The Mobile Economy
Asia Pacific
2022

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GSMA Intelligence

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Contents

Executive summary 2

1 The mobile market in numbers 10

1.1 Mobile adoption continues to rise 11
1.2 5G adoption accelerates as 4G reaches its peak 12
1.3 Shift to digital drives smartphone adoption and data traffic growth 14
1.4 Competitive pressures weigh on revenue growth as 5G accounts for growing share of capex 15

2 Key trends shaping the mobile industry 16

2.1 Growing efforts to scale and monetise 5G 17
2.2 Telco of the future: security and sustainability move up the agenda for network transformation 22
2.3 Metaverse ecosystem gains traction in Asia Pacific 26

3 Mobile contributing to economic growth and social progress 28

3.1 Mobile's contribution to economic growth 29
3.2 Mobile enhancing digital and financial inclusion 32
3.3 Social impact: spotlight on the mobile industry's response to Typhoon Rai 35

4 Policies for digital innovation 36

4.1 Establishing a modernised and flexible regulatory regime 38
4.2 Adopting policies that ensure fair competition and regulation to reflect the evolving digital economy 40
4.3 Meeting the spectrum needs for future connectivity 41

Executive summary

Closing the mobile internet usage gap becomes a greater priority

> At the end of 2021, the number of mobile internet users in Asia Pacific exceeded 1.2 billion

As the world emerges from the pandemic and many social and economic activities adopt a 'new normal', digital connectivity will underpin innovative applications for consumers and new business models for enterprises. In addition, governments are considering ways to leverage digital connectivity to drive economic recovery and promote sustainable development. Consequently, ensuring universal access to connectivity has become a priority among policymakers and other stakeholders.

In Asia Pacific, and elsewhere, mobile connectivity remains the foremost form of internet connectivity, particularly as for many it's the only form of connectivity. Today, mobile broadband networks cover around 96% of the region's population, which serves as a testament to operators' investment in 3G, 4G and, increasingly, 5G networks over the last decade. Moreover, mobile operators remain focused on extending coverage to underserved areas, as evidenced by partnerships with satellite providers to accelerate network deployment in rural and remote areas, where the coverage gap is widest.

At the end of 2021, the number of mobile internet users in Asia Pacific exceeded 1.2 billion, reflecting a penetration rate of just under 45% of the population. This means that more than half of the population live in areas covered by a mobile broadband network but do not yet subscribe to a mobile internet service (usage gap). The main reasons for the usage gap include the lack of digital skills (especially among older populations), lack of affordability among low-income households and online safety concerns among minority and vulnerable population groups. Addressing the usage gap for these key groups will extend the benefits of the internet and digital technology to more people in society. This requires concerted efforts by a broad range of stakeholders working together with mobile operators and other ecosystem players, such as device manufacturers and digital content creators.

4G still dominates, but 5G is accelerating

5G adoption, as a percentage of total connections, is set to accelerate in Asia Pacific as the technology's footprint expands across the region. 5G is now commercially available in 14 countries, with several others, including India and Vietnam, expected to come on board in the coming years. These new networks and the expansion of existing ones in pioneer markets will drive the transition to 5G. Momentum is being boosted by a number of factors, including the economic recovery from the pandemic, rising 5G handset sales and overall marketing efforts.

By 2025, there will be more than 400 million 5G connections in Asia Pacific, equivalent to just over 14% of total mobile connections. The figure will be much higher (67% on average) in developed Asia Pacific, which comprises Australia, Japan, Singapore and South Korea. In these markets, 4G adoption has begun to decline; however, the technology still has significant room to grow elsewhere in the region, particularly in South Asia and Southeast Asia. For the Asia Pacific region as a whole, 4G adoption will peak at 71% in 2023, before declining to 69% by 2025.

Security and sustainability move up the agenda for operators

Security is the top priority for network transformation strategies among operators in Asia Pacific. This is not surprising given the backdrop of rising security threats to telecoms networks and, increasingly, to end users. In Thailand, for example, 56% of cyber threats in 2021 reportedly occurred via vulnerabilities in mobile devices.

Operators across the region 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 addressing the challenge through a comprehensive set of actions, such as the use of solar and improving the energy efficiency of networks.

The mobile industry continues to deliver benefits to the economy and wider society

Mobile technologies and services continue to make a significant contribution to Asia Pacific's economy, generating 5% of GDP in the region in 2021 – equivalent to around $770 billion of economic value added. The mobile ecosystem also supported approximately 8.8 million jobs (directly and indirectly) in 2021 and made a substantial contribution to the funding of the public sector, with around $80 billion raised through taxation.

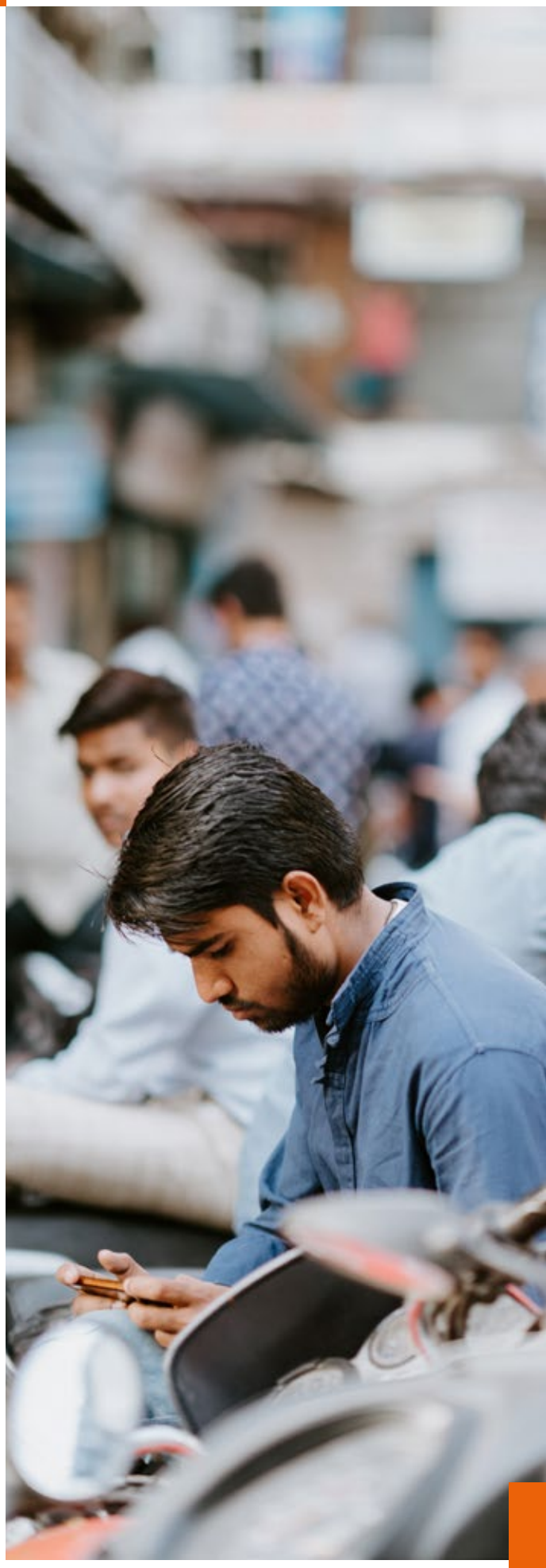
The mobile industry continues to deliver social impact across Asia Pacific, primarily by providing the connectivity that enables the growth of small businesses and digital transformation of enterprises, and granting access to life-enhancing services and tools for citizens. Mobile money is one example, with adoption scaling rapidly in parts of Asia Pacific as operators support the region's shift to digital payments. Another example is mobile operators in the Philippines playing a crucial role during and after Typhoon Rai, by restoring connectivity faster, supporting community needs and working with the government and other stakeholders for a coordinated response.

Policies to facilitate digital innovation

The Covid-19 pandemic, and the associated movement restrictions, has shown the importance of mobile connectivity in supporting people in their daily activities and helping businesses to operate safely. As society now moves towards a 'new normal' post pandemic, mobile connectivity will be central to the development of new and innovative technological solutions to today's problems. As 5G network deployments continue, 5G's ability to support next-generation offerings (such as cloud services, AI, IoT and edge computing) will drive digital economic growth and innovation.

Policymakers and regulators can fuel growth and innovation by finding the proper balance in the regulatory environment to support mobile network deployment and operations. Specifically, policymakers should make positive decisions that help drive spectrum availability in prime 5G bands, and also ensure that necessary spectrum resources are available at the right time, at the right price and under the right conditions to expedite network deployment, increase coverage and boost the quality and affordability of services. Policymakers should also take steps to:

- establish a forward-looking regulatory regime that supports the financial sustainability of the industry and provides non-discriminatory conditions to drive new innovations from large companies as well as SMEs
- adopt policies that enable the building and deployment of infrastructure to support future networks accessible to all
- create and maintain a safe and trustworthy online environment to protect users from threats
- ensure that available spectrum serves the future demand for connectivity.



The Mobile Economy Asia Pacific

Unique mobile subscribers

2021 **1.6bn**

2025 **1.8bn**

Penetration rate
Percentage of population

59% 2021

62% 2025

CAGR 2021-2025 **2.2%**

Mobile internet users

2021 **1.2bn**

2025 **1.5bn**

Penetration rate
Percentage of population

44% 2021

52% 2025

CAGR 2021-2025 **5.2%**

SIM connections

(excluding licensed cellular IoT)

2021 **2.8bn**

2025 **3.0bn**

Penetration rate
Percentage of population

100% 2021

105% 2025

CAGR 2021-2025 **2.2%**

4G

Percentage of connections
(excluding licensed cellular IoT)

2021 **62%** → 2025 **69%**

5G

(excluding licensed cellular IoT)

430m
connections in 2025

14% of total connections

Smartphones

Percentage of connections *(excluding licensed cellular IoT)*

2021 **73%**

2025 **83%**

Internet of Things

2021 **2.1bn** Total connections

2025 **3.3bn**

Operator revenues and investment

2021 **$210bn**

2025 **$224bn**

Total revenues

Operator capex

$134bn

2022 — 2025

75% on 5G

Mobile industry contribution to GDP

2021 **$770bn** (5% of GDP)

2025 **$870bn**

Public funding

$80bn

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

Employment

5.2 million jobs

Directly supported by the mobile ecosystem

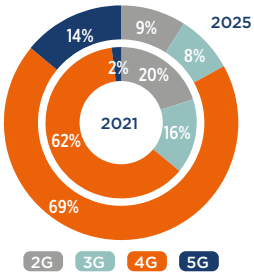
3.6m jobs supported indirectly

Subscriber and technology trends for key markets

Asia Pacific

Connections[1]

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2021 → 2025

100% → 105%

SMARTPHONE ADOPTION

2021 → 2025

73% → 83%

Subscribers[2]

SUBSCRIBER PENETRATION

2021 → 2025

59% → 62%

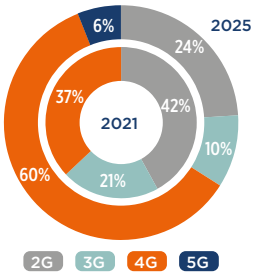
2021	44%	52%	4%
2025	52%	46%	3%

Connected to mobile internet · Usage gap · Coverage gap

'Leading Nations' programme[3]

Bangladesh

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2021 → 2025

107% → 116%

SMARTPHONE ADOPTION

2021 → 2025

47% → 63%

SUBSCRIBER PENETRATION

2021 → 2025

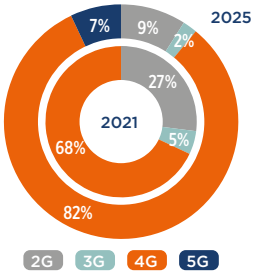
55% → 59%

2021	31%	64%	5%
2025	38%	61%	1%

Connected to mobile internet · Usage gap · Coverage gap

India

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2021 → 2025

79% → 83%

SMARTPHONE ADOPTION

2021 → 2025

73% → 84%

SUBSCRIBER PENETRATION

2021 → 2025

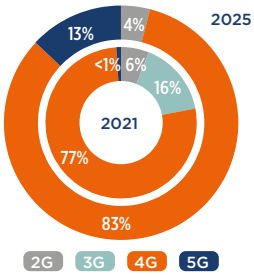
54% → 57%

2021	38%	61%	1%
2025	46%	53%	1%

Connected to mobile internet · Usage gap · Coverage gap

Indonesia

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2021 → 2025

132% → 136%

SMARTPHONE ADOPTION

2021 → 2025

80% → 89%

SUBSCRIBER PENETRATION

2021 → 2025

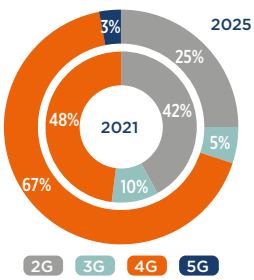
67% → 68%

2021	55%	40%	5%
2025	60%	36%	4%

Connected to mobile internet · Usage gap · Coverage gap

Pakistan

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2021 → 2025

82% → 93%

SMARTPHONE ADOPTION

2021 → 2025

57% → 74%

SUBSCRIBER PENETRATION

2021 → 2025

43% → 48%

2021	30%	60%	10%
2025	42%	48%	10%

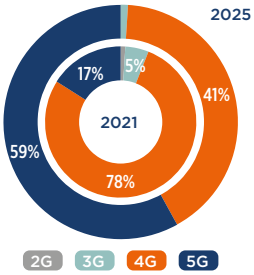
Connected to mobile internet · Usage gap · Coverage gap

1. Unique SIM cards (or phone numbers, where SIM cards are not used), excluding licensed cellular IoT, that a mobile network has registered during the period of analysis. The number of subscribers differs from the number of connections because a unique user can have multiple connections.
2. Unique users who have used internet services on their mobile device during the period of analysis. We define mobile internet services as any activity that consumes mobile data, excluding SMS, MMS (multimedia messaging service) and cellular voice calls.
3. The GSMA Leading Nations engagement (comprising Bangladesh, India, Indonesia and Pakistan) seeks to accelerate the growth of the digital economy and advance the mobile industry's sustainability by lobbying for regulatory modernisation with relevant stakeholders.

