

The Mobile Economy 2025



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

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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

Today, mobile connectivity is not only a means for people to communicate, but also an important tool for governments and other authorities to stimulate socioeconomic progress, support vulnerable people and build innovative solutions to enhance the well-being of society. Mobile connectivity has helped provide much-needed relief to victims of conflicts and various disasters around the world, and 4G and 5G networks, which now support more than 7 billion connections collectively, have formed the basis for the development of many smart solutions across various economic sectors.

Mobile technologies and services now generate around 5.8% of global GDP, a contribution that amounts to \$6.5 trillion of economic value added. By 2030, this figure will rise to almost \$11 trillion, or 8.4% of GDP. Much of this will be driven by countries around the world increasingly benefiting from the improvements in productivity and efficiency brought about by the increased take-up of mobile services and digital technologies, including 5G, IoT and AI.

Meanwhile, as of February 2025, 72 operator groups had signed up to the GSMA Open Gateway initiative, accounting for 78.5% of mobile connections globally. Open Gateway use cases around mitigating fraud and other security threats underline the commitment of the industry to ensuring a safe digital environment for individuals and enterprises.



Key trends shaping the mobile ecosystem

The focus shifts to realising 5G's full potential

Operators and other 5G ecosystem players, especially in pioneering markets, have shifted their focus to deploying advanced 5G networks, with a view to delivering enhanced services to consumers and businesses. 5G standalone (SA) networks will be pivotal to fully realising the capabilities of 5G-Advanced. After a slowstart, the rollout of 5G SA networks is beginning to gain momentum. As of December 2024, 60 operators globally offered commercial 5G services on SA networks, with Asia Pacific leading the way, followed by Europe.

Energy efficiency is a top priority

Energy efficiency within networks continues to be a top priority for operators and network vendors in the short-to-medium term, ahead of many other industry topics. There are two main factors supporting the focus on energy efficiency in 2025 and beyond: costs and sustainability. Energy typically accounts for approximately 20% of operators' total operational costs, according to a GSMA Intelligence survey, while improving energy efficiency has become crucial to meeting the expectations of stakeholders, including investors and customers, around sustainability.

AI opens up enterprise revenue opportunities

The telecoms industry has been at the forefront of AI adoption, with application in areas such as network operations, energy optimisation, customer call centres for automatic language recognition and retail operations. While early deployments have focused on internal solutions to improve network performance and customer services, there is a growing shift towards developing AI solutions for external customers, particularly in the enterprise segment, as a means to generate new revenue opportunities.

GSMA Intelligence enterprise and consumer surveys reveal key insights

In 2024, GSMA Intelligence conducted surveys on digital transformation trends among enterprises and behaviour/technology adoption trends among consumers. Enhancing security and protecting against cybersecurity threats ranked as the top digital transformation objective among enterprises. This reflects the expanded attack surface facing enterprises, as well as the threat posed from new forms of AI and rapid digitisation. For consumers, video streaming topped the list of add-ons to 5G bundles. This highlights the strong demand for digital entertainment services and reinforces the importance of bundling content offerings with 5G plans.





Policies for growth and innovation

Mobile's ability to deliver economic growth relies on spectrum. The mobile ecosystem is already working with governments to plan spectrum for 6G, which will come into use around the 2030s. Channel sizes will increase from 100 MHz in the 5G era to 200–400 MHz in the next phase of mobile evolution.

Spectrum must be effectively licensed at the correct time. To deliver this, countries would 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 plans that enable enterprise digitalisation are also part of roadmap planning. This means that operators will require spectrum not just for consumers but for industrial connectivity. Now that connecting enterprises is a maturing sector, the practice of setting aside spectrum for specific uses is being limited. Setting aside spectrum for specific uses, such as local or bespoke private networks, does not encourage private networks (as had been initially thought), but harms the amount of spectrum available to provide industrial connectivity through mobile operators. Small set-asides to encourage experimentation and creativity (e.g. in 4.1–4.2 GHz or in non-core bands) are continuing, which are less disruptive.

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

2024 **5.8bn**

71% penetration rate*

2030 **6.5bn**

76% penetration rate*

*Percentage of population

Smartphones

(percentage of connections)



Excluding licensed cellular IoT



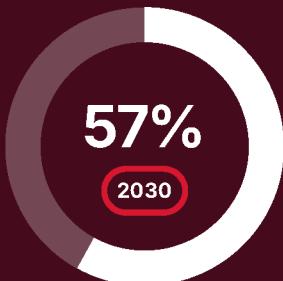
4G (percentage of connections)



Excluding licensed cellular IoT



5G (percentage of connections)



Excluding licensed cellular IoT



Mobile internet subscribers

2024 **4.7bn**

58% penetration rate*

2030 **5.5bn**

64% penetration rate*

*Percentage of population



Operator revenues and investment

2024 **\$1.08tn**

2030 **\$1.25tn**

Operator capex of **\$1.3 trillion** for the period 2024–2030



Mobile's contribution to GDP

2024 **\$6.5tn**

5.8% of GDP

2030 **\$11tn**

8.4% of GDP



Public funding

\$600bn

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

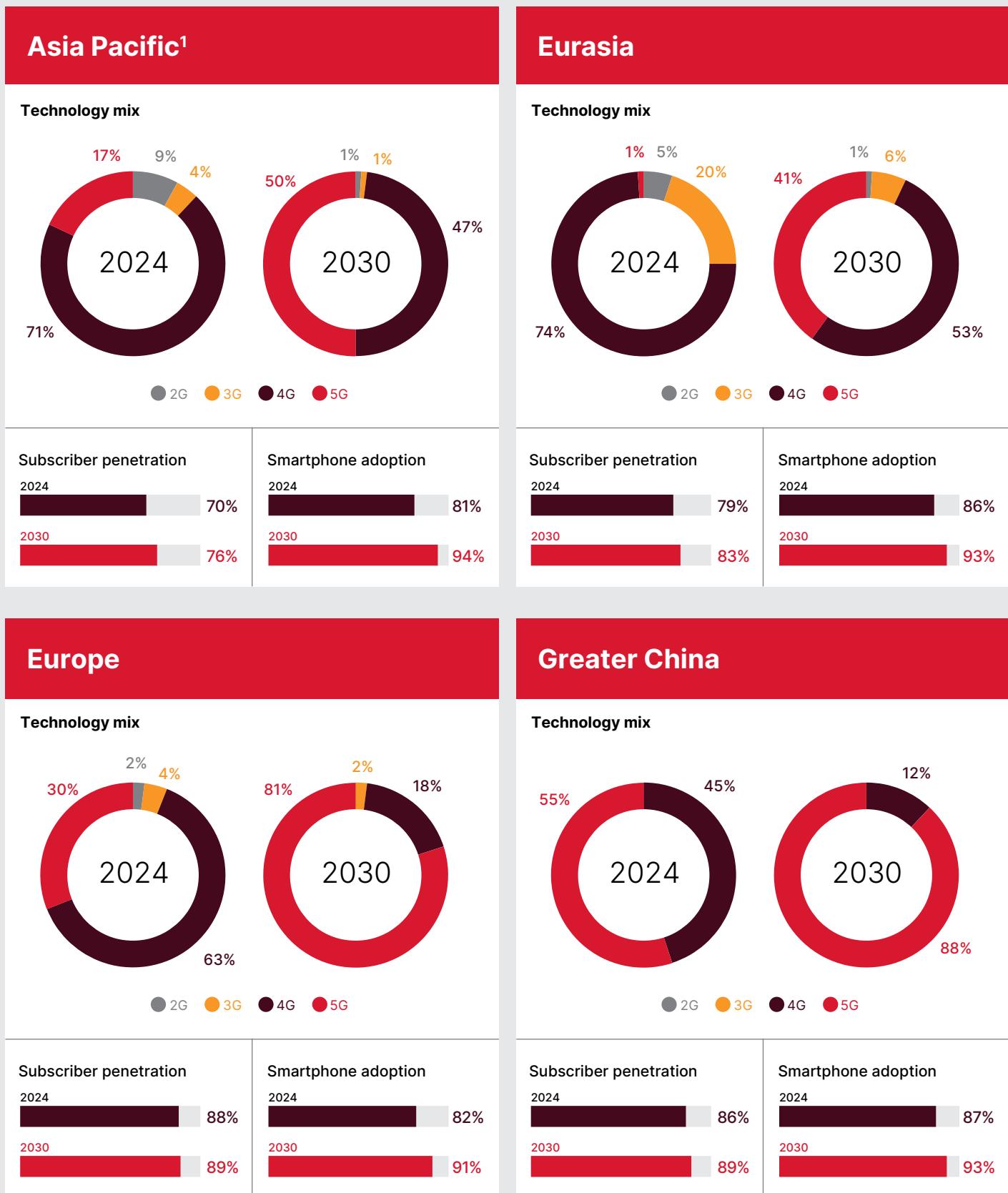


Employment

24m jobs directly supported by the mobile ecosystem

16m jobs indirectly supported

Subscriber and technology trends*

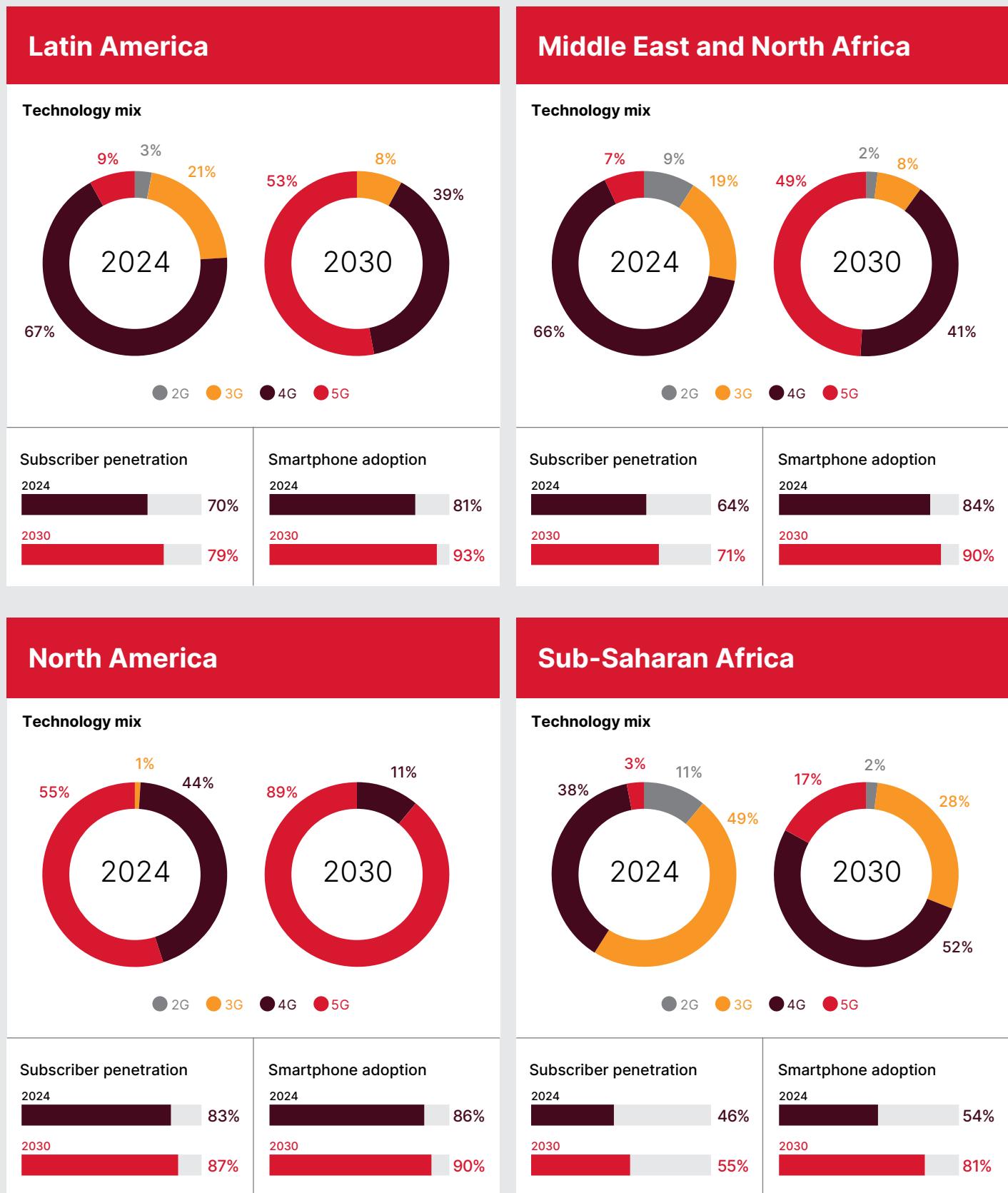


* Percentage of total connections (excluding licensed cellular IoT)

Note: Totals may not add up due to rounding.

