GSMA

The Mobile Economy Asia Pacific 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 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

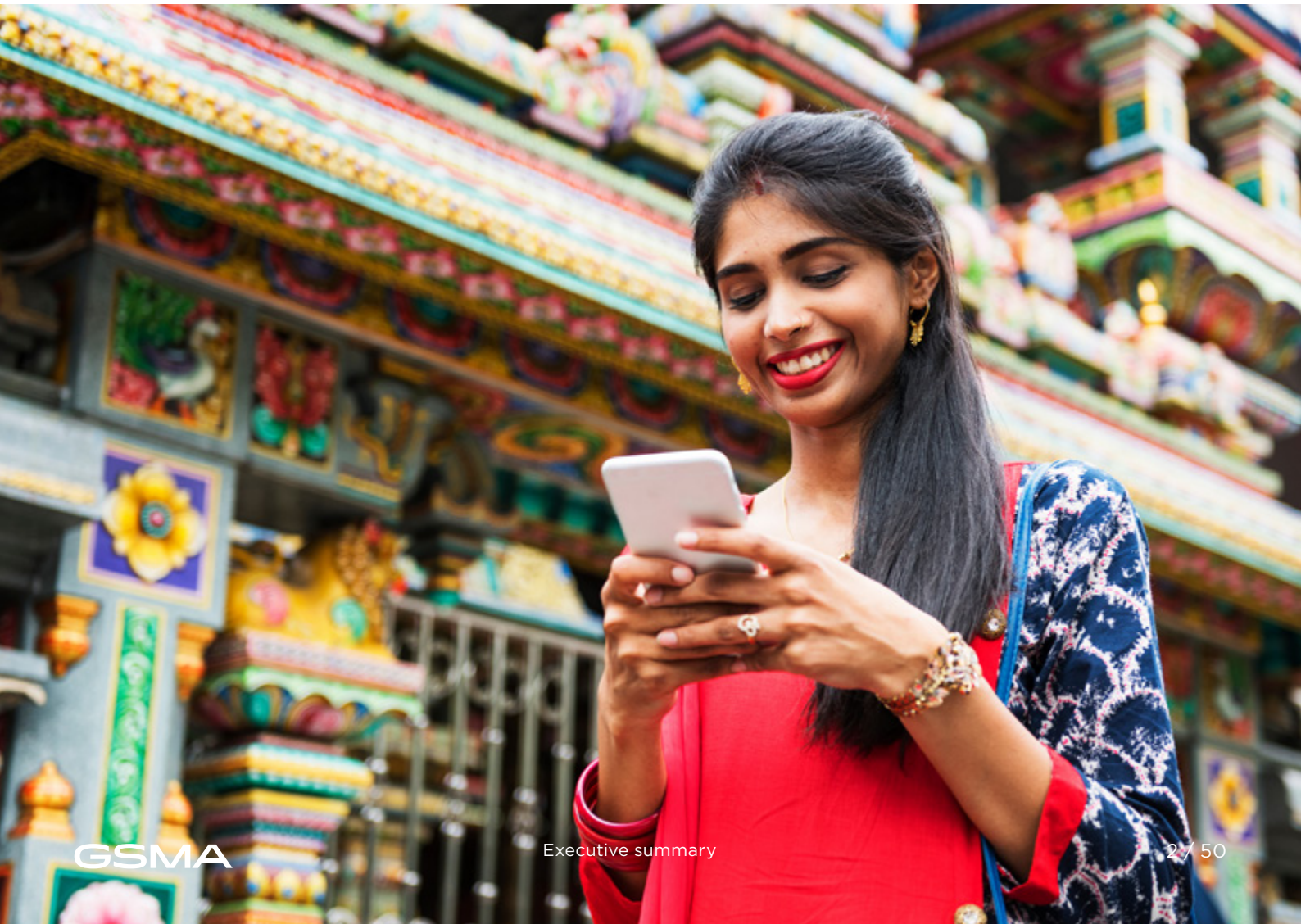
Mobile enabling digital transformation

The mobile industry continues to underpin the rapid digital transformation in Asia Pacific, with advanced mobile networks enabling innovative use cases for consumers and enterprises. The role of mobile infrastructure and services will become even more vital to the way society functions as governments increasingly use digital technologies to tackle some of the most pressing social and economic challenges.

By the end of 2023, 1.8 billion people in Asia Pacific (63% of the population) subscribed to a mobile service. Growth in mobile internet penetration has been remarkable. At the end of 2023, 51% of the region's population used mobile internet, equating to just over 1.4 billion users – almost triple the figure a decade earlier. However, large swathes of the population across the region still remain unconnected, most of them within the usage gap.[1] Addressing the usage gap is crucial to closing the digital divide and enabling life-enhancing applications around finance, health and education.

The impact of mobile connectivity is evidenced by its contribution to the economy. In 2023, mobile technologies and services generated 5.3% of Asia Pacific's GDP, a contribution that amounted to $880 billion of economic value added, and supported around 13 million jobs across the region.

1. People covered by a mobile broadband network but do not yet subscribe to a mobile internet service



Key trends shaping the mobile ecosystem

5G: focus shifts to 5G-Advanced and 5G RedCap

Commercial 5G standalone (SA) networks are now present in seven countries in Asia Pacific (Australia, India, Japan, the Philippines, Singapore, South Korea and Thailand), providing the opportunity to develop new 5G applications. Operators in the region are looking to leverage 5G-Advanced and 5G reduced capability (RedCap) technologies to deliver new solutions for enterprise. The growing focus on advanced 5G networks and services is expected to kick-start a new round of 5G investments in 2024 and beyond. It will also lay the foundation for the next wave of 5G use cases that could unlock new revenue streams for operators and the wider ecosystem in both the consumer and enterprise segments.

Open Gateway: operators unite to drive API progress

Although it has been possible to expose network APIs for some time, operators have struggled to adopt a standardised approach that achieves scale. However, recent initiatives by the mobile industry have sought to provide fresh momentum behind developing a common set of network APIs. By April 2024, 49 operator groups had signed up to the GSMA Open Gateway, representing 240 mobile networks and accounting for 65% of mobile connections globally. Operators across Asia Pacific have joined the initiative, including those in Australia, Indonesia, Japan, Malaysia, Singapore, South Korea, Sri Lanka, Thailand and Vietnam. The focus is now on translating operator commitments into commercially available network APIs and demonstrable use cases.

Satellites and NTNs: momentum builds behind aerial connectivity

Due to the geographical make-up of several countries in Asia Pacific, aerial connectivity will play an important role in realising universal connectivity. From archipelagos and rainforests to deserts and mountain ranges, Asia Pacific is home to some of the most challenging terrains for terrestrial networks. As a result, there has historically been significant interest in aerial solutions and the opportunity they offer to help extend connectivity to hard-to-reach locations. This interest has been heightened by the emergence of low Earth orbit (LEO) and high-altitude platform station (HAPS) solutions. Importantly, telecoms operators across the region are actively engaged in the evolving aerial connectivity market, mostly through partnerships and investments.

GenAI: operators seek revenue-generating opportunities

Operators across Asia Pacific are harnessing the power of generative AI (genAI) to drive internal transformations and seize new revenue streams through AI investment. GenAI has applications in various domains – such as customer service, sales, marketing and code development – offering immediate opportunities. Moreover, leveraging AI for network enhancement remains a priority for operators. Exploring new revenue streams, regional operators are investing in AI startups and organisations while developing their own large language models (LLMs). Tailored LLMs make it easier for operators to deploy high-quality genAI models swiftly and efficiently, helping them to accelerate AI-enabled transformation.

Consumer trust: stakeholders take steps to enhance online safety

With the rise of online threats targeting individuals and enterprises, there is a risk that consumer trust in digital services will erode. Meanwhile, the proliferation of advanced AI tools, notably genAI applications, adds a new dimension to the threat landscape by potentially enabling new types of attacks and making existing ones harder to detect. Such attacks can have a profound impact on victims, including financial losses and a mental toll, resulting in a loss of trust in digital platforms. While governments and digital ecosystem players have taken steps to combat online threats, the task of maintaining trust must be viewed as a shared responsibility between these stakeholders, as opposed to the sole responsibility of any single group.

The task of maintaining trust must be viewed as a shared responsibility between governments and digital ecosystem players

Policies for growth and innovation

For the mobile industry to advance and deliver on digital transformation ambitions, the policy and regulatory environment requires an approach that supports a conducive environment for rapid growth and innovation. Policies that will have a key role towards this objective include those that promote investment in networks, reduce taxation burdens, promote ease of doing business by reducing onerous compliance costs, improve efficiency, and foster inclusivity and online trust and safety. Similarly, as demand for high-speed, high-quality mobile connectivity continues to grow, regulators and policymakers should review current policies to identify those that create unnecessary barriers for mobile operators, hindering their ability to invest without necessarily having any positive impact on consumer welfare.

The ITU's World Radiocommunication Conference 2023 (WRC-23) opened the doors to a new era of connectivity and laid the spectrum foundations for mobile to progress into 5G-Advanced and 6G. Importantly, WRC-23 identified 6 GHz (6.425–7.125 GHz) for mobile use by countries in every ITU Region (EMEA, CIS, the Americas and Asia Pacific) and the conditions for its use have been agreed in the ITU's Radio Regulations. Countries in Asia Pacific can now take advantage of the harmonisation of 6 GHz that was achieved at WRC-23 and begin developing national plans to assign the band. With 6 GHz, mobile operators can meet the growth in 5G traffic demand in a practical, cost-effective and environmentally friendly way using existing 5G macro sites.

The Mobile Economy Asia Pacific

Unique mobile subscribers

2023 **1.8bn**
63% penetration rate*

2030 **2.1bn**
70% penetration rate*

CAGR 2023-2030 **2.1%**

*Percentage of population

Mobile internet users

2023 **1.4bn**
51% penetration rate*

2030 **1.8bn**
61% penetration rate*

CAGR 2023-2030 **3.0%**

*Percentage of population

SIM connections

(excluding licensed cellular IoT)

2023 **2.7bn**
97% penetration rate*

2030 **3.1bn**
106% penetration rate*

CAGR 2023-2030 **1.8%**

*Percentage of population

4G

Percentage of connections (excluding licensed cellular IoT)

2023 **70%**

2030 **50%** ↓

5G

Percentage of connections (excluding licensed cellular IoT)

2023 **10%**

2030 **45%** ↑

Smartphones

Percentage of connections

2023 **78%**

2030 **94%**

Licensed cellular IoT connections

2023 **144m**

2030 **270m**

Operator revenues and investment

2023 **$197m**

Total revenues

2030 **$227bn**

Total revenues

Operator capex for the period 2023–2030: **$271bn**

Mobile's contribution to GDP

2023 **$880bn**

5.3% of GDP

2030 **$1tn**

Public funding

2023

$90bn

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

Employment

2023 **9m jobs**

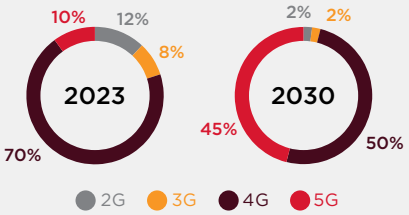
Directly supported by the mobile ecosystem

Plus 4m indirect jobs

Subscriber and technology trends for key markets

Asia Pacific

Technology mix*



Subscriber penetration

2023	63%
2030	70%

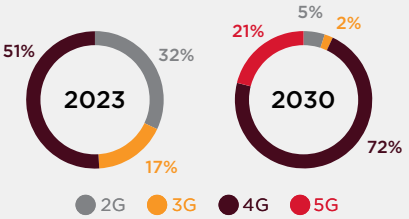
Smartphone adoption

2023	78%
2030	94%

Leading Nations programme[2]

Bangladesh

Technology mix*



Subscriber penetration

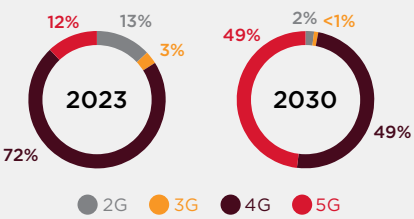
2023	56%
2030	69%

Smartphone adoption

2023	56%
2030	84%

India

Technology mix*



Subscriber penetration

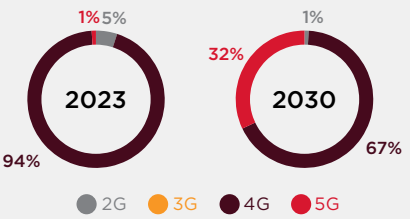
2023	71%
2030	78%

Smartphone adoption

2023	80%
2030	95%

Indonesia

Technology mix*



Subscriber penetration

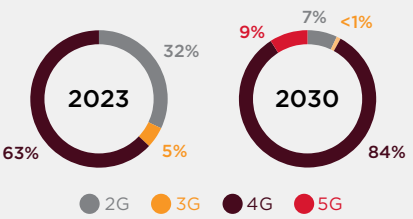
2023	66%
2030	77%

Smartphone adoption

2023	87%
2030	94%

Pakistan

Technology mix*



Subscriber penetration

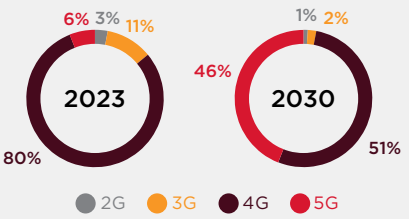
2023	41%
2030	55%

Smartphone adoption

2023	63%
2030	80%

Philippines

Technology mix*



Subscriber penetration

2023	73%
2030	78%

Smartphone adoption

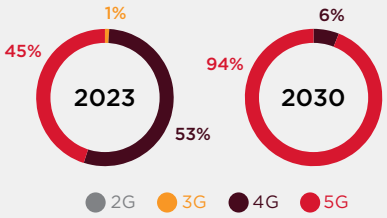
2023	86%
2030	92%

2. The GSMA Leading Nations engagement (comprising Bangladesh, India, Indonesia, Pakistan and the Philippines) seeks to accelerate the growth of the digital economy and advance the mobile industry's sustainability by lobbying for regulatory modernisation with relevant stakeholders.