APAC 5G Forum[4]

Australia

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

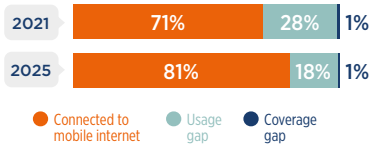
2021 → 2025: 122% → 122%

SMARTPHONE ADOPTION

2021 → 2025: 88% → 93%

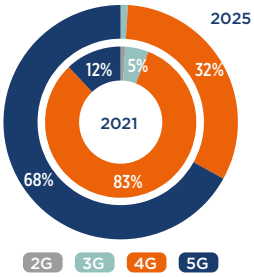
SUBSCRIBER PENETRATION

2021 → 2025: 84% → 85%



Japan

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

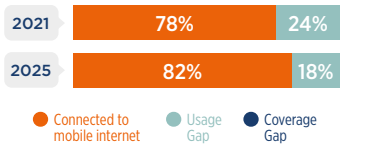
2021 → 2025: 153% → 154%

SMARTPHONE ADOPTION

2021 → 2025: 71% → 81%

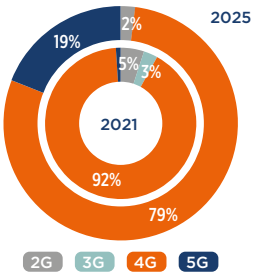
SUBSCRIBER PENETRATION

2021 → 2025: 87% → 88%



Malaysia

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

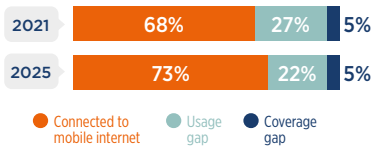
2021 → 2025: 129% → 132%

SMARTPHONE ADOPTION

2021 → 2025: 89% → 93%

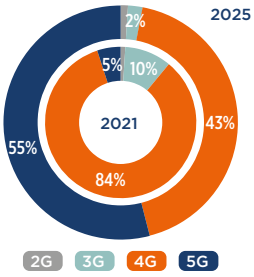
SUBSCRIBER PENETRATION

2021 → 2025: 80% → 82%



Singapore

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

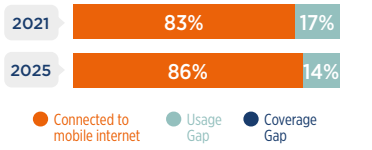
2021 → 2025: 148% → 153%

SMARTPHONE ADOPTION

2021 → 2025: 89% → 93%

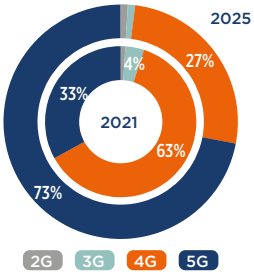
SUBSCRIBER PENETRATION

2021 → 2025: 88% → 90%



South Korea

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

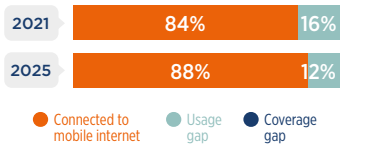
2021 → 2025: 122% → 120%

SMARTPHONE ADOPTION

2021 → 2025: 85% → 91%

SUBSCRIBER PENETRATION

2021 → 2025: 89% → 89%



4. The GSMA APAC 5G Forum is a 5G industry engagement community platform to help 5G-pioneering operators and governments to collaborate in order to promote and foster the timely deployment and rollout of commercial 5G networks and services (B2C, B2B, B2G) through the promotion of active sharing of knowledge, experiences and know-how of best practices related to 5G technologies, commercial strategies and industry policies.

** Percentage of total mobile connections (excluding licensed cellular IoT)*
Note: Totals may not add up due to rounding

01
The mobile market in numbers

1.1 Mobile adoption continues to rise

Figure 1

Key milestones for the mobile industry in Asia Pacific to 2025

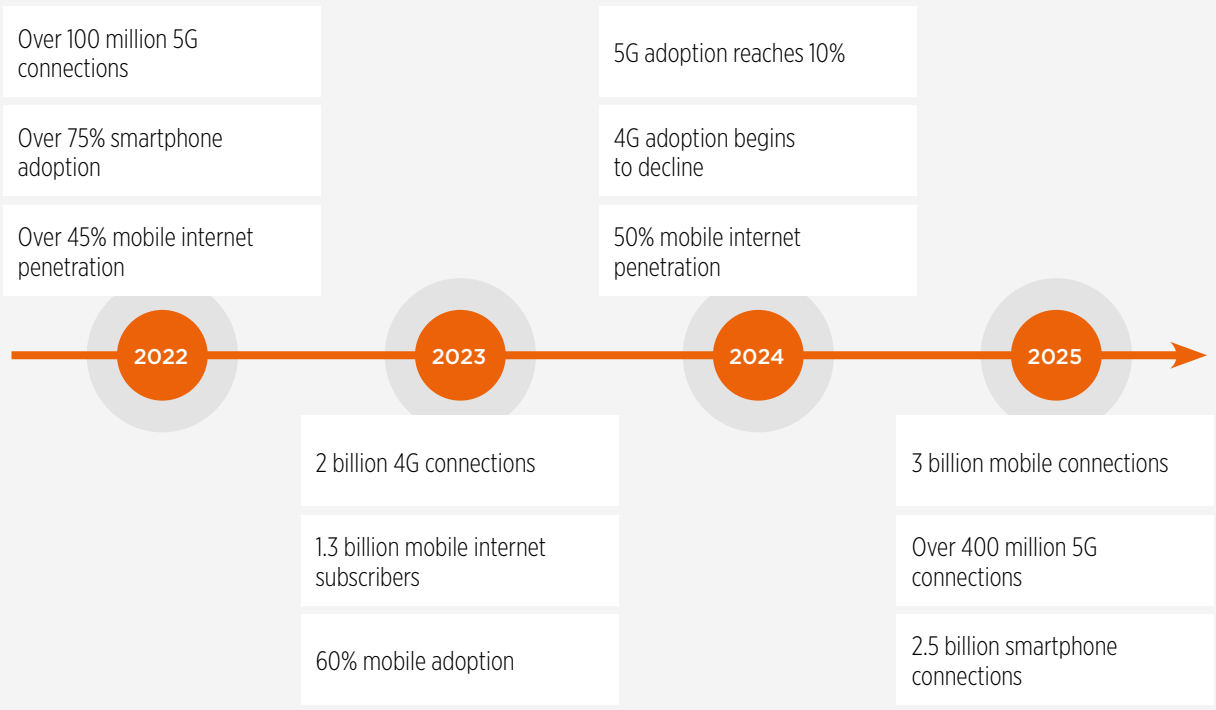
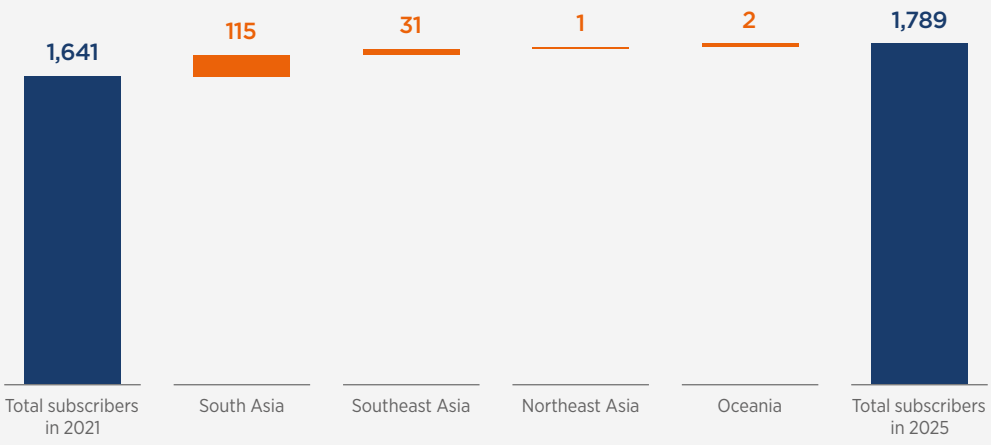


Figure 2

Mobile subscribers to grow by nearly 150 million in Asia Pacific by 2025, with South Asia accounting for more than three quarters of new subscribers

New mobile subscribers (million)



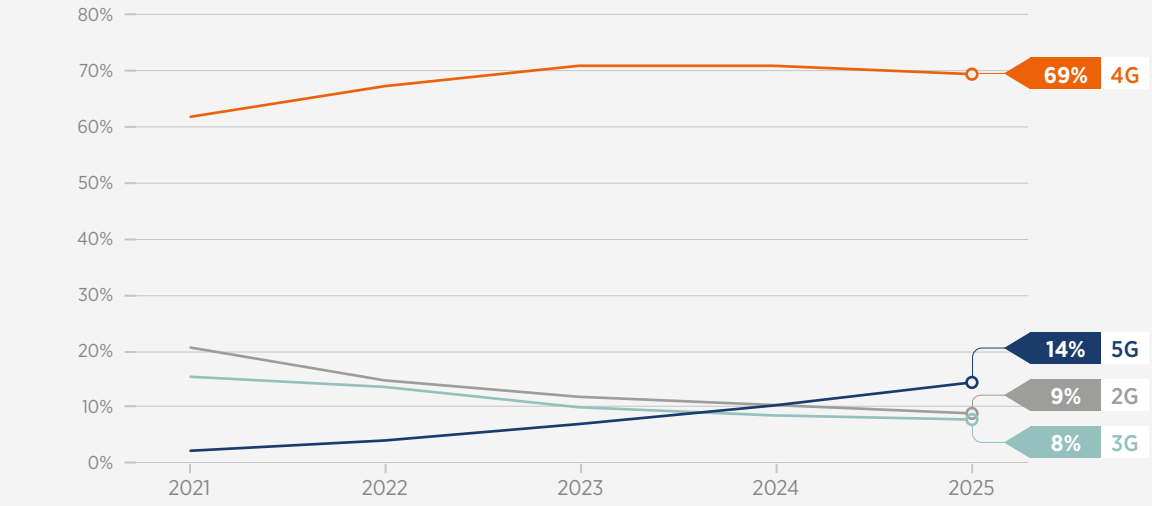
Source: GSMA Intelligence
Note: Totals may not add up due to rounding

1.2 5G adoption accelerates as 4G reaches its peak

Figure 3

4G will remain the dominant technology in Asia Pacific, but 5G is set to gain ground across the region

Percentage of connections (excluding licensed cellular IoT)

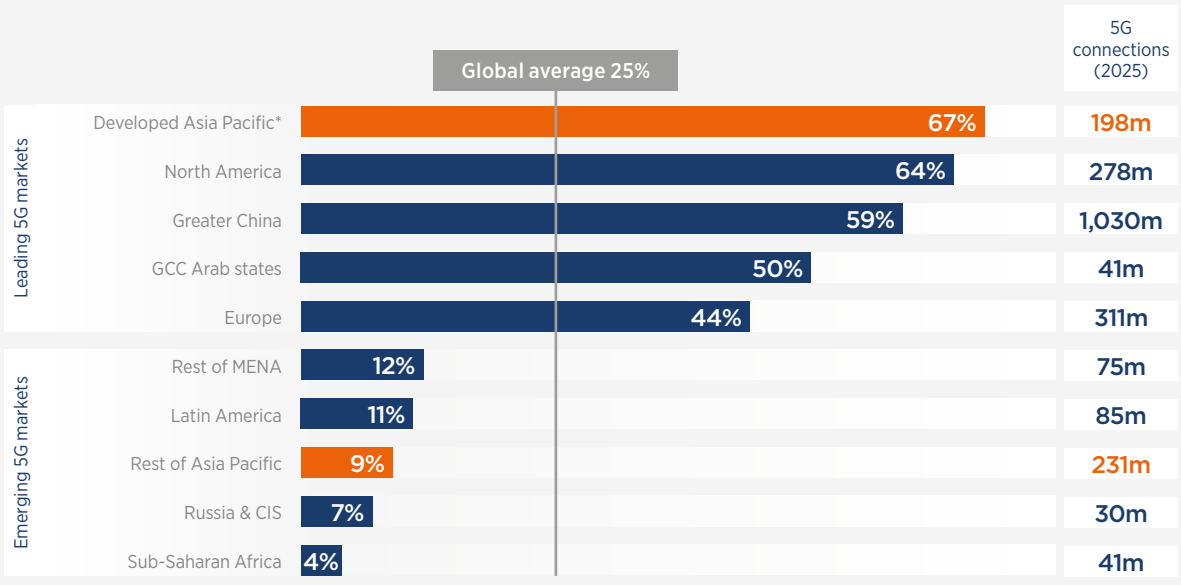


Source: GSMA Intelligence

Figure 4

Asia Pacific is home to some of the world's leading 5G markets, but it is still early days for the technology in several others