1. Asia Pacific in this report excludes Greater China unless otherwise stated.

Subscriber and technology trends*



* Percentage of total connections (excluding licensed cellular IoT)

Note: Totals may not add up due to rounding.

01

The mobile industry in numbers



Mobile market update

Almost 60% of the world's population subscribed to mobile internet at the end of 2024

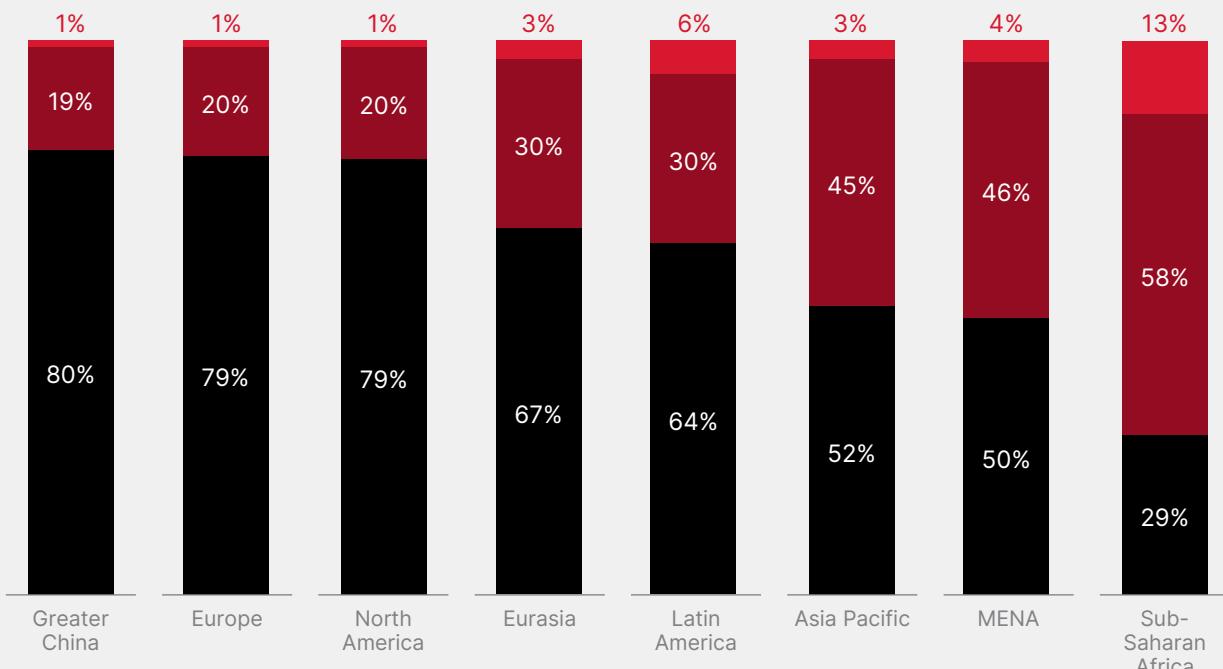
By the end of 2024, 58% of the world's population used mobile internet, equating to 4.7 billion users – an increase of 2.2 billion since 2015. However, the growth rate at which people are adopting mobile internet has slowed in recent years. Around 110 million people started using mobile internet in 2024, which is slightly down on the 2022 and 2023 figures, and significantly lower than growth in 2015–2021, when more than 200 million people became connected each year.

Of the 3.4 billion people who remain unconnected to mobile internet, almost 90% live in an area already covered by mobile broadband but do not use mobile internet. With mobile internet adoption outpacing network expansion, this usage gap has continued to shrink, standing at 38% by the end of 2024. However, the usage gap remains nine times the size of the coverage gap, and is over 45% in Asia Pacific, the Middle East and North Africa, and Sub-Saharan Africa.

Figure 1
Mobile internet connectivity by region, 2024

Percentage of population

Coverage gap
Usage gap
Connected



Source: GSMA Intelligence

There will be almost 800 million new mobile internet subscribers by 2030

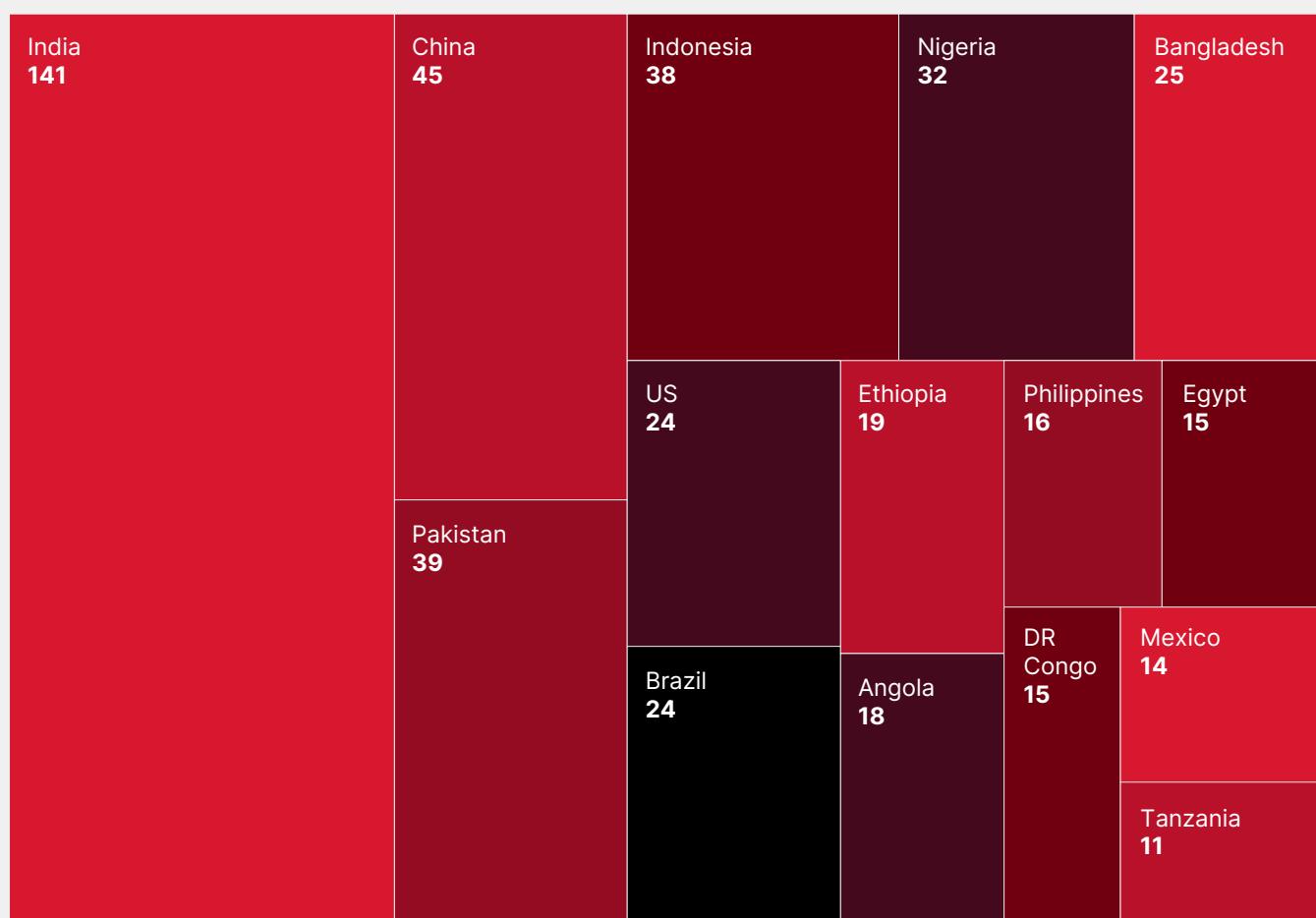
Despite near saturation in high-income countries, there is still room for growth in mobile internet subscribers across many low- and middle-income countries (LMICs). Consequently, mobile internet penetration is projected to increase to 5.5 billion by 2030, encompassing 64% of the global population.

Almost 40% of new mobile internet subscribers between 2025 and 2030 are expected to come from Asia Pacific, driven by growth in India, Pakistan and Indonesia. In the same period, Sub-Saharan Africa is expected to account for nearly a quarter of new mobile internet subscribers, while Latin America and the Middle East and North Africa are each anticipated to contribute just over 10%.

Figure 2

Top 15 markets by increase in mobile internet subscribers, 2025–2030

Million



Source: GSMA Intelligence

By 2028, 5G adoption will surpass 4G adoption

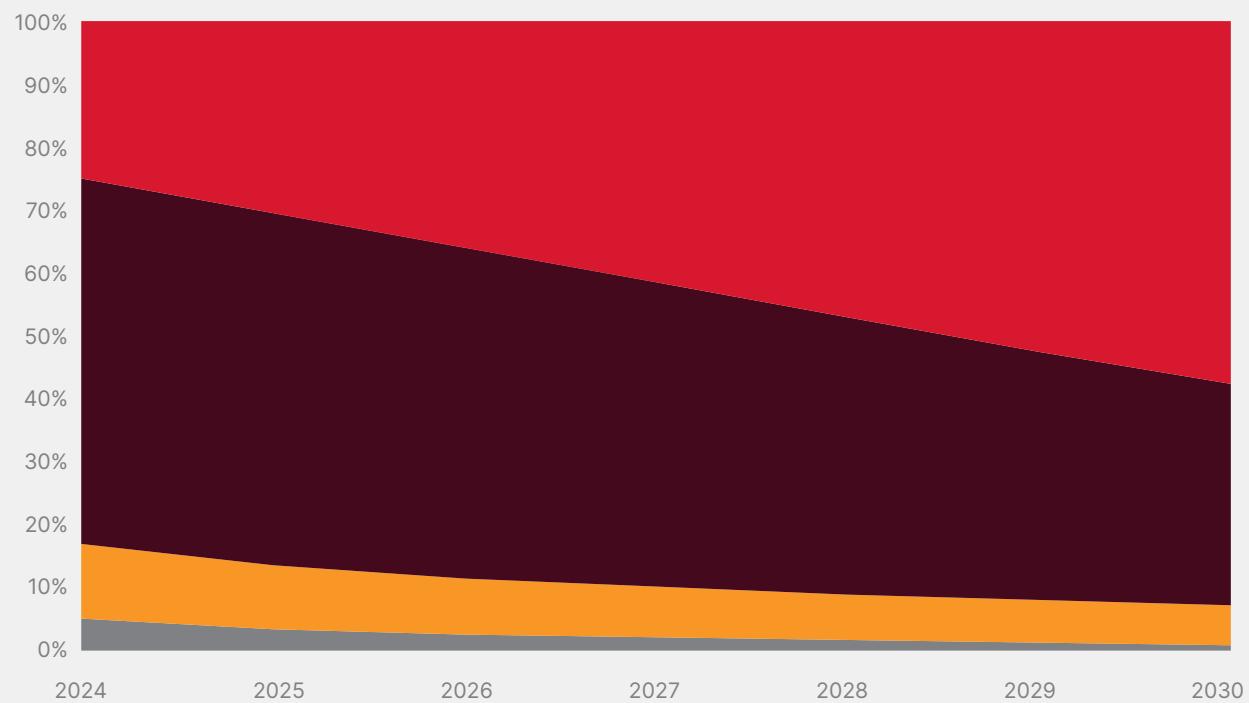
The share of mobile connections on 4G is beginning to wane as 5G commercialisation gathers pace. As of December 2024, 305 operators in 121 markets had launched commercial 5G mobile services. More countries are expected to follow, with 80 operators from 60 markets announcing launch plans for mobile 5G services in the coming years.

With 2G and 3G networks accounting for less than 20% of mobile connections worldwide, legacy networks are being phased out in many regions. By the end of November 2024, a total of 152 networks had been shut down and another 131 networks were planned to be shut down by 2030.² Asia Pacific and Europe lead the way, accounting for around 70% of network sunsets to date. Network sunsets enable more efficient spectrum use while also reducing energy consumption.

Figure 3
Mobile adoption by technology

Percentage of total connections

5G —
4G —
3G —
2G —



Source: GSMA Intelligence

2. [Spectrum: five trends to watch in 2025](#), GSMA Intelligence, December 2024

The number of 5G connections worldwide surpassed 2 billion at the end of 2024

By the end of 2024, 5G accounted for more than half of mobile connections in North America, Greater China and developed Asia Pacific. Growth will intensify in the second half of this decade, with 5G adoption set to exceed 80% in leading 5G markets by 2030.

