Latin America	**262**
MTN	Starlink, OneWeb, AST SpaceMobile and Lynk Global	Africa	**232**
Orange	OneWeb	Europe, Africa, Latin America	**229**
Deutsche Telekom	Skylo and Intelsat	Europe, US	**193**
Veon	OneWeb	Asia, Eurasia, Ukraine	**158**
Vodafone	AST SpaceMobile	Africa	**153**
Verizon	Project Kuiper	US	**144**
T-Mobile	Starlink	US	**119**
AT&T	OneWeb and AST SpaceMobile	US	**114**
KDDI	Starlink	Japan	**67**
Telstra and Optus	Starlink	Australia	**28**
STC	AALTO	Saudi Arabia	**25**
BT	OneWeb	UK	**22**
Rakuten	AST SpaceMobile	Japan	**6**

Note: Market refers only to where the operator is present. Data is correct as of December 2023.
Source: GSMA Intelligence based on company announcements

D2D market poised for growth

There has been a resurgence of direct-to-device (D2D) solutions following technical breakthroughs that enable satellites to connect to standard smartphones for SMS, voice and data services. In September 2023, AST SpaceMobile placed a satellite call over 5G in partnership with AT&T and in December 2023, Lynk Global and Rogers Canada announced plans to launch commercial satellite-to-mobile voice services in 2024 after successful trials. In January 2024, SpaceX launched six Starlink satellites for D2D services to be delivered in partnership with telecoms operators, including T-Mobile US, Optus, Rogers, KDDI and Entel.

For satellite providers, partnerships with telecoms operators are key to scale up this model, leveraging operators' existing relationships with end users and, in some cases, existing spectrum holdings. For telecoms operators, D2D satellite offers access to new customers in underserved areas and the ability to provide connectivity for emergency services and existing customers where a terrestrial signal is not available. GSMA Intelligence estimates a total incremental revenue opportunity from D2D services of over $30 billion for telecoms operators by 2035.[4]

> For satellite providers, partnerships with telecoms operators are key to scale up this model, leveraging operators' existing relationships with end users and, in some cases, existing spectrum holdings

4. Satellite 2.0: going direct to device, GSMA Intelligence, 2022

2.4
Digital consumer: eSIM adoption should accelerate as new services launch

An eSIM, or embedded SIM, is a built-in electronic SIM card inside a mobile device, enabling flexible and remote management of mobile subscriptions without the need for a physical SIM card. eSIMs have been around for over a decade but have recently risen to prominence due to the significant growth in the number of eSIM-enabled consumer devices over the last few years.[5]

Smartwatches led the first wave of eSIM launches (2016–2018), but smartphones have since taken the lead, accounting for 60% of all eSIM consumer devices launched as of the end of H1 2023 (cumulatively).[6] Most of the top brands for the three main categories (smartphones, smartwatches and tablets) have launched eSIM. This is important, as these brands represent a major share of the three markets and lead in device innovation.

The number of commercial eSIM services is also on the rise. As of June 2023, commercial eSIM service for smartphones had been launched in 116 countries around the world. In Europe, eSIM service for smartphones is now available in the vast majority of countries.[7] Africa is catching up (most of the 16 new launches in H1 2023 were in countries from Africa). China is still a notable exception; eSIM service is available for smartwatches and some IoT applications in the country, but not for handsets. The timeline is uncertain, but eSIM will eventually be launched for smartphones in China.

Limited consumer awareness remains a barrier to eSIM adoption

While progress on eSIM launches (devices and services) accelerates, consumer awareness of eSIM remains low outside of the US: on average across seven major countries analysed,[8] 36% of consumers were aware of eSIM in late 2022, up from 20% in 2020. Of those consumers who are aware of eSIM, 29% discovered the technology by reading an article. In comparison, only 14% of eSIM-aware consumers discovered the technology via OEM channels; the counterpart figure for operator channels was 10%.

