The Mobile Economy
Asia Pacific 2021

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Executive summary

Mobile industry continues to support Covid-19 response and recovery

Covid-19 has brought into sharp focus the importance of connectivity to society's wellbeing, as it has helped people and businesses to stay connected during the pandemic and enabled innovative solutions to curb the spread of the virus. As vaccination programmes progress and governments make plans to restart many social and economic activities, connectivity continues to play a vital role in keeping people safe and building more resilient economies that can withstand future shocks.

Mobile has been particularly instrumental during this period and will be even more integral to the way people live and businesses operate post pandemic. Across Asia Pacific, operators are using the exceptional scale and utility of mobile networks and services to facilitate innovative digital solutions for large and small enterprises in line with Industry 4.0 objectives. In particular, 5G and IoT will play key roles in the implementation of digital transformation projects across different industries.

5G makes inroads into new markets

A second wave of 5G network rollouts has begun in Asia Pacific, marked by a number of significant 5G-related activities in several new markets, including India, Indonesia and Malaysia. The arrival of 5G in some of these markets could further incentivise the mass production of more affordable 5G devices to cater for consumers in lower-income brackets, as well as drive the development of new 5G applications for consumers and enterprises in emerging markets. By the end of 2025, 5G will account for 14% of total mobile connections, overtaking 2G and 3G in the intervening period.

The progress of 5G notwithstanding, 4G will remain the dominant technology in Asia Pacific for the foreseeable future. In developing markets in the region, the immediate focus of governments and operators will be to close the usage gap for mobile broadband services, particularly 4G. In Southeast Asia and South Asia, 4G accounts for 52% and 54% of mobile connections respectively, rising to 71% and 76% by 2025.

Subscriber growth continues but at slowing rates

By the end of 2020, 1.6 billion people subscribed to mobile services, representing nearly 60% of the region's population. Adding new subscribers is increasingly difficult, as markets are becoming saturated and the economics of reaching rural populations are becoming more difficult to justify in a challenging financial climate for mobile operators. That said, there will be nearly 200 million new subscribers by 2025, taking the total number of subscribers to 1.8 billion (62% of the region's population). Much of the growth will come from South Asia, with India accounting for more than half of new subscribers by 2025.

At the end of 2020, 1.2 billion people across Asia Pacific were connected to the mobile internet, equivalent to a 42% penetration rate. With digital services set to be at the heart of a post-Covid-19 world, the urgency to bring unconnected communities online, particularly vulnerable groups such as women, has never been greater. Several operators in Asia Pacific have made formal commitments as part of the GSMA Connected Women Commitment Initiative to improve digital inclusion for women over the 2020–2023 period. By 2025, over 333 million people across the region will start using mobile internet for the first time, taking the penetration rate to 52% of the population.

The mobile industry continues to contribute to economic growth and the fight against climate change

In 2020, mobile technologies and services generated over $750 billion of economic value added (5.1% of GDP) in Asia Pacific. This figure will grow by $110 billion by 2025 to $860 billion, as countries increasingly benefit from the improvements in productivity and efficiency brought about by the increased take-up of mobile services. 5G is expected to benefit all economic sectors of the region's economy during this period, as governments and enterprises adopt new digital solutions in line with Industry 4.0 objectives.

In April 2021, the mobile sector was credited by the United Nations (UN) for achieving a critical breakthrough towards its mission of combatting climate change. Being the first major sector to achieve the rigorous criteria set by the UN's Race to Zero campaign demonstrates the commitment and leadership of mobile operators in the push to meet the goals of the Paris Agreement. This comes at a time when political and economic leaders are giving renewed impetus to delivering a zero-carbon world.

Policies to enable digital advancement

The pandemic has emphasised the need for connectivity and the critical role of mobile technology. As Asia Pacific continues to deal with, and ultimately emerges from, the pandemic, connectivity will be crucial to rebuilding economies and making them more resilient to future shocks. 5G networks, cloud services, edge computing, AI, big data and IoT will all play a key role in realising the full potential of a post-pandemic digital economy. Now is the time for governments to reassess the business and regulatory environment for mobile services in order to accelerate investment and innovation for a digitally inclusive society. Specifically, policymakers should take steps to:

- cultivate an enabling regulatory environment to bolster connectivity, which in turn supports digital transformation and innovation
- adopt policies that facilitate infrastructure deployment and create a sustainable investment climate
- create safe and trustworthy internet environments as more people come online
- establish an effective spectrum policy that allows for timely and transparent allocation of harmonised spectrum to meet future connectivity demand.

Actions taken today by policymakers should be seen as an investment into future economic growth, societal development and technological innovation.

For The Mobile Economy Asia Pacific 2021 report, industry data and analysis does not include Greater China (mainland China, Hong Kong, Macao and Taiwan), as opposed to previous editions of the report. As a result, the aggregate regional data in this report is not directly comparable with previous reports. Industry data and analysis for the Greater China region are presented in The Mobile Economy China 2021 report.