It is still early days for 5G adoption in most emerging 5G markets. However, 5G adoption will gather pace over the next few years with the arrival of cheaper 5G smartphones and new spectrum assignments. As a result, 5G is expected to account for almost 40% of total mobile connections in LMICs (excluding China) by the end of the decade, equivalent to 2.3 billion connections.

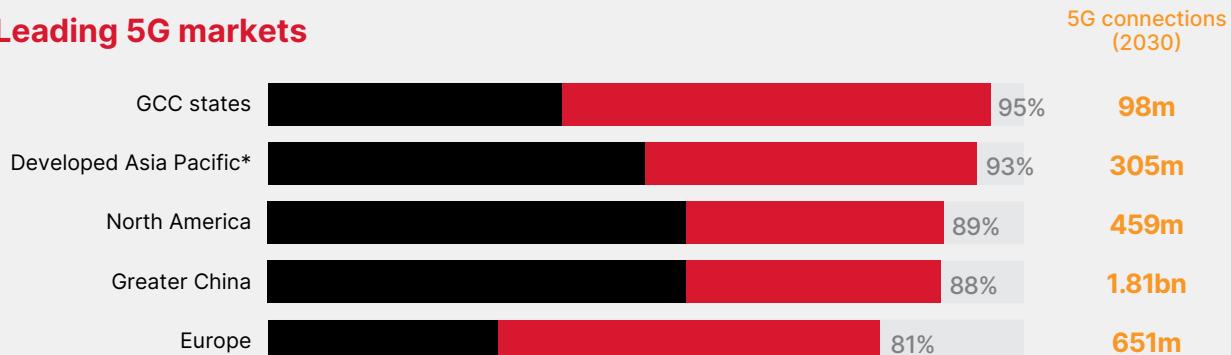
Figure 4

5G adoption in leading and emerging 5G markets

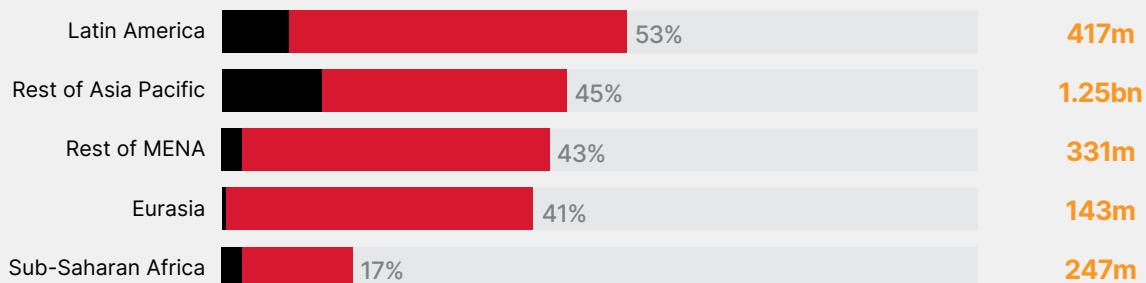
2025-2030 increase ■
2024 ■

Percentage of total connections

Leading 5G markets



Emerging 5G markets



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

5G FWA commercialisation shows good momentum

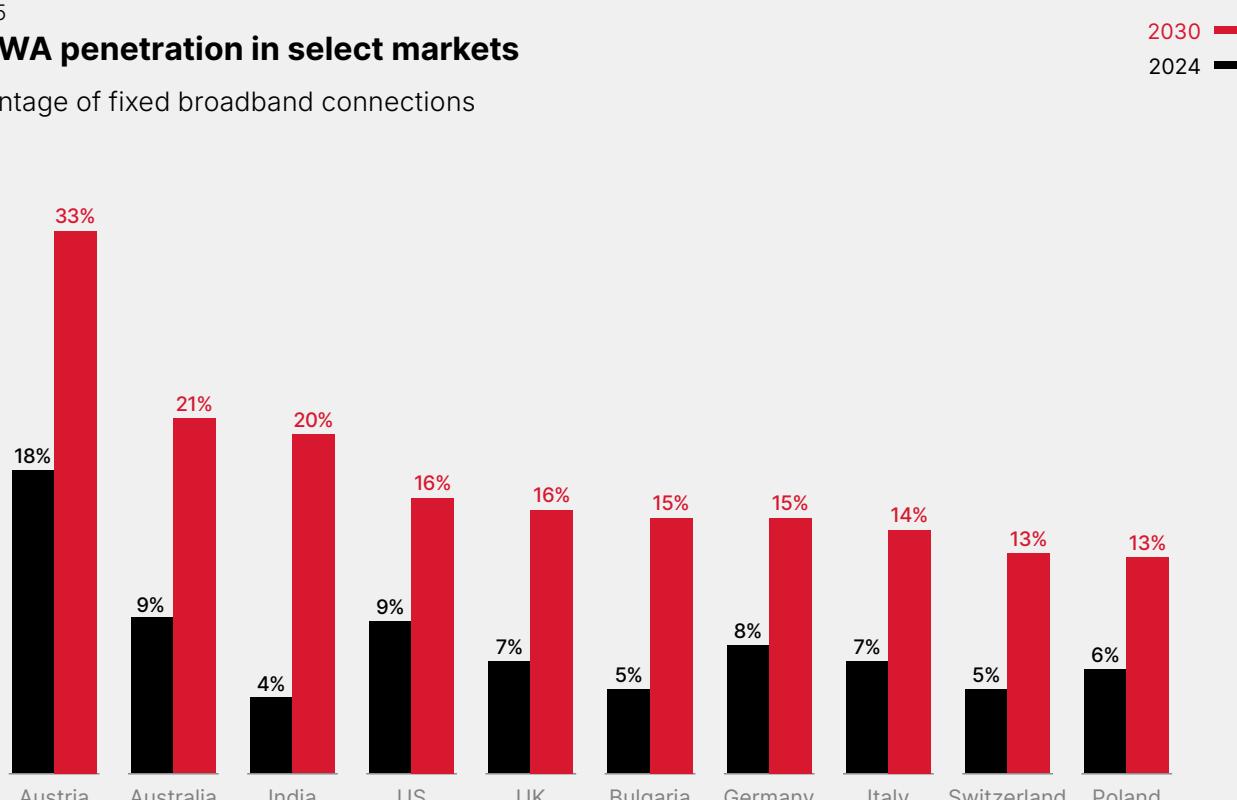
5G fixed wireless access (FWA) has emerged as an important use case in the consumer and enterprise segments, complementing operators' enhanced mobile broadband (eMBB) offerings. As of December 2024, 146 operators in 72 markets had launched 5G FWA services, while a further 21 operators in 16 markets have announced plans to launch 5G FWA services in the coming years.

With 11.6 million 5G FWA connections at the end of 2024, the US is the world's largest 5G FWA market, followed by India at 2.3 million connections. Three markets will have a 5G FWA penetration of 10% or more by the end of 2025 (as a percentage of fixed broadband connections): Austria (23%), the US (11%) and India (10%). Many more countries are set to hit this figure by the end of the decade.³

Figure 5

5G FWA penetration in select markets

Percentage of fixed broadband connections



Source: GSMA Intelligence

3. [Fixed and pay-TV markets: five trends to watch in 2025](#), GSMA Intelligence, December 2024

Mobile data traffic will rise threefold in the period to 2030

Mobile data traffic has experienced massive growth globally over the past decade, driven by the increasing adoption of smartphones and growing consumption of both short-form and long-form video content. These trends are expected to continue with the growing consumption of video on social media platforms and the rise of AI-generated content and services, which will drive new demands on mobile networks, particularly for uplink traffic.

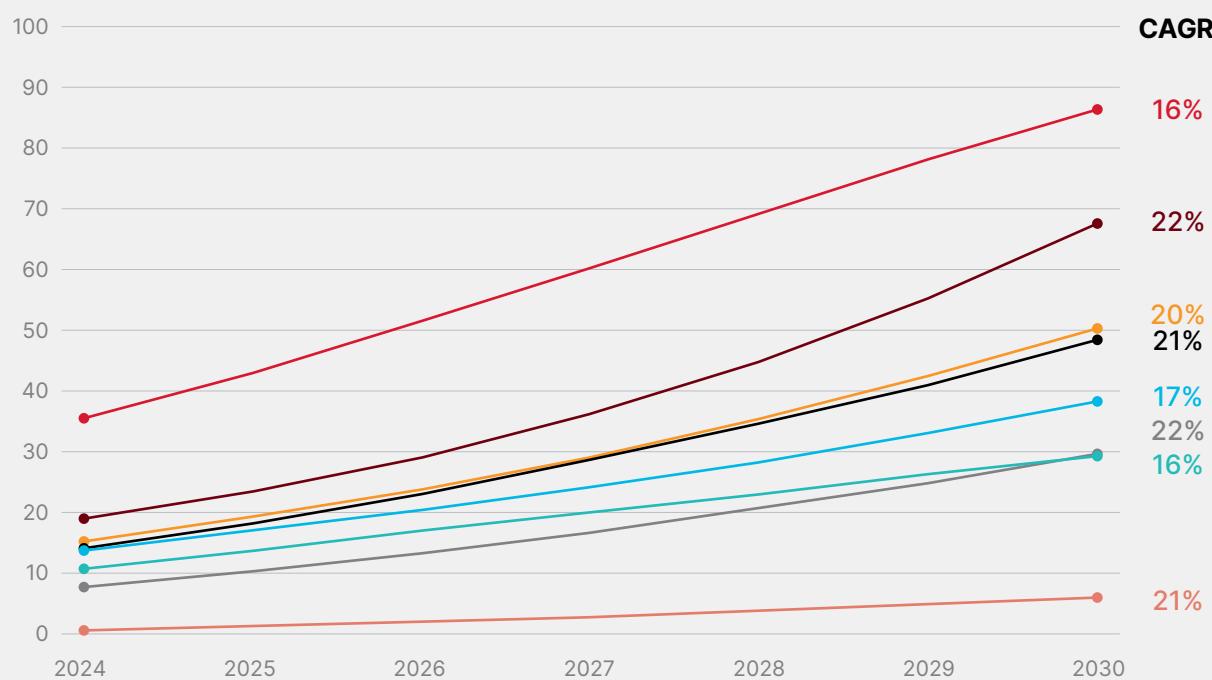
A further boost to data traffic could come from the adoption of extended reality devices; however, these remain niche and are only likely to meaningfully contribute towards data traffic growth nearer the end of the decade. Smartphones remain the dominant consumer device and are projected to make up 91% of mobile connections by 2030, up from 80% in 2024.⁴ This increase is supported by the growing availability of financing plans and more affordable devices in LMICs.

Figure 6

Mobile data traffic per mobile connection

GB per month

North America ■ Eurasia ■
Greater China ■ Latin America ■
Asia Pacific ■ MENA ■
Europe ■ Sub-Saharan Africa ■



Source: GSMA Intelligence

4. Excluding licensed cellular IoT connections

Mobile revenue growth is expected to remain tepid through to 2030

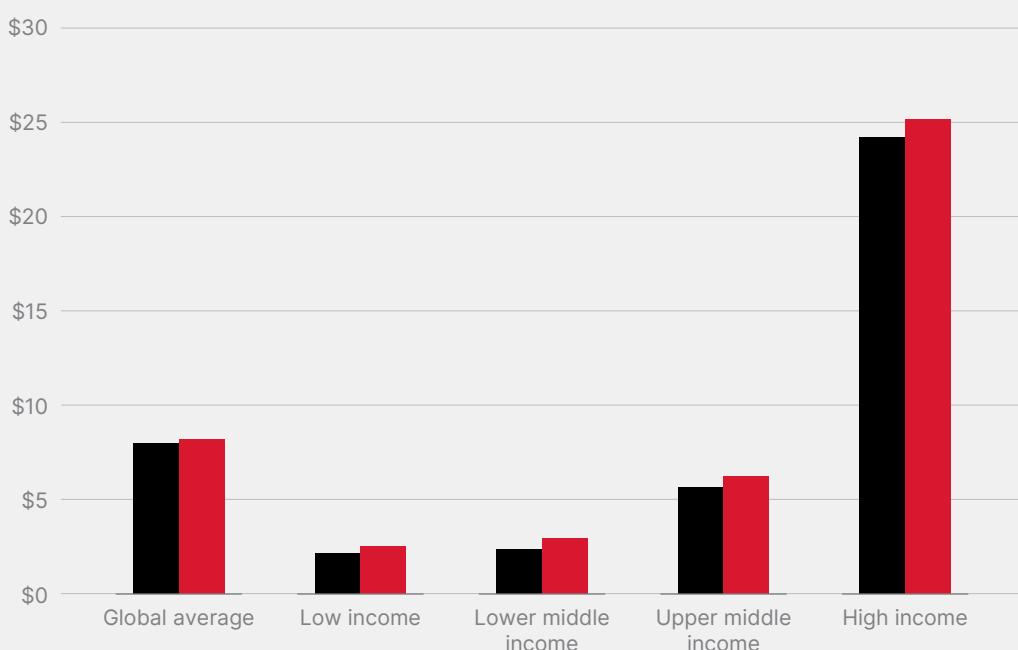
The highly competitive nature of the mobile industry market is restricting prospects for revenue growth, as highlighted by the weak projections for mobile average revenue per user (ARPU) during this decade. ARPU growth will be strongest in LMICs, with a projected CAGR of 3% between 2024 and 2030 (versus 1% in high-income countries).