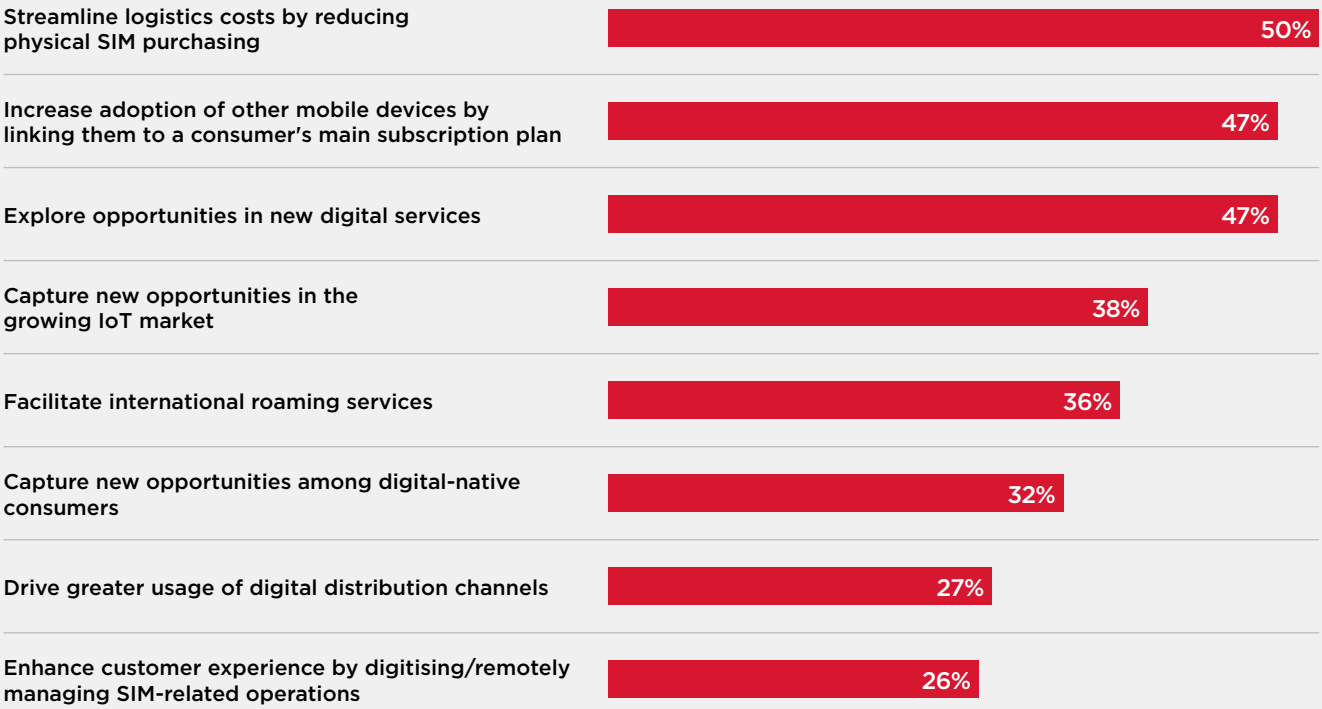
Limited eSIM discovery through operator and OEM channels implies that operators and OEMs are increasingly launching eSIM services and devices, respectively, but not talking much about eSIM to their customers. Raising consumer awareness of eSIM and educating customers (e.g. explaining and promoting eSIM's benefits) are key to driving eSIM adoption. As they are the main contact points with end users, operators and OEMs have a key role to play here. For operators, driving eSIM adoption can secure cost savings and unlock new revenue opportunities while also helping OEMs to sell more devices.

5. eSIM devices include smartphones, smartwatches, tablets, laptops and a range of consumer IoT devices (e.g. bikes, GPS trackers, security cameras).
6. Accelerating eSIM globally: state of the consumer market, user behaviour and adoption growth scenarios, GSMA Intelligence, 2023
7. ibid.
8. The seven countries surveyed were France, Germany, Italy, Japan, South Korea, the US and the UK.

Figure 17

Potential benefits associated with eSIM: importance to business

Percentage of operators that rated the following potential benefits of eSIM as extremely important



N = 100
Source: GSMA Intelligence Operators in Focus: Future of Retail Survey 2021

eSIM adoption will gather pace

As consumer awareness increases, eSIM adoption will gain momentum over the next two years, followed by a more substantial acceleration from 2026 onwards (due to the scale of China, where GSMA Intelligence expects eSIM service for smartphones will be launched during 2024–2025). By 2025–2026, most operators will offer commercial eSIM service to their smartphone customers, and eSIM-only smartphones (a major factor pushing eSIM adoption) will likely be more widespread globally.

Given the 2–3 year smartphone replacement period in most countries, a sizeable base of smartphones with removable SIMs will likely remain in place for several years. The GSMA Intelligence baseline scenario predicts around 1 billion eSIM smartphone connections globally by the end of 2025, growing to 6.9 billion by 2030. This would account for around three quarters of the total number of smartphone connections by 2030.

North America is the region with the fastest rate of eSIM adoption due to Apple's launch of eSIM-only smartphones in the US in September 2022. GSMA Intelligence estimates that 27% of smartphone connections in the region used eSIM at the end of 2023, and this is forecast to grow to 50% by the end of 2025. Europe will have the second-fastest rate of eSIM adoption, with more than half of European smartphone connections expected to use eSIM by the end of 2027. eSIM adoption will be slower in developing markets, especially in Sub-Saharan Africa (55% eSIM penetration by 2030) and India (65%).

2.5
Generative AI: operators take steps to realise benefits

Mobile operators have utilised AI for a while now to varying degrees. However, in the past year, generative AI (genAI) has come to the fore, driven by the launch of ChatGPT. Most operators are in the experimentation phase for genAI. This involves carefully selecting partners, choosing foundational models and prioritising use cases that can be implemented in the near term.

Much of the early work on genAI in the mobile industry has focused on using the technology to improve customer services, such as by developing more intelligent chatbots and crafting sales scripts for call centre agents. Operators are also exploring how genAI can be used to support sales and marketing activities, ranging from generating new marketing collateral to creating personalised product suggestions and promotions.

Furthermore, genAI has implications for network operations and management. Network engineers regularly use manuals and other text-based sources to assist with day-to-day tasks. Operators are turning to genAI to ingest this documentation and provide engineers with prompts that accelerate the network installation process. In the longer term, mobile operators will look to implement more complex genAI use cases in the networks domain. For instance, the technology could be used for tasks such as fault detection and resolution, network optimisation and network planning.