5G adoption in 2025 (percentage of connections)



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

Figure 5

5G state of play: 14 markets in Asia Pacific have launched 5G commercial services, with at least 10 more to follow before the end of 2025

Live

Australia	Maldives
Bhutan	New Zealand
Guam	North Mariana Islands
Indonesia	Philippines
Japan	Singapore
Laos	South Korea
Malaysia	Thailand

Planned

Bangladesh	Nepal
Brunei Darussalam	Pakistan
Cambodia	Samoa
India	Sri Lanka
Myanmar	Vietnam

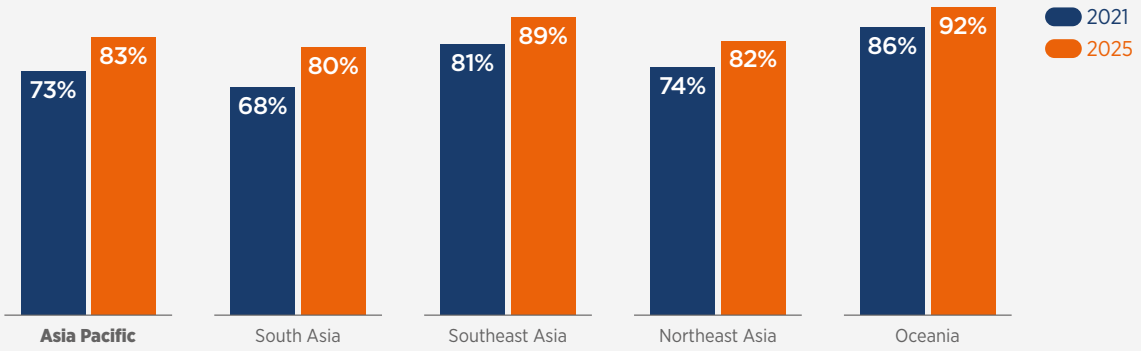
Source: GSMA Intelligence
Data correct to May 2022

1.3 Shift to digital drives smartphone adoption and data traffic growth

Figure 6

South Asia will see the biggest increase in smartphone adoption over the period to 2025

Smartphones as a percentage of total connections (excluding licensed cellular IoT)



Top three smartphone markets in Asia Pacific (smartphone connections, 2025)

India
1 billion

Indonesia
334 million

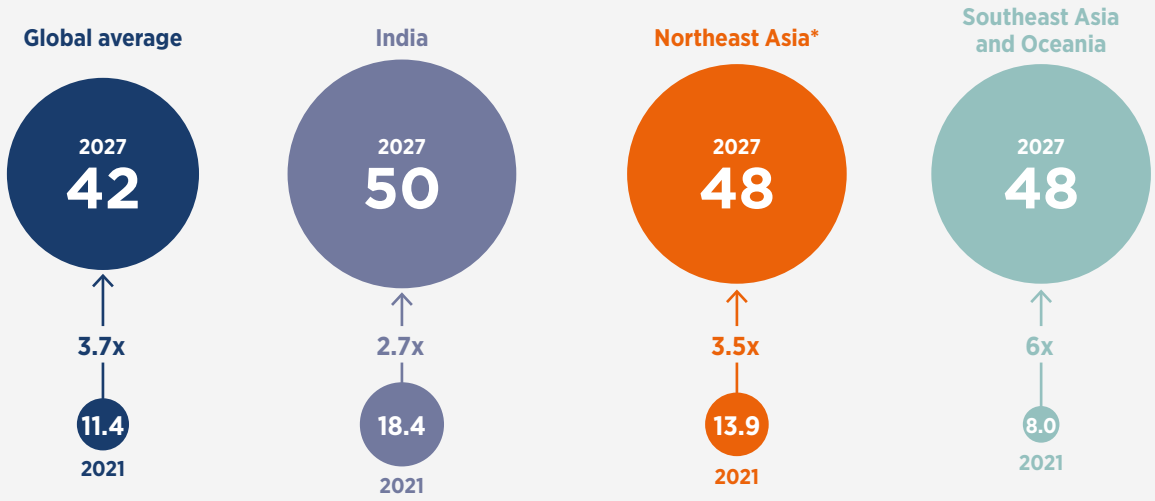
Japan
169 million

Source: GSMA Intelligence

Figure 7

Data traffic on smartphones will rise across Asia Pacific by 2027; Southeast Asia and Oceania will see the biggest increase

Mobile data traffic per smartphone (GB per month)



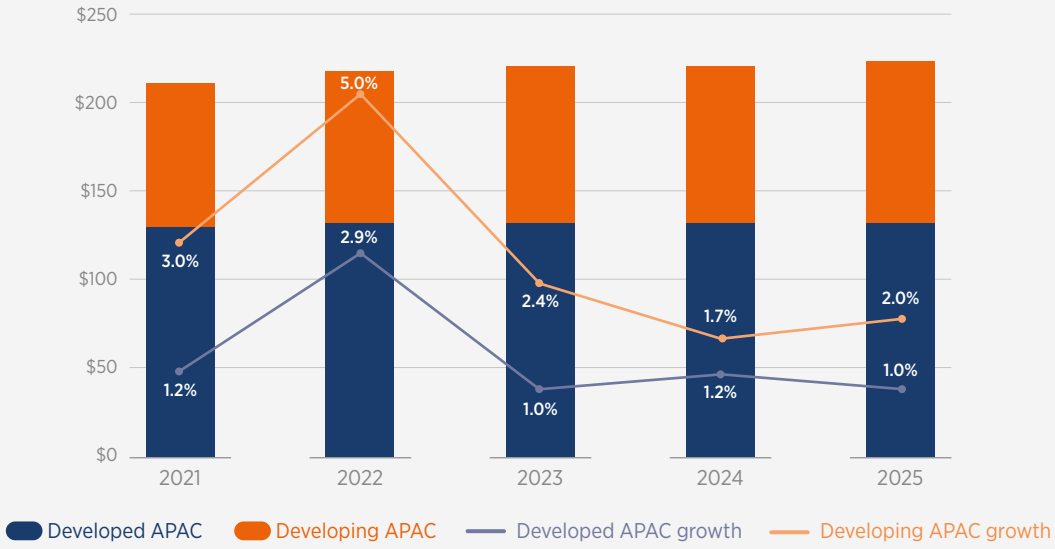
Source: Ericsson
* Includes China

1.4 Competitive pressures weigh on revenue growth as 5G accounts for growing share of capex

Figure 8

Revenue growth will rebound in 2022 as the industry recovers from the pandemic, but it will largely remain flat over the period to 2025 due to competitive pressures

Mobile revenue (billion)

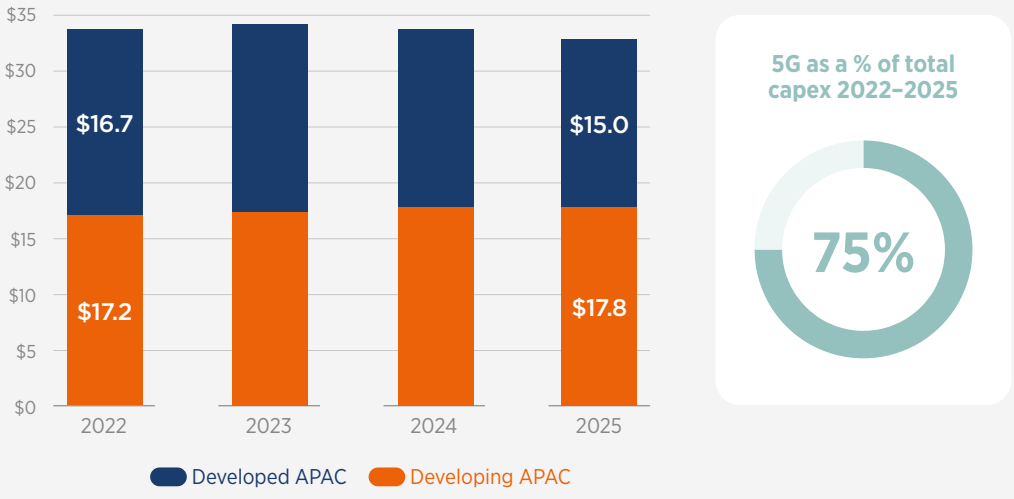


Source: GSMA Intelligence

Figure 9

Capex levels will remain stable in developing Asia Pacific in the coming years, but will decline in developed Asia Pacific following initial investments in 5G networks

Operator capex (billion)



Source: GSMA Intelligence

02
Key trends shaping the mobile industry

2.1 Growing efforts to scale and monetise 5G

At the end of March 2022, 33 mobile operators in 14 markets across Asia Pacific had launched commercial 5G services, including 14 operators in seven countries that also offer 5G fixed wireless access (FWA) services. 5G has become mainstream in pioneer markets, notably South Korea, where 5G now accounts for around two in five of mobile connections. Momentum has been boosted by a number of factors, including economic recovery from the pandemic, rising 5G handset sales, network coverage expansions and overall marketing efforts.

Elsewhere, there are growing efforts to launch new commercial networks and scale existing ones. For example, the Bangladesh Telecommunication Regulatory Commission (BTRC) concluded its auction for licences in the 2.3 and 2.6 GHz bands in April 2022, setting the stage for operators to improve existing networks and prepare for 5G. In India, the government has unveiled plans for a 5G spectrum auction in the second half of 2022 and set a target for the launch of commercial 5G services by March 2023. Meanwhile, the Malaysian government has reiterated its intention to deploy 5G via a single wholesale network – an approach that will make the country stand out from other markets that will adopt the commercialisation of multiple competing next-generation mobile networks.

Consolidation provides opportunity to scale 5G

In the last two years there has been a wave of operator consolidation across Asia Pacific. Notable announcements include the following:

- **Australia:** Vodafone and TPG completed a $15 billion merger in 2021, creating a single unit with more integrated mobile and fixed network assets.
- **Indonesia:** Authorities have approved a $6 billion merger between Ooredoo Indosat and CK Hutchison. The combined unit has a market share of 28%.
- **Malaysia:** Celcom Axiata and Digi.Com expect to complete a $12.1 billion deal to combine their operations by the second half of 2022, subject to regulatory approval. The combined unit will have a market share of 45%.
- **New Zealand**: 2degrees and Orcon have announced plans to merge their operations in a $2.3 billion deal. The new company will combine 2degrees' mobile network with Orcon's more landline-focused business.
- **Thailand:** True and Dtac are awaiting the green light to complete a merger valued at $8.6 billion. The operators will combine their infrastructure and spectrum assets, with the new unit having a market share of 53%.

Scale is becoming increasingly important for operators, often being the main investment and strategic rationale for mergers in the industry. For operators, building innovative partnerships is crucial in a period when the telecoms industry is looking to leverage next-generation technologies to drive new consumer and enterprise opportunities. Furthermore, as operators ramp up their investments in 5G, scale will be essential to drive cost efficiencies and to distribute and monetise 5G services to end users.