Developed 5G markets[3]

Australia

Technology mix*



Subscriber penetration

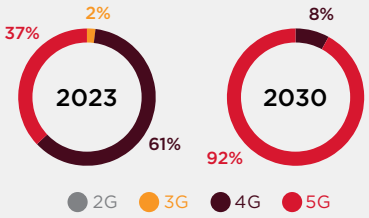
2023	86%
2030	88%

Smartphone adoption

2023	89%
2030	94%

Japan

Technology mix*



Subscriber penetration

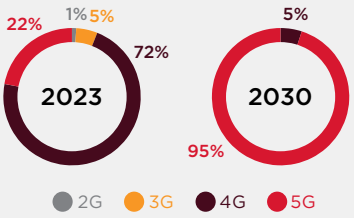
2023	89%
2030	90%

Smartphone adoption

2023	75%
2030	94%

New Zealand

Technology mix*



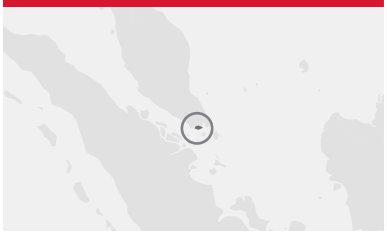
Subscriber penetration

2023	85%
2030	88%

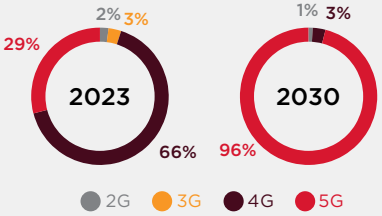
Smartphone adoption

2023	90%
2030	94%

Singapore



Technology mix*



Subscriber penetration

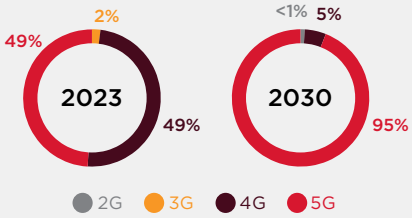
2023	90%
2030	91%

Smartphone adoption

2023	91%
2030	96%

South Korea

Technology mix*



Subscriber penetration

2023	95%
2030	96%

Smartphone adoption

2023	83%
2030	96%

* Percentage of total connections
Note: The penetration figures this year have been revised to reflect updates in population figures from the UN. Totals may not add up due to rounding.

3. Markets in Asia Pacific with the highest 5G penetration

01

The mobile industry in numbers

By the end of 2023, more than half of the population in Asia Pacific subscribed to mobile internet services

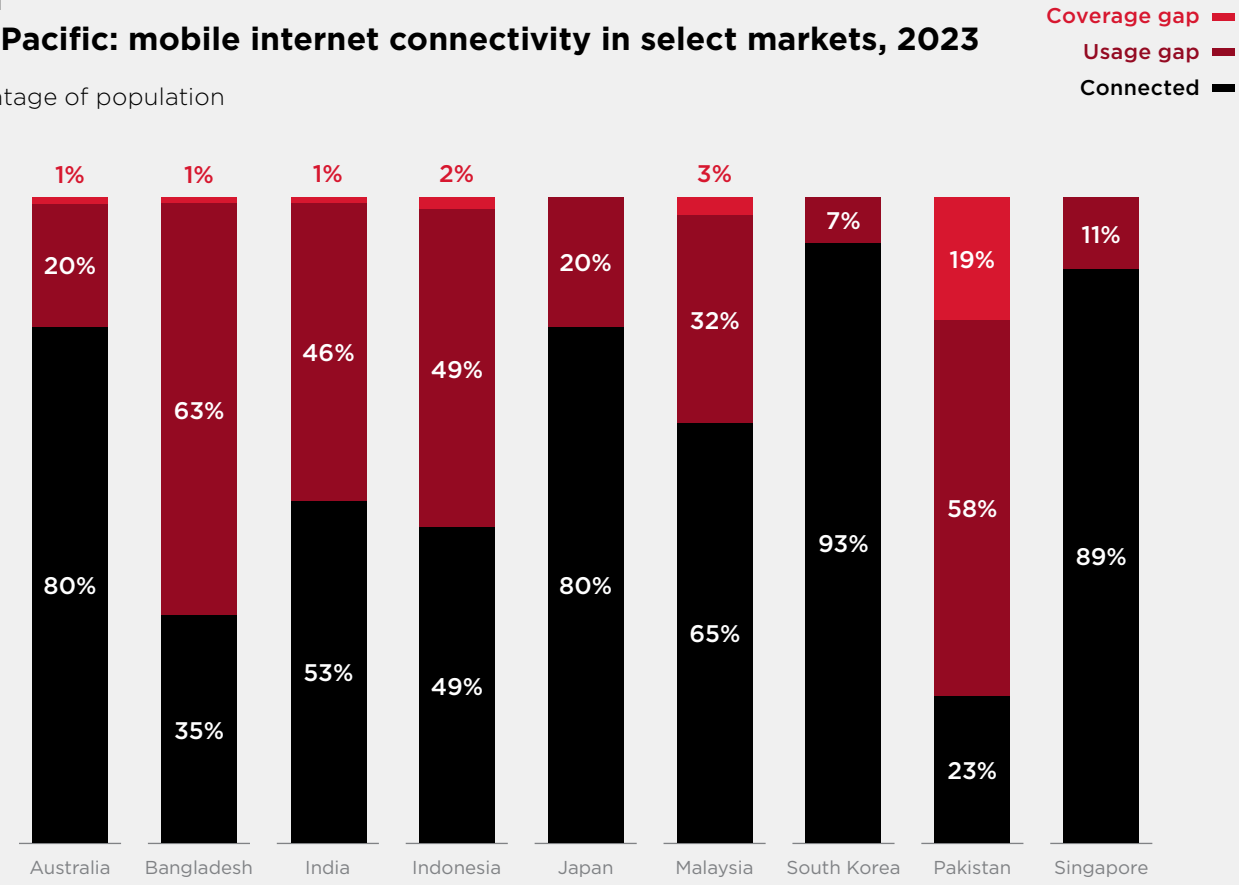
Asia Pacific has experienced significant growth in internet connectivity levels in recent years. The number of people in the region who subscribe to mobile internet services has more than doubled in the last decade to over 1.4 billion. Growth during this period was largely driven by the expansion of mobile broadband networks, with the coverage gap now under 2% in most markets across the region.

The usage gap has also narrowed on aggregate but remains stubbornly high in some markets, notably Bangladesh, India and Pakistan, where 50% or more of the population are covered by mobile internet networks but have not yet subscribed to the service. Key adoption barriers include lack of affordability, particularly for devices, and lack of digital skills, particularly among older citizens. For example, the Japanese government estimates that around 20 million older citizens are unfamiliar with how to operate smartphones and other digital devices.[4]

Figure 1

Asia Pacific: mobile internet connectivity in select markets, 2023

Percentage of population



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

4. "Japan looks to bridge digital divide between young and old", The Japan Times, June 2023

5G continues to rapidly grow, but 4G will remain the dominant technology for the foreseeable future

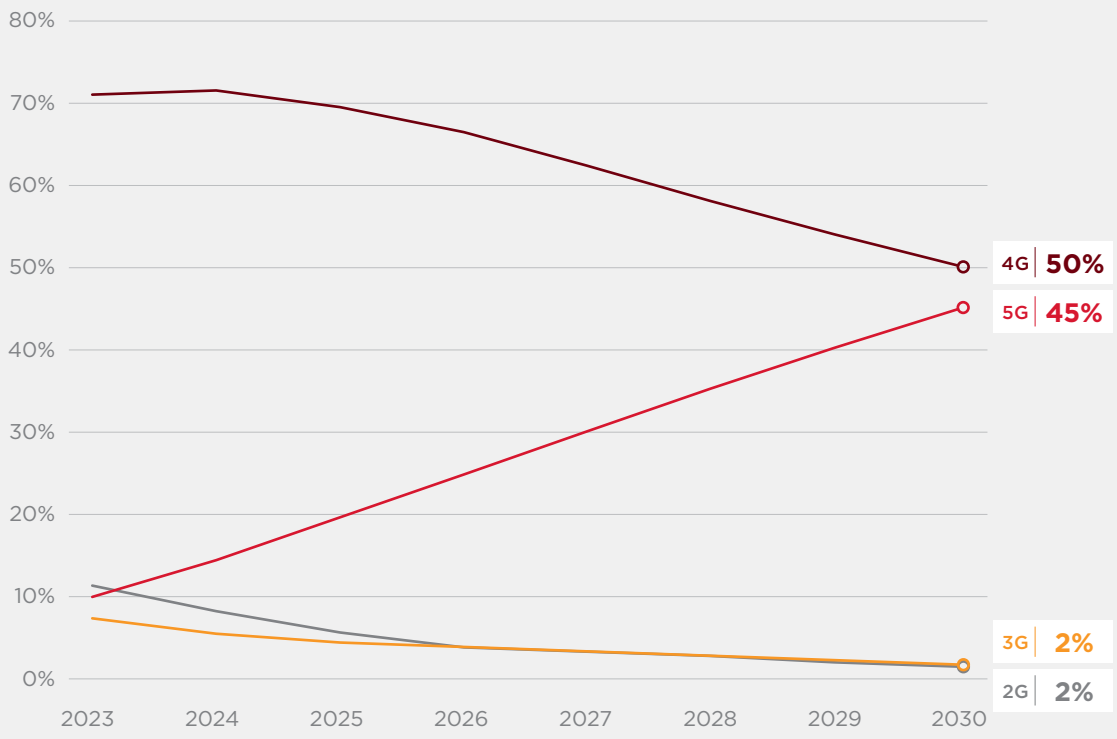
5G is now well established in pioneer countries across Asia Pacific. By the end of 2024, the technology will account for a third or more of total mobile connections in five of these countries: Australia, Japan, New Zealand, Singapore and South Korea (over 60% in South Korea). In countries that form the second wave of deployments, notably India and Thailand, rapid 5G network expansion has led to quickly rising adoption.

However, many other operators in the region will continue to prioritise the expansion of 4G capacity in urban areas and the extension of coverage to underserved regions in the short-to-medium term. As a result, 4G will remain the dominant technology across the region by 2030, albeit with a much narrower gap with 5G compared to today.