SK Telecom targets AI leadership

In September 2023, SK Telecom unveiled its AI pyramid strategy with the aim of tripling investments in projects related to AI by 2028. The pyramid is formed of three layers:

- **Infrastructure:** Forming the base of its AI pyramid strategy, SK Telecom plans to develop its own AI infrastructure, encompassing data centres, chips and multiple large-language models (LLMs).
- **Transformation:** In the middle area of the pyramid, covering its core businesses and new areas, SK Telecom plans to leverage AI in marketing and customer contact centres. Additionally, it aims to enhance the operational efficiency of its network infrastructure, targeting cost reductions of 20–30%.
- **Services:** At the top of the pyramid is its plan to use genAI to build new services. SK Telecom has launched the world's first Korean LLM service, A Dot, which it released in beta in 2022. It plans to adapt A Dot into a personal AI assistant service.

SK Telecom's bold vision highlights the potential of AI to transform the business of mobile operators. It demonstrates that the technology has potential to not only support internal use cases but also to help operators generate new revenues from AI investments. There are signs that a growing number of operators are recognising this opportunity. For example, KT recently unveiled its genAI platform for enterprises, while NTT and SoftBank have both announced plans to develop genAI solutions.

Maximising the AI opportunity

The speed of AI adoption in the mobile industry may depend on several factors. First, mobile operators often face difficulties in accessing the internal data needed for training AI models, hindered by the diversity and volume of data sources. Additionally, operators must ensure the accuracy of AI-generated insights, as reliance on inaccurate data may lead to flawed decision-making.

Second, ethical concerns around AI still need to be addressed. The mobile industry is committed to the ethical use of AI in its operations and customer interactions to protect customers and employees, remove any entrenched inequality and ensure that AI operates reliably and fairly for all stakeholders. The GSMA's AI Ethics Playbook serves as a practical tool to help organisations consider how to ethically design, develop and deploy AI systems.[9]

Telefónica's methodology, called 'The responsible use of AI by design', is an example of ethical AI in action. This encompasses AI principles, awareness and training for employees, a questionnaire, technical tools and a governance model that defines roles and responsibilities. The operator has also established an AI ethics committee consisting of multidisciplinary experts.

Finally, partnerships within the telecoms industry and beyond will play an important role in scaling up genAI and AI services more broadly. Research from GSMA Intelligence shows that while 56% of operators are actively trialling genAI solutions, commercial deployment is less prevalent among mid-sized and smaller operators. Democratising AI is critical to ensure all players in the industry and their customers can reap the benefits. To achieve that, GSMA and IBM announced a collaboration in January 2024 to facilitate and accelerate the adoption of genAI and the development of AI skills in the telecoms industry. Two initiatives are being launched: GSMA Advance's AI Training programme and the GSMA Foundry Generative AI challenge and programme.

Mobile operators are also forming partnerships to share the costs of developing new AI solutions. In July 2023, Deutsche Telekom, e&, SK Telecom and Singtel signed an agreement to form the Global Telco AI Alliance – a platform expected to serve as the foundation for new AI services, including those designed to improve the existing telco business, digital assistants and super-apps. Additionally, mobile operators are forming partnerships with cloud providers and telecoms vendors to leverage new AI capabilities, with both open source and proprietary approaches to AI development under consideration.

> The mobile industry is committed to the ethical use of AI in its operations and customer interactions to protect customers and employees, remove any entrenched inequality and ensure that AI operates reliably and fairly for all stakeholders

Open source versus proprietary AI: operators weigh different approaches

Recent announcements highlight the diverging approaches of tech firms to AI development. In December 2023, Google unveiled Gemini, a proprietary AI model,[10] which follows in the footsteps of OpenAI's ChatGPT and Baidu's Ernie Bot. That same month, IBM and Meta launched the AI Alliance in collaboration with more than 50 leading organisations across industry, startups, academia, research and government. The goal is to support an 'open innovation' and 'open science' approach, whereby AI systems that constitute the repository of all human knowledge and culture are open source and freely available for everyone to contribute to them.

The debate around the merits of an open source versus proprietary approach to AI will continue in 2024. To date, operators have formed partnerships with companies developing both open source and proprietary AI models. For example, SK Telecom and Deutsche Telekom have partnered with Meta (known in this area for its Llama 2 open-source LLM, distributed by Microsoft) as part of their plans to develop a telco-specific LLM for digital assistants in customer services.

Meanwhile, Vodafone announced plans in January 2024 to invest $1.5 billion over the next decade in cloud and customer-focused AI services developed in conjunction with Microsoft. The companies will collaborate to transform the customer experience using OpenAI's technology running on Microsoft Azure. Vodafone and Microsoft have pledged to build the technology on unbiased and ethical privacy and security policies under Vodafone's established framework for responsible AI.

9. The Mobile Industry Ethics Playbook, GSMA, February 2022
10. Proprietary AI models are developed and owned by a specific entity, restricting access and modification. In contrast, open source AI models are freely available for people to modify, share and distribute.