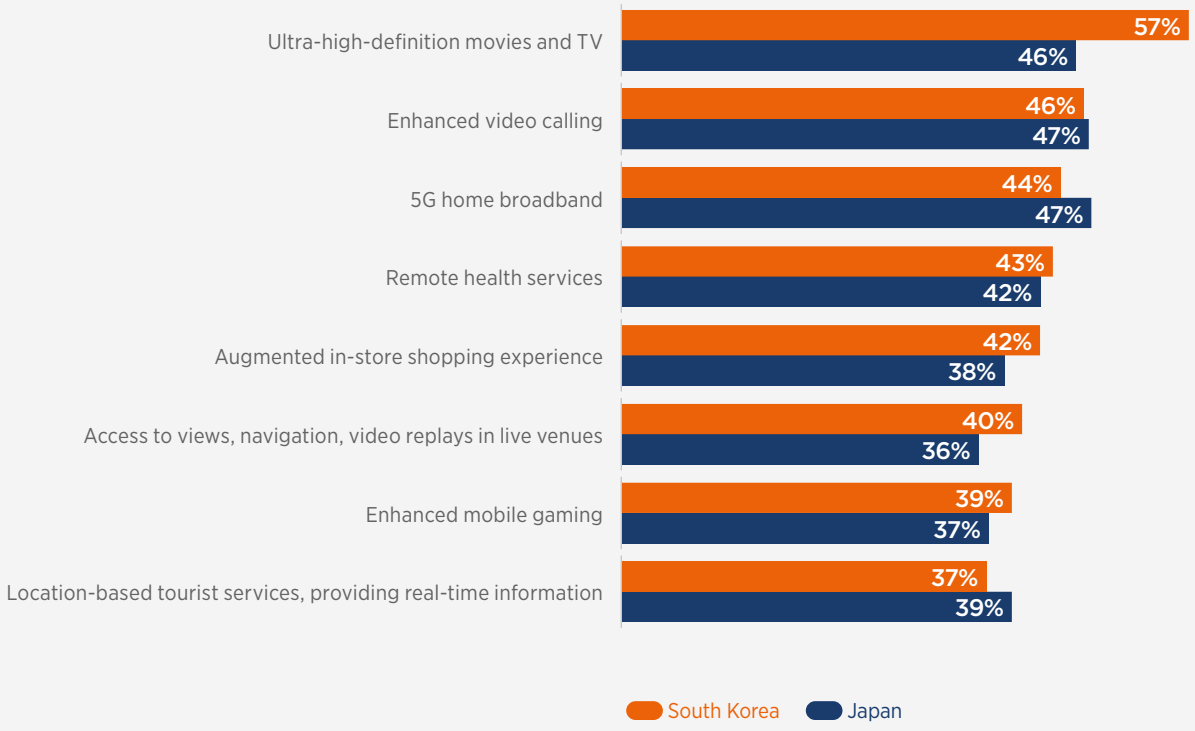
Operators home in on 5G consumer use cases

Monetising 5G remains top of mind for operators. The good news, according to GSMA Intelligence's consumer survey, is that consumer intent to upgrade to 5G is growing and existing 5G users are increasingly interested in adding content and services (video streaming, music, gaming, live sports, cloud storage etc.) to their 5G plans. Immersive experiences, which leverage the low-latency and high-bandwidth capabilities of 5G networks, are also gaining traction among consumers. Entertainment experiences (e.g. sporting activities and venues, concerts, gaming labs, movies and theatres), which customers pay a premium for in the physical world, provide avenues for operators to demonstrate the value of 5G.

Figure 10

Video and FWA pique the interest of 5G consumers

To what extent does each of the potential services listed below appeal to you?
(Percentage of customers who have already upgraded or intend to upgrade to 5G)



Source: GSMA Intelligence Consumers in Focus Survey 2021

Expectedly, operators in Asia Pacific are making efforts to promote the incremental benefits that 5G brings and the services that benefit consumers the most. For example, in May 2022 Telstra partnered with Google and Accenture to develop an AR app over its 5G network to help sports fans navigate a stadium in Melbourne. The app will be available before the start of the Australian Football League season in March 2023. In India, Bharti Airtel has implemented immersive video technologies over its 5G test network to recreate famous historical cricket matches, while in the Philippines, Smart Communications has teamed up with Oppo to further explore and develop 5G use cases, including immersive media.

Gaming is also an area of interest for operators. The shift of gaming consumption from consoles to mobile devices, combined with the rise of cloud-based gaming, offers new opportunities to monetise digital gaming. 5G can play a role in providing the high-speed connectivity and low latencies required for cloud-based content access, delivery and consumption. Some operators in Asia Pacific have launched their own cloud gaming propositions or formed distribution partnerships with specialist players. For example, in January 2022, Singapore's M1 formed an exclusive partnership with Blacknut, a subscription-based cloud gaming platform, to offer 5G-streamed cloud gaming services. In India, Jio has trialled high-definition VR-enabled multiplayer cloud gaming ahead of the commercial launch of its 5G network.

Operators drive 5G enterprise opportunities

While the consumer market has been the focus of early 5G deployments, the enterprise segment is the largest incremental opportunity in the 5G era, and a raft of digital transformation projects are underway across different industries. To fully exploit these opportunities, 5G leaders in Asia Pacific are building new capabilities and partnerships in a range of areas, including the following:

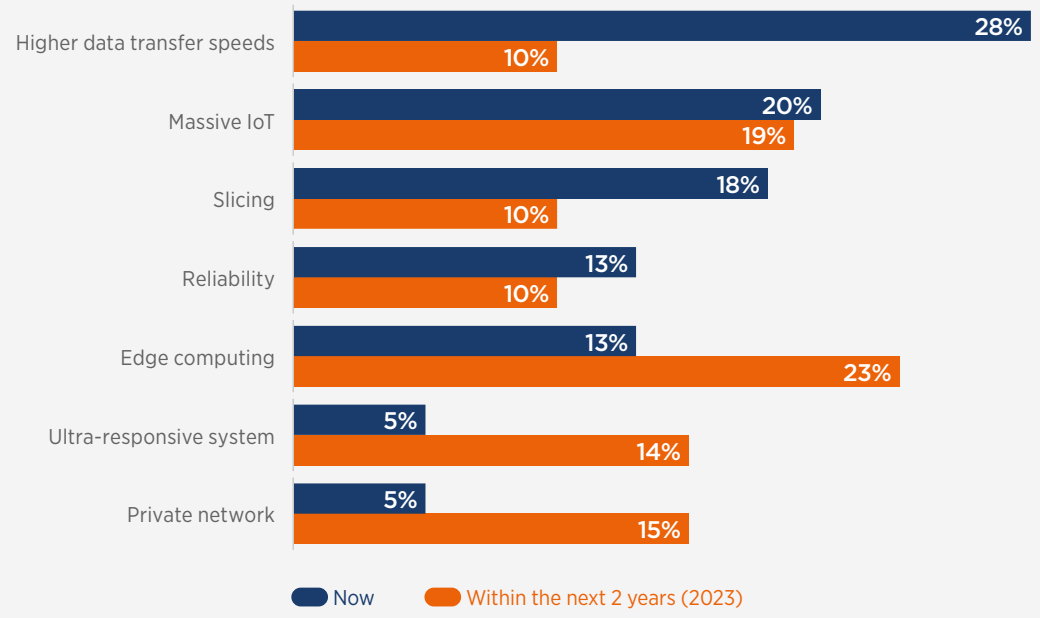
- **AIS:** AIS has announced a collaboration with Tata Consultancy Services (TCS), which combines AIS's expertise in connectivity with TCS's background in IT consulting to develop 5G-enabled IoT offerings for enterprises in Thailand. Solutions will be jointly marketed to customers in sectors such as manufacturing, logistics, smart cities and transportation.
- **KDDI:** Since January 2021, KDDI and Sony have been working together to create new business use cases and entertainment services based on 5G standalone (SA) networks. In February 2022, the two companies announced they had successfully used 5G to livestream 8K videos. Network slicing on a 5G SA network was used to connect the camera at the event venue and the large display at the satellite location.
- **Singtel:** Singtel, Gammon Pte. Limited and the Building Construction Authority of Singapore are trialling the use of 5G technologies to make building sites safer and more efficient. They are exploring multiple use cases involving robots to scan progress on the site, CCTV to bolster safety, drones for inspections and AR to visualise the building process.[6]

These examples highlight how collaboration can enable a faster time to market with solutions that take advantage of unique 5G capabilities. It also demonstrates how operators selling 5G to enterprises are doing so by marketing various 5G benefits rather than focusing on speed alone.

Figure 11

The primary 5G value proposition will shift further away from speed and towards edge computing, ultra-responsive systems and private networks

What is the primary 5G value proposition you are marketing to enterprises now and expect to market to enterprises within two years? (Percentage of respondents in Asia Pacific)



Source: GSMA Intelligence Operators in Focus Survey 2021

6. https://www.gsma.com/5GHub/construction

5G standalone is key to delivering on the promise of advanced 5G use cases

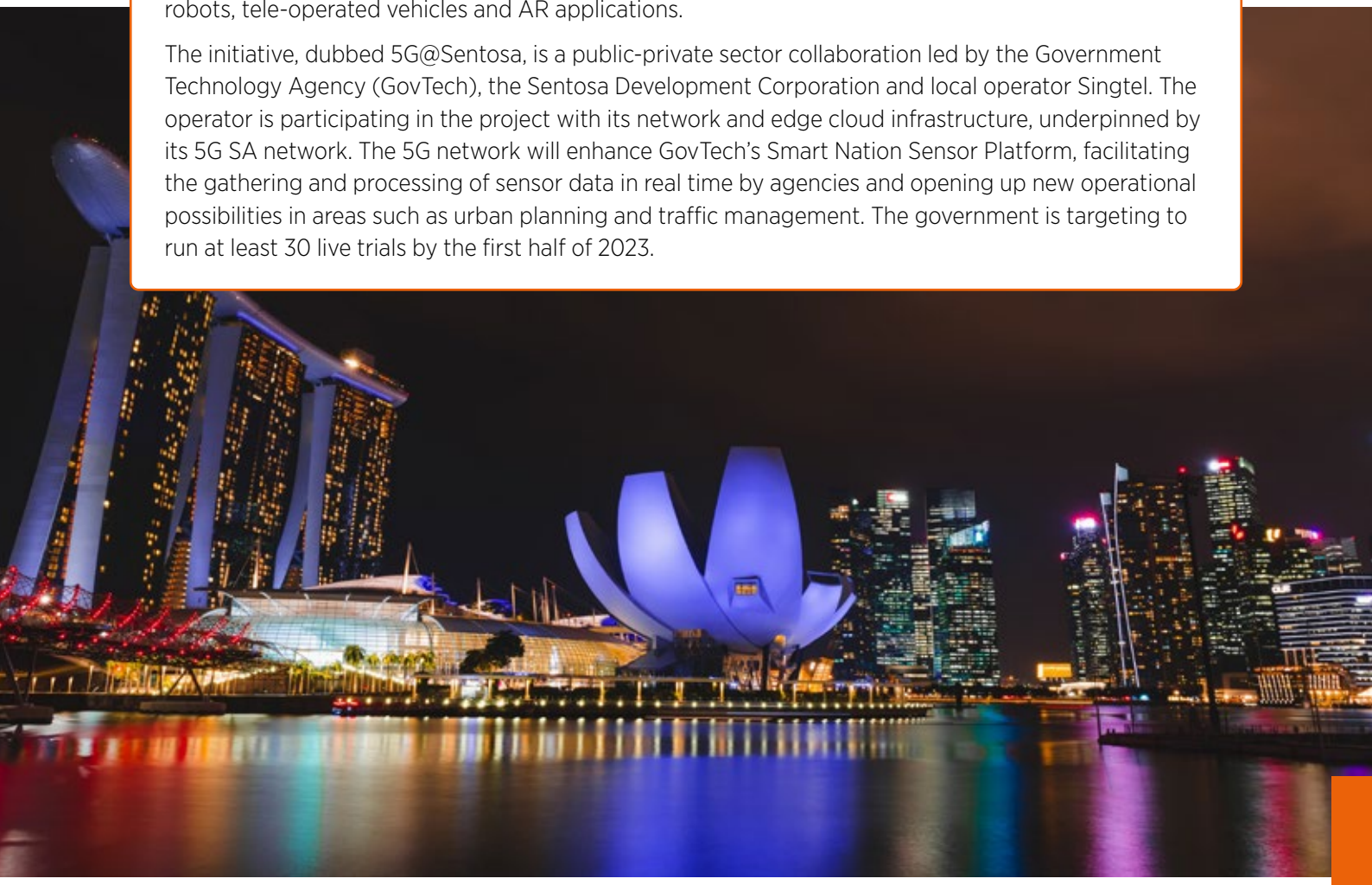
Operators around the world began their 5G deployment efforts with the non-standalone (NSA) version of the technology. However, 5G SA deployments ramped up in 2021 and the first quarter of 2022. As of April 2022, 25 operators in 18 countries had launched commercial 5G SA services. Asia Pacific leads the way on 5G SA commercialisation, with launched networks in Australia, Japan, South Korea, the Philippines, Singapore and Thailand.

While 5G NSA has allowed operators to quickly roll out eMBB services and serve up additional network capacity, SA breaks an underlying service connection with LTE and brings a number of enhanced functionalities. The result is an improved ability to support IoT (machine type), network slicing and ultra-reliable, low-latency use cases while delivering a simplified network architecture and the cost optimisation that follows.

Singapore government paves the way for innovative 5G use cases in the public sector

In October 2021, the government of Singapore announced a 5G testbed in Sentosa, which will trial promising public sector use cases for various industries, including healthcare, manufacturing and construction. The testbed will enable state agencies to trial use cases that improve operational effectiveness and deliver citizen-centric services. The first set of trials involves multiple agencies, including the Building and Construction Authority, National Environment Agency and the Centre for Healthcare Assistive and Robotics Technologies. These trials will involve the use of 5G for autonomous robots, tele-operated vehicles and AR applications.

The initiative, dubbed 5G@Sentosa, is a public-private sector collaboration led by the Government Technology Agency (GovTech), the Sentosa Development Corporation and local operator Singtel. The operator is participating in the project with its network and edge cloud infrastructure, underpinned by its 5G SA network. The 5G network will enhance GovTech's Smart Nation Sensor Platform, facilitating the gathering and processing of sensor data in real time by agencies and opening up new operational possibilities in areas such as urban planning and traffic management. The government is targeting to run at least 30 live trials by the first half of 2023.