The limited prospects for mobile revenue growth mean there is increased pressure on operators to diversify their services and generate new revenue streams in adjacent areas. The enterprise segment remains a focus for the industry, with the launch of the next iteration of 5G networks an important underpinning for growth prospects in this area.

Figure 7

Monthly ARPU by mobile connection, by income group

2030 —
2024 —



Source: GSMA Intelligence

Operators step up their revenue diversification efforts

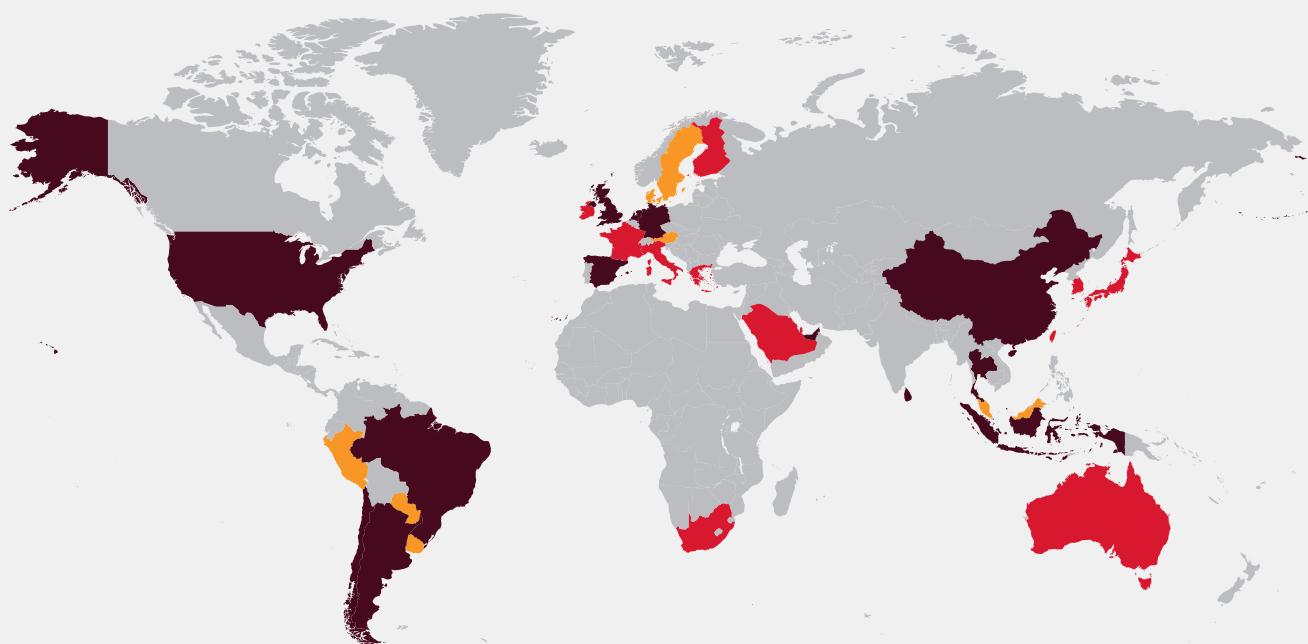
Pressure on connectivity revenues is driving efforts in new areas. One example is the GSMA Open Gateway initiative, which aims to leverage the power of mobile networks globally by opening up access to network capabilities through common application programming interfaces (APIs). As of February 2025, 72 operator groups had signed up to the GSMA Open Gateway initiative, accounting for 78.5% of mobile connections globally. The focus in 2025 will be on translating these commitments into further commercial launches.

Mitigating fraud and other security threats has been the most prevalent use case of APIs deployed by mobile operators and their partners. There are a range of APIs in this domain, including SIM Swap, Number Verification and One Time Password SMS. The use of Open Gateway APIs for payments and network-related functions (e.g. quality of service and edge compute) is still nascent and expected to grow. Developers value these capabilities, with around 40% citing edge and payments as the most attractive to their enterprise customers (jointly the second highest after security applications).⁵

Figure 8

Number of GSMA Open Gateway API launches, by country

High —
Medium —
Low —



Data correct to 26 February 2025
Source: GSMA Intelligence

5. [GSMA Open Gateway: State of the Market, H2 2024](#), GSMA Intelligence, 2024

1.2

Economic impact of mobile⁶

Mobile added \$6.5 trillion of economic value to the economy in 2024

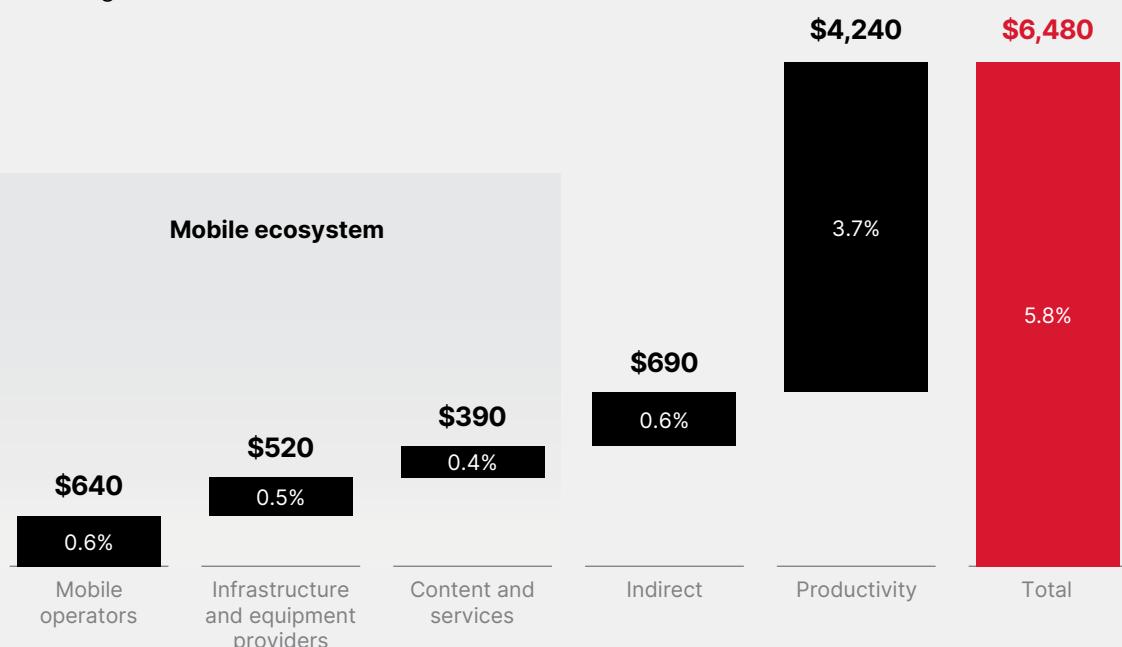
In 2024, mobile technologies and services generated 5.8% of global GDP, a contribution that amounted to \$6.5 trillion of economic value added. The greatest benefits came from the productivity effects reaching over \$4 trillion, followed by the direct contribution of the mobile ecosystem generating \$1.6 trillion.

The impacts of mobile technologies include connectivity and digital transformation. The former refers to the use of mobile technologies, while the latter involves the integration by enterprises of advanced mobile and digital technologies such as 5G, IoT and AI.

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

Figure 9
Economic contribution of mobile, 2024

Billion, percentage of GDP



Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

6. Compared to previous editions of the Mobile Economy report, we have made adjustments to the economic impact methodology by incorporating the wider impacts of digitalisation, including for enterprises and consumers. Further details can be found in the Mobile Economy Economic Impact methodology.

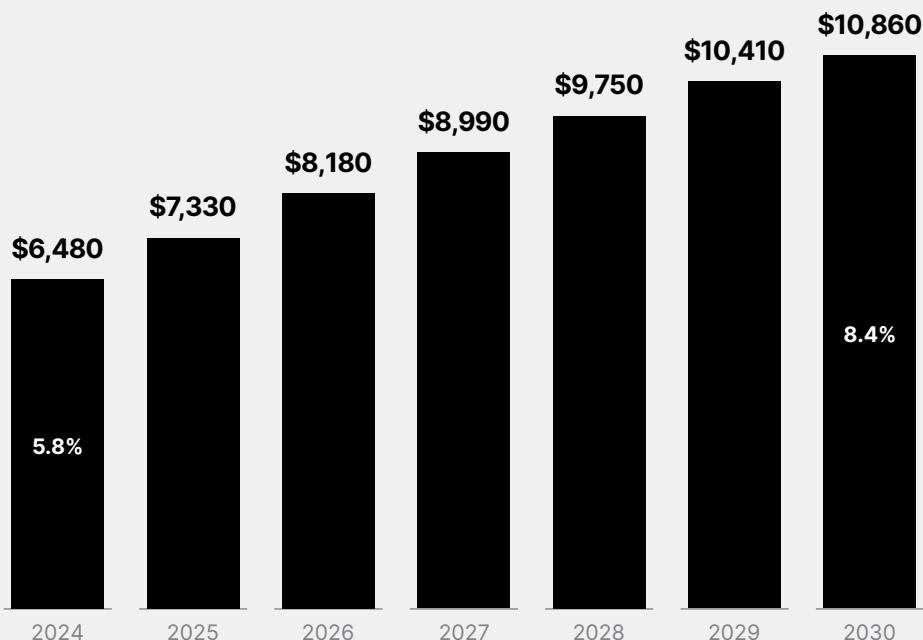
Mobile's economic contribution will reach nearly \$11 trillion by 2030

By 2030, mobile's contribution to the global economy is expected to reach almost \$11 trillion, or 8.4% of GDP. Much of this will be driven by countries around the world increasingly benefiting from the improvements in productivity and efficiency brought about by the increased take-up of mobile services and digital technologies, including 5G, IoT and AI.

Figure 10

Economic impact of mobile

Billion, percentage of GDP



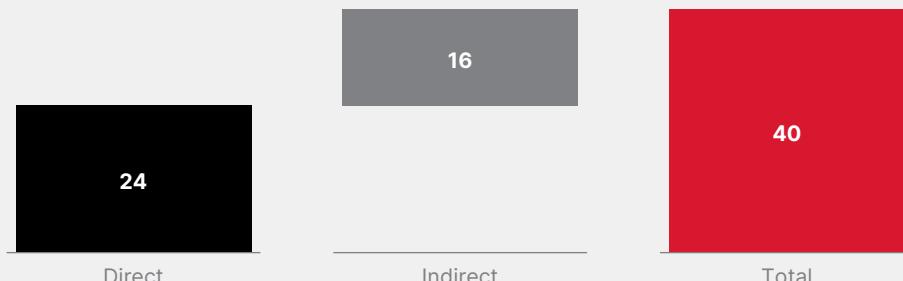
Source: GSMA Intelligence

The global mobile ecosystem supported around 40 million jobs in 2024

Figure 11

Employment impact of the mobile ecosystem, 2024

Jobs (million)



Source: GSMA Intelligence

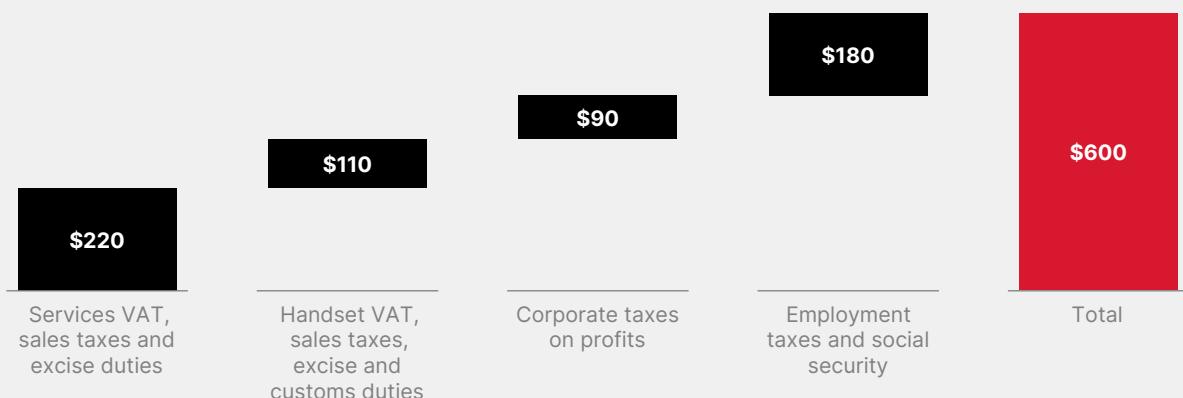
The fiscal contribution of the mobile ecosystem reached \$600 billion in 2024

In 2024, the mobile sector made a substantial contribution to the funding of the public sector, with around \$600 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, which generated \$180 billion.