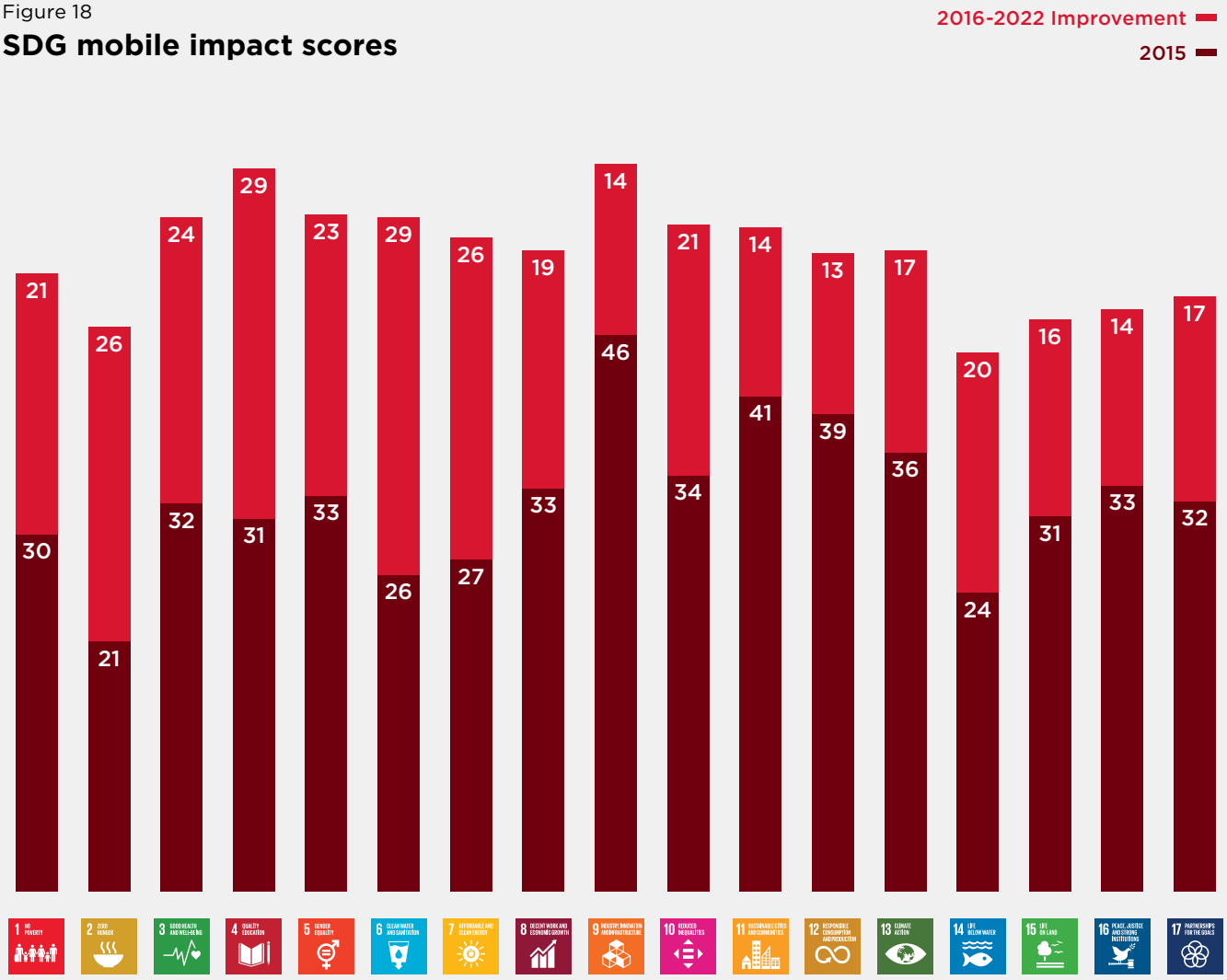
03

Mobile industry impact

3.1
The mobile industry's impact on the SDGs

In 2016, the mobile industry became the first sector to commit to the 17 UN Sustainable Development Goals (SDGs). Each year since then, the GSMA has measured the impact of the mobile industry across all SDGs.[11] In 2022, the average SDG impact score across the 17 goals was 53. This means the industry achieved 53% of its potential contribution to the SDGs – up from 33% in 2015.

Figure 18
SDG mobile impact scores



Source: GSMA Intelligence

11. 2023 Mobile Industry Impact Report: Sustainable Development Goals, GSMA, 2023

The most recent analysis shows that the mobile industry continues to achieve its highest impact on SDG 9: Industry, Innovation and Infrastructure, driven by the increased reach of mobile networks and growing take-up of mobile internet services. Progress has also been made in reducing disparities in mobile internet adoption between different user segments, supporting the industry's contribution to SDG 5: Gender Equality and SDG 10: Reduced Inequalities. Examples include the following:

- There were 410 million new mobile internet subscribers in rural areas between 2015 and 2022. Consequently, rural mobile internet adoption reached 41% (1.4 billion people) at the end of 2022.
- Mobile internet was used by 47% of the world's poorest 40% at the end of 2022,[12] which is equivalent to 1.5 billion people and represents an increase of 710 million people since 2015.
- 61% of women in LMICs used mobile internet at the end of 2022, compared to 75% of men. While 1.4 billion women were using mobile internet (470 million more than in 2017), there were still 310 million fewer women than men doing so. This equates to a 19% mobile internet gender gap (compared to 25% in 2017).[13]

Being connected to mobile internet, however, is only the first step. To harness the full potential of mobile technology, individuals must engage with new and enriching online services that can accelerate social and economic inclusion. As Figure 19 shows, the proportion of mobile subscribers engaging in activities on their phones relevant to the SDGs has grown significantly since 2015, amplifying mobile's influence across several areas. These improvements are particularly important in LMICs, where access to traditional services is often lacking, especially in areas such as education and healthcare.