2.2 Telco of the future: security and sustainability move up the agenda for network transformation

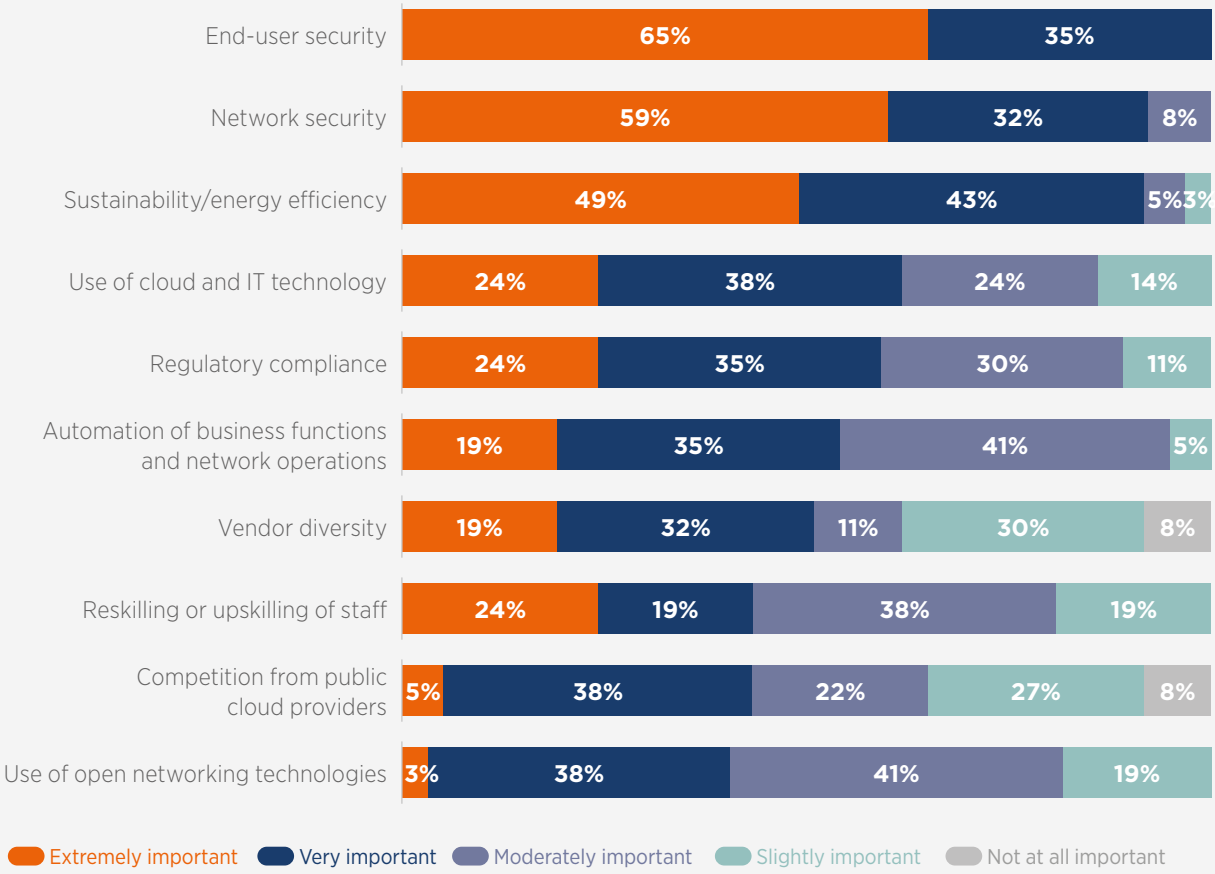
Security is the top priority for network transformation strategies among operators in Asia Pacific. This is not surprising given the backdrop of rising security threats to telecoms networks and, increasingly, to end users. In Thailand, for example, 56% of cyber threats in 2021 reportedly occurred via vulnerabilities in mobile devices.[7]

As a result, operators are taking steps to boost their presence in this area and combat threats to consumers and enterprises. In February 2022, Vodafone New Zealand announced it had signed a conditional agreement to acquire a 60% majority share in cybersecurity specialist DEFEND, building on a previous collaboration between the two companies. In March 2022, Dtac launched a new solution for SMEs in Thailand to protect business information and personal data from cyber threats, including phishing. In South Korea, SK Telecom has developed a convergent security service, leveraging the capabilities of ADT Caps, which it acquired in 2019, to reach new customers and markets.

Figure 12

Nine in 10 operators in Asia Pacific consider end-user security, network security and sustainability to be "extremely" or "very" important

How important are the following priorities as a part of your network transformation strategy? (Percentage of respondents)



Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2021

7. Cybersecurity for SMBs: Asia Pacific Businesses Prepare for Digital Defense, Cisco, 2021

Operators across the region 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, such as the use of solar and improving network energy efficiency. Some recent announcements demonstrate the commitment of operators in the region to set ambitious targets, diversify their energy mix with renewables and increase their energy efficiency:

- In March 2022, Japan's NTT Docomo signed a power purchase agreement (PPA) with NTT Anode Energy Corp, tied to a newly constructed solar power plant. PPAs, whereby an operator (or company from any industry) invests capital in a renewable energy provider to fund capacity at a specific generation facility such as a solar or wind farm, will be vital to reach net zero.
- To meet its target to cut greenhouse gas emissions by 50% by 2030, Thailand's Dtac is focusing on precision cooling, e-waste collection and solar panels.
- In Pakistan, Telenor is investing in green network transformation. The operator's Thunderbolt project resulted in 6,072 metric tons of CO_2 savings in 2020 and 16,869 metric tons in 2021.

Several operators across the region have committed to net zero targets and are increasingly taking responsibility for the emissions of their entire supply chain. Figure 13 highlights the climate commitments of operators in Asia Pacific.

Figure 13

Climate targets by operators in Asia Pacific

Network operator	Science–based targets	Carbon-neutral target	Race to Zero Target
2degrees	Committed		
Axiata	Committed		2050
Bharti Airtel	1.5˚C		2050
CH Hutchison	Committed		
Globe Telecom	Committed		2050
KDDI	1.5˚C	2030	
LG Uplus		2030	
NTT Docomo	1.5˚C	2030	
Reliance Jio	1.5˚C		2040
Singtel	Well below 2˚C		2050
SK Telecom	1.5˚C	2050	
SoftBank	1.5˚C	2030	
Spark	1.5˚C		
Telenor Group	1.5˚C	2030	
Telstra	1.5˚C	2020	2030
TPG	Committed		2050
Vodafone	1.5˚C	2030	2040

Definitions

Science-based targets (SBTs): Defined by the Science-Based Targets Initiative (SBTi) to set carbon-reduction targets in line with limiting global warming to below 2°C.
See gsma.com/betterfuture/setting-climate-targets

Carbon-neutral target: Refers to reducing and offsetting carbon emissions from a company's own operations (Scope 1 and 2 emissions). For operators, the largest sources of Scope 1 and 2 emissions are electricity use for networks and diesel fuel used for transport and generators.

Race To Zero target: Committing to achieving net zero carbon emissions by 2050 at the latest, as part of the UN-led Race to Zero campaign with businesses, cities, regions, investors and financial and educational institutions. See unfccc.int/climate-action/race-to-zero-campaign

Source: SBTI, UNGC, company websites

Revenue diversification still the focus

Revenue diversification is still a strategic focus for operators, with services beyond core now a key component of growth stories. This enables operators to offset stagnating (or declining) core telecoms revenues and to capture incremental value from new growth areas (such as digital services and platforms). Additionally, GSMA Intelligence research shows that operators experiencing higher revenue growth beyond core also demonstrate stronger performances in their core businesses. This means services beyond core help core services (churn reduction, ARPU uplift and data usage growth) and vice versa (leveraging the operator brand and key core assets such as distribution, networks and customer relationships).[8]

Financial services and e-commerce are two areas that present significant revenue diversification opportunities for operators across Asia Pacific. With the Covid-19 pandemic accelerating the shift to digital, a growing number of operators in the region are making new moves in financial services through M&As and partnerships. Such moves target both customer engagement and new digital capabilities for businesses, including for fraud prevention, credit risk, identity and digital currencies.

> Financial services and e-commerce are two areas that present significant revenue diversification opportunities for operators across Asia Pacific.

The following are some examples:

- Singtel has obtained digital banking licences in Singapore and Malaysia through its joint venture with Grab and other investors.
- Bharti Airtel has forged a partnership with India's third-largest private bank, Axis Bank, to jointly develop a range of fintech offerings.
- KT issued $2 billion in digital currency after striking partnerships with several city municipalities.

There has also been a significant uptick in demand for online shopping as a result of the pandemic, providing a further boost to the revenue diversification strategies of various operators. This is evidenced by recent trends in Japan. For example, in FY 2021, SoftBank reported 23% year-on-year growth in revenue for its Yahoo Japan and Line business unit, driven by higher e-commerce sales and the Line consolidation. Rakuten is another player in Japan that sees value in aligning mobile services with e-commerce. In May 2022, it reported that 35% of its mobile customers who have never used the Rakuten Ichiba e-commerce platform began using the service within 12 months of subscribing to Rakuten Mobile.

8. Operator revenue diversification: growth beyond core continues as Covid-19 spurs digitisation, GSMA Intelligence, September 2021

2.3 Metaverse ecosystem gains traction in Asia Pacific

The metaverse ecosystem is growing in many countries around the world, including in Asia Pacific. This is demonstrated by the interest of public agencies and private enterprises in establishing a presence in the metaverse and actively utilising the platform in their engagement with customers and other stakeholders. South Korea plans to spend at least $186.7 million to create its metaverse ecosystem, as part of the country's Digital New Deal.

Other governments in the Asia Pacific region, both at national and provincial levels, have outlined plans to harness the potential of the metaverse to increase the efficiency and quality of public services, as well as improve collaboration between local and national government agencies (some examples are highlighted in Figure 14). This will be crucial to the development of the broader metaverse ecosystem, including for content creators and telecoms operators. For example, Indonesia's Ministry of Home Affairs has developed a virtual platform called Kovi Otda, which can help local governments hold real-time consultations in the metaverse.

Figure 14

Examples of metaverse activities in Asia Pacific

Australia	Tennis Australia partnered with decentralised platform Decentraland to co-host the 2022 Australian Open (AO) in the metaverse. Set around key areas in Melbourne Park, where the tournament is held, the AO metaverse featured games, viewing screens and stores for purchasing NFTs of digital wearables.
Indonesia	The Governor of Jakarta has partnered with AR technology company WIR Group to utilise the metaverse platform to provide more convenient services and new experiences for the public, as part of the Jakarta Smart City project.
Japan	Local authorities in the city of Yabu have teamed up with Yoshimoto Kogyo, one of Japan's biggest entertainment industry players, to create a virtual space for the city. It will feature a virtual recreation of the city's Tendaki waterfall and the Hachikogen winter sports resort.
Malaysia	i-City announced an RM10 million ($2.3 million) digital transformation plan to enhance its theme park with a metaverse experience. The new experience, which will be unveiled in 2023, is expected to attract an additional 10 million visitors in the metaverse.
Thailand	The Tourism Authority of Thailand, together with the provinces of Chanthaburi, Rayong, and Si Sa Ket, has launched the 'Amazing Thailand Metaverse: Amazing Durian project'. The virtual travel experience was specially created to attract a new sector of tourists using the metaverse platform.

Source: Company sources

As the metaverse concept becomes more mainstream, the question of how operators can participate, beyond providing the underlying connectivity, has risen up the agenda:

- In July 2021, SK Telecom launched the Ifland platform for users to make digital interactions in a virtual environment.
- In February 2022, Reliance Jio announced that it is investing $15 million in AI startup Two Platforms for a 25% equity stake, while KDDI has invested in Airmeet Inc., a company that provides a virtual events platform across the world.
- In June 2022, Airtel unveiled India's first multiplex in the metaverse, providing a platform to access content from OTT partners available on the application.

These examples highlight the opportunity for operators to capture additional value elsewhere in the value chain, particularly in developing platforms, content and services in the metaverse. Leveraging new and existing relationships to create partnerships within the telecoms industry and beyond will be necessary to capitalise on the potential of the metaverse.

03
Mobile contributing to economic growth and social progress

3.1 Mobile's contribution to economic growth

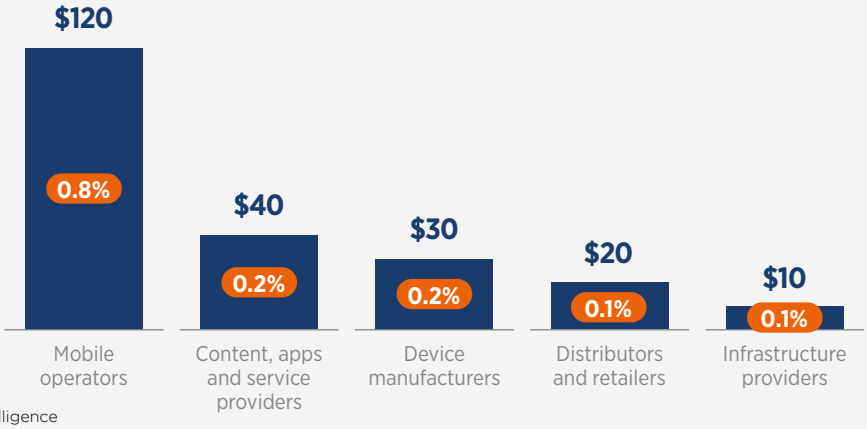
In 2021, mobile technologies and services generated 5% of GDP across Asia Pacific, a contribution that amounted to more than $770 billion of economic value added. The mobile ecosystem also supported more than 8.8 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with more than $80 billion raised through taxes on the sector.