Figure 12

Fiscal contribution of the mobile ecosystem, 2024

Billion



Source: GSMA Intelligence

5G and its ecosystem will significantly boost GDP by the end of the decade

Mobile technologies and the ensuing digital transformation will boost the economy by nearly \$11 trillion in 2030. Much of this will materialise in regions with a higher integration of digital technologies in enterprises, including North America, Europe and Asia Pacific. Towards the end of the decade, LMICs are expected to realise an increasing proportion of economic benefits as mobile technology achieves greater scale and widespread adoption. However, current adoption of more advanced technologies in LMICs is lagging behind adoption in high-income countries.

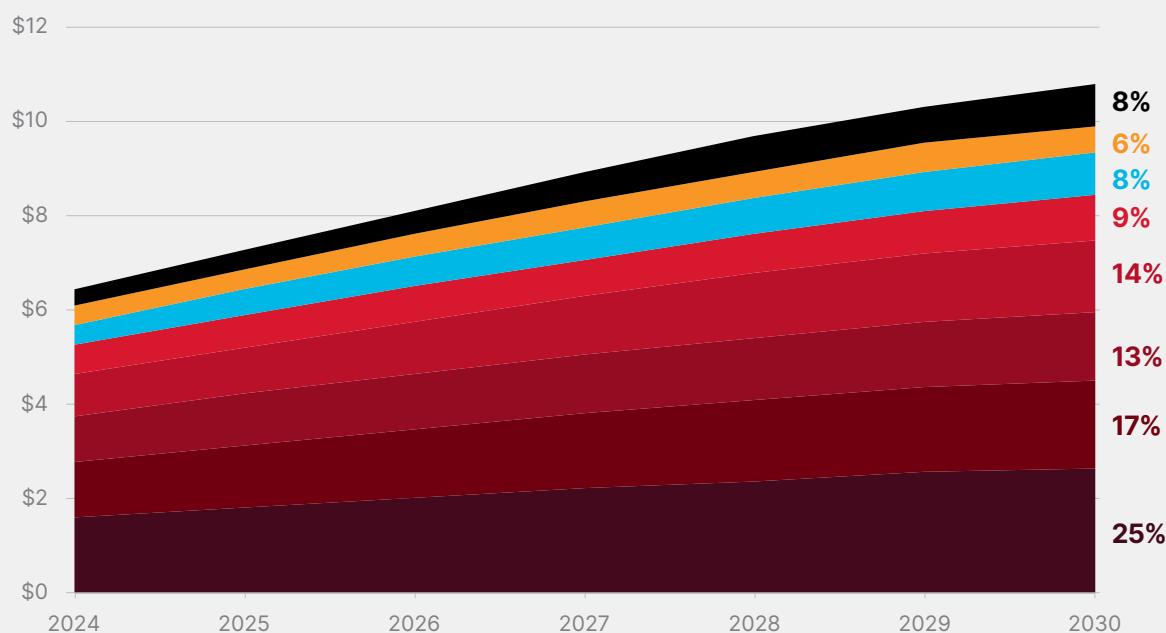
Mobile technologies are expected to benefit all sectors of the global economy, although some industries will benefit more than others due to their ability to incorporate the latest wave of digital technologies, including 5G, IoT and AI. The benefits of digital transformation will primarily be driven by the enterprise segment. These gains will stem from new revenue streams and improvements in productivity and efficiency enabled by the growing adoption of digital technologies. Between 2024 and 2030, 25% of benefits are expected to originate in the manufacturing sector.

Figure 13

Mobile technologies' contribution to GDP by industry, 2024 –2030

Trillion

ICT — Public administration —
Agriculture — Construction and real estate —
Finance — Accommodation and food services —
Services — Manufacturing —



Source: GSMA Intelligence

02

Mobile industry trends





2.1

5G: the industry focus shifts to realising 5G's full potential

5G is now in its sixth year since launch and is commercially available in over 120 countries around the world, underlining the technology's growing maturity and reach. By the end of this year, 5G connections will account for nearly a third of total mobile connections globally. For comparison, 3G and 4G accounted for 10% and 15% of total connections at the same period in their respective deployment cycles. The rapid uptake of 5G, relative to earlier generations, has been driven by a combination of factors, including the availability of cheaper devices (especially in lower-income markets), increased demand from consumers and businesses seeking faster speeds, and operator investment in spectrum and infrastructure upgrades.

5G momentum is expected to continue, with over 80 operators across more than 60 markets intending to launch commercial 5G services in the coming years. Most of the new 5G launches will be in emerging markets, where regulators are increasingly making efforts to issue 5G permits and spectrum to keep pace with global technology trends. In Egypt, for example, the National Telecommunications Regulatory Authority (NTRA) granted 5G licences to Vodafone Egypt, Orange Egypt and e& Egypt in October 2024, after Telecom Egypt received its 5G licence earlier in the year, marking a significant step towards 5G deployment.

Advanced networks and innovation fuel new offerings

5G has no doubt revolutionised mobile technology, with consumers and businesses benefiting from some of its key features, notably faster speeds. Insights from the GSMA Intelligence consumer survey show that nearly half of 5G users have added or are interested in add-ons, compared to 33% for 4G users, with video streaming being the most popular add-on. Meanwhile, 5G FWA remains the most appealing use case for consumers, according to the same survey. By the end of December 2024, there were 144 5G FWA networks, representing 48% of 5G mobile networks, in 70 countries around the world.

Despite the progress so far, the broad consensus among industry players is that 5G still has a long way to reach its full potential. In practice, realising the technology's potential involves the development and mass adoption of new use cases that can have a transformational impact on consumers and businesses and support the long-term financial sustainability of the mobile industry. Digital innovation

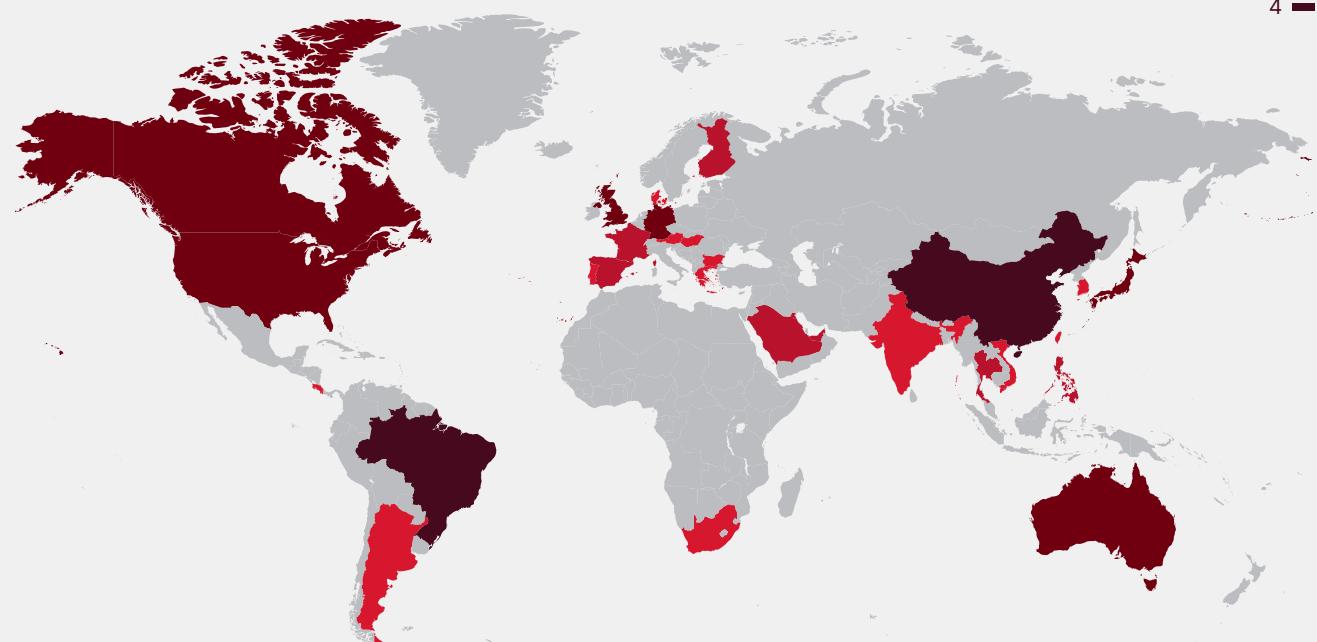
across verticals and having a network that enables advanced 5G features and capabilities are two critical factors required to realise the technology's potential.

In this context, operators and other 5G ecosystem players, especially in pioneering markets, have shifted their focus to deploying advanced 5G networks, with a view to delivering enhanced services to consumers and businesses. A first step in this journey for operators is the rollout of 5G services based on the standalone (SA) network architecture. After a slow start, the rollout of 5G SA networks is beginning to gain momentum. According to the GSMA Intelligence network transformation survey, 5G SA is a top investment priority for more than 50% of operators surveyed. As of December 2024, 60 operators globally offered commercial 5G services on SA networks, with Asia Pacific leading, followed by Europe. Together, these two regions account for two thirds of commercial SA networks.

Figure 14

Number of operators that have deployed 5G SA, by country

- 1
- 2
- 3
- 4



Data correct to December 2024
Source: GSMA Intelligence



5G SA networks will be crucial to fully realising the capabilities of 5G-Advanced – the next phase of 5G technology, which will improve network performance and enable new applications. 5G-Advanced has risen to the top of the list of operator technology priorities: 80% of operators surveyed in the GSMA Intelligence operator survey intend to launch 5G-Advanced within two years after the release of 5G-Advanced standards, and more than 90% intend to launch 3–4 years after the release of standards. While this may seem rather optimistic, it emphasises the confidence in the potential of the technology to support B2B revenue goals – ahead of other much-talked-about technologies, such as AI, network API exposure and private networks, according to the GSMA Intelligence Network Transformation Survey 2024.

Operators in several countries have begun to announce 5G-Advanced service launches and take steps to develop innovative solutions for consumers and enterprises, such as the following:

- **Verizon** has launched enhanced video calling on iPhones by using 5G-Advanced features. These enable network slicing to power a service that improves connectivity in congested areas. The enhanced video calling provides a better experience across apps, including Zoom, FaceTime and WhatsApp, minimising disruptions for business users.
- **China Mobile** used its 5G-Advanced network to create a new experience for spectators during the 2024 Shanghai marathon, with 5G-Advanced devices worn by runners used to deliver live 3D broadcasts of the race. China Mobile also uses the technology to offer differentiated services, with upgrade options generating incremental revenues.
- **Du** has launched a 5G-Advanced Commercial Innovation Centre to explore how the capabilities of 5G-Advanced can create innovative new services. The Innovation Centre, based in Dubai, will work to develop new services in the consumer, home and enterprise segments, leveraging 5G-Advanced's improved capabilities over traditional 5G.