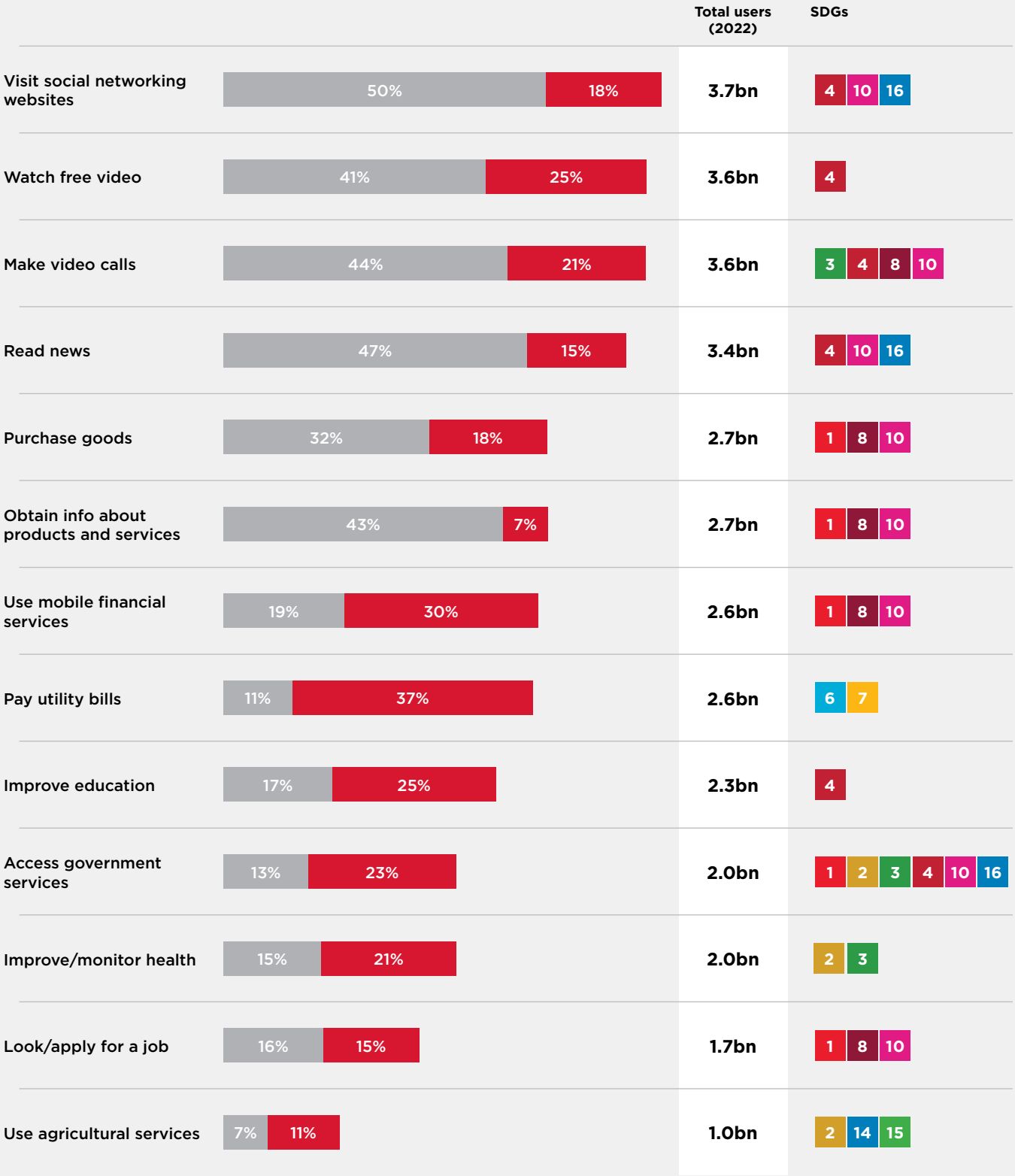
12. This calculation of mobile internet penetration takes into account the poorest 40% of population in each country.
13. The Mobile Gender Gap Report 2023, GSMA, 2023