Figure 2

Asia Pacific: mobile adoption by technology

Percentage of total connections



Source: GSMA Intelligence

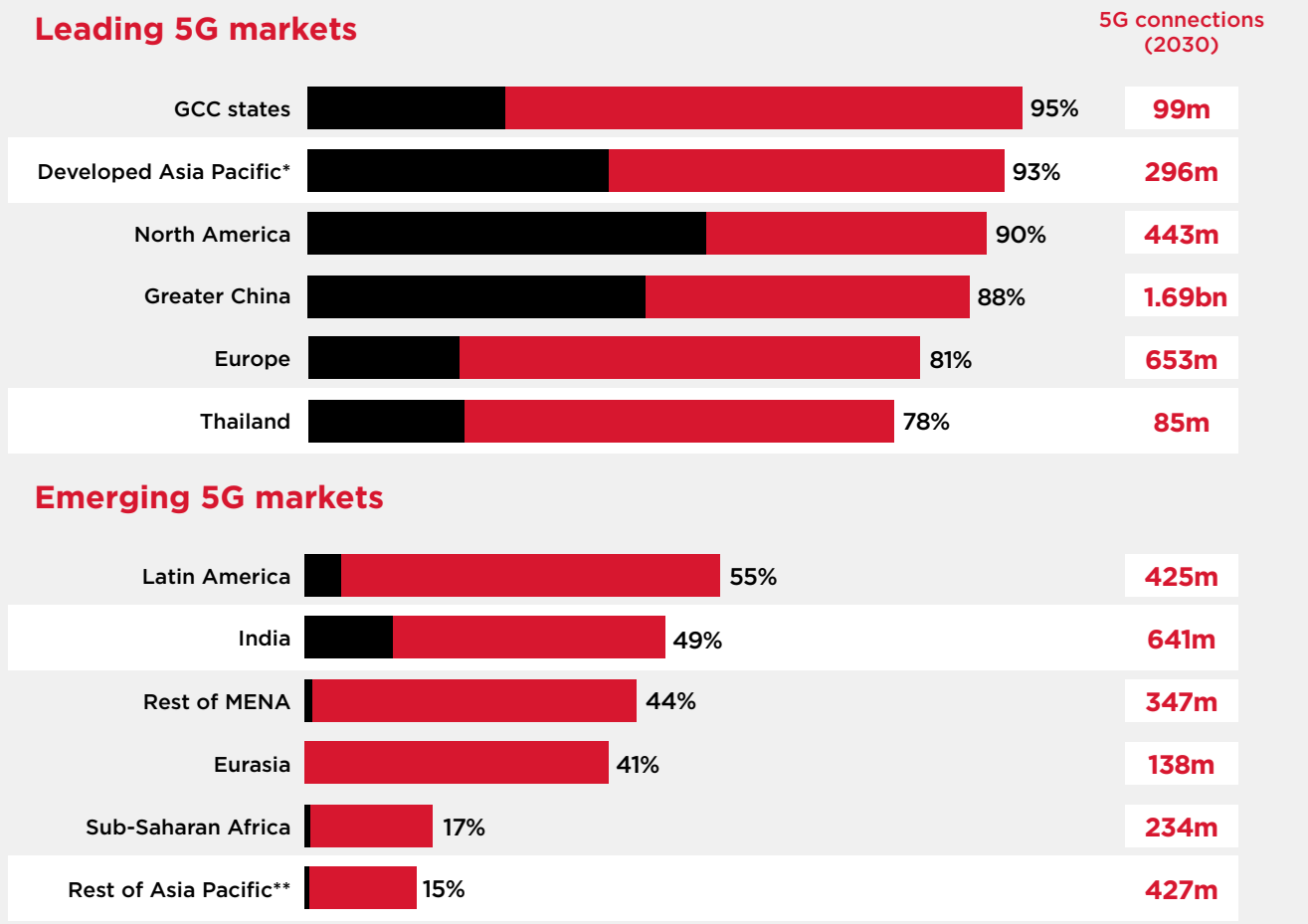
By the end of 2030, Asia Pacific countries will be on both ends of the global 5G spectrum

By 2030, 5G adoption in developed 5G markets in Asia Pacific will reach 95% of total connections, on average, meaning these markets will be among the global 5G leaders. However, the rest of the region will be on the other end of the spectrum, with 40% adoption on average. With nearly 80% 5G adoption by 2030, Thailand will be an outlier among developing Asia Pacific economies.

Figure 3

5G adoption

Percentage of total connections



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

Mobile data traffic in Asia Pacific will quadruple between 2023 and 2030

The growth in mobile data traffic per smartphone is primarily being driven by enhanced device capabilities, network improvements and an increase in data-intensive content. As 4G subscribers migrate to 5G, average mobile data traffic per smartphone will increase and is expected to reach 53 GB per month in 2030. In India, for example, 5G users have been consuming approximately 3.6× as much mobile data compared to 4G since October 2022, according to Nokia's MBiT 2024 report. Furthermore, as countries in the region progress with their digital nation agendas, new services could result in faster growth in mobile data traffic.

Figure 4

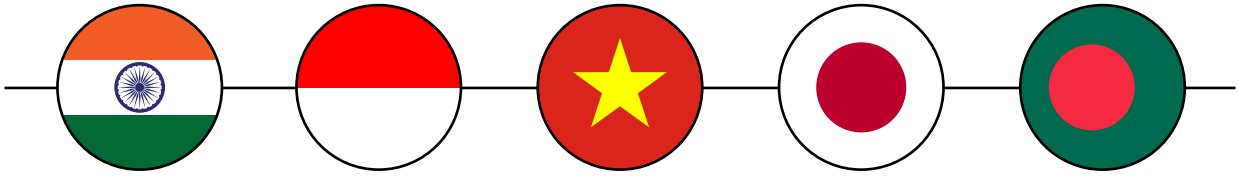
Mobile data traffic per connection

GB per month

Region	2023	2030	Increase
Japan and South Korea	18	87	**4.8×**
Southeast Asia (Cambodia, Indonesia, Malaysia, Myanmar, Singapore, Thailand and Vietnam)	13	59	**4.5×**
India	17	69	**4.1×**
Oceania (Australia, Pacific islands and New Zealand)	13	50	**3.8×**
Global	13	48	**3.7×**
Rest of South Asia (Bangladesh, Bhutan, Nepal, Pakistan and Sri Lanka)	4	12	**3.0×**

Top five smartphone markets in Asia Pacific

(number of smartphone connections, 2030)



India	Indonesia	Vietnam	Japan	Bangladesh
1.2bn	387m	190m	183m	178m

Source: GSMA Intelligence

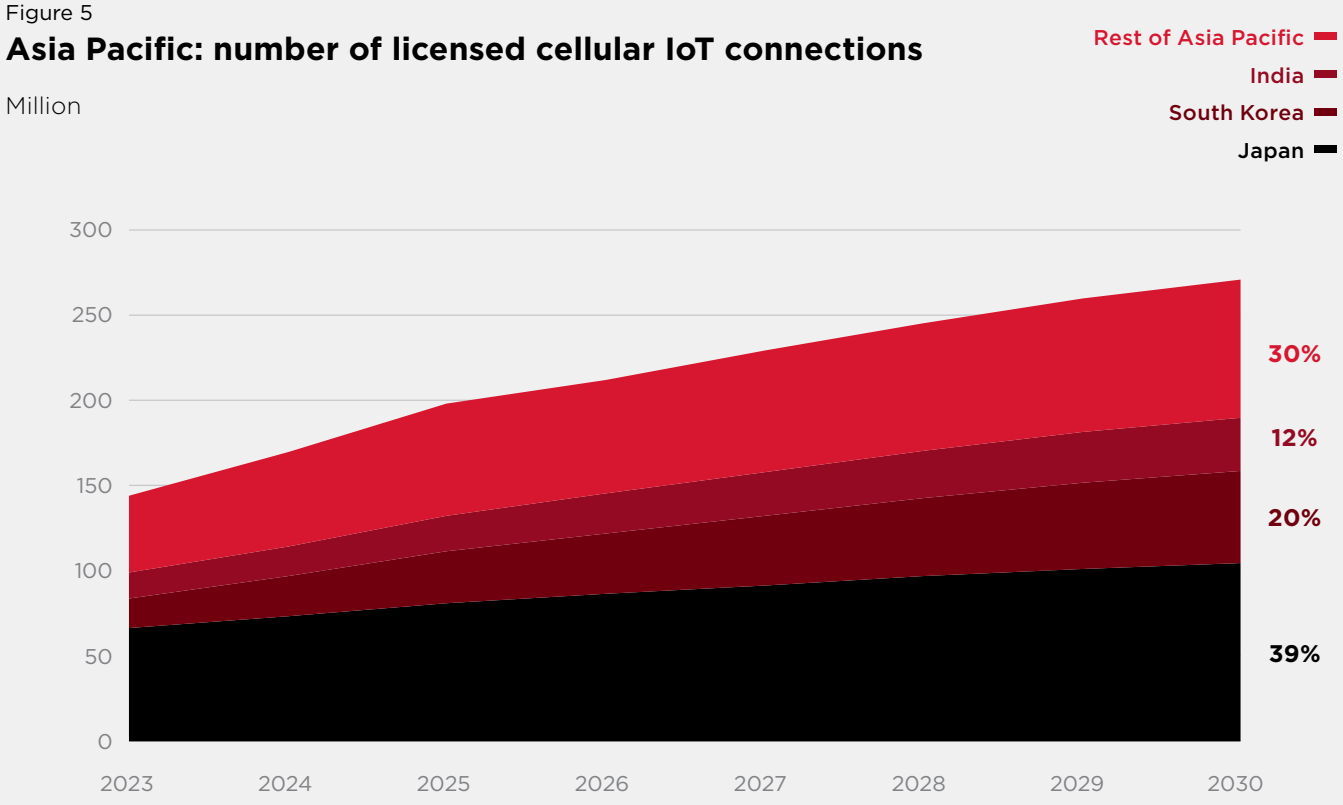
Licensed cellular IoT connections in Asia Pacific will reach 270 million by 2030

The licensed cellular IoT market of Asia Pacific will almost double between 2023 and 2030 with a CAGR of 9%. Japan leads in the region and will account for just under 40% of total connections in 2030. IoT will also gain traction in South Korea, India and Australia. The increasing availability of low-power, wide area (LPWA) networks is crucial to the widespread adoption of IoT.

Operators see the potential in partnerships for jointly selling IoT solutions to local and global customers. In Japan, NTT Docomo and NTT Communications – whose focus has mostly been the Japanese market – have integrated their IoT-related assets and offerings with the wider group's global units (NTT Data and NTT Ltd.) and Transatel, NTT's subsidiary IoT mobile virtual network enabler, to pursue a focused IoT strategy with a global reach.

Figure 5

Asia Pacific: number of licensed cellular IoT connections



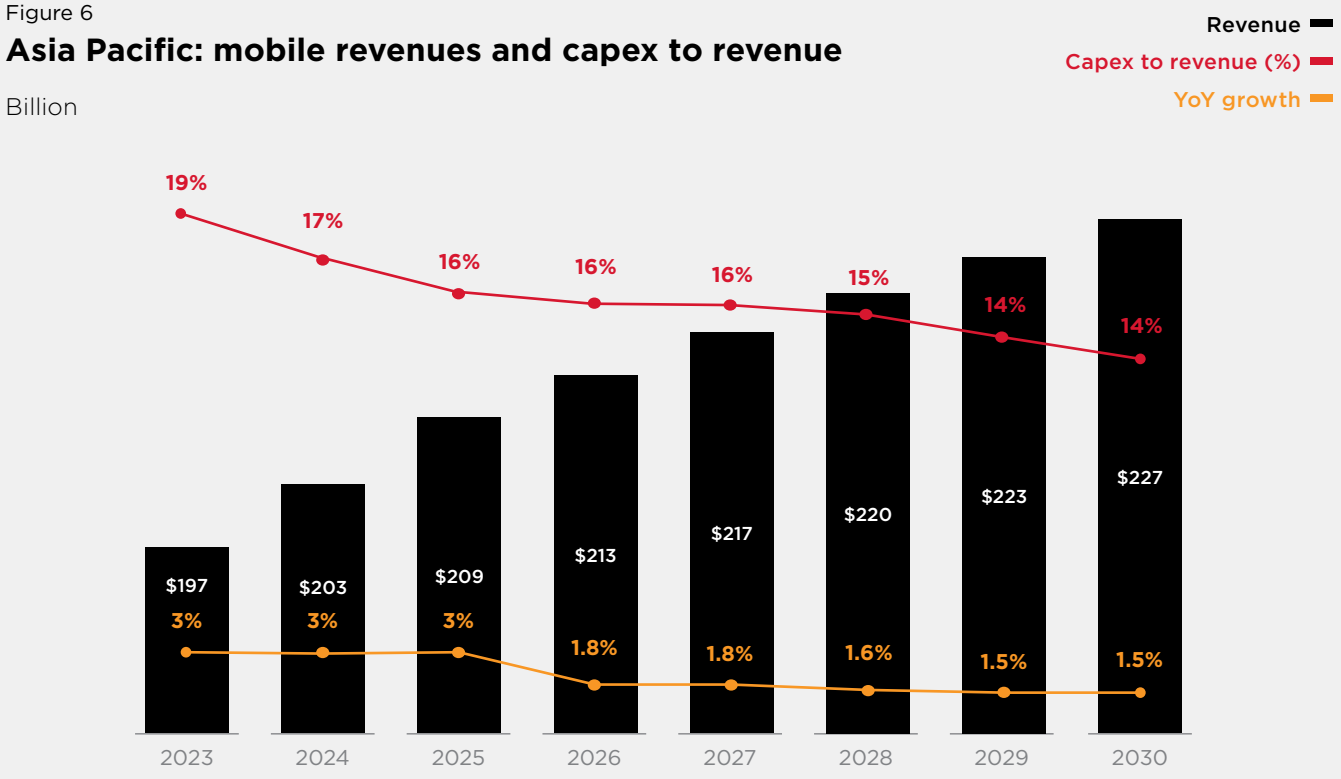
Source: GSMA Intelligence

By 2030, mobile revenues will reach $227 billion in Asia Pacific

Mobile revenues are expected to grow at a CAGR of 2.2% between 2023 and 2030 as mobile markets increasingly become saturated. This will drive operators to expand efforts in generating new revenue streams beyond connectivity. GSMA Intelligence research[5] shows that operators in Asia Pacific prioritise revenue generation over cost savings on a nearly three-to-one basis, when asked about the primary success criteria of network transformation initiatives. This has been true for years – but there was a greater focus on new revenues in 2023 than in 2022, potentially linked to 5G monetisation (and investment).