5G-Advanced has risen to the top of the list of operator technology priorities

2.2

Energy efficiency: a top priority for the industry

Energy efficiency has gained significant attention in recent years due to energy price increases and the advent of 5G technology. Energy efficiency continues to be a top priority for operators and network

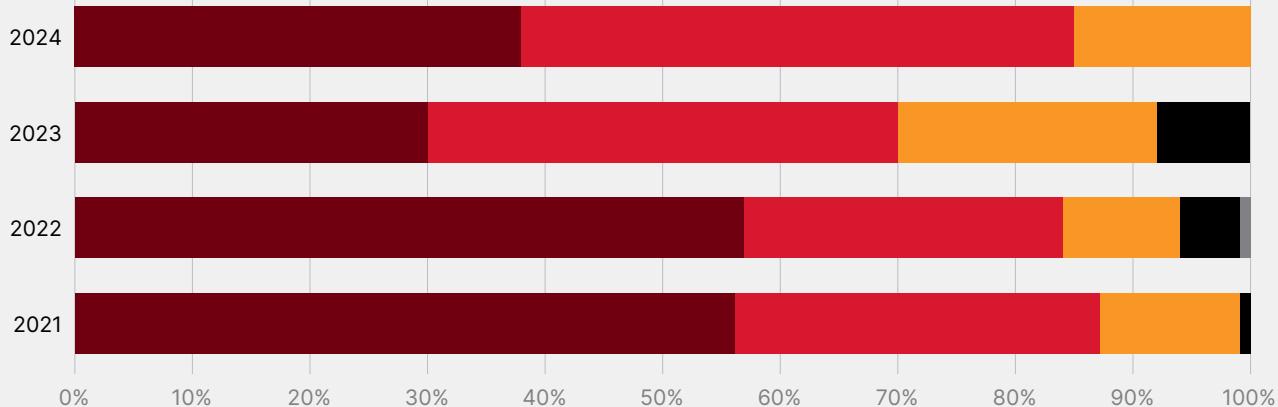
vendors in the short-to-medium term (see Figure 15), ahead of many other industry topics, according to the GSMA Intelligence Network Transformation Survey.

Figure 15

The importance of energy efficiency for mobile operators

Percentage of respondents

Extremely important
Very important
Moderately important
Slightly important
Not at all important



Source: GSMA Intelligence Network Transformation Survey 2022, 2023, 2024 and 2025

There are two main factors supporting the focus on energy efficiency in 2025 and beyond:

- Costs:** Financial considerations play a major role in operators' strategies. According to the latest GSMA Intelligence Energy Efficiency Analysis and Benchmarking project, energy typically accounts for approximately 20% of an operator's total operational costs. Furthermore, energy remains the only major variable cost that is not expected to decrease. While network operators are expected to reduce expenditures on other variable costs such as labour and site rental, through virtualisation, AI and site simplification, energy usage is influenced by coverage, the number of network layers, new services and the number of sites – all of which are expected to increase. Thus, energy efficiency will be a true differentiator for wireless networks.

- Sustainability:** Stakeholder expectations about sustainability are consistent and increasingly strict. Investors prefer green investment portfolios, sustainability is an important factor for younger consumers and Scope 3 emissions reporting requires the entire value chain to provide detailed reporting. Energy consumption, particularly in regions where the energy mix relies heavily on non-renewable sources, is a major contributor to Scope 3 emissions. Therefore, improving energy efficiency not only reduces emissions but also helps operators meet stakeholder expectations around sustainability.

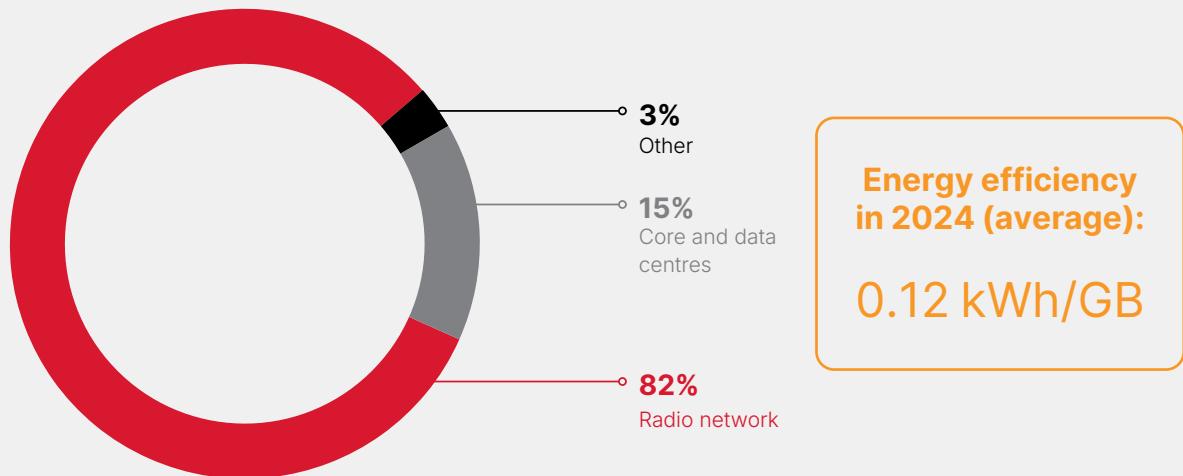
Measuring energy efficiency in the 5G era

Energy efficiency plays a critical role, but effectively measuring energy efficiency remains a complex challenge due to the diverse nature of networks, varying traffic patterns and the interplay of different energy sources. Recognising the significance of this issue, GSMA Intelligence launched its Energy Efficiency Analysis and Benchmarking study to help operators measure and compare energy efficiency

across their networks.⁷ The initiative provides a standardised framework for assessing energy performance, allowing operators to identify areas for improvement and implement best practices. It remains challenging to draw definitive conclusions about year-on-year changes, however, due to the steadily growing number of network operators included in the study each year.

Figure 16

How much energy do different parts of the mobile network consume?



Note: Mobile networks only (excludes fixed).

Source: GSMA Intelligence Energy Efficiency Analysis and Benchmarking project

7. Going green: measuring the energy efficiency of mobile networks 2025, GSMA Intelligence, 2025



Network operator use cases to boost energy efficiency

Maximising energy efficiency while ensuring high-quality network service is a complex challenge, especially as business demands and network traffic continue to increase. While operators may have diverse operational backgrounds, initiatives to improve energy efficiency can follow a common structure. However, every project must be carefully fine-tuned and tailored to its specific scenario. Some examples are highlighted below:

China Mobile: China Mobile is using the latest technologies, including 5G-Advanced, open APIs and AI-powered network planning, to develop a clean energy society in China. This covers a wide range of deployment scenarios, including outdoor users in Shanghai and indoor users in Shenzhen.

STC: STC is using AI-based network planning and engineering to conduct the biggest-ever network expansion in Saudi Arabia while committing to net zero by 2060. Solution capabilities include multi-dimensional network insight, service traffic identification and service cut-over orchestration.

Telkom Openserve: Openserve is using an AI-based energy management system to help address the energy shortage for fixed networks in South Africa. The system determines the best balance between the use of diesel, battery and grid energy based on network data, weather and load shedding data.

Hong Kong Telecom: Hong Kong Telecom is using its data-driven network operational platform and open APIs to model and integrate different data sources to support network site modernisation and different vertical applications, including unmanned drones for building inspections and emergency medical services.

2.3

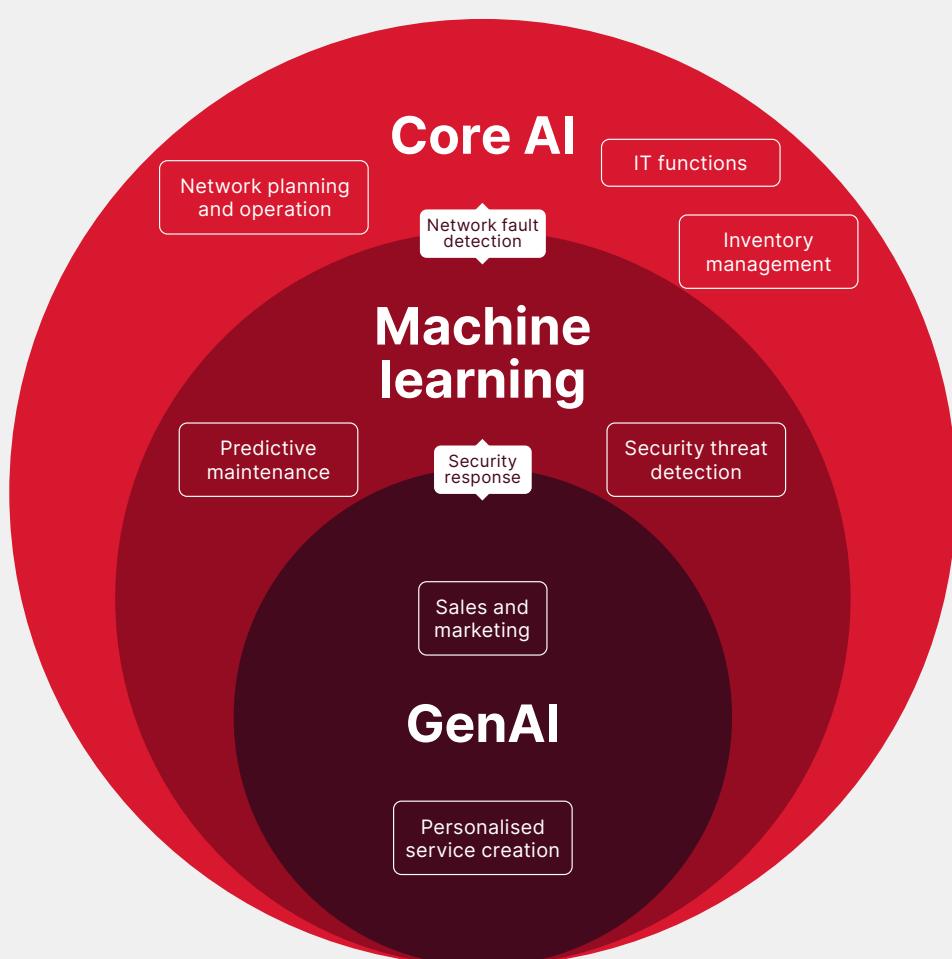
AI: new opportunities to serve enterprises

The telecoms industry has been at the forefront of AI adoption, with applications in areas such as network operations, energy optimisation, customer call centres for automatic language recognition and retail operations. This has become a bigger trend in recent years as operators explore solutions to improve operational efficiency, tackle emerging and more sophisticated threats and meet evolving customer expectations. This trend will remain for the foreseeable future as the AI landscape continues to evolve with new developments and innovation from operators, network vendors, cloud providers and the broader digital ecosystem.

Each advancing level of AI offers different capabilities and/or deeper intelligence. At its simplest, core AI is the application of intelligence in machines. Machine learning extends this by working with larger datasets. Generative AI (genAI) goes further to enable content creation without the need for defined input parameters. Given the plethora of options, the value of AI for operators is a function of selecting the right approach and technology for the right use case.

Figure 17

Examples of telco-specific use cases with AI



Source: GSMA Intelligence

Early deployments have focused on internal solutions to improve performance across the various layers of the telecoms value chain, such as network fault detection and automating more of the functions used in customer-care centres. For example, China Unicom and ZTE have launched an AI-driven anti-fraud system solution to enhance network defence, while Vodafone, in collaboration with Google, is using genAI to enhance the network lifecycle.

However, there is a growing shift towards developing solutions for external customers, particularly in the enterprise segment, as a means to generate new revenue opportunities from the capabilities of the technology. Table 1 highlights some examples of operator activities in this area.

Table 1

Examples of operator-led AI solutions for enterprises

Operator	Activity
China Mobile	China Mobile intends to accelerate the deep integration of AI into all production and operational processes of the financial industry to help reduce operating costs, increase efficiency and boost core competitiveness. The operator is collaborating with financial regulators and institutions to implement national strategies aimed at accelerating the development of digital finance.
Indosat Ooredoo Hutchison	Indosat Ooredoo Hutchison teamed up with India-based AI and data analytics company AlonOS to develop applications for enterprises in the Indonesian market, with a focus on AI for smart agriculture, AI talent development and tourism in Indonesia.
LG Uplus	LG Uplus plans to invest up to KRW3 trillion (\$2.1 billion) and forge close relationships with tech giants to help it become an AI transformation company. Through its ambitious AI-fuelled 'All in AI' enterprise services strategy, the operator hopes to generate KWR2 trillion (\$1.4 billion) in annual revenues by 2028.
Orange	Orange Business has launched a new multi-LLM solution it calls Live Intelligence, which it says will help enterprises and government entities adopt AI more readily due to its ease of operation. The plug-and-play service has been used internally and will initially target enterprises in France before expanding across Europe.
Rakuten	Rakuten Mobile has unveiled a genAI service for enterprises in Japan to support their digital transformation with access to low-cost and accurate models. A Rakuten Group survey found only one in six small and medium-sized enterprises (SMEs) in Japan use AI, with 40% of non-users unaware of the benefits of AI. The operator intends to target the new service at its existing base of 18,000 enterprise clients as well as Rakuten Group's 630,000 corporate customers.
Singtel	In October 2024, Singtel introduced its AI cloud service through a partnership with Silicon Valley firm Scale AI, aimed at allowing enterprises to deploy and scale up their genAI applications.
Swisscom	Swisscom has developed the Swiss AI Platform, which provides local companies with AI infrastructure and applications. The operator has reported seeing high demand from the financial and public sectors, with initial applications such as a chatbot to query internal instructions by bank employees and a system to automate the transcription of emergency calls.
Telefónica	Telefónica Tech has launched the Telefónica Tech GenAI Platform to help organisations create customisable virtual assistants capable of solving complex queries, automating repetitive tasks and optimising internal processes through a clear and intuitive interface.
Verizon	Verizon has unveiled Verizon AI Connect, an integrated suite of solutions and products designed to enable businesses to deploy AI workloads at scale.