Figure 19

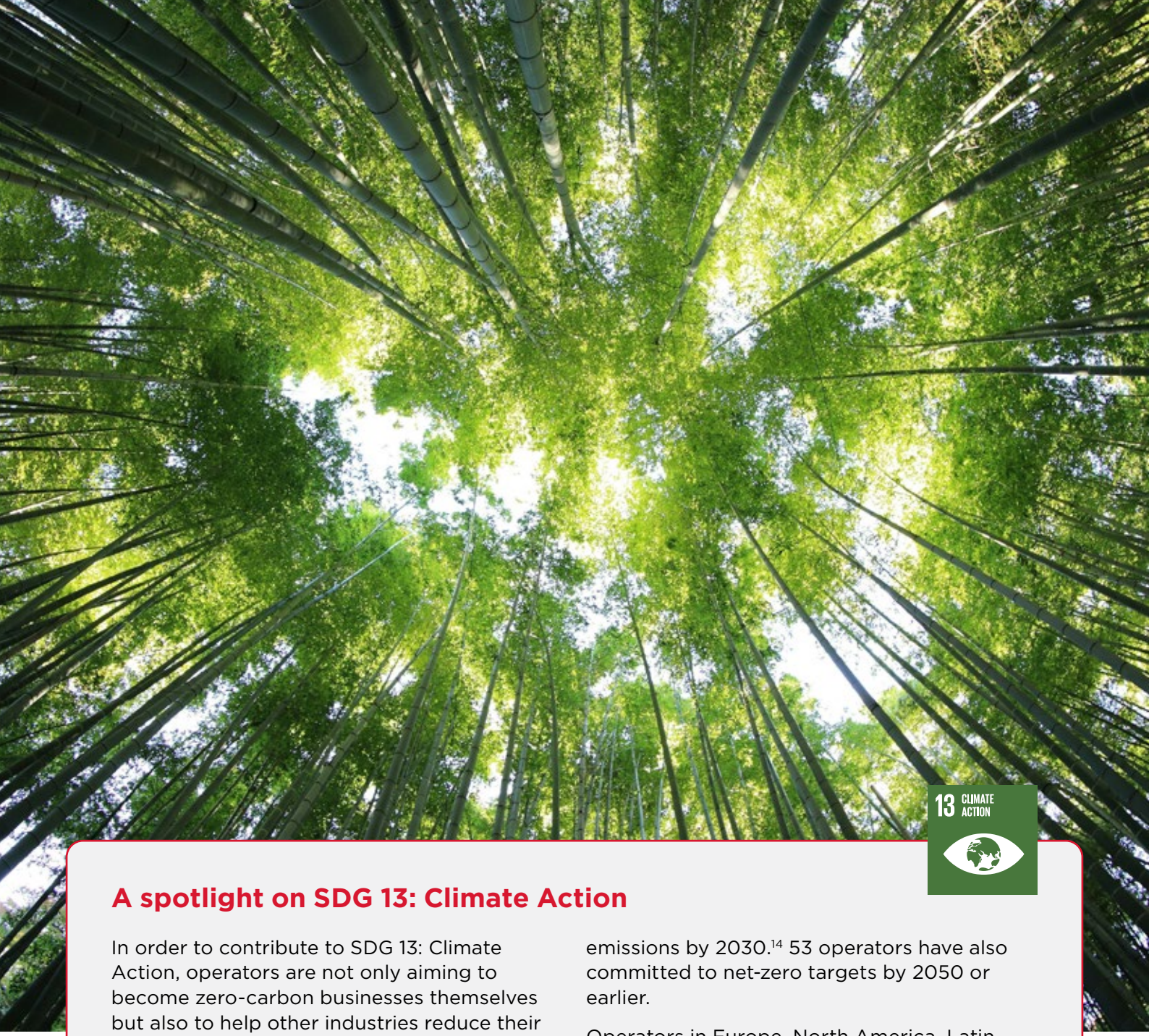
Mobile usage by activity and the related SDGs

2016-2022 Improvement
2015

Percentage of mobile users engaging in an activity on a mobile device



Note: Data sourced from the GSMA Intelligence Consumers in Focus Survey, which has more than 50,000 respondents and covers 52 countries, during 2017–2022. The number of users is calculated by multiplying unique mobile subscribers by the percentage of survey respondents that performed a particular activity (e.g. reading the news) on a mobile. Unique subscriber data is sourced from GSMA Intelligence, combining data reported by mobile operators with the annual GSMA Intelligence Consumers in Focus Survey.
Source: GSMA Intelligence



A spotlight on SDG 13: Climate Action

In order to contribute to SDG 13: Climate Action, operators are not only aiming to become zero-carbon businesses themselves but also to help other industries reduce their carbon footprint, which has a bigger impact overall. As of January 2024, 70 operators, representing over two thirds of the industry by revenue and nearly half by connections, had committed to a science-based target of rapidly decreasing their direct and indirect emissions by 2030.[14] 53 operators have also committed to net-zero targets by 2050 or earlier.

Operators in Europe, North America, Latin America and MENA are making the biggest strides on climate action, with strong progress on energy efficiency and renewable energy. Further progress is needed across all regions to achieve the industry's 2030 climate targets.

14. https://www.gsma.com/betterfuture/climate-action

Looking ahead to 2030

While it is important to recognise the mobile industry's progress on the SDGs since 2015, the average SDG impact score stalled in 2022. Following the current trajectory, the mobile industry is projected to achieve 76% of its full potential impact on the SDGs by 2030. The slowdown observed in 2022 emphasises the uncertainty ahead and the importance of accelerating the industry's contribution to the SDGs. This can be achieved by:

- ensuring continuous industry commitment to drive and scale impact on the SDGs through integrating purpose into core business
- reforming policy to support sustainable levels of investment in mobile broadband infrastructure, contributing to SDG 9: Industry, Innovation and Infrastructure, which in turn enables the industry to impact a range of other SDGs
- facilitating the use of mobile-enabled activities and scaling IoT solutions to power enterprise digitisation
- leveraging the role of the international community, UN agencies and multilateral development banks to prioritise investment in digital development
- tapping into the potential of AI, big data analytics and mobile innovation to address societal challenges.