Figure 6

Asia Pacific: mobile revenues and capex to revenue



Source: GSMA Intelligence

5. Network Transformation 2023, GSMA Intelligence, 2023

The mobile sector added $880 billion of economic value to the Asia Pacific economy in 2023

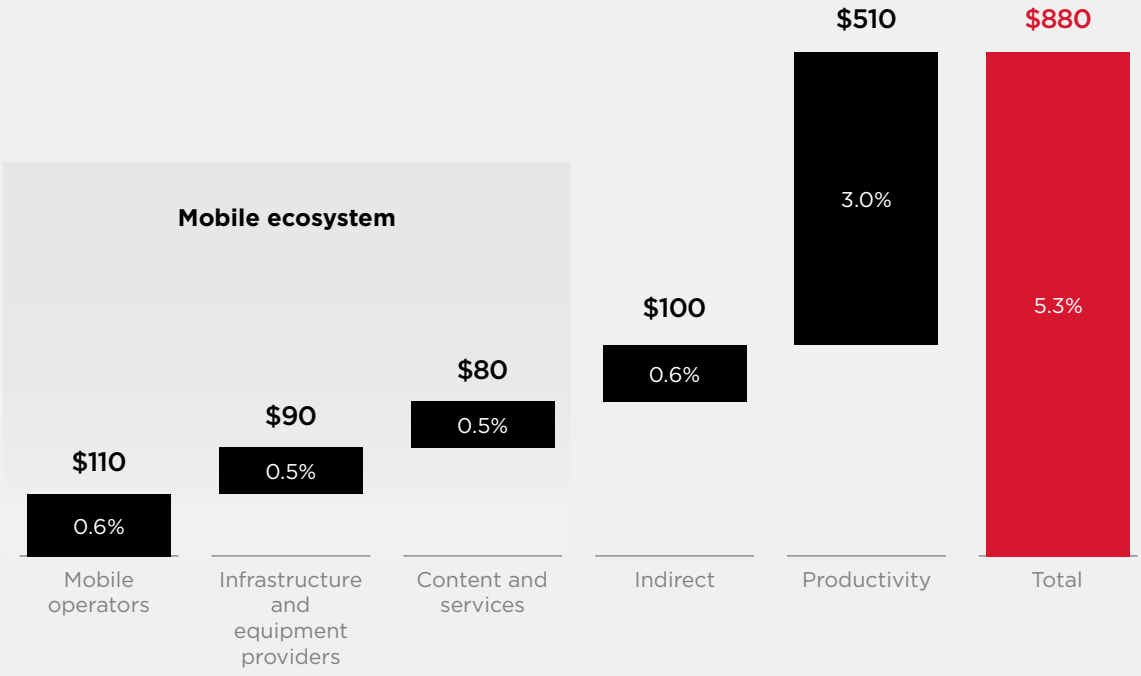
In 2023, mobile technologies and services generated 5.3% of GDP across Asia Pacific, a contribution that amounted to $880 billion of economic value added. The greatest benefits came from the productivity effects generated by the use of mobile services across the economy, which reached $510 billion. The direct contribution by the mobile ecosystem was also significant at $280 billion.

The mobile ecosystem comprises three categories: mobile operators; infrastructure and equipment providers; and content and services. The infrastructure and equipment category includes 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 7

Asia Pacific: total economic contribution of mobile, 2023

Billion, % of GDP



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

At the end of the decade, mobile's economic contribution will reach $1 trillion

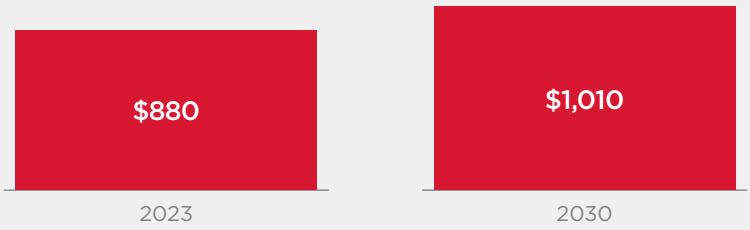
By 2030, mobile's contribution will reach approximately $1 trillion in Asia Pacific, driven mostly by the continued expansion of the mobile ecosystem and verticals increasingly benefiting from the improvements in productivity and efficiency brought about by the take-up of mobile services.

The increase in mobile's contribution to the economy in 2030 is expected to be higher in Asia Pacific (15%) compared to average global growth (12%). This is because 5G penetration is expected to grow more quickly in Asia Pacific than many other regions towards the end of the decade.

Figure 8

Asia Pacific: economic impact of mobile

Billion



Source: GSMA Intelligence

The mobile ecosystem in Asia Pacific supported around 13 million jobs in 2023

Mobile operators and the wider mobile ecosystem provided direct employment for approximately 9 million people in Asia Pacific in 2023. In addition, economic activity in the ecosystem generated more than 4 million jobs in other sectors, meaning around 13 million jobs were directly or indirectly supported.

Figure 9

Asia Pacific: employment impact of the mobile ecosystem, 2023

Jobs (million)

Source: GSMA Intelligence

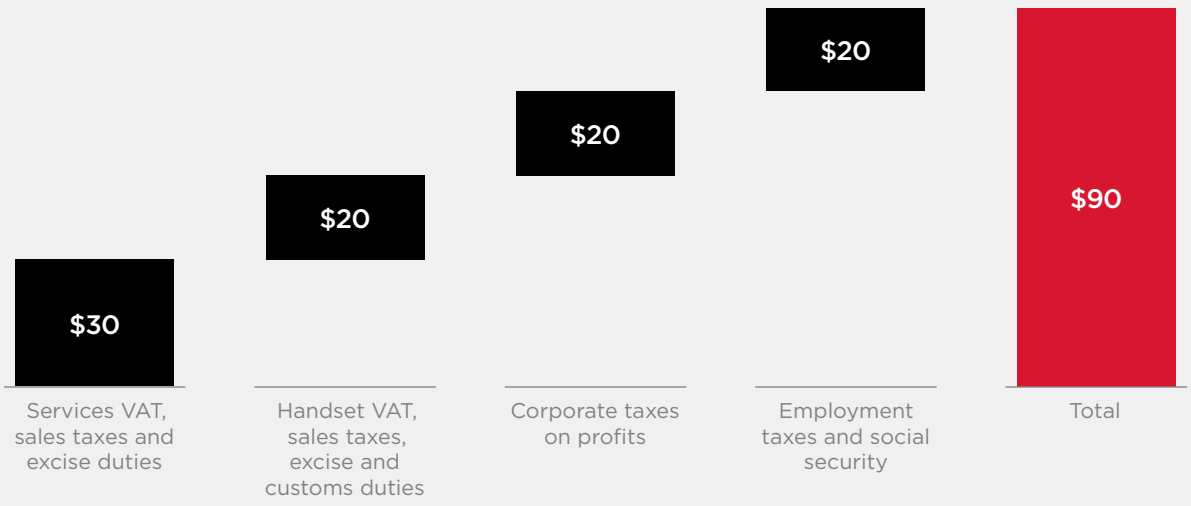
The fiscal contribution of the mobile ecosystem reached $90 billion in 2023

In 2023, the mobile sector in Asia Pacific made a substantial contribution to the funding of the public sector, with around $90 billion raised through taxes. A large contribution was driven by services VAT, sales taxes and excise duties, which generated $30 billion.

Figure 10

Asia Pacific: fiscal contribution of the mobile ecosystem, 2023

Billion



Source: GSMA Intelligence

5G will add almost $130 billion to the Asia Pacific economy in 2030

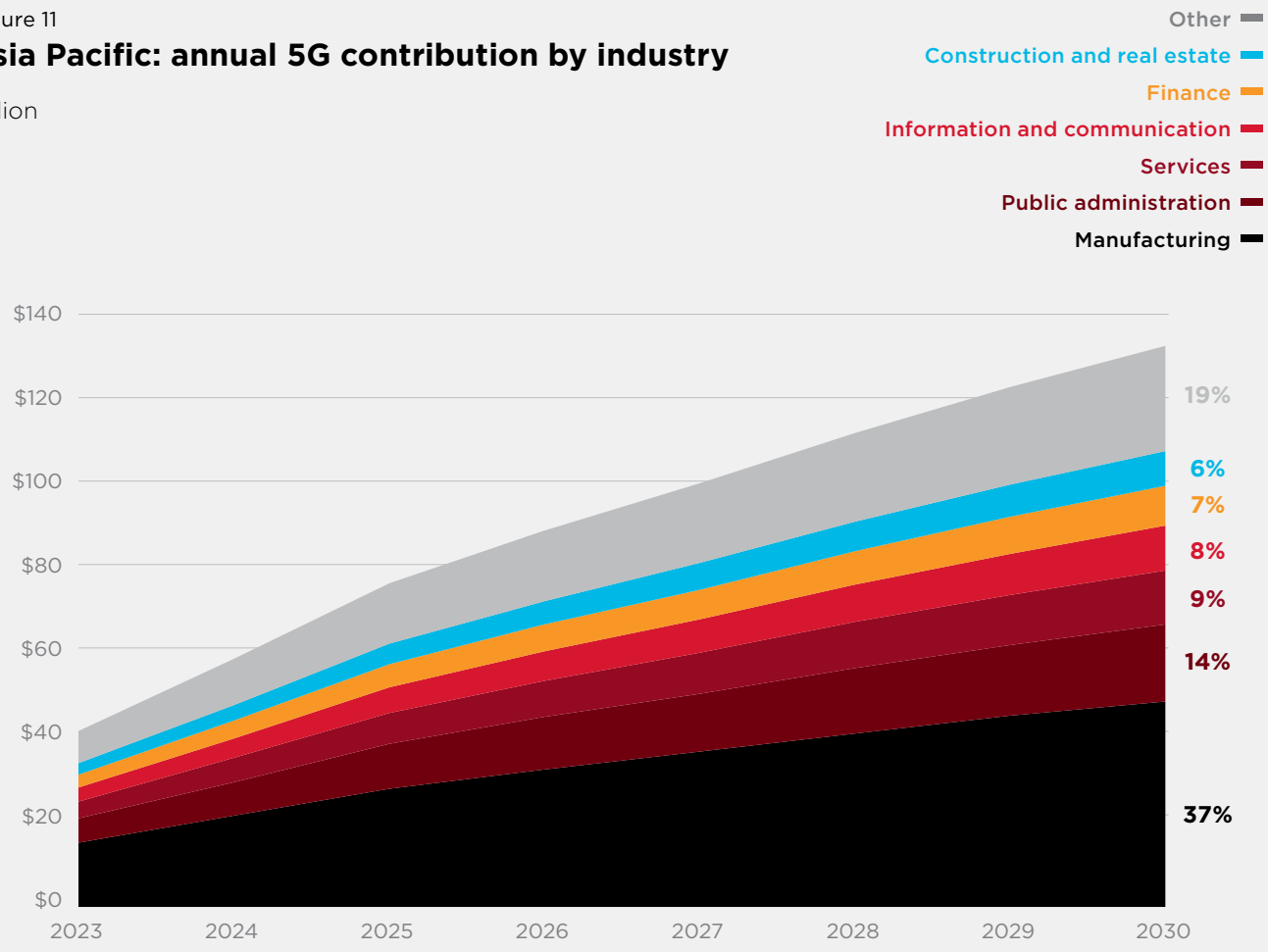
5G is expected to benefit the Asia Pacific economy by $130 billion in 2030, accounting for almost 12% of the overall economic impact of mobile. Much of the 5G benefit will materialise over the period to 2030, as some countries are in early stages of deployment and 5G economic benefits will increase as the technology starts to achieve scale and widespread adoption.

While 5G is expected to benefit most sectors of the Asia Pacific economy, some industries will benefit more than others due to their ability to incorporate 5G use cases in their business. Between 2023 and 2030, 37% of the benefits are expected to originate from the manufacturing sector, driven by smart factories, smart grids and IoT-enabled products, among other applications. Other sectors that will experience significant benefits are the public administration and services sectors at 14% and 9%, respectively.

Figure 11

Asia Pacific: annual 5G contribution by industry

Billion



Source: GSMA Intelligence

02

Mobile industry trends

2.1
5G: focus shifts to 5G-Advanced and 5G RedCap

5G technology is now available in more than 100 countries around the world. As of June 2024, 295 operators in 114 markets had launched commercial 5G services. GSMA Intelligence data shows that the number of 5G connections will reach 2 billion globally by the end of 2024, accounting for nearly a quarter of total mobile connections. In several pioneer countries, notably China, South Korea and the US, 5G adoption has reached mass-market levels, accounting for more than half of total connections.

The commercialisation of 5G FWA services continues to grow globally, highlighting the capability of 5G FWA as a credible alternative to other broadband technologies. As of June 2024, 131 operators had launched commercial 5G FWA services across 64 markets, while fixed broadband service providers in several other countries have announced plans to launch 5G FWA services. As mobile networks usually offer nationwide coverage, regional operators increasingly view 5G FWA as an opportunity to gain subscribers outside of their traditional fixed broadband service areas.

Advanced 5G technologies on the horizon

In Asia Pacific, operators are increasingly deploying 5G networks based on the SA architecture and private 5G networks to enable innovative solutions for enterprises. Commercial 5G SA networks are now present in seven countries in the region (Australia, India, Japan, the Philippines, Singapore, South Korea and Thailand), providing the opportunity to unlock new 5G applications. For example, Jio has deployed more than 1 million 5G cell sites for its SA network in India and has introduced network slicing with dedicated slices for gaming, high-security services and FWA customers, among other applications. In Australia, Telstra announced in February 2024 that it had achieved an uplink speed of 340 Mbps over 5G SA using sub-6 GHz frequencies in a live commercial network.