Source: GSMA Intelligence based on company announcements

2.4

Global digital transformation survey: understanding enterprise needs and supplier opportunities

Between June and August 2024, GSMA Intelligence surveyed nearly 4,200 enterprises across 21 countries and 10 vertical sectors to gain insight into their digital transformation. The survey focused on different aspects of enterprise digital transformation such as strategic objectives, investment plans and priorities, deployment challenges and supplier decisions. It also asked enterprises for their views on a range of technologies enabling digital transformation, including 5G, private networks, AI, cloud, edge, IoT, eSIM, cybersecurity and network APIs. Below, we highlight five key findings from the survey and examine the implications for mobile operators:⁸

- Enhancing security is the top digital transformation priority, while revenue generation is prioritised over cost savings**

Enhancing security and protecting against cybersecurity threats ranked as the top digital transformation objective, with virtually all enterprises undertaking digital transformation deploying some form of cybersecurity technology. This reflects the expanded attack surface facing enterprises, as well as the threat posed from new forms of AI and rapid digitisation. Beyond security, revenue-related objectives are deemed slightly more important than cost-related objectives, as highlighted in Figure 18.

- Enterprise spending on digital transformation will account for 10% of enterprise revenues during 2024–2030**

On average, enterprise spending on digital transformation will account for 9.2% of enterprise revenues during 2024–2026, growing to 10.8% during 2027–2030. The average for 2024–2030 will be 10%. As expected, mega enterprises (those with 10,000 or more employees) will spend more on digital transformation than SMEs (20–249 employees). This likely reflects the implementation of bigger, and in some cases multi-country, digital transformation projects.

- Connectivity and AI will be the top two areas of enterprise spending on digital transformation**

Connectivity (mobile and fixed) and associated devices will account for 21% of enterprise spending on digital transformation during 2024–2030, with mobile at 13% and fixed/Wi-Fi at 8%. Within mobile, 5G will increasingly replace 4G (with 5G spending 2.5× higher than 4G spend). Meanwhile, AI will be the technology beyond connectivity that captures the biggest share of spending during 2024–2030, growing from 13% during 2024–2026 to 15% during 2027–2030. This is unsurprising, given the consensus among enterprises that AI will have a big impact across several business areas.

Enhancing security and protecting against cybersecurity threats ranked as the top digital transformation objective

8. [The rise of digital industries: navigating enterprise needs, investments and supplier decisions](#), GSMA Intelligence, 2023

- **The financial services sector tops the digital transformation ranking of vertical sectors**

Analysis of three key aspects of digital transformation (objectives, current use of technologies and spending during 2024–2030) highlight differences across enterprises sectors. Sectors where enterprises tend to have more direct and frequent engagement with consumers (financial services and media and entertainment) lead on digital transformation as engagement with consumers increasingly shifts to digital. Utilities and energy came third in the rankings followed by manufacturing and industrial sectors, highlighting the need to drive efficiencies and facilitate data-driven decision-making in capital-intensive industries.

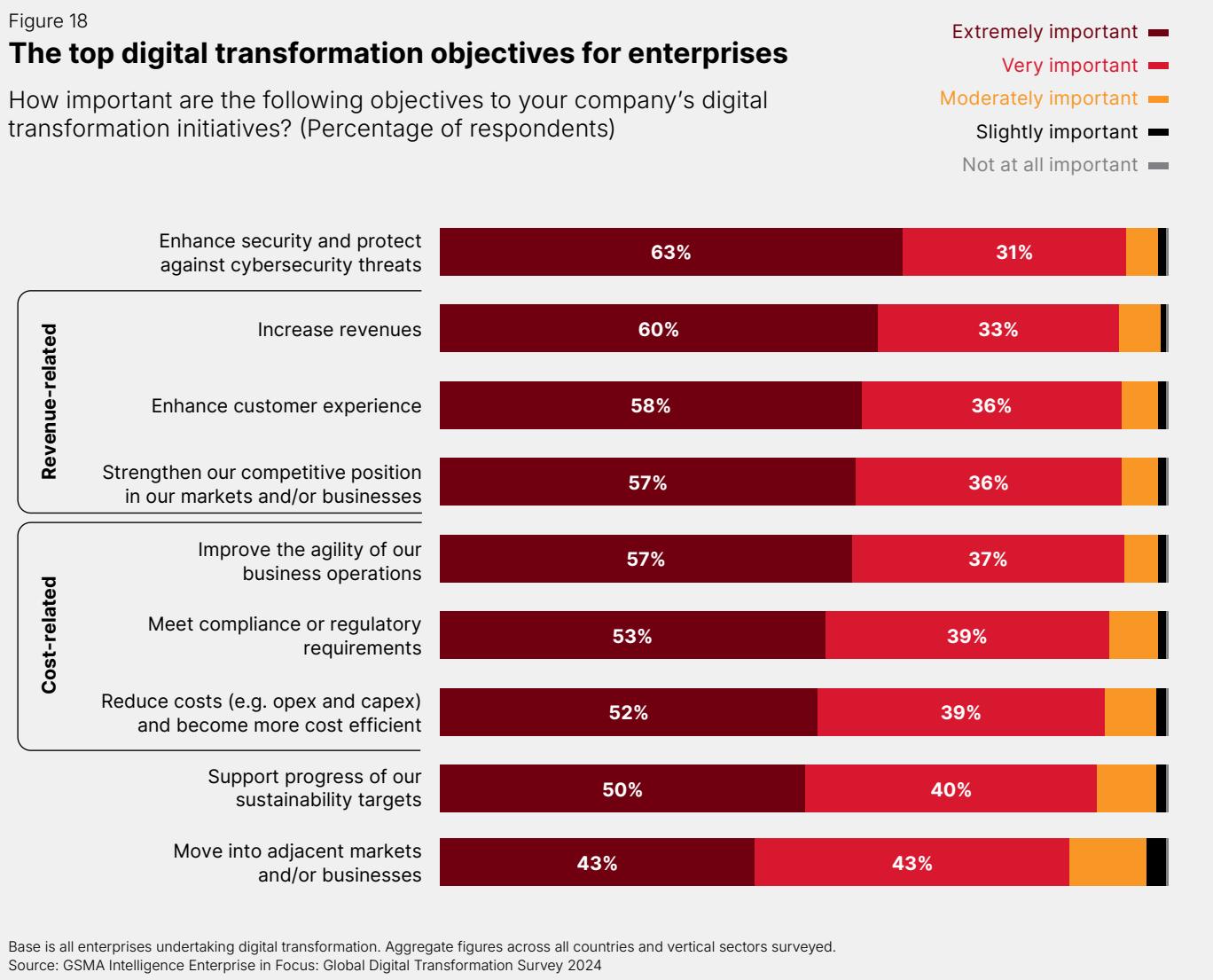
- **The US leads in digital transformation, while Brazil and Indonesia feature highly among developing countries**

Among the 21 countries surveyed, enterprises in the US are projected to have the highest spending on digital transformation as a percentage of revenue during 2024–2030, followed by South Korea and Australia. Additionally, US enterprises are among the top three for advanced use of genAI, cloud and cybersecurity, indicating a holistic approach to digital transformation. Among developing countries, enterprises in Brazil are expected to lead in spending on digital transformation in 2025–2030, followed by South Africa and Egypt. Indonesia is ranked fifth, with the country also being one of the top-three developing countries for advanced use of genAI, cloud and cybersecurity.

Figure 18

The top digital transformation objectives for enterprises

How important are the following objectives to your company's digital transformation initiatives? (Percentage of respondents)



Base is all enterprises undertaking digital transformation. Aggregate figures across all countries and vertical sectors surveyed.
Source: GSMA Intelligence Enterprise in Focus: Global Digital Transformation Survey 2024



B2B offers significant growth opportunities for mobile operators

Operator strategies continue to evolve as the mobile industry seeks to capture new growth opportunities in the enterprise market. Most operators are pursuing dual strategies: leveraging enhanced, high-speed connectivity (5G, fibre, 5G FWA) to provide incremental value to enterprise customers while also ramping up diversification efforts in non-connectivity services.

Riding the digital transformation wave, operators have seen faster growth on average in the B2B segment than in B2C.⁹ With demand expanding for solutions across a range of technology areas (cloud, edge, IoT, security), B2B offers continued growth opportunities as enterprises look for service providers to integrate a blend of technologies for their specific environment and needs.

To succeed, operators must adopt an enterprise-centric, solution-oriented approach, behaving more like IT consultants than connectivity sellers. They need to consolidate and simplify their enterprise portfolios, adapt their sales and marketing approach, be prepared to bid as consortia with other competitors and as 'frenemies', and acquire new technical and commercial skills.

9. [The opportunity for operators in B2B technology services](#), GSMA Intelligence, 2024

2.5

Global consumer survey: shifting consumer behaviour and rising expectations

The rapid evolution of consumer technology and shifting user expectations are reshaping digital experiences, creating new opportunities for operators and ecosystem providers. Between June and August 2024, GSMA Intelligence conducted a consumer survey across 12 major developed countries¹⁰ to gain fresh insights into consumer behaviour and technology adoption trends. The survey explored eight topics shaping the digital landscape: 5G, devices, eSIM, genAI, pay TV, gaming, the metaverse and XR, and sustainability.¹¹ This section focuses on 5G adoption, with five key findings from the survey and implications for operators listed below:

- **Despite a growing share of consumers already using 5G, upgrade intentions remain strong**

Across the 12 countries surveyed, 46% of consumers intend to upgrade to 5G. At the same time, consumer satisfaction with 5G is also increasing, with 82% of users stating that 5G has met or exceeded their expectations. Consumers in the UAE, China and Italy show the highest intent to upgrade according to the survey. However, speed dissatisfaction remains a concern, with slow 5G performance topping the list of reasons for dissatisfaction. This is expected to improve with the expansion of 5G SA networks and early 5G-Advanced deployments in 2025 and beyond.

- **Consumers intending to upgrade to 5G are willing to pay 5% more on average compared to their current 4G subscriptions**

While price sensitivity is expected to rise as adoption expands beyond early adopters, this presents a near-term monetisation opportunity for operators. To maximise this potential, operators need to enhance their 5G value propositions, linking connectivity to high-value digital services.

- **Over 40% of smartphone users consider 5G home broadband connectivity highly appealing**

Enhanced video streaming and remote digital health services are among the top 5G use cases for smartphone users. This highlights that, beyond connectivity, 5G is unlocking new revenue streams. For instance, the growing momentum behind smart home devices offers operators an opportunity to provide connectivity solutions and integrate smart devices into multi-play bundles. According to the consumer survey, 42% of 5G smartphone users have added or are interested in adding smart home devices to their mobile subscriptions (see Figure 19). Some operators are targeting the smart home directly, such as Deutsche Telekom with Magenta SmartHome and Telefónica with its Movistar Prosegur Alarms.

- **5G users are more engaged with digital entertainment content**

Across paid video, music and gaming platforms, 40% of 5G users consume digital content on a weekly basis – 16 percentage points higher than the same figure for 4G users. There are notable country-level differences, with the share of 5G users consuming digital content on a weekly basis being highest in the UAE (62%), China (53%) and the UK (40%). This trend highlights the strong demand for digital entertainment services, reinforcing the importance of bundling content offerings with 5G plans.

- **Users show demand for bundling, digital services and speed-based tiers**

5G users show a greater inclination toward bundled services and premium digital offerings compared to 4G users. Nearly 50% of 5G users have added or are interested in adding non-connectivity services – such as content subscriptions, devices or cloud gaming – to their mobile plans, compared to 33% of 4G users. Speed-based and tiered data plans are also gaining traction, indicating that consumers are willing to pay for enhanced network performance. This presents a key opportunity for operators to design 5G-centric commercial strategies, leveraging bundles, premium services and differentiated pricing models.