Driving sustainable development through AI

Mobile operators are providing governments and public agencies with the AI solutions and big data analytics necessary to address a wide range of problems. Operators can deliver valuable tools to tackle pressing policy challenges, including climate change and pollution, the need for improved healthcare and transportation, and responses to epidemics. These tools enable governments to make informed decisions and to implement targeted strategies for sustainable development and resilient public services. Examples include the following:

- **Measuring CO2 emissions:** Telia Travel Emission Insights gives city and environmental planners the tools to measure and benchmark the CO2 emissions from different routes and modes of transport, prioritise which actions will have the biggest impact and create progress reports. The service combines anonymised, location-specific crowd movement data from Telia's mobile network with the CERO model of CO2 emissions developed at the Swedish Royal Institute of Technology.
- **Managing emergency services:** Turkcell has developed a real-time analytics tool, called Galata, which can process more than 100 billion events per day to enable Turkey's governmental emergency response and aid agencies to make better-informed, time-sensitive decisions before and during natural disasters.
- **Identifying flood risks:** XL Axiata, the Jakarta municipal government, and Nodeflux have developed a flood detection solution. Mobile sensor networks monitor and evaluate water levels in dams, sewers and waterways, as well as groundwater levels. AI is then used to predict flooding. This enables Jakarta's government to better anticipate floods, alert citizens and respond more effectively, resulting in less injury and loss of life and property.

These examples illustrate the transformative impact of mobile big data analytics and AI on both business and society. The potential for these technologies to unlock life-changing benefits is only just beginning to be seen. Inspired by this promise, the GSMA's AI for Impact is developing global partnerships to accelerate action and achieve impact in alignment with the SDGs.[15]

15. https://www.gsma.com/betterfuture/aiforimpact

3.2
Empowering women micro-entrepreneurs through mobile

Micro-enterprises play a significant role in shaping economies and societies, particularly in LMICs, where they are the dominant form of employment. It is estimated that there are more than 400 million micro-enterprises in emerging markets.[16] In low-income countries, 88% of working-age women earn income through self-employment, yet they are more likely than men to be disadvantaged when it comes to accessing the resources they need to start, run and grow a business.[17] This is because social norms and structural inequalities tend to shape women's access to finance, markets, business information, training and peer networks.

As the primary way people in LMICs access the internet, mobile phones can provide a gateway to business services, resources and information that women would not otherwise be able to access easily. Using a mobile phone for business can also enable women micro-entrepreneurs to better combine family and work life, as they can connect with customers and business contacts and conduct marketing, sales and financial transactions more conveniently. This becomes particularly transformative for women with limited time and mobility due to family responsibilities or societal norms.

The use of mobile phones can also contribute to increased incomes, business resiliency and household consumption.[18] In Tanzania, women who used smartphones and feature phones for their business and mobile money transactions experienced a 16–24% increase in household consumption.[19] Using mobile money services also allowed women entrepreneurs in Malawi to expand their business and save on transport costs.[20] Meanwhile, in Uganda, women entrepreneurs reported that using mobile made their business more profitable.[21]

16. Bridging the credit gap for Micro and Small Enterprises through digitally enabled financing models, CGAP and Dalberg, 2019
17. World Employment and Social Outlook: Trends 2022, ILO, 2022
18. Digital Adoption of MSMEs during COVID-19, Center for Financial Inclusion/ACCION, 2022
19. Mobile Phone Ownership Increases Poor Women's Household Consumption: A Field Experiment in Tanzania, Roessler, P. et al., 2018.
20. ICT Use and Livelihoods of Women Micro-enterprises in Malawi, Malanga, D. and Banda, M. 2021
21. Usage of Mobile Technology in Women Entrepreneurs: A Case Study of Uganda", Komunte, M, 2015

Figure 20

How mobile phones support the business activities of women micro-entrepreneurs

Access to markets

- Connect remotely with customers, suppliers, resellers, peers and partners to take orders, agree sales, organise delivery, order supplies and schedule appointments
- Market products via social communication platforms
- Find new customers, suppliers and resellers

Access to financial services

- Sending/receiving payments from customers and suppliers, bill payments and salary payments
- Access to business finance
- Access to savings products
- Access to insurance and other financial products

Business management

- Financial management and bookkeeping
- Store business/customer information
- Stock/inventory management
- Source business-related information on trends, competition, pricing and regulations
- New ideas and inspiration for product improvement

Access to training

- Business management
- Financial literacy
- Digital skills

Source: GSMA[22]

Although there are a small but growing number of mobile products and services bridging the gender gap, mobile ecosystem providers have further work to do.[23] Steps include starting more detailed gender-specific data collection and use, in addition to designing and delivering products and services with a deliberate focus on gender. Efforts are also needed to raise awareness and enhance the digital, financial and business skills of women micro-entrepreneurs. Finally, there is a need to expand agent networks that are culturally sensitive and accessible.

To address the scarcity of gender-specific data, the GSMA recently published a report analysing the results of a survey conducted among micro-entrepreneurs in LMICs. The survey focused on their use of mobile phones for business and the barriers they faced.[24] Some of the key findings are as follows:

- Women micro-entrepreneurs are less likely than men to own a mobile phone, own a smartphone and use mobile internet and digital financial services, including mobile money. Even when women micro-entrepreneurs use a mobile phone for business, they tend to use it for fewer business activities than their male counterparts.
- Making network calls is the main way that micro-entrepreneurs in all the survey countries use a mobile phone to communicate with customers and suppliers, especially women. Other channels, including instant messaging and video calls, are used significantly less.
- In nine of the 10 survey countries, women micro-entrepreneurs are less likely than men to be aware of every mobile-related business use case beyond communication. Even among micro-entrepreneurs who already use a mobile phone for their business, gender gaps are evident.