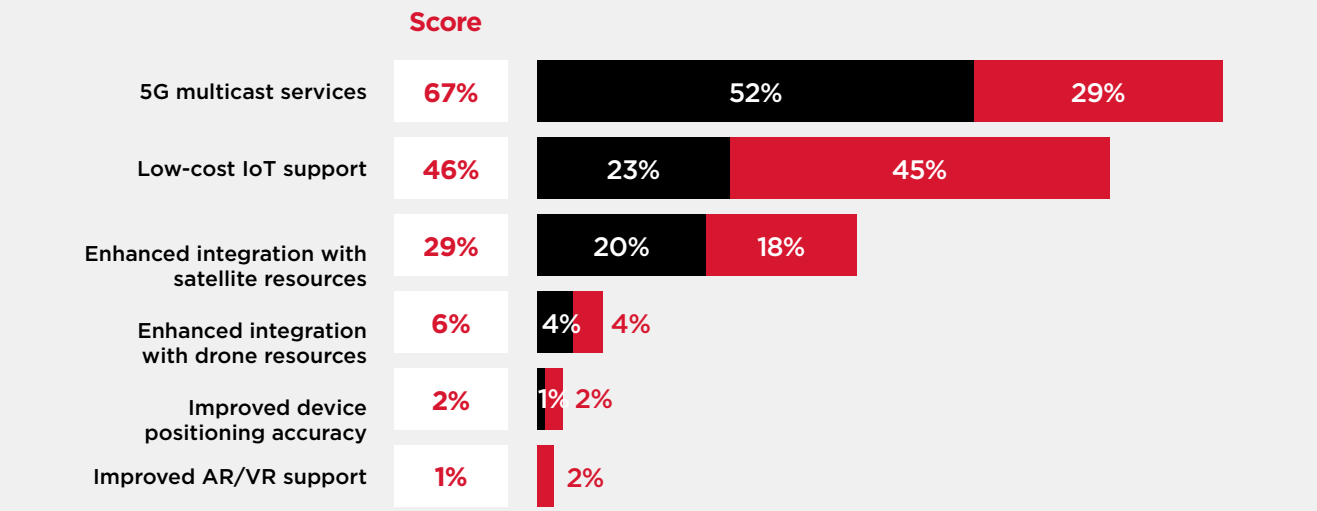
GSMA Intelligence research found that 16% of operators in Asia Pacific expect private networks to account for over 20% of enterprise revenues by 2025.[6] Private 5G networks are expected to revolutionise industries, from manufacturing to healthcare. In Thailand, for example, NTT Ltd. has partnered with Nokia to make private wireless networking solutions available to more than 3.2 million enterprises across Thailand. In Indonesia, Telkomsel has partnered with Huawei to launch the country's first 5G smart warehouse, which showcases the potential of 5G technology to transform warehouse management and boost the operational efficiency of the logistics industry.

Furthermore, operators in Asia Pacific are looking to leverage 5G-Advanced and 5G RedCap technologies to deliver new solutions for enterprises. 5G-Advanced, as part of 3GPP Release 18 in 2024, is the next milestone in the 5G era. The technology is set to enhance mobility by enabling uplink and multicast at better latency, increasing accuracy for extended reality (XR) applications and improving the reliability of AI and machine-learning (ML) data-driven designs. Insights from the GSMA Intelligence Network Transformation Survey 2023 show that 5G multicast and low-cost IoT top the list of 5G-Advanced use cases for operators.

Figure 12

5G-Advanced: priority use cases

Which 5G-Advanced use cases and applications are most important to your network transformation priorities? (Top two choices – ranked)



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

6. Network Transformation 2023, GSMA Intelligence, 2023

3GPP Release 17 introduced the RedCap user equipment category for energy- and cost-efficient 5G IoT connectivity (also known as 5G NR-Light). In comparison to 5G enhanced mobile broadband (eMBB) devices that can deliver gigabits per second throughput in both the downlink and uplink, RedCap devices efficiently support 150 Mbps and 50 Mbps in the downlink and uplink, respectively. The reduced complexity of RedCap devices contributes to cost-efficiency, a smaller device footprint and longer battery life due to lower power consumption.

5G RedCap is an important enabler for mid-tier cellular IoT applications; it serves as a platform for the successful migration of IoT applications to 5G networks in order to take advantage of the benefits of 5G beyond just speed. A range of use cases will benefit from RedCap, notably wearables, video monitoring and telematics. For example, most wearables support medium data rates in small form factors with relatively low power consumption, which is not achievable with eMBB or massive machine-type communications (mMTC). Also, many video applications for surveillance don't require eMBB's high data rates and can therefore benefit from the lower power consumption achievable with 5G RedCap.

Operators in Asia Pacific have begun trials of 5G RedCap solutions, often in collaboration with equipment vendors and other ecosystem players

Operators in Asia Pacific have begun trials of 5G RedCap solutions, often in collaboration with equipment vendors and other ecosystem players, such as the following examples:

- **SK Telecom** has worked with Nokia and MediaTek to develop RedCap technology for commercial frequencies and conduct trials at its testbed in Seoul.
- **Airtel** began India's first pre-commercial RedCap trials in August 2023 in collaboration with Ericsson and Qualcomm.
- In August 2023, Australian operator **Optus** completed an over-the-air data call using pre-commercial Ericsson RedCap RAN software.
- In October 2023, **AIS** partnered with ZTE and MediaTek to complete a validation test of 5G RedCap at 2.6 GHz at the AZ Innovation Centre in Bangkok.
- In December 2023, **Singtel** announced that it had successfully completed Singapore's first RedCap trial on its live 5G network in collaboration with Ericsson and MediaTek.

The growing focus on 5G-Advanced and 5G RedCap is expected to kick-start a new round of 5G investments in 2024 and beyond. It will also lay the foundation for the next wave of 5G use cases that could unlock new revenue streams for operators and the wider ecosystem in both the consumer and enterprise segments. More than half of respondents in the GSMA Intelligence Network Transformation Survey 2023 indicated that they plan to deploy commercial 5G-Advanced solutions and services within one year of the release of the 5G-Advanced standards.

5G development is still nascent in parts of Asia Pacific

The 5G landscape in Asia Pacific presents a mixed picture. Despite widespread 5G deployment and adoption in many pioneer countries, some countries in the region are on the other end of the 5G deployment spectrum. Given that 5G is a capital-intensive technology, it is essential for policymakers, operators and other ecosystem players to put in place the necessary building blocks for the efficient deployment of 5G networks and a sustainable business case ahead of commercial rollout. This includes ensuring the availability of adequate 5G spectrum and upgrading existing networks to prepare for future 5G rollout.

Recent developments in some countries highlight progress being made, such as the below:

- In **Vietnam**, the authorities concluded spectrum auctions in April 2024, which resulted in operators Viettel and Vietnam Posts and Telecommunications Group (VNPT) winning licences in the 2.5–2.6 GHz band and the 3.7–3.8 GHz band, respectively.
- In **Cambodia**, the Ministry of Posts and Telecommunication is working on a policy that will allow all operators to have the required 100 MHz spectrum to run 5G networks.
- In **Bangladesh**, operators have each received a unified licence from the Bangladesh Telecommunication Regulatory Commission (BTRC), which allows technology-agnostic deployment across existing network generations and includes provisions for the rollout of future technologies such as 5G and beyond.
- Digicel is working with Nokia across several **Pacific islands**, including Fiji and Samoa, to upgrade its cell sites to support future 5G rollout. Meanwhile, Vodafone Fiji has invested over $100 million to upgrade and enhance its network for 5G, having conducted live user trials in several districts across the archipelago.

2.2
Open Gateway: operators unite to drive API progress

Around 80% of operators in the GSMA Intelligence Network Transformation Survey 2023 claim to have exposed network APIs on a commercial basis. However, while it has long been possible to expose network APIs, operators have struggled to adopt a standardised approach that unlocks innovation at a global scale. This is the driving force behind the GSMA Open Gateway, which helps developers and cloud providers enhance and deploy services more quickly via single points of access to operator networks.

GSMA Open Gateway is achieved via common, northbound service APIs that expose mobile operators' network capabilities within a consistent, interoperable and federated framework. The APIs are defined, developed and published in CAMARA, the open-source project for developers to access enhanced network capabilities, driven by the Linux Foundation in collaboration with the GSMA.

The GSMA Open Gateway comprises a library of 17 APIs. These are split into different families based on the use case being addressed. The APIs have the potential to facilitate numerous use cases, including tackling digital fraud, simplifying user authentication and addressing quality-of-service (QoS) issues.

Open Gateway is gaining traction across Asia Pacific

By the end of June 2024, 53 operator groups had signed up to the GSMA Open Gateway, representing 247 mobile networks and accounting for 67% of mobile connections globally. Operators in several countries across Asia Pacific have committed to the initiative. These include Australia (Telstra), Indonesia (Telkomsel, Indosat Ooredoo Hutchison, XL Axiata and Smartfren), Japan (KDDI, NTT Docomo, SoftBank), Malaysia (Celcom Digi, Maxis, Telekom Malaysia, U Mobile, YTL Communications), the Philippines (Globe Telecom, Smart Communications), Singapore (M1, Singtel, StarHub), South Korea (KT), Sri Lanka (Airtel, Dialog, Hutch and Mobitel), Thailand (AIS, Telkomsel, True/Dtac) and Vietnam (Viettel). Moreover, operator commitments are beginning to translate into commercially available network APIs:

- **March 2024:** Singapore-based operators Singtel and M1 revealed plans to work together on network APIs in alignment with the GSMA Open Gateway. The initial focus is on APIs that help combat digital fraud, starting with the Number Verify and Device Location APIs.
- **March 2024:** Thai operator AIS released its first batch of GSMA Open Gateway APIs, mainly aimed at fraud prevention. Meanwhile, True announced its readiness to support GSMA Open Gateway APIs in December 2023, launching an early adopter programme targeted at startups and developers in Thailand.
- **February 2024:** Four major Indonesian mobile operators – Telkomsel, Indosat Ooredoo Hutchison, XL Axiata and Smartfren – announced the launch of three API services: Number Verify, SIM Swap and Device Location. These API services are focused on enhancing security and customer experience.
- **November 2023:** All four Sri Lankan mobile operators – Airtel, Dialog, Hutch and Mobitel – have launched three GSMA Open Gateway APIs: One Time Password, Device Location and Carrier Billing. The initial set of APIs gives enterprises and developers a standard way to technically and commercially reach Sri Lankan mobile subscribers regardless of their network operator, opening up a range of new digital applications.

Figure 13

Countries with operators that have commercially launched GSMA Open Gateway APIs

Asia Pacific countries that have commercially launched

Australia
Indonesia
Japan
Philippines
Singapore
South Korea
Sri Lanka
Thailand
Vietnam

Data correct as of June 2024
Source: GSMA Intelligence

Operators begin to formulate go-to-market plans

The next 12 months will likely bring more operator commitments and further market launches in Asia Pacific. Concrete examples of how federation and agreement on common APIs can drive success will be key to drive usage. This will require operators to focus on the developer experience, dedicating internal resources to work directly with developers while building partnerships with API aggregators that can help operators reach a broader set of developers.

Ericsson's Vonage has been one of the most proactive aggregators in building partnerships with mobile operators. It is working with multiple operators in Europe and North America, as well as Telkomsel in Asia Pacific. It also has a partnership with KDDI, which is reselling the aggregator's communication APIs. In addition, Microsoft's Azure Programmable Connectivity (APC) launched in public preview at MWC Barcelona 2024, featuring APIs such as Number Verification and SIM Swap, among other capabilities. APC's partners include 13 operators, with Singtel being one of them. Google, Infobip and Nokia are also involved in the API aggregator space but have yet to publicly announce partnerships with mobile operators in Asia Pacific.

The ultimate impact of the GSMA Open Gateway will depend on the participation of API aggregators and hyperscalers. These companies have already amassed legions of developers and go-to-market channels that operators will require to monetise their networks at scale. Most of them see Open Gateway as a win–win, as it brings further API assets for their own channels. However, this should not be taken for granted; connecting developers to the Open Gateway value proposition will require work and messaging.

2.3
Satellites and NTNs: momentum builds behind aerial connectivity

Telecoms networks remain the primary form of connectivity, supported by the wide area coverage of wireless networks and the mass production and adoption of mobile devices. In recent years, however, technological advances in various satellite and other non-terrestrial networks (NTNs), such as unmanned aerial vehicles (UAVs), have helped to overcome several limitations associated with aerial connectivity. This has resulted in significant performance improvements, lower deployment costs and more commercially viable business models for satellite and NTN-based connectivity solutions.

LEO satellite and HAPS providers have attracted much attention on the back of significant investments and technical breakthroughs that improve the business case for delivering connectivity at scale. A key selling point for aerial connectivity solutions is 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.

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.