By 2025, mobile's contribution will grow by more than $90 billion (approaching $870 billion), as the countries in the region increasingly benefit from the improvements in productivity and efficiency brought about by the increased take-up of mobile services.

Figure 15

The Asia Pacific mobile ecosystem directly generated more than $200 billion of economic value in 2021

Billion, percentage of GDP

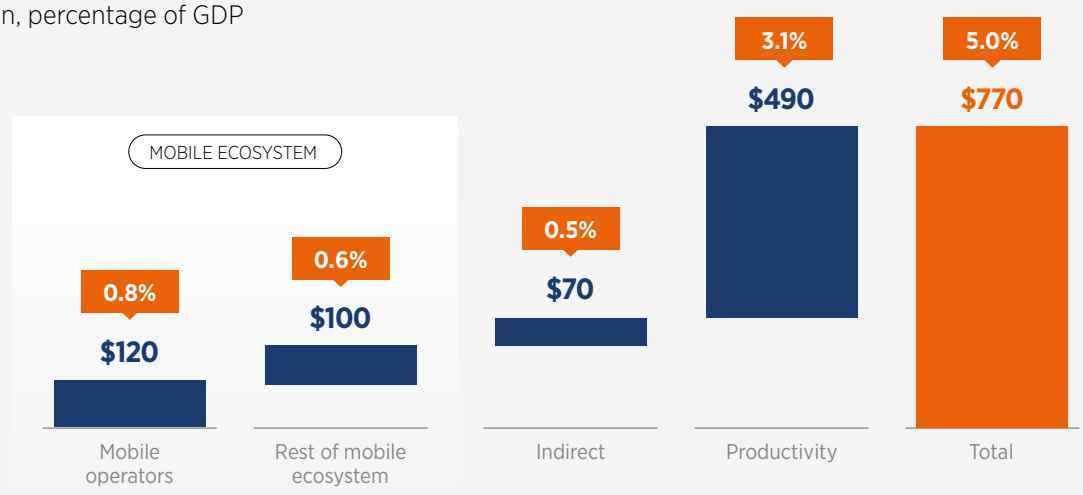


Source: GSMA Intelligence

Figure 16

Additional indirect and productivity benefits bring the total contribution of the mobile industry to the regional economy to more than $770 billion

Billion, percentage of GDP

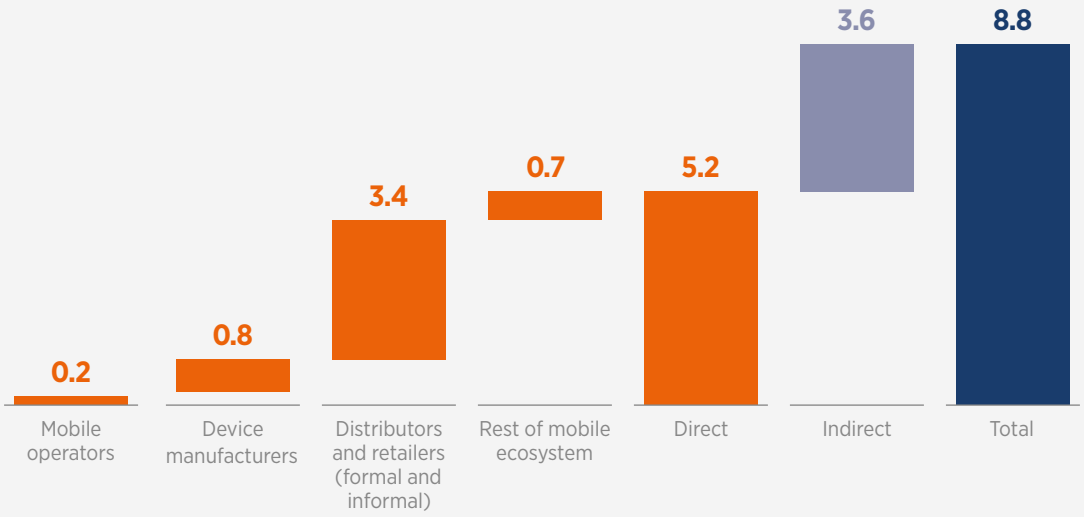


Source: GSMA Intelligence
Note: Totals may not add up due to rounding

Figure 17

The Asia Pacific mobile ecosystem directly employed more than 5.2 million people in 2021, plus another 3.6 million indirectly through adjacent industries

Jobs (million)

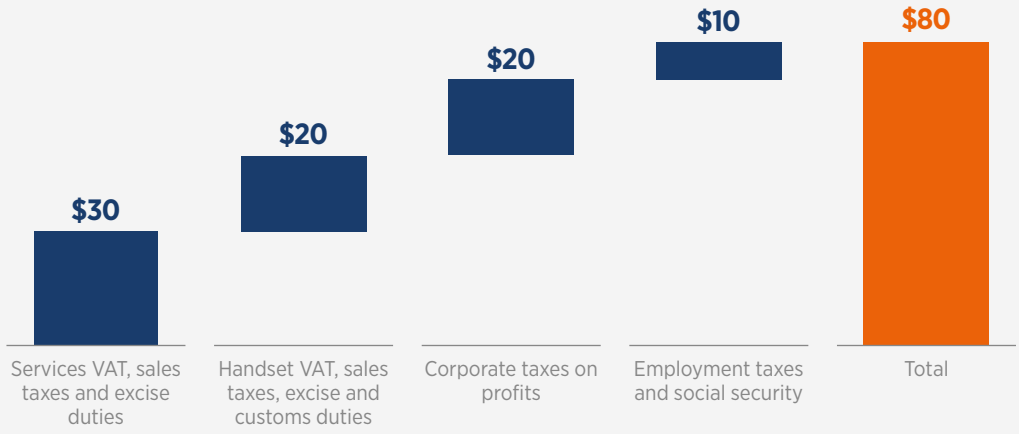


Source: GSMA Intelligence
Note: Totals may not add up due to rounding

Figure 18

In 2021, the mobile ecosystem contributed more than $80 billion to the funding of the public sector through consumer and operator taxes

Billion



Source: GSMA Intelligence

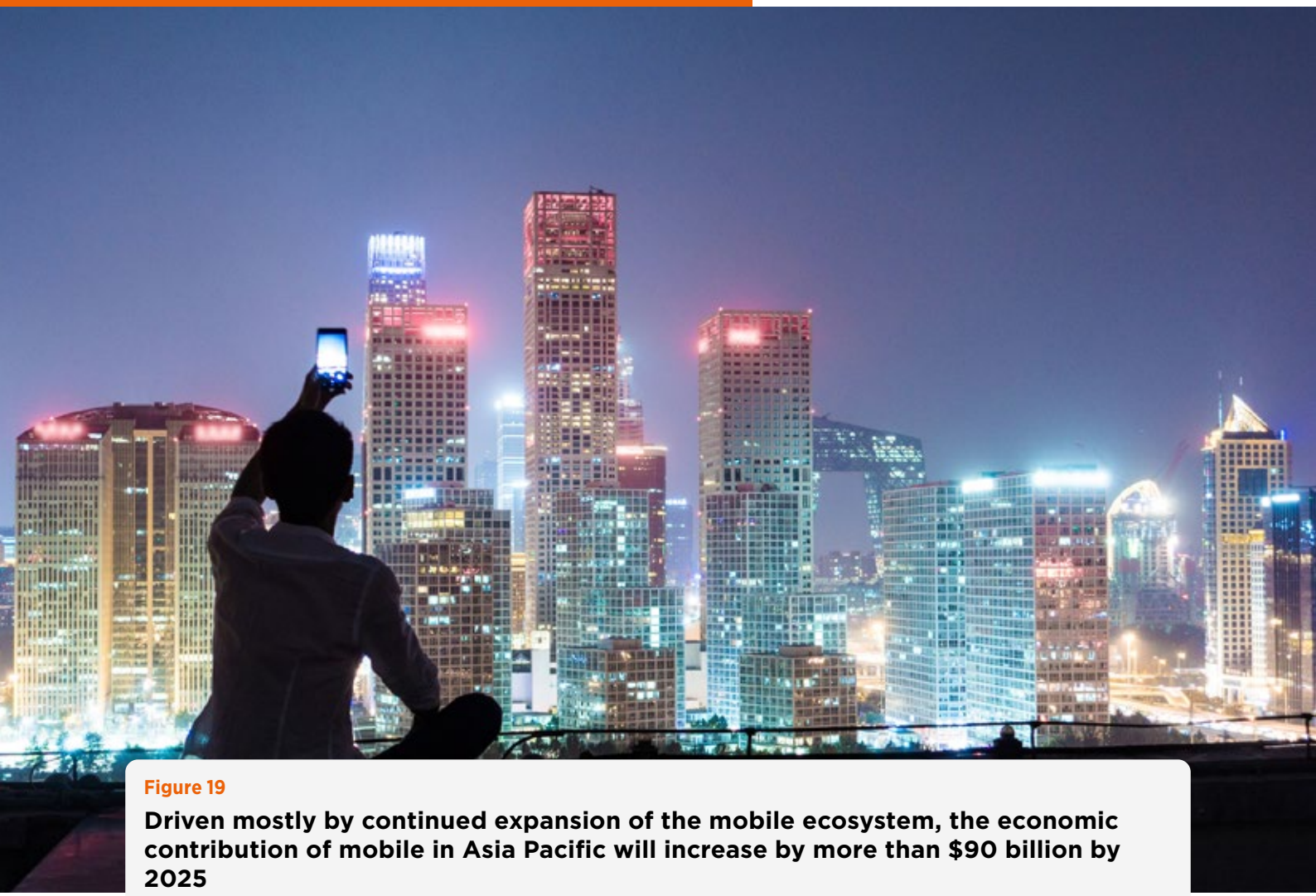
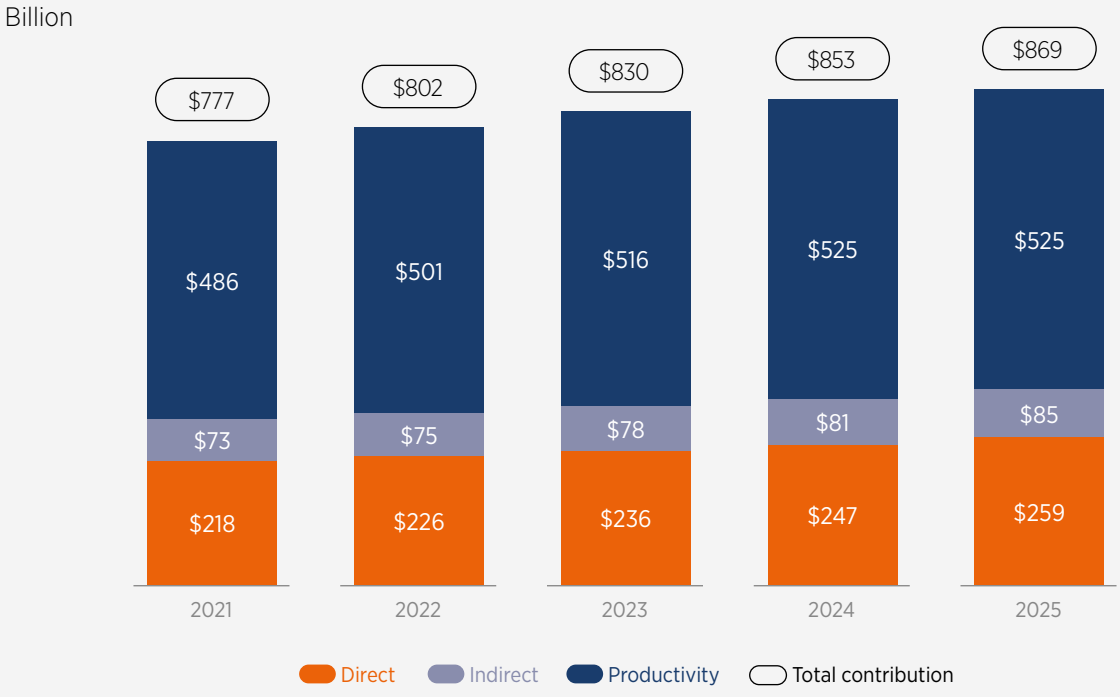


Figure 19

Driven mostly by continued expansion of the mobile ecosystem, the economic contribution of mobile in Asia Pacific will increase by more than $90 billion by 2025



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

3.2 Mobile enhancing digital and financial inclusion

Bringing more people online

Over the last two years the Covid-19 pandemic has reinforced the importance of connectivity to society's wellbeing. Consequently, the need to ensure universal access to quality and affordable connectivity has moved up the agenda for authorities in Asia Pacific and around the world. Throughout the pandemic, mobile connectivity served as a lifeline for individuals and communities, particularly those with limited or no access to other forms of connectivity.