22. Empowering women micro-entrepreneurs through mobile, GSMA, 2023
23. ibid.
24. Understanding women micro-entrepreneurs' use of mobile phones for business, GSMA, 2023

04

Mobile industry enablers

Spectrum policy: meeting connectivity needs

Spectrum availability and its effective licensing encourage the investment required to expand mobile access, meet increases in demand for data services and enhance the quality and range of services offered.

The World Radiocommunication Conference 2023 (WRC-23) has set the agenda for spectrum planning up to the end of the 2030s, with new spectrum harmonisation in low and mid-bands. Now that this international agreement is in place, countries can turn to the execution of their decisions in national allocation tables.

Harmonisation of the 5G pioneer band at 3.5 GHz was completed throughout Eurasia, the Americas and Europe, the Middle East and Asia at WRC-23. The 3.5 GHz range is also an important part of the mid-band spectrum needed to ensure that countries have delivered a total of 2 GHz, on average, of mid-band per market by 2030.

Mid-band 5G spectrum will drive an increase of more than $610 billion in global GDP in 2030, accounting for almost 65% of the overall socioeconomic value generated by 5G. Low and high bands are also necessary to deliver the most innovative services to everyone, irrespective of if they are on a factory floor or a rural location. Low bands will account for around $130 billion of economic value in 2030, and high-band spectrum will add another $220 billion, for a total of close to $1 trillion in additional GDP by the end of the decade.

While high-band (mmWave) spectrum was identified in 2019, WRC-23 also found new mobile spectrum in low bands, including 600 MHz. Discussion on this valuable spectrum for digital equality will continue up until WRC-31, and more mobile development is anticipated.

> Mid-band 5G spectrum will drive an increase of more than $610 billion in global GDP in 2030, accounting for almost 65% of the overall socioeconomic value generated by 5G

Spectrum licensing, pricing and conditions

The results at WRC-23 now need to be incorporated into national tables and plans before being effectively licensed at the correct time. As part of this work, countries will benefit from the development of spectrum roadmaps that consider market dynamics and growth in demand for mobile data. Roadmaps are an important means of ensuring there is sufficient spectrum for future demand from consumers and new technologies. Information on spectrum releases is critical for mobile operators to prepare investment plans, secure financing and develop arrangements for deploying different technologies.

The timely release of technology- and service-neutral spectrum bands can deliver a positive impact on consumers. Long-term value, innovation and cost reductions need to be provided through relatively short technology cycles, and if spectrum is released sooner, operators have more time to invest in more efficient and sustainable new technologies to make them available nationwide. More spectrum also eases capacity constraints in urban areas so that operators are better able to invest in rural areas. Conversely, unnecessary delays to spectrum awards risk harming mobile broadband service rollouts, leaving more people unconnected and weakening the positive enablement effect that mobile can have on the reduction of carbon emissions.

Spectrum roadmaps can help define when spectrum should be made available, but barriers still remain. Setting aside spectrum for specific uses such as local or bespoke private networks is a frequent – and unnecessary – barrier to meeting demand and should be avoided in priority 5G bands (i.e. 3.5, 26 and 28 GHz). Approaches such as leasing or sharing are typically better options in these situations, while private mobile networks are commonly provided by MNOs within licensed public mobile spectrum.

The cost of spectrum also has a major impact. Governments and regulators should assign 5G spectrum to support their digital connectivity goals rather than as a means of maximising state revenues. Effective spectrum pricing policies are vital to support better-quality and more affordable 5G services. In turn, this will help address issues such as the usage gap. High reserve prices, artificially limited spectrum supply (including the set-asides mentioned above) and poor auction design can all have a negative impact due to suppressed investment capabilities (i.e. slower mobile broadband, limited coverage and higher prices for consumers). Auctions are the most common mechanism to assign spectrum and have shown, if well designed, to be successful in delivering better mobile services rather than maximising state revenues. But auctions are not the only means of assigning spectrum. Other methodologies, such as direct assignments and beauty contests, can also be successful for specific market circumstances.

> Governments and regulators should assign 5G spectrum to support their digital connectivity goals rather than as a means of maximising state revenues

Regulators should also apply the right 5G spectrum licence terms and conditions and carefully consider best practice for awarding spectrum. Licences should be technology- and service-neutral to allow the upgrade of existing bands to 5G. Consulting with the industry will help maximise consumer benefits and ensure 5G is available for all. To maximise the benefits of 5G, governments and regulators should:

- make available sufficient 5G spectrum and avoid limiting the supply via set-asides
- set modest reserve prices and annual fees to let the market determine spectrum prices
- carefully consider auction design to avoid unnecessary risks for bidders (e.g. avoiding mismatched lot sizes, which create artificial scarcity)
- develop and publish a 5G spectrum roadmap with the input of stakeholders to help operators plan effectively around future availability
- consult stakeholders on the award rules and licence terms and conditions, taking them into account when setting prices (onerous obligations reduce the value of spectrum).

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