Countries in Asia Pacific explore aerial connectivity solutions

The geographical make-up of several countries in Asia Pacific means that aerial connectivity will play an important role in realising universal connectivity. From archipelagos and rainforests to deserts and mountain ranges, Asia Pacific is home to some of the most challenging terrains for terrestrial networks. As a result, there has historically been significant interest in aerial solutions and the opportunity they offer to help extend connectivity to hard-to-reach locations. For example, satellites play a prominent role in Indonesia's Palapa Ring project, which was designed to bridge the digital divide across the country.

The emergence of LEO and HAPS solutions have heightened this interest, as demonstrated by recent developments. Importantly, telecoms operators across the region are actively engaged in the evolving aerial connectivity market, mostly through partnerships and investments, as highlighted in Figure 14.

Figure 14

Examples of recent aerial connectivity activities in Asia Pacific

Country	Activity
 **Australia**	Telstra has partnered with Starlink to offer LEO satellite connectivity to consumer and enterprise customers, adding the service to a mix of technologies it uses to provide voice and broadband services in rural and remote Australia.
 **India**	Bharti Group emerged as the largest shareholder of Eutelsat OneWeb, following the completion of the merger between Eutelsat and OneWeb. Bharti Airtel will leverage the strategic investment in the satellite service provider to improve broadbandconnectivity in India and beyond.
 **Indonesia**	Starlink internet service was formally launched in June 2024, with the expectation that it will deliver much-needed connectivity to the most remote islands in Indonesia. The country's government and SpaceX also signed an agreement on enhancing connectivity in the health and education sectors.
 **Japan**	In May 2024, a Japanese consortium, which includes mobile operator NTT Docomo, achieved what it called the world's first demonstration of 5G communication from an altitude of 4 km using the 38 GHz band. The demonstration is part of a project on HAPS-based wireless communications led by Japan's Ministry of Internal Affairs and Communications. Separately, another consortium led by NTT Docomo has committed to invest $100 million in Aalto HAPS, the company which manufactures and operates the stratospheric, solar-powered Zephyr HAPS solutions.
 **South Korea**	A South Korean project to establish a satellite communications system in LEO has passed a preliminary feasibility study and will officially begin in 2025, according to a government statement. The Ministry of Science and ICT aims to launch two LEO satellites based on 6G by 2030.
 **Sri Lanka**	In June 2024, the Telecommunications Regulatory Commission of Sri Lanka approved the launch of Starlink satellite connectivity services in the country. Different sectors, including education and fishery, are expected to benefit from improved connectivity in remote areas.
 **Thailand**	In December 2023, Thaicom announced the official launch of the Thaicom and Globalstar satellite gateway. The new gateway will extend Globalstar's LEO satellite constellation coverage to Thailand and Southeast Asia and enable the deployment of commercial LEO satellite services.

Source: GSMA Intelligence

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 January 2024, SpaceX launched six Starlink satellites for D2D services to be delivered in partnership with telecoms operators around the world, including Optus and KDDI. For its part, satellite service provider Lynk Global has started D2D services in Palau and the Cook Islands. Meanwhile, Rakuten Mobile has outlined plans to provide D2D services in Japan in 2026, in collaboration with AST SpaceMobile.

For operators, D2D services offer access to new customers in underserved areas and the capability to provide connectivity in remote areas. For satellite providers, operators' existing relationships with end users and, where relevant, existing spectrum holdings are crucial for satellite solutions to achieve scale. The availability of compatible devices will contribute to the take-up of end-user satellite-enabled services, for example messaging and voice calling in emergency situations or areas without access to terrestrial networks. GSMA Intelligence estimates a total incremental revenue opportunity from D2D services of over $30 billion for telecoms operators by 2035.

2.4
GenAI: operators seek revenue-generating opportunities

The rise of genAI has pushed the envelope of AI capabilities. Operators are utilising advanced AI models, such as ChatGPT, to drive network automation and deliver a smarter customer experience. This has the potential to improve bottom-line performance by, for example, developing more personalised pricing to increase ARPU and optimise staffing levels.

In Asia Pacific, operators are using AI for internal improvements and investing in AI development to explore revenue-generating opportunities. Applications of genAI in customer services, sales, marketing and code development present near-term opportunities for operators in the region. For instance, One New Zealand reported improvements in customer service three months after deploying genAI capabilities from AWS to enhance services in its call centres. The operator noted a 10% improvement in customer trust, accompanied by a similar level of improvement in the share of customers reporting interactions with knowledgeable and friendly staff.

Despite growing use of genAI in customer-facing operations, networks will remain the primary genAI focus for operators. Suppliers are delivering diverse genAI operations and support tools for network enhancement and management. According to the GSMA Intelligence Network Transformation Survey 2023, network troubleshooting, maintenance and threat detection are the top expected benefits of genAI by a significant margin over other use cases, aligning well with operators' strategic focus on user experience and security.

Below are recent examples of operators focusing on AI for networks:

- **Rakuten Mobile's AI-powered analytics:** Rakuten's continued collaboration with Radcom will include advanced AI-powered analytics such as anomaly detection and automated root cause analysis. Rakuten will use the new tools to drive efficient network operations and network automation monitoring, as they proactively identify and prevent degradations.
- **KT deploys AI-enabled VOC:** KT has broadened the use of its AI-enabled voice of the customer (VOC) system, dubbed AI-VOC portal, to help improve the quality of its customer-engagement services. The portal gathers anonymised customer interaction data and analyses, summarises and monitors this using KT's LLM, Belief. The new system can quickly share up to 3 million customer inquiries and complaints every month with relevant departments through the AI-VOC portal, and provide responses that can then be used to improve the quality of customer service.
- **KDDI uses AI to detect faults in its LTE core:** KDDI is using a failure-detection system that utilises AI in its LTE mobile core network. It can monitor and analyse time-series performance data such as the amount of traffic output from network devices, the number of successful connections and the device's CPU usage rate. It uses these to detect when a standard value has been exceeded to prevent failures.
- **DNB and Ericsson automate network management:** Malaysia's Digital Nasional Berhad (DNB) and Ericsson conducted a proof of concept in the use of AI, ML and automation to simplify management of the 5G network and reduce manual configuration tasks and human errors. The automation allows the manual configuration of individual network elements, reduces the maintenance period for upgrades and enables service-level agreement obligations to be maintained.
- **Airtel deploys predictive-maintenance solution:** Bharti Airtel has partnered with Avanseus to deploy a predictive-maintenance solution across its operations. The solution utilises the principles of AI analytics to uncover actionable operational insights, enabling Airtel to proactively predict and prevent incidents in the network.
- **Maxis uses genAI for network coding:** Maxis expanded its collaboration with Google Cloud by integrating genAI into its workflow and service offerings. By integrating these platform capabilities, Maxis seeks to upgrade its internal processes, productivity, operational insights and customer-behaviour modelling.

Operators appear to be taking different approaches to developing genAI solutions. Some have relied on partnerships with webscalers (such as Google, AWS and Microsoft Azure) to support their genAI efforts. For example, Google Cloud has announced partnerships with Airtel and Telkomsel to utilise genAI for personalised offerings and communications, and KDDI has partnered with AWS to develop genAI solutions in Japan.

Conversely, the Global Telco Alliance (SK Telecom, Singtel, SoftBank, Deutsche Telekom and e&) are co-developing their own telecoms-specific AI models, benefiting from a global customer base of 1.3 billion across 50 countries. Compared to general LLMs, telco-specific LLMs are tailored to match specific requirements and have a better understanding of users. Tailored LLMs also facilitate the swift and efficient deployment of high-quality genAI models, accelerating AI transformation. However, achieving a universally applicable LLM across diverse telecoms environments is a challenging task. Thus, the success of collaborative efforts such as the Global Telco AI Alliance depends heavily on the degree of LLM refinement and adaptation required by each operator.

Investing in AI development

Another notable trend among operators in the region is the increase in investments and partnerships to develop revenue-generating solutions and LLMs specific to local markets, such as the following:

- **Reliance Jio** has partnered with the Indian Institute of Technology Bombay to develop and launch BharatGP, an LLM designed to meet the needs of India's multiple languages.
- **SK Telecom** has invested an additional $100 million in Anthropic, an AI safety and research company based in San Francisco, to jointly develop a multilingual LLM that supports various languages, including Korean, English, Japanese and Spanish.
- **SK Telecom** has invested $10 million in Perplexity, a San Francisco–based genAI-enabled conversational search engine developer. Perplexity will collaborate with SK Telecom on the development of genAI-based search engines to be integrated in the operator's AI personal assistants, including its A Dot application.
- **KDDI** has joined forces with AI startup Elyza to launch a genAI platform to deliver new services to enterprises and local governments. The operator now owns a 43% stake in Elyza, while KDDI Digital Divergence holds a 10% stake.
- **NTT Docomo Ventures** has invested in Sakana AI, a company aiming to develop next-generation genAI infrastructure models. The partnership aims to develop sustainable genAI solutions through 'lightweight' LLMs to mitigate the enormous power-consumption requirements of current LLMs.
- **KT** and **KT Cloud** have jointly invested KRW15 billion ($11.6 million) in Moreh, an AI computing infrastructure startup. Moreh's AI solutions allow users, including AI developers, data centre operators and AI chip makers, to build more flexible AI infrastructure.
- **KT** has also partnered with the Thai communication technology company Jasmine Group to create an LLM service based on the Thai language.

The GSMA and IBM collaborate to accelerate AI for the industry

In January 2024, the GSMA and IBM announced a new collaboration 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. Democratising AI is critical to ensure all players in the industry and their customers can reap the benefits.

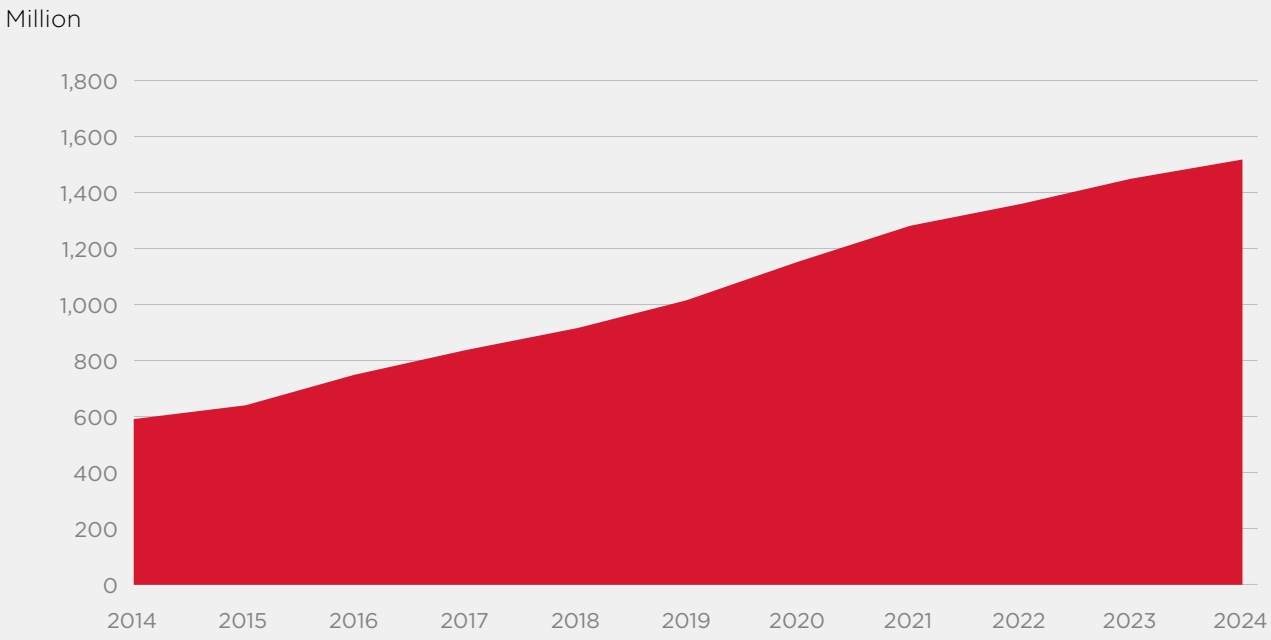
To achieve this, the new initiatives launched by the GSMA and IBM aim to provide the industry with access to AI tools and knowledge, alongside the necessary skills and training. The initiatives should help provide scale, allowing operators and industry players of all sizes and in all regions to navigate the fast-evolving landscape of AI technologies and associated opportunities. This includes investigating the use of genAI in various functional areas of a telecoms provider and exploring innovative use cases across vertical sectors.

2.5
Consumer trust: stakeholders take steps to enhance online safety

Asia Pacific is one of the most digitally advanced regions in the world. The number of mobile internet subscribers has more than doubled in the last decade and will reach 1.5 billion in 2024 (Figure 15). Access to connectivity plays a central role in efforts to accelerate economic growth, improve personal and business communications, and build resilient and sustainable economies. It also underpins a slew of life-enhancing services, including e-commerce, digital health, online education and digital banking services.

Figure 15

Number of mobile internet subscribers in Asia Pacific



Source: GSMA Intelligence

However, the simultaneous rise of online threats targeting individuals and enterprises risks the erosion of consumer trust in digital services. These threats, which vary considerably in scope and scale, include online scams, frauds, abuses, and misinformation and disinformation perpetuated against vulnerable individuals and communities, as well as malicious cyberattacks and data breaches targeting enterprises of various sizes. The threat of online misinformation and disinformation becomes more acute considering its potential impact on major elections across the region in 2024 and 2025.