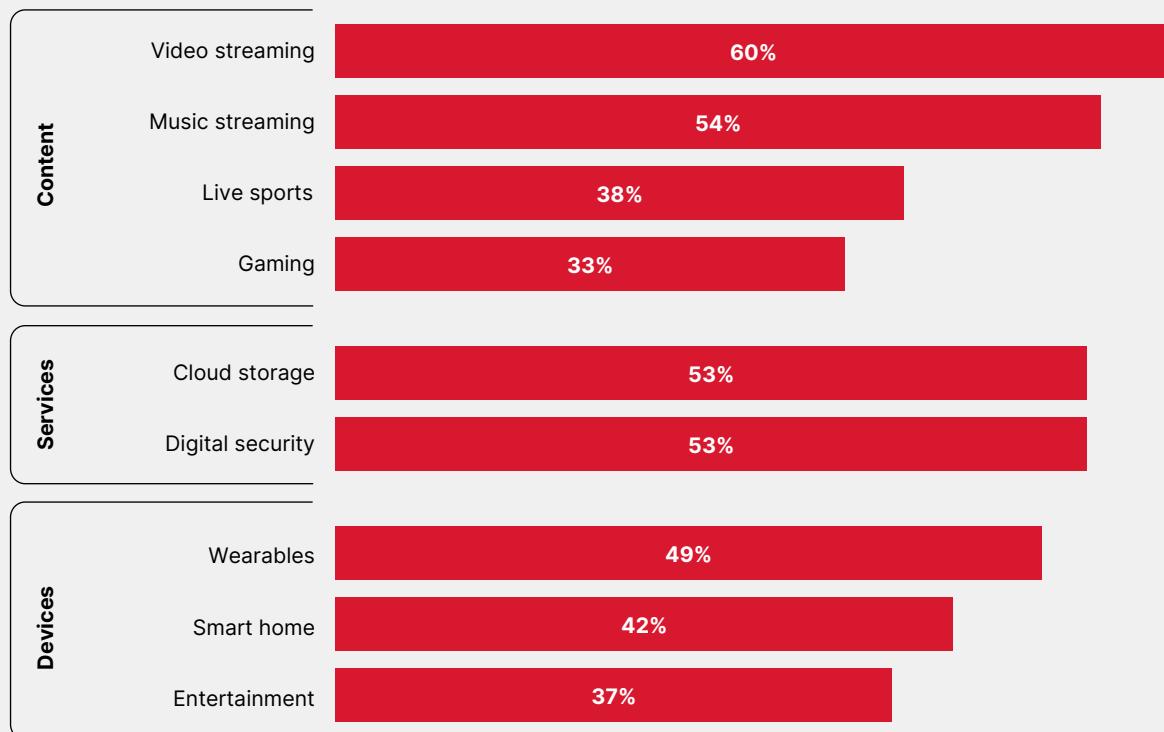
10. Australia, China, France, Germany, Italy, Japan, Poland, South Korea, Spain, UAE, the UK and the US.

11. [The changing shape of the digital consumer in 2025: insights from the Global Consumer Survey](#), GSMA Intelligence, 2024

Figure 19

Interest in bundling among 5G users

Percentage of contract mobile subscribers who have added or are interested in adding the following to their contract subscriptions



Base is smartphone users who are most frequently connected to 5G networks. Aggregate figures across the 12 countries surveyed.
Source: GSMA Intelligence Consumers in Focus: Global Consumer Survey August 2024

Opportunities in service expansion to enhance user experience

While 5G adoption and user satisfaction levels are rising, large-scale monetisation remains a challenge for the mobile industry. The expansion of 5G SA and early 5G-Advanced networks will address technical limitations such as speed issues and inconsistent coverage. To unlock further revenue growth, operators must expand their service offerings (such as value-added digital services), explore new

revenue models centred on consumer experience and link 5G offerings with high-value applications (e.g. cloud gaming and metaverse experiences). As 5G adoption matures, operators will need to align network capabilities with evolving consumer expectations, ensuring seamless experiences and differentiated service propositions that drive engagement and monetisation.

03

Mobile industry impact



As mobile devices are the primary means for people to access the internet, the potential of mobile technologies to deliver life-enhancing services cannot be overstated. Mobile internet access is critical for connecting individuals to essential services such as healthcare, education and financial solutions. At the same time, the mobile industry has been advancing the UN Sustainable Development

Goals (SDGs). Among the many sectors driving this progress, the mobile industry stands out as a transformative force. Mobile technologies have consistently made significant contributions toward achieving the SDGs, demonstrating their potential to uplift and transform communities worldwide, as outlined in the GSMA 2024 Mobile Industry Impact Report.¹¹

Bridging the connectivity gap

In today's digital world, while efforts are being made to connect everyone, millions in underserved and rural areas remain disconnected, missing out on opportunities that could improve their livelihoods. Expanding network coverage in these regions presents challenges, particularly in terms of cost and infrastructure complexity. However, a promising shift is underway as telecoms operators are increasingly collaborating to bridge this gap. Through shared

infrastructure, innovative technologies and strategic partnerships, the mobile industry is working towards ensuring that no one is left behind.

Connectivity is integral to achieving the SDGs by providing access to education, healthcare, justice and inclusion. It can also help reduce poverty, create jobs and promote sustainable development.

Case study: Vodacom and Orange build and operate solar-powered base stations in rural areas

Challenge: Expanding connectivity in rural regions of the Democratic Republic of Congo (DRC) presents significant challenges due to high costs and logistical complexities. The vast and less densely populated areas make traditional infrastructure deployment economically and operationally demanding.

Solution: To address these challenges, Vodacom and Orange plan to jointly construct up to 2,000 new solar-powered base stations over the next six years, utilising 2G and 4G technologies. The initial phase includes a commitment to build 1,000 sites, with the potential to scale up by an additional 1,000 towers. This initiative leverages renewable energy and promotes infrastructure sharing, allowing other mobile network operators to utilise the passive infrastructure where feasible.

Impact: This collaboration is set to significantly enhance connectivity in rural DRC, providing millions with access to essential telecommunications and mobile financial services. By bridging the digital divide, the initiative supports the country's National Digital Plan Horizon 2025, fostering digital transformation across various sectors, including e-health, e-education and e-commerce. Moreover, the use of solar power aligns with environmental sustainability goals, reducing the carbon footprint associated with traditional energy sources.

Such joint ventures exemplify how strategic partnerships between operators can overcome infrastructural challenges, delivering widespread connectivity and fostering inclusive socioeconomic development in underserved regions.

¹². 2024 Mobile Industry Impact Report: Sustainable Development Goals, GSMA, 2024

Operators supporting communication, recovery and post-disaster aid

The mobile industry not only enhances service access but also plays a crucial role during emergencies. Globally, connectivity has been vital in managing crises. By leveraging mobile network infrastructure, the industry provides critical communication for preparedness and warnings before disasters. It also facilitates early warning systems, coordinates humanitarian response efforts and supports network restoration during emergencies. Mobile networks are essential for

affected populations to communicate within and beyond disaster zones.

Additionally, the industry collaborates to support post-disaster aid through mobile money services and e-payments, ensuring immediate support for critical needs such as food, shelter and healthcare. Examples of recent operator assistance in emergency responses are listed in Table 2.

Table 2

Examples of operator support during and after disasters

Country	Context	Operator support
US	In January 2025, wildfires caused extensive damage to lives and property in California	Verizon, AT&T and T-Mobile deployed portable cell towers, drones and emergency networks to maintain connectivity for first responders and affected communities.
China	A 6.2 magnitude earthquake struck Gansu and caused significant casualties and damage	Chinese telecoms operators, including China Mobile and China Telecom, restored communication services, deployed emergency response teams and provided free calls and data to affected residents.
Vietnam	Typhoon Yagi led to flooding and destruction in multiple provinces	VNPT provided a VND50 billion support package, including network restoration, emergency communication services and financial aid, to affected communities.
Global	Emergency communication solution to cover 18 countries	In June 2024, 14 leading telecoms companies, including seven operators, collaborated to launch Virtual Command Centers (VCC) for disaster recovery. The VCC platform integrates technologies such as AI and digital twins to provide emergency services with uninterrupted access to critical data, expediting response times during crises.
Palestine	Expanded mobile networks and mobile money services in West Bank and Gaza	Ooredoo and Jawwal Pay allowed aid agencies to transfer funds directly to affected families during periods of conflict. These mobile wallets enabled families to buy food and medicine in a region where banking services are often disrupted.

Source: GSMA Intelligence based on company announcements

04

Mobile industry enablers



4.1

Meeting connectivity needs through effective spectrum policies

Continued growth and innovation depend on clarity on spectrum availability in the short and long terms, with roadmaps for the 2030s for low-, mid- and high-band spectrum. More spectrum is needed for increased capacity and faster networks. Importantly, if progress stalls and is constrained to historical levels, up to 40% of the economic impact of 5G could be lost by 2030.

Mid-bands provide city-wide coverage and cater for around 80% of indoor capacity in urban areas, where mobile is predominantly used indoors. They will also deliver much of the capacity required for enterprise digitalisation and industrial connectivity. Consequently, any country that wants to maximise the socioeconomic benefits derived from 5G needs to assign more mid-band spectrum. By 2030, mobile networks will need an average of 2 GHz of mid-band spectrum per country.

An ongoing effort to increase the amount of spectrum available in the 3.5 GHz range is needed. 3.5 GHz has already helped roll out a majority of 5G networks, and the further harmonisation of the range at the World Radiocommunication Conference 2023 (WRC-23) allows more countries to take advantage of its economies of scale. However, reaching the 2 GHz goal is difficult to achieve without adding new bands.

Spectrum licensing, pricing and conditions

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. 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.

The accelerating momentum behind 6 GHz has confirmed it as the harmonised home for the future of mid-band capacity. Following the decision to identify the band for mobile at WRC-23, a growing number of countries are taking steps to assign the band. Hong Kong ushered in a new era when it became the first market in the world to conduct an auction for the 6 GHz band for mobile services.

Increasing low-band capacity should also be a priority as countries plan their roadmaps. Low bands are ideal for covering wide areas with a lower population density. This makes them an important resource as countries look to address coverage and usage gaps with broad and affordable connectivity.

High-band spectrum, or mmWave, is essential for the deployment of 5G networks with ultra-high speeds and the lowest possible latencies. Governments and regulators should also plan to make an average of 5 GHz of high-band spectrum available per country by 2030 as demand increases. High bands can complement low- and mid-band spectrum in dense urban areas, provide fibre-like connectivity through 5G FWA technologies and help innovate enterprise connectivity.

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 (particularly 3.5 and 6 GHz). Approaches such as leasing or sharing are typically better options in these situations, while private mobile networks are commonly provided by mobile operators within licensed public mobile spectrum.

The cost of spectrum also has a major impact, from when it is assigned to ongoing fees and the cost of renewals. 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.

Fortunately, governments and regulators are increasingly mindful of the negative impact of high prices and poorly designed assignment mechanisms. Instead, they are adopting new pricing and licensing approaches to ease the financial pressure on operators while encouraging investments in connectivity and coverage. These approaches include licensing spectrum on a technology-neutral basis. This is a crucial step, as it allows for the refarming of spectrum for 4G and 5G at a pace driven

by market demand. Licensing terms are extended without additional payments, helping create an investment-friendly environment for the future. Regulators are also attaching coverage commitments in exchange for lower prices when auctioning or renewing spectrum.

Conditions should always be used with caution after careful consideration of any potential risks. Consulting with the industry will help maximise the chance of a successful outcome.

In summary, 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).

6G spectrum and WRC-27

200–400 MHz channels will be required for mobile evolution going into the 2030s. The mobile ecosystem is working with governments and international bodies to ascertain which bands may be used for the future expansion of mobile.

mmWave bands will be used for the busiest locations – such as stadia, train stations, airports and shopping areas – and low bands will be required to deliver digital equality between urban and rural areas. However, a lot of emphasis will be placed on finding the right mid-band assignments to deliver city-wide connectivity. 6 GHz capacity will be brought into play by many governments to facilitate the next phase of data growth but, beyond that, other bands are being considered.

The World Radiocommunication Conference 2027 (WRC-27) will consider bands in the 4.5, 7–8 and 14 GHz bands. Particular attention is being given to the 7–8 GHz range, as this sits closely above existing 6 GHz assignments.

Mobile broadband can deliver economic growth. As wireless connectivity expands from connecting the phones in our pockets to the machines in our factories or the vehicles on our roads, this potential requires spectrum to cater for demand.

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