Today, mobile broadband networks cover around 96% of the population in Asia Pacific, which serves as a testament to the significant investments made by mobile operators and other industry players over the last decade in 3G, 4G and, increasingly, 5G networks. Moreover, mobile operators remain focused on extending coverage to underserved areas. This is evidenced by investments in innovative solutions and partnerships, particularly with satellite providers, to accelerate network deployment in rural and remote areas, where the coverage gap is widest. Recent examples include the following:

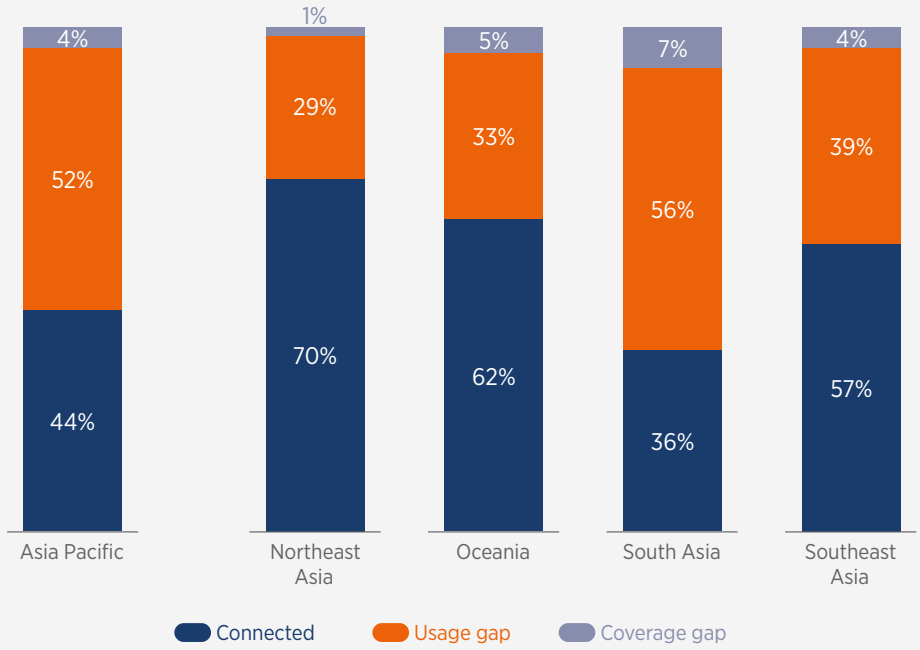
- Jio Platforms partnered with SES to form a joint venture – Jio Space Technology Limited – to deliver scalable and affordable broadband services in India, particularly in rural and remote areas.
- KDDI selected SpaceX's Starlink satellite broadband service as a backhaul provider to support the rollout of high-speed wireless internet coverage in rural areas in 2022. Starlink will deliver broadband internet to 1,200 remote mobile towers across Japan.
- Airtel has signed a six-year agreement with OneWeb, in which it holds a 30% stake, to connect towns, villages, and local and regional municipalities in the hardest-to-reach areas across India.
- Indonesian operator DTP has partnered with Hughes Network Systems to connect people in Papua and throughout Indonesia using the latter's Jupiter platform. The partnership will enable DTP to deploy satellite connectivity across 1,400 rural locations.

At the end of 2021, 1.23 billion people in Asia Pacific subscribed to mobile internet services. This was equivalent to 44% of the region's population. Another 264 million people are expected to subscribe to mobile internet for the first time over the period to 2025, taking the total number of internet subscribers to 1.49 billion (equivalent to 52% of the region's population). With the near universal coverage of mobile broadband networks, the challenge for stakeholders is to address the usage barriers that weigh on people's ability and willingness to adopt and use mobile internet services.

Figure 20

Over 95% of the population in Asia Pacific is covered by a mobile broadband network, but the usage gap now stands at more than half of the population

Percentage of population, 2021



Source: GSMA Intelligence

The usage barriers to mobile internet adoption are multifaceted. They include issues around poor digital skills, especially among older populations; lack of affordability of devices and services, especially among rural and low-income populations; lack of relevant content to stimulate demand for digital connectivity; and online safety concerns, especially for vulnerable populations such as women and people with disabilities. Addressing these barriers requires a collaborative effort among stakeholders across the public and private sectors.

In the wake of the Covid-19 pandemic and the shift to digital, governments and other stakeholders in the region have stepped up efforts to address the barriers to use of digital services. In Singapore, for example, the government has established the Singapore Digital Office (SDO) to drive initiatives that accelerate digital adoption. One key part of the SDO's work was the Seniors Go Digital programme, which involved mobilising digital ambassadors to train over 100,000 senior citizens, through one-to-one coaching and small group learning sessions.

In Pakistan, addressing the affordability barrier to mobile phone ownership is critical to closing the usage gap. Here, mobile operator Jazz offers 4G smart feature phones at affordable prices, starting from PKR4,500 ($33) and bundled with free access to social media sites and free on-net calls during the first three months of ownership.

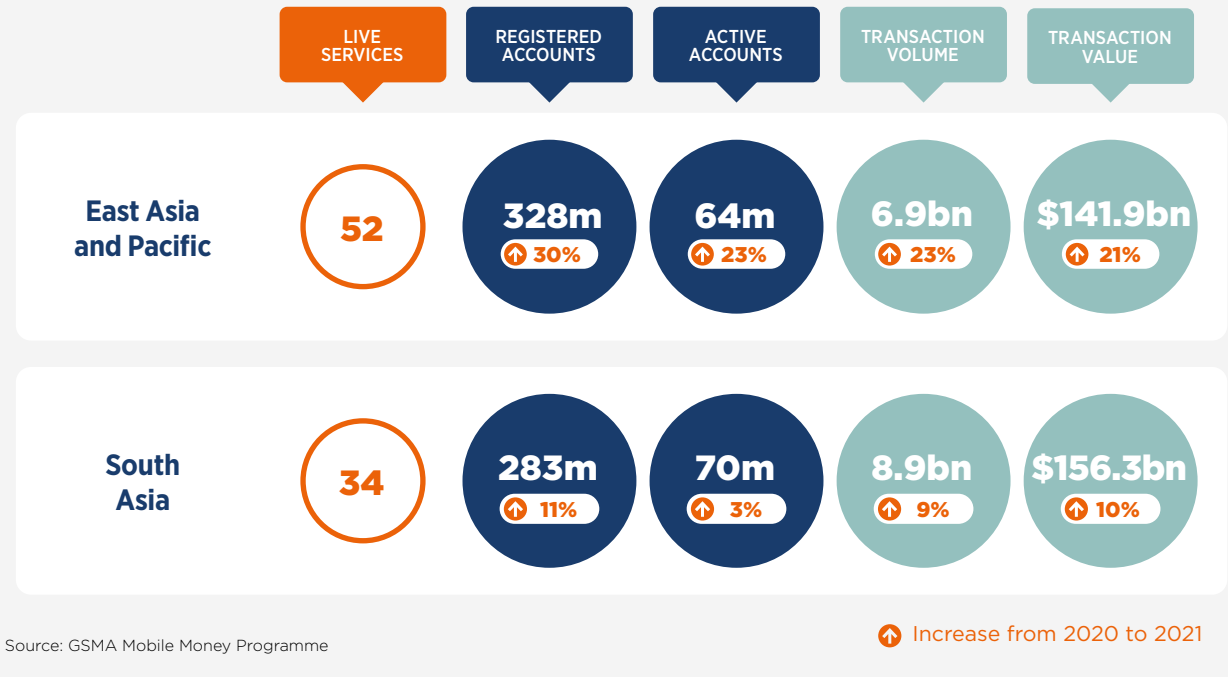
Increasing access to financial services

Mobile money can bring about positive socioeconomic outcomes, particularly in low- and middle-income countries (LMICs). This is especially true in Asia Pacific countries where the service is available, as the increase in the number of customers and transactions signals a growing impact on socioeconomic activities in local communities. The service is expanding into new countries in the region, notably Vietnam, where Viettel and Vietnam Posts and Telecommunication Group launched commercial services at the beginning of 2022. By the end of March 2022, the government reported that 463,000 people were using mobile money, with over 77,000 establishments accepting mobile money payments nationwide.[9]

Figure 21

Mobile money is making progress in LMICs across Asia Pacific, giving many people access to formal financial services for the first time

Number of services and accounts and transaction volumes, 2021



Source: GSMA Mobile Money Programme

Despite the progress being made, there are still barriers to adoption of mobile money for some groups of the population. For instance, in India and Indonesia, security and the preference for cash for payments are the biggest deterrents to more widespread adoption of mobile money services. The persistent gender gap in mobile ownership is also a factor in some countries. In Bangladesh, a comparatively mature mobile money market in the region, 84% of men own mobile phones, while just 65% of women own a mobile phone, resulting in a 23% gap in terms of mobile money account ownership. In Pakistan, the gender gap in terms of mobile money account ownership reaches 71% of the total adult population. This highlights the need for more to be done to address gender biases for greater financial inclusion to take place.

In Pakistan, Ufone has introduced a number of initiatives to increase female access to connectivity. For example, the operator has introduced a smart code that allows women customers to receive mobile top-ups without having to share their phone numbers with retailers.

9. https://opengovasia.com/mobile-money-widely-used-in-vietnam/

3.3 Social impact: spotlight on the mobile industry's response to Typhoon Rai[10]

Background

On December 16 2021, the Philippines was hit by Typhoon Rai (known locally as Odette) causing devastation in island and coastal communities in the east and flooding cities all over the country. Typhoon Rai made an initial landfall in the Caraga region in north-eastern Mindanao and the Leyte and Southern Leyte provinces in the Visayas island, with gusts up to 270 km/h and winds of 195 km/h near the centre. Considered a super typhoon, Rai was the strongest storm to hit the Philippines in 2021 and the second deadliest disaster globally in the same year, after the Haiti earthquake.

Nearly 8 million people were affected by the typhoon – with many communities suffering compounding effects due to the ongoing pandemic.

Across the Visayas and northern Mindanao there was widespread damage to livelihoods, agriculture and infrastructure. Many people lost their homes, and power lines, water supplies and communication networks were destroyed and interrupted in many communities. The lack of power and communication posed communications challenges, disrupting emergency response efforts: a total of 379 cities experienced power outages and interruptions. In total, more than $100 million is estimated to be required to support the recovery in the two worst-affected regions. With over 800,000 people preemptively evacuated and more than 300,000 displaced, Typhoon Rai was one of the most damaging disasters to have hit the Philippines.

Mobile industry actions in response to Typhoon Rai

The mobile industry works closely with the authorities in the Philippines in preparedness, early warning and response. The country has a well-established system for disaster risk reduction and management at the national level, led by the National Disaster Risk Reduction and Management Council under the Office of Civil Defence. In addition to this, provincial and local governments must establish their own Disaster Risk Reduction and Management Office. As public utilities, mobile operators are required to support disaster preparedness and response activities in the Philippines. Mobile operators Globe and Smart have been active in the response to the typhoon, supporting the government, first responders and the residents of the Philippines. Some of the activities by the operators are highlighted below:

- **Anticipating hazards, disseminating warnings:** When hazards are imminent, Globe sends geo-targeted SMS warnings and cell broadcasts to customers. It has partnered with local government units (LGUs) to provide them with free services and charging stations in affected areas. Smart also sends blast SMS messages to its customers via its Infocast to reach specific target communities.
- **Preparedness and pre-positioning:** Given that the Philippines is at such consistent risk from natural hazards, operators have developed strong preparedness plans. This includes an annual simulation drill conducted by both Globe and Smart together with the Metro Manila Development Authority.
- **Resilient infrastructure and network repair:** While measures are in place to ensure network infrastructure can withstand strong winds, both Globe and Smart reported infrastructure damage. However, services were quickly restored as operators worked with the government and other service providers to re-establish damaged infrastructure in a joint response effort.
- **Supporting customers:** To help those in need in the most heavily affected areas, Globe provides internet through their GoWiFi service in selected locations. Globe provided free A2P messaging services to affected LGUs and allowed customers to send unlimited texts to all networks and free unlimited calls to Globe and TM numbers at the onset of the disaster. Likewise, Smart had different initiatives to support customers, including free SIM cards to enable immediate access to call, text and data in affected areas.

10. Typhoon Rai Response: The role of the mobile industry, GSMA, 2022

04
Policies for digital innovation

More than 1.6 billion people in Asia Pacific now use mobile connectivity to work, learn, shop and stay in touch with friends and family. At the same time, 5G deployment and adoption is increasing; the number of 5G connections in the region will reach the 100 million milestone in 2022. The Covid-19 pandemic, and the associated movement restrictions, has shown the importance of mobile connectivity in supporting people in their daily activities and helping businesses to operate safely.

As society now moves towards a 'new normal' post pandemic, mobile connectivity will be central to the development of new and innovative technological solutions to today's problems. As 5G network deployments continue, 5G's ability to support next-generation offerings (such as cloud services, AI, IoT and edge computing) will drive digital economic growth and innovation. Policymakers and regulators can fuel growth and innovation by finding the proper balance in the regulatory environment to support mobile network deployment and operations. Specifically, policymakers should take steps to:

- establish a forward-looking regulatory regime that supports the financial sustainability of the industry and provides non-discriminatory conditions to drive new innovations from large companies and SMEs
- adopt policies that enable the building and deployment of infrastructure to support future networks accessible to all
- create and maintain a safe and trustworthy online environment to protect users from threats
- ensure that available spectrum serves the future demand for connectivity.