Meanwhile, the proliferation of advanced AI tools, notably genAI applications, adds a new dimension to the threat landscape by potentially enabling new types of attacks and making existing ones harder to detect. Across Asia Pacific (including Greater China), there was a 1,530% increase in the number of deepfakes[7] detected in 2023, with the majority of cases in Vietnam and Japan.[8]

Online threats can have a profound impact on victims, including financial losses and a mental toll, resulting in a loss of trust in digital platforms.

7. The use of AI/ML algorithms to create highly realistic audio or video content with the intent to deceive or manipulate.
8. Identity Fraud Report 2023, Sumsub

As a result, several countries in the region have responded to the rising incidence and sophistication of online threats through new regulations, such as Australia's Comprehensive Anti-Scam Initiative[9] and the proposed Shared Responsibility Framework in Singapore.[10]

Beyond regulations, digital ecosystem players, notably mobile operators and social media firms, are taking steps to tackle online threats and, by extension, protect their customers, mitigate reputational damage and maintain trust in digital platforms. Awareness is an important first step to protecting individuals and businesses. As such, operators across Asia Pacific have invested in various initiatives, for example dedicated pages on their websites, to inform their customers of new threats and educate them on how to protect themselves and others.

A growing number of operators in the region have also launched Rich Communication Services (RCS) to improve security for consumers and businesses. RCS protects consumers by enabling spam filtration – a feature that prevents malicious text messages from reaching your inbox. Flagged spam texts are automatically sent to a spam filter, so that users don't interact with a fake message. This feature is often added on top of RCS and is currently being added to the RCS standard. Moreover, RCS business messaging (RBM) gives businesses the ability to verify their accounts, meaning that users can be certain that the business they're speaking to is not a fake account. This business verification feature is a key consumer protection tool, as it prevents users from falling prey to fake business spam texts.

Other technical solutions have also been developed to combat various threats, such as the following:

- **Singtel** has launched SingVerify, a suite of solutions to protect customer data and mitigate online frauds. The solution enables a multifactor-authentication process that instantly verifies users' digital identities to prevent phishing and malware application scams.
- **SK Telecom** has released an AI service called AI Spam Indicator that helps users recognise spam calls in real time by displaying a spam rating (e.g. phishing alert, spam alert and suspected spam) when they receive a call from an unknown number.
- **Airtel** launched the Airtel IQ Spam Shield, an AI/ML-based solution, which helped a local bank reduce spam messages by 98% and block more than 8,000 suspicious SMS headers. This helped to prevent over 160,000 potential frauds by blocking harmful content and templates.
- **Meta** has committed to build tools to detect, identify and label AI-generated images shared on its platforms. It has also committed to develop LLMs to automatically moderate content online and collaborate with industry partners on common technical standards for identifying AI-generated content.
- **Google DeepMind** has launched a watermarking tool that labels whether images have been generated with AI. The tool, called SynthID, can help people tell when AI-generated content is being passed off as real or help protect copyright.

Importantly, the task of maintaining and enhancing trust must be viewed as a shared responsibility between stakeholders, as opposed to the sole responsibility of any single stakeholder. To this end, stakeholders in some countries have announced collaborative initiatives to tackle online threats. In June 2024, the South Korean government said it will share phishing scam call data with private companies, including operators, to help them to develop AI-based services and software to prevent voice phishing scams. In March 2024, Singtel Cyber Security Institute, SIM Academy and UOB announced the co-development of a cyber scam preparedness programme called Defence Against Cyber Scams to upskill and reskill employees of large enterprises.

9. "Banks unite to declare war on scammers", Australian Banking Association, November 2023
10. Consultation Paper on Proposed Shared Responsibility Framework, Monetary Authority of Singapore

03

Mobile industry impact

3.1
Accelerating digital inclusion

Globally, digital inclusion has become a top policy priority. In 2023, the G20 Leaders' Summit in New Delhi emphasised digital inclusion, setting a target to halve the digital gender gap by 2030. Additionally, the UN Economic and Social Commission for Asia and the Pacific highlighted the importance of digital inclusion and cooperation in its 2023 Annual Report. Looking ahead, the upcoming Summit of the Future will see governments agreeing on the Global Digital Compact,[11] aiming to overcome digital divides by addressing key barriers such as affordability and digital literacy.

Addressing the digital divide is a key priority of the mobile industry, which, supported by the GSMA, continues to lead on accelerating digital inclusion for underserved groups. Through the GSMA Connected Women Commitment Initiative, over 50 mobile operators across low- and middle-income countries (LMICs) have made formal commitments to reduce the gender gap in the customer base of their mobile internet or mobile money services since 2016, collectively reaching over 70 million additional women with these services.

Connected Women Commitment Partners are actively working to tackle the barriers preventing women from using mobile and mobile money services by:

- **increasing awareness of relevant use cases and the benefits of mobile internet and mobile money for women** (e.g. through enhanced marketing and sales campaigns)
- **improving affordability of internet-enabled devices** (e.g. through handset financing schemes and improving availability of ultra-low-cost internet-enabled devices)
- **increasing knowledge and skills** (e.g. through digital skills campaigns)
- **improving safety and security** (e.g. by enabling customers to privately recharge their credit or data to minimise risk of harassment)
- **ensuring services are relevant for women** (e.g. by adapting mainstream products and services to better meet women's needs).

GSMA's Connected Women Commitment Partners have highlighted that setting clear targets and taking informed, targeted action makes a difference. However, the digital gender divide is driven by a complex set of social, economic and cultural factors that cannot be addressed by one organisation alone. Further action is required by policymakers, industry, the development community and other stakeholders working together to better measure, understand and address the needs of digitally underserved populations and the barriers they face.

For many, mobile devices are the primary, and often sole, means of internet access, especially for women, older people, people with disabilities and those in rural areas. While mobile technology has significantly advanced digital inclusion, substantial connectivity gaps remain. Mobile operators and their partners are continually addressing barriers to mobile internet adoption and use, focusing on underserved populations.

> **Further action is required to better measure, understand and address the needs of digitally underserved populations and the barriers they face**

11. https://www.un.org/techenvoy/global-digital-compact

Supporting vulnerable populations

Operators in Asia Pacific recognise that vulnerable communities, such as older people and low-income families, may encounter challenges in keeping up with technological advancements due to limited resources or skill sets. Consequently, they are actively addressing this issue.

For example, Singtel and its partners have launched various digital enablement initiatives in Singapore to narrow the digital gap for older citizens. Singtel's Donate Your Data and Donate Your Device programmes allow customers to contribute their unused data and devices to support vulnerable older people and low-income families. Since 2015, Singtel has digitally empowered over 840,000 individuals, with a target of reaching 1 million people by 2025. Through initiatives such as Singtel Digital Silvers, the operator has significantly boosted older people's confidence in utilising mobile devices to navigate the digital landscape.

Empowering users with assistive tech

Accessible digital solutions are essential preconditions for people with disabilities to live independently and participate fully in the digital world. For them, access to assistive technology can be transformative and empowering. The Global Report on Assistive Technology by the World Health Organization and Unicef estimates that 2.5 billion people need assistive technology and that this will rise to 3.5 billion by 2050. While a digital gap certainly exists in terms of access to digital devices such as mobile phones and other assistive tech, there is also a mobile disability gap[12] in internet usage that needs to be addressed. Operators play a crucial role in supporting the development of disability innovations, either by ensuring accessibility of their own products and services or by supporting digital assistive-technology providers.

For instance, Jazz Pakistan and Dialog Sri Lanka have collaborated on DeafTawk,[13] an assistive technology that aids communication for the deaf by offering on-demand sign-language interpretation via an app. The platform has had a significant impact, with 91% of users reporting an improvement in their quality of life and 33% reporting that they used mobile internet services more, as of December 2022. Furthermore, DeafTawk has enhanced the earning potential for sign-language interpreters, who can connect easily to their deaf customer base without having to travel, saving time and costs.[14] Through its innovation incubator programme, Jazz supported the development of DeafTawk in 2021,[15] In 2023, Dialog launched DeafTawk for its Sri Lankan deaf customers and in 2024 it integrated DeafTawk services within its customer service call centre to improve communication and support to customers.

The GSMA Innovation Fund for Assistive Tech supported DeafTawk and similar assistive technologies providers in Africa and Asia that are driving the digital inclusion of people with disabilities.

12. The Mobile Disability Gap Report 2021, GSMA, 2021
13. See GSMA Innovation Fund Grantees: DeafTawk
14. See Empowering persons with disabilities through digital innovation, GSMA 2023
15. This started in 2019, while a significantly improved version (with group calling and enhanced scalability) was launched in December 2021.

3.2
The mobile industry's impact on the SDGs

The mobile industry continues to achieve its impact on the UN Sustainable Development Goals (SDGs), driven by the increased reach of mobile networks and growing take-up of mobile internet services. SDG 9: Industry, Innovation and Infrastructure, SDG 6: Clean Water and Sanitation and SDG 4: Quality Education were the most improved SDGs in the region between 2015 and 2022. The growing use and adoption of smartphones and mobile internet is contributing to mobile's impact on the SDGs.

Figure 16

Mobile's impact on the SDGs in Asia Pacific

Source: GSMA Intelligence

Connectivity boosts smarter industrial solutions

Countries in Asia Pacific are utilising connectivity to boost production and enhance communications. SDG 9 aims to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation. Additionally, it strives for universal and affordable internet access, with SDG target 9.c having the aim of substantially enhancing access to information and communication technology.

The mobile industry supports progress on SDG 9 by building resilient infrastructure and improving industrial processes. Technologies such as 5G, IoT, cloud computing and AI all play a significant role in enterprise digital transformation across a range of sectors, such as manufacturing and logistics.

These technologies are boosting innovation in the region, leading to a range of improved business outcomes, such as productivity gains, cost savings and new revenue streams.

For example, Telkomsel and Huawei's 5G smart warehouse solution in Indonesia uses IoT and big data analytics to support operations, enhance security and reduce energy consumption. The warehouse managers can use digital twins and real-time data analysis to optimise inventory management and prevent stock-outs. The 5G network is designed to facilitate communication between staff and autonomous guided vehicles, ensuring goods movement.

Protecting the environment through emissions reduction

Operators across Asia Pacific are also accelerating the shift to more sustainable operations, given the demand for a greater focus on energy efficiency from key stakeholders, including shareholders and customers. The industry is working on this challenge through a comprehensive set of actions, including technical solutions that improve network energy efficiency. Some recent developments demonstrate the commitment of operators and their partners to meet key sustainability targets:

- **KT develops AI technologies for power reduction:** KT has developed three AI technologies to reduce power consumption in communication services in South Korea. These include AI TEMS for efficient temperature management; the energy-saving orchestrator for radio wave output control; and a server power supply optimisation solution for server power usage. The energy-saving orchestrator began piloting in select 5G base stations from April 2024.
- **MobiFone partners with Nokia to reduce emissions:** MobiFone achieved overall energy savings of almost 14% in a trial of Nokia's Digital Design service. The service analyses each individual cell in the network to determine interference, load and beam-set configuration and recommends the most appropriate radio link power balance to reduce transmit power. While the in-built RAN software functions help reduce power consumption during low traffic hours, the Digital Design service addresses peak-hour power consumption as well, leading to considerable energy savings.
- **Globe Telecom uses Nokia solution to cut power use:** Globe Telecom uses Nokia's AVA Energy Efficiency software, which is delivered in a software-as-a-service delivery model, to lower network power consumption and costs. The AI/ML-based solution enables Globe to shut idle and unused equipment automatically during low-usage periods.

Mobile phones improving quality of life

SDG 6 aims to ensure the availability and sustainable management of water and sanitation for all. Mobile technology improves many aspects of water delivery and sanitation provisioning. Effective metering and revenue collection are central to a healthy, functioning water utility, but many utilities struggle to collect their tariff revenues. IoT solutions such as smart water meters can help break the vicious cycle of low revenue collection and poor service.

For example, XL Axiata and PT Berkat Air Laut (BAL) have developed an IoT-based smart water meter solution to monitor the distribution of clean water for residents of Indonesia. The smart water meter has an NB-IoT SIM card from XL Axiata to transmit the required data from the water meter to the server operated by PT BAL. The solution enables transparent and more precise billing, making it easier for the bank to assess or calculate cash flow. In addition, maintenance costs are lower, as it is easier and faster to detect leaks in water pipes or improper use.[16]

Mobile technology also contributes to SDG 4 and seeks to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all. Access to quality education in Asia Pacific has improved significantly, with increasing adoption of digital technologies.