Mobile Economy Asia Pacific

UNIQUE MOBILE SUBSCRIBERS

2020-2025
CAGR: 2.2%

2020 **1.6bn**

2025 **1.8bn**

58% → Penetration rate → 62%

Percentage of population

SIM CONNECTIONS

(excluding licensed cellular IoT)

2020-2025
CAGR: 2.4%

2020 **2.7bn**

2025 **3.1bn**

100% → Penetration rate → 107%

Percentage of population

MOBILE INTERNET USERS

2020-2025
CAGR: 5.2%

2020 **1.2bn**

2025 **1.5bn**

42% → Penetration rate → 52%

Percentage of population

OPERATOR REVENUES AND INVESTMENT

Total revenues

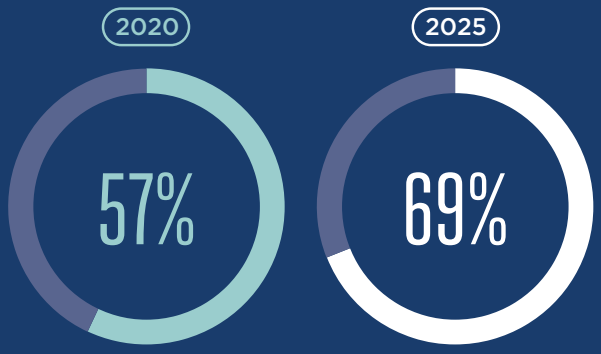
2020 **$217bn**

2025 **$230bn**

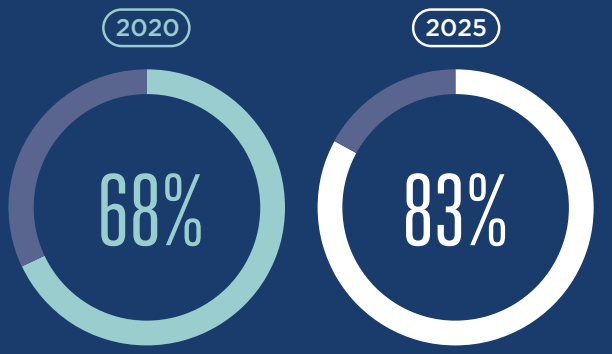
Operator capex of **$219 billion** for the period 2020–2025 (74% on 5G)

4G

Percentage of connections
(excluding licensed cellular IoT)



SMARTPHONES



Percentage of connections
(excluding licensed cellular IoT)

MOBILE INDUSTRY CONTRIBUTION TO GDP

2020
$750bn
5.1% of GDP

2025
$860bn

5G

2025
429m
Connections

Percentage of total connections
(excluding licensed cellular IoT)

INTERNET OF THINGS

2020
1.8bn
Total connections

2025
3.3bn
Total connections

PUBLIC FUNDING

2020
$70bn

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

EMPLOYMENT

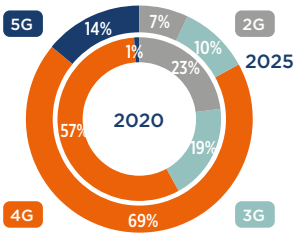
4.8m 2020
Jobs directly supported by the mobile ecosystem

+3.5m jobs supported indirectly

Connections[1] | Subscribers[2]

Asia Pacific

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

100% → 107%

SMARTPHONE ADOPTION

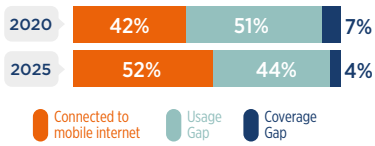
2020 → 2025

68% → 83%

SUBSCRIBER PENETRATION

2020 → 2025

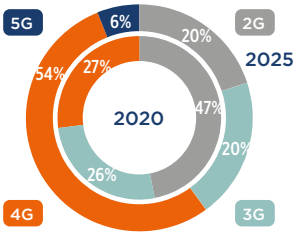
58% → 62%



"Leading Nations" programme[3]