These steps have the potential to set the proper foundation to support future economic growth, societal development and technological innovation.

4.1 Establishing a modernised and flexible regulatory regime

Finding the proper balance in a regulatory environment may include the efficient allocation of public resources to facilitate the economic growth needed to meet societal goals, which include technological innovations.

A balanced approach to revenue collection

In order to support low-latency, high-capacity use cases, 5G networks will utilise many more sites, both macrocell and small cell. As part of this deployment, an increase in capital expenditure is expected. Despite this, ARPU levels continue to decline. Along with this pressure, there is a clear need to ensure that mobile internet is affordable, allowing more people to receive the benefits of connectivity. This financial pressure on mobile network operators limits deployment and in turn slows the innovation cycle.

Adding to this pressure, some governments are imposing taxes, both general and sector-specific, on consumers, devices and mobile operators to raise revenue or address shortfalls due to the pandemic. For example, a 2022 GSMA report estimates that about half of Bangladesh's population remains unconnected to a mobile network partly due to the negative effects of the high-taxation environment.[11] High tax levels put stress on the investment environments for operators and can limit innovation and long-term economic growth. India's adjustment to the definition of adjusted gross revenue, one piece of the recent 'big bang reforms', is expected to lower tax payments to the government, helping operators to prepare for the deployment of 5G. A taxation approach that avoids favouring particular industries and balances short- and long-term gains has the potential to create an investment environment that can support digitisation, innovation and the adoption of new technologies.

11. Taxation of the mobile industry in Bangladesh, GSMA, 2022

Policy actions to close the digital divide

People rely on mobile connectivity for a wide range of purposes such as remote learning and working, e-commerce transactions, banking, and communicating with family and friends. However, more than half of the population in the Asia Pacific region lives in areas covered by mobile broadband networks and yet does not use mobile internet services. This makes Asia Pacific the region with the largest usage gap globally. Studies have found that affordability, knowledge and digital skills, availability of relevant content and services, safety and security, and access are all key barriers to mobile internet adoption.[12]

The mobile internet gender gap had previously been closing, but progress has stalled in some cases. In South Asia, the mobile internet gender gap had narrowed significantly, from 67% in 2017 to 36% in 2020, but it has widened to 41% in 2022. This is due to a continued increase in mobile internet adoption among men but no notable increase among women, particularly in India, where men's mobile internet use increased from 45% to 51%, while the figure for women has remained flat at 30%.[13] Pakistan in particular has made its efforts to close the gender gap a priority, with initiatives such as the 'Connected Pakistan: Accelerating Gender Inclusion in ICTs' event[14] and the signing of an MoU with the GSMA to collaborate on reducing the digital gender gap.[15] Furthermore, the Pakistan Telecoms Authority (PTA) has established a Gender Committee and is collaborating with mobile operators and with relevant social enterprises to fast-track the efforts to reduce the gender gap in Pakistan.

Innovation depends on widespread adoption, as use cases are developed based on market demand, which fuels further research and development. An ongoing usage gap has the potential to limit innovation if adoption lags. Whole-of-society efforts to address the usage gap are ongoing, with the GSMA's Mobile Connectivity Index (MCI) focusing on four key enablers: infrastructure, affordability, consumer readiness, and content and services.

Safe and secure connectivity

As innovative new use cases are developed, it is imperative that subscribers experience a safe and secure online environment. Today, people face numerous issues that undermine a safe experience, including cyber threats, abuse, bullying, misogyny, and misinformation and disinformation. These issues could become more pronounced with new use cases being developed as mobile networks are increasingly incorporated into industry verticals.

Efforts across the region, such as the ASEAN Digital Ministers' development of ASEAN CERT and update of the ASEAN Cybersecurity Cooperation Strategy,[16] along with wider mobile ecosystem collaboration, can build stronger online awareness and security resilience. Public discourse, digital literacy programmes,[17] and advancements in network and service security[18] will keep new online environments safe and secure. These ongoing safety and security efforts can stimulate innovation and the adoption of new technologies.

12. Accelerating mobile internet adoption: Policy considerations to bridge the digital divide in low- and middle- income countries, GSMA, 2021
13. The Mobile Gender Gap Report 2022, GSMA, 2022
14. "Gender inclusion in ICTs event held", Pakistan Telecommunication Authority, March 2022
15. "PTA GSMA sign agreement to accelerate gender inclusion in ICTs in Pakistan", Pakistan Telecommunication Authority, March 2022
16. https://asean.org/wp-content/uploads/2022/01/2nd-ADGMIN-Joint-Media-Statement.pdf
17. Exploring the metaverse and the digital future, GSMA, 2022
18. Mobile Telecommunications Security Landscape 2022, GSMA, 2022

Consideration of stakeholder input in policymaking

5G networks are a key enabler for the use of emerging technologies and these innovations need flexible regulatory frameworks to provide a conducive environment for growth. A successful enabling environment utilises a fair and transparent consultation process, allowing for the intake and consideration of input of all the relevant stakeholders that are impacted by the law and policy. Australia's best practice for public consultations provides a framework to help regulators consider stakeholder views.[19] Thoughtful consideration of stakeholder input can offer stability, helping to improve the investment environment and drive innovation.

Streamlined rights-of-way and other infrastructure policies

While macrocells will still be utilised in 5G networks, the deployment of small cells will be critical because of the introduction of higher spectrum bands that necessitate denser network deployments to support larger traffic volumes. Streamlining the small cell deployment process will greatly facilitate deployment, which can be achieved by:

- amending infrastructure policies to include small cells
- harmonising local, state and federal rules
- designing specific guidelines on small cell installation, infrastructure design, availability of street furniture, sharing of infrastructure, no/nominal charges, faster time-bound permits and provisions for categorical exemptions in permits.[20]

Japan is giving operators the ability to install 5G base stations on traffic lights and this has helped to propel 5G deployments across the country.[21] As small cells are deployed and network density is increased, higher-capacity use cases will be able to flourish.

19. https://obpr.pmc.gov.au/sites/default/files/2021-09/best-practice-consult.pdf
20. Paving the way for 5G readiness in India: A guide for effective policymaking on small cell deployment, GSMA, 2022
21. Realising 5G's full potential: Setting policies for success, GSMA, 2020

4.2 Adopting policies that ensure fair competition and regulation to reflect the evolving digital economy

A competitive and efficient market structure

A vibrant, competitive market structure can drive investment and innovation. As consumption of mobile data grows, mobile operators continue to invest in their networks to meet this demand with improved offerings at lower costs. Policymakers in Asia Pacific can foster innovation and support the wider societal benefits of mobile connectivity by preserving competition by allowing market mechanisms to determine the optimal market structure.

In some markets, competitive forces may push mobile network operators towards consolidation. Indonesia's Ministry of Communication and Information Technology, Kominfo, approved the merger of Indosat and Tri in part because of the potential for a more efficient market that could fuel digital transformation in Indonesia. Consolidation may increase an operator's ability to invest in the market, along with the positive spillover effects for the wider economy. Competitive market forces have a proven track record of driving innovation.

However, some markets are looking at single wholesale networks to deploy 5G. In select instances, infrastructure sharing on a voluntary basis may significantly save costs, enhance efficiency and help promote connectivity in rural and remote areas. A competitive market structure can enable the delivery of a network, and the associated innovative use cases, demanded by users. Government-mandated wholesale networks have been much slower to expand coverage, perform upgrades and embrace new technologies, limiting innovation. GSMA studies have shown limited success with single wholesale networks, as such models often require significant public subsidies and have failed to deliver the planned connectivity.[20] Regulators and competition authorities must recognise the dynamic nature of competition in the digital age and the stifling impact of excessive regulation.

Leveraging the digital economy to propel economic recovery

As policymakers and regulators work to reignite economies, digitisation (especially by SMEs) has the potential to drive economic growth for the foreseeable future. Mobile networks are a foundational piece of a digital economy, connecting the majority of Asia Pacific to new and innovative use cases. Regional agreements, such as the Regional Comprehensive Economic Partnership, along with digital trade agreements have the potential to stimulate digital economies both regionally and globally. Data privacy regulations are another foundational piece in an innovation-enabling environment, as they are crucial to boosting consumer confidence in digital technologies.

Cross-border data flows have the potential to drive digital trade, facilitating the building of digital nations. Development of data privacy regimes, with new considerations for the collection, storage and portability of personal information, can enable new technologies and innovation. South Korea's investments into the policy frameworks that underpin the metaverse have the potential to grow the digital economy in the future. Likewise, Singapore's digital trade agreements enhance the ability to do business across borders. These efforts, combined with those to stimulate internet adoption, will offer Asia Pacific new economic opportunities.

22. Single Wholesale Networks: Lessons Learned From Existing and Earlier Projects, GSMA, 2019

4.3 Meeting the spectrum needs for future connectivity

Positive decisions that help drive spectrum availability in prime 5G bands are crucial for governments and regulators that want to realise innovative networks and services. Making sure the necessary spectrum resources are available at the right time, at the right price and under the right conditions will expedite network deployment, increase coverage and boost the quality and affordability of services.

Developing a spectrum roadmap for 5G

The success of 5G networks and services depends on an adequate supply of harmonised mobile spectrum across low, mid- and high bands. However, several essential policy actions are needed before 5G can be deployed. Many countries in Asia Pacific still have to make sure that the right quantity of harmonised IMT spectrum is available.

Spectrum harmonisation has always played a vital role in the success of mobile networks, and the rollout of 5G is no different. While low-band spectrum (below 1 GHz) is required to provide more expansive coverage areas, mid-band frequencies have been used as the basis for the first commercial 5G networks worldwide. The initial focus has been on the 3.5 GHz range, which has become the birthplace of commercial 5G, as it offers the scale needed to bring down the cost of network equipment and mobile devices.

The timely release of spectrum bands is also crucial. This helps produce better consumer outcomes, which is important in markets where long-term value, innovation and cost reductions are driven through relatively short technology cycles. Beyond the initial requirement of 80–100 MHz of contiguous mid-band spectrum per operator, additional mid-band capacity will be needed as 5G demand increases. On average, a total of around 2 GHz of mid-band spectrum will be required for 5G per country by 2030.

Refarming 2G, 3G and 4G spectrum can, in time, contribute to meeting future spectrum requirements, but adding new bands will be necessary to keep up with demand in the longer term. A number of frequency ranges have the potential to support future mid-band needs. It is important to maximise mobile use within the 3.5 GHz range (3.3–4.2 GHz). Also, additional capacity in both 4.8 and 6 GHz is essential to meet the 2 GHz requirement.

At the same time, the momentum behind mmWave spectrum is growing. As of May 2022, five countries in Asia Pacific – Australia, Japan, Singapore, South Korea and Thailand – had assigned mmWave spectrum to operators, with more countries soon to follow. Spectrum in this range is key to meeting the ultra-reliable, industrial-grade connectivity demanded by private networks and enterprise use cases.

Developing a national spectrum roadmap is a prerequisite to the development of 5G, as this creates a more certain regulatory environment and gives confidence for operators to plan their investment and network rollout. The roadmap should comprise the following steps:

1. Identify suitable, harmonised bands to be released for 5G.
2. Assess options for refarming, taking account of incumbent use (if any), associated timescales and coexistence issues.
3. Determine technical conditions and licensing aspects.
4. Assess spectrum value and pricing approach.
5. Design award taking account of market context and policy objectives.
6. Implement the award and issue licences.

Making the right policy calls

A lack of sufficient quantity of spectrum, excessive spectrum pricing and limited spectrum for backhaul are some pitfalls that can lead to unnecessary delays of mobile broadband service rollouts, risk leaving more people unconnected and exacerbate the digital divide in a post-pandemic world.

Spectrum set-asides for vertical industries in priority 5G bands (i.e., 3.5, 26 and 28 GHz) create artificial scarcity and deprive public mobile networks of much-needed spectrum, leading to quality degradation or increased costs, ultimately harming consumers as a result. A better alternative is voluntary sharing. When implemented correctly, this can support improved mobile services by enabling unused, or lightly used, spectrum to be shared, transferred or leased to operators that can use it more efficiently.

Spectrum cost also has a major impact. Assignments should support digital connectivity goals, rather than simply serving as a means of maximising revenues.

Affordable, reliable and resilient connectivity is a critical infrastructure pillar to maximise the socioeconomic benefits of 5G. Importantly, research shows there are strong links between high spectrum prices and slower network speeds as well as lower coverage.[23] Licensing authorities should set reserve prices conservatively and then allow the market to determine a fair price.

Regulators should also apply the right 5G spectrum licence terms and conditions and carefully consider best practice for awarding spectrum. Additionally, licences should be technology and service neutral to allow the upgrade of existing bands to 5G. Consulting with the industry helps maximise consumer benefits and ensure 5G is available for all. The speed, reach and quality of future mobile services depend on governments and regulators supporting timely access to the right amount and type of affordable spectrum, under the right conditions.

23. www.gsma.com/spectrum/resources/effective-spectrum-pricing/

gsma.com

For more information, please visit the GSMA website at **www.gsma.com**