Some examples are highlighted below:

- **Kacific and Microsoft improve rural education:** In April 2024, Kacific Broadband Satellites Group announced a collaboration with Microsoft's Airband initiative to connect rural educational and healthcare institutions across developing countries in Asia Pacific using satellite broadband connectivity. The project aims to deploy broadband connections over the next two years to 750 rural educational and healthcare institutions in Papua New Guinea, the Philippines, Solomon Islands, Vanuatu, Cook Islands, Samoa and Timor-Leste using high-powered Ka-band beams from the Kacific-1 satellite.
- **CelcomDigi and Virnect develop experiential education services in the metaverse:** CelcomDigi and Virnect agreed to explore the development of experiential learning and education using the metaverse for multiple Malaysian universities in September 2023. Virnect is a technology company specialised in the development and commercialisation of industrial XR services. The collaboration aims to produce industry-ready graduates skilled in metaverse applications and to co-create industrial virtual learning programmes reimagined using the metaverse and AI-based services.

16. "PT Berkat Air Laut Applying NB-IoT Technology for Smart Water Meter Solution, Ensuring Clean Water Supply in Gili Trawangan and Gili Meno", XL Axiata, March 2023

04

Mobile industry enablers

4.1
Policies to sustain investments

The mobile industry is a major engine of economic growth across Asia Pacific and is expected to contribute more than $1 trillion to the region's economy by the end of the decade. As mobile networks continue to impact the daily lives of people, the rollout of 5G is amplifying that impact even further by enabling innovative solutions to drive productivity across various sectors of the economy.

For the mobile industry to advance and deliver on these promises, policies and regulations need to support a conducive environment for rapid growth and innovation. In particular, policies that will play a key role towards this objective include those that promote investment in networks, reduce taxation burdens, promote ease of doing business by reducing onerous compliance costs, improve efficiency, and foster inclusivity and online trust and safety.

As demand for high-speed, high-quality mobile connectivity continues to grow, regulators and policymakers need to sufficiently incentivise investment in network infrastructure and services. This requires a review of current policies to identify those that create unnecessary barriers for mobile operators, hindering their ability to invest without necessarily having any positive impact on consumer welfare. Some of these policies are highlighted below.

Reducing the taxation burden

A high tax burden on operators and mobile services, especially in the form of sector-specific taxes, can negatively impact operators' ability to invest in their networks and weigh on the affordability of services for consumers. Indeed, GSMA research has shown that sector-specific taxes can be regressive (i.e. falling disproportionately on the poorest households) where they raise the price of mobile services across the population without regard for capacity to pay.

In Bangladesh, where the mobile industry plays an important role in driving digital transformation and the realisation of the Smart Bangladesh 2041 aspiration, mobile operators have kept the price of mobile internet services at a low rate. However, the tax contribution of the mobile sector remains significantly higher compared to similar markets in the region, thereby limiting the capacity of the mobile industry to maintain low prices and to continue to invest in networks. The mobile sector in Bangladesh is subject to a turnover tax of 2% of gross receipts applied irrespective of bottom-line performance. Consumers also face a high tax burden with general and sector-specific taxes, comprising effective VAT rate (17.25%), supplementary duty (15%) and surcharge (1%), resulting in a combined usage tax of 33.25%.

In Pakistan, the mobile sector has expanded rapidly over the last decade, but there remains a significant unconnected population. The GSMA estimates that around three in five of Pakistan's population do not yet subscribe to a mobile service and only a quarter of the population subscribe to mobile internet services. In 2020, the total tax contribution of the mobile sector, amounted to PKR170 billion ($1.1 billion), equivalent to 38% of mobile-sector revenues. This is substantially higher than the average in Asia Pacific (24%) and globally (22%). Additionally, mobile consumers in Pakistan must pay 16% or 19.5% in sales tax on mobile services depending on their province, plus 15% advance income tax (or withholding tax). Not many countries impose such sector-specific taxation on mobile services, and among those that do, Pakistan has the highest rates.

The tax burden on operators and consumers in Bangladesh and Pakistan create additional barriers to digital inclusion, particularly for low-income households. As such, a conducive tax framework is required to incentivise investment and usage, which in turn would maximise the benefits of connectivity for individuals and communities. To achieve this, policymakers should adopt measures to make the tax regime more conducive by:

- aligning mobile-sector taxation levels with the rest of the economy
- reducing sector-specific taxes on mobile consumers
- streamlining the tax assessment mechanism
- removing certain onerous sector-specific taxes such as advance income tax in Pakistan.

Streamlining regulatory compliance around QoS

QoS regulations vary considerably across countries and regions. While there is no one size fits all, competitive advanced markets tend towards exercising an approach of light-touch regulation. Nonetheless, in recent times there has been a growing trend towards tightening QoS regulations by regulators in Asia Pacific. For example, BTRC's working draft on QoS regulation, which was released in 2022 but is yet to be finalised, lays down specific benchmarks for KPIs, such as for voice, SMS, coverage and data, with penalties for failures. In India, the Telecom Regulatory Authority of India (TRAI) released a consultation paper in 2023 on review of QoS standards and the need for a revised regulatory framework. It has proposed several changes, such as reducing the reporting requirement from quarterly to monthly and reducing the geographical area for reporting from Licensed Service Areas, which span across states, to district levels. TRAI has proposed a draft regulation with parameters and benchmarks for compliance.

Poor QoS can constrain citizens' participation and contribution to the digital economy. However, failures do not always sit squarely with operators. Quality from the mobile tower to the terminal is also affected by other factors such as consumption patterns, network load, user device (especially counterfeit handsets), weather-related interference, fibre transmission networks and the power supply. The availability of spectrum under the right conditions is crucial as well (see Chapter 4.2). Further, GSMA research shows that network deployment policies, such as those around rights of way, directly impact QoS. To this end, regulatory actions designed to improve QoS in mobile communications must focus on promoting the right incentives for operators and avoid worsening the investment gap.

Pro-investment business environment: trends in market consolidation

Policymakers and regulators should avoid interventions that impose a certain market structure and, recognising the dynamics of a competitive mobile sector, allow the number of operators to be determined organically as the market dictates. Given the level of sustained network investment that mobile operators are faced with, this may result in market consolidation (i.e. fewer players), which may lead to more positive outcomes.

In Thailand, after a year marked by a spate of mergers and acquisitions in 2023, analysts expect the country's remaining operators to emerge stronger and report better performance in the year ahead. In Indonesia, there are reports of a merger between XL Axiata and Smartfren – a unit of Indonesian conglomerate Sinar Mas. In Sri Lanka, Bharti Airtel and Dialog Axiata jointly announced the signing of a formal agreement in April 2024 to merge their Sri Lankan operations.

When assessing a mobile merger, policymakers should consider a range of factors, not only the expected price effects. For example, innovation and investment are significant factors that may improve as a result of consolidation. Competition policy that favours a higher number of market players can cause significant efficiency losses related to costs, network quality and deployment by failing to give appropriate weight to the long-term effects of investment and innovation on consumer welfare. A balanced consideration of the effects of mergers on dynamic competition is necessary to incentivise investments.

Developing policies that foster adoption and innovation in emerging technologies

In recent years, governments and international organisations have begun issuing principles, frameworks and recommendations on AI ethics and governance. Singapore's Model AI Governance Framework serves as a good example. Singapore's Infocomm Media Development Authority (IMDA) and Personal Data Protection Commission (PDPC) have also partnered with the World Economic Forum Centre for the Fourth Industrial Revolution to develop the Implementation and Self-Assessment Guide for Organisations.

As AI adoption accelerates, it is crucial to design, develop, and deploy systems responsibly, protecting individual privacy and personal data. Governments and regulators can foster innovation and build trust by ensuring laws are supportive rather than restrictive. Policymakers and regulators should consider legislative impacts on the industry, advocating for a risk-based approach that is flexible and balances safeguards with the promotion of innovation and competition. Standardising and consistently applying AI laws internationally can also help achieve economies of scale.

Spurring digital inclusion

Network quality continues to improve across all regions, driven by improved networks and consumers migrating to 4G or 5G. There was a notably large improvement in network quality in South Asia, with download and upload speeds increasing by 30% and 25%, respectively, between 2022 and 2023.[17] This was likely driven in part by the assignment of additional mid-band spectrum (above 1 GHz) in India and Bangladesh, allowing operators to expand capacity.

However, despite these improvements, digital inclusion remains a challenge in South Asia and the wider Asia Pacific region. In South Asian markets, the top barrier is literacy and digital skills, except in India. According to a GSMA report,[18] between 2022 and 2023 the gender gap in mobile internet adoption decreased most sharply in South Asia, from 41% to 31%. This was driven primarily by India, where adoption among women increased, while adoption among men remained unchanged. However, this gap remains one of the highest in the world.

As digital inclusion has emerged as a top policy priority worldwide, a united and determined effort is essential to attain meaningful connectivity, enabling users to have a safe, enriching experience that is also affordable. Achieving this goal requires focused actions from stakeholders, including mobile operators, policymakers, international partners and the broader private sector. Strategies should take into account structural disparities, such as income and education levels, and societal norms that affect adoption and usage.

Rationalising networks

Legacy network sunsets continue to gain momentum around the world. Between 2010 and the end of Q1 2024, a total of 114 networks, including 2G and 3G, have been shut down. Momentum has accelerated in recent years, with more than half of total network shutdowns having been completed in the last three years. Asia Pacific and Europe have been at the forefront of network sunsets, accounting for more than 75% of shutdowns to date.

Decisions to sunset legacy 2G and 3G services are based on a wide range of considerations. Mobile network operators seek to rationalise legacy network technologies as more spectrally efficient technologies become available and connectivity demand evolves. Comprehensive strategies require an understanding of key factors for both operators and consumers. These include operational cost savings, legacy customer devices and associated migration costs and service disruption risks, potential customer churn, and VoLTE implementation and interoperability issues.

While consumer protection is typically the paramount concern of regulators, the implications of a 2G or 3G switch-off should also be considered in relation to key spectrum management issues. These include technology-neutral licensing and minimum spectrum assignments that are optimal for utilising newer technologies.

17. The State of Mobile Internet Connectivity 2023, GSMA, 2023
18. The Mobile Gender Gap Report 2024, GSMA, 2024

4.2
A spectrum roadmap towards 2030: meeting future connectivity demand

As connectivity permeates every aspect of society and digital transformation accelerates among enterprises, mobile networks will require spectrum capacity plans that are integrated into a long-term vision of each nation's industrial future. Spectrum roadmaps set the stage for this. They help define when spectrum should be made available to meet surging demand for mobile services in the short, medium and long terms. They also help governments to forecast future trends and manage their work, and they provide certainty for mobile operators to plan their investments.

Low, mid- and high bands are all required to support 5G use cases. Low bands (sub-1 GHz) have strong propagation characteristics and are essential to build coverage in thinly populated areas and provide indoor coverage in built-up areas. Mid-bands (1–7 GHz) are crucial for citywide 5G capacity to enable consistent 5G speeds for consumers and enterprises. High bands or mmWave (above 24 GHz) support ultra-high speeds and the lowest latencies, delivering the highest performance envisioned for 5G over shorter distances.

The ITU's WRC-23 opened the door to a new era of connectivity and has laid the spectrum foundations for mobile to progress into 5G-Advanced and 6G. Importantly, WRC-23 identified 6 GHz (6.425–7.125 GHz) for mobile use by countries in every ITU Region (EMEA, CIS, the Americas and Asia Pacific) and the conditions for its use have been agreed in the ITU's Radio Regulations.

Countries in the Asia Pacific region can now take advantage of the harmonisation of 6 GHz that was achieved at WRC-23 and begin developing national plans to assign the band. With 6 GHz, mobile operators can meet the growth in 5G traffic demand in a practical, cost-effective and environmentally friendly way using existing 5G macro sites. This would ensure fast, affordable and sustainable mobile broadband services while unlocking digital growth and industrial development through 5G-enabled innovation and use cases. It would also set the foundations for the next generation of mobile connectivity.

Effective spectrum pricing and investment-friendly conditions

While 5G networks are well established in advanced Asia Pacific markets such as Australia, Japan and South Korea, the pace of 5G development differs significantly across the region. 5G deployment is expanding rapidly in India following a successful auction in 2022, while the 5G journey is only just beginning in other countries, including major markets such as Indonesia and Vietnam and in the Pacific islands.

High-quality mobile connectivity depends on the adequate supply of spectrum across multiple frequency ranges. However, the expansion of spectrum resources must take into account its overall cost to the industry. Expensive spectrum negatively impacts the quality of mobile networks through reduced investment and slower deployment of the latest network technologies. This in turn leads to less-than-optimal GDP growth and fewer social and environmental benefits linked to mobile-enabled innovations and advanced use cases.

Governments and regulators should assign spectrum to support their digital connectivity goals rather than as a means of maximising state revenues. Effective spectrum pricing policies are vital to support 5G services that are better quality and more affordable. This will help address issues such as usage gaps. High reserve prices, artificially limited spectrum supply (including set-asides) and poor auction design can all have a negative impact i.e. slower mobile broadband and suppressed network investments.

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
- **provide incentives for network coverage and investment** (e.g. in exchange for reducing monetary payments or through more favourable payment structures)
- **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
- **minimise uncertainty for expiring spectrum** by creating a presumption of renewal unless a fundamental reallocation of spectrum to a new service is required or an overriding policy need arises.

> **High-quality mobile connectivity depends on the adequate supply of spectrum across multiple frequency ranges, but the expansion of spectrum resources must take into account its overall cost to the industry**

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