Bangladesh

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

102% → 103%

SMARTPHONE ADOPTION

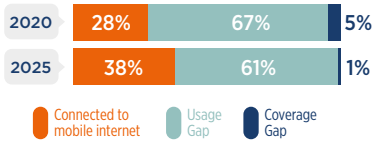
2020 → 2025

41% → 62%

SUBSCRIBER PENETRATION

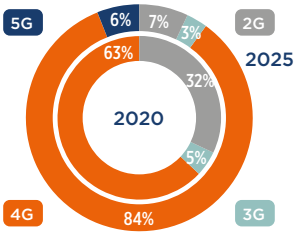
2020 → 2025

54% → 59%



India

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

80% → 89%

SMARTPHONE ADOPTION

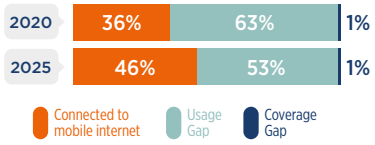
2020 → 2025

69% → 85%

SUBSCRIBER PENETRATION

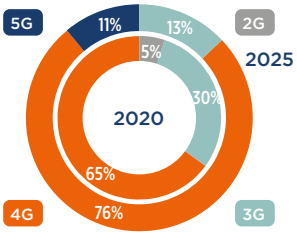
2020 → 2025

53% → 57%



Indonesia

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

130% → 133%

SMARTPHONE ADOPTION

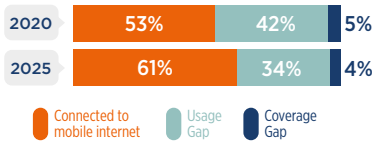
2020 → 2025

77% → 88%

SUBSCRIBER PENETRATION

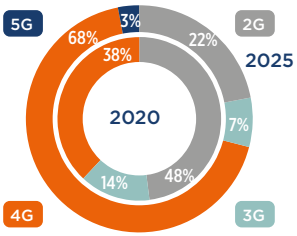
2020 → 2025

66% → 69%



Pakistan

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

79% → 90%

SMARTPHONE ADOPTION

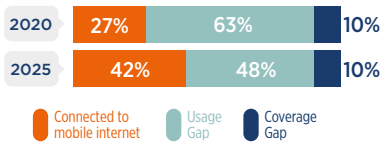
2020 → 2025

51% → 74%

SUBSCRIBER PENETRATION

2020 → 2025

41% → 48%

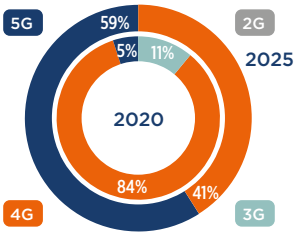


1. Unique users who have used internet services on their mobile device during the period of analysis. We define mobile internet services as any activity that consumes mobile data, excluding SMS, MMS (multimedia messaging service) and cellular voice calls.
2. Unique SIM cards (or phone numbers, where 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.
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

2020 → 2025

126% → 129%

SMARTPHONE ADOPTION

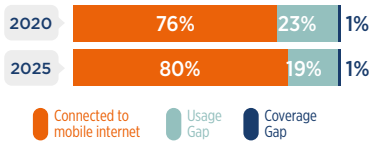
2020 → 2025

83% → 92%

SUBSCRIBER PENETRATION

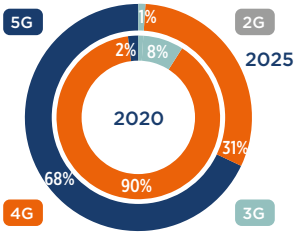
2020 → 2025

84% → 85%



Japan

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

156% → 164%

SMARTPHONE ADOPTION

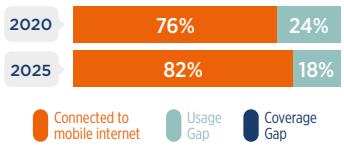
2020 → 2025

68% → 82%

SUBSCRIBER PENETRATION

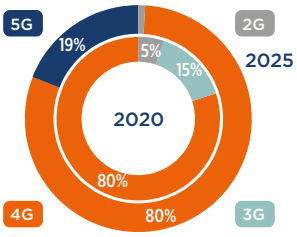
2020 → 2025

87% → 88%



Malaysia

TECHNOLOGY MIX*



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SUBSCRIBER PENETRATION

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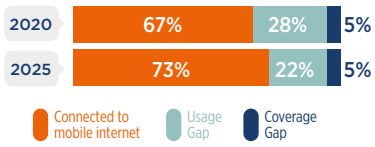
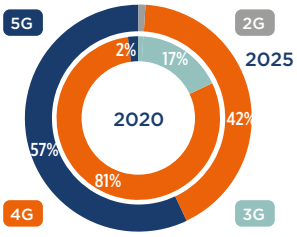


Singapore

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

2020 → 2025

145% → 152%

SMARTPHONE ADOPTION

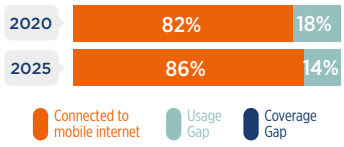
2020 → 2025

88% → 93%

SUBSCRIBER PENETRATION

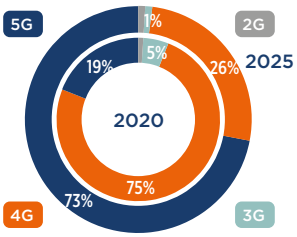
2020 → 2025

88% → 90%



South Korea

TECHNOLOGY MIX*



CONNECTIONS PENETRATION

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SMARTPHONE ADOPTION

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SUBSCRIBER PENETRATION

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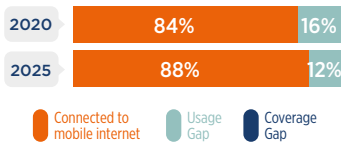


4. The GSMA APAC 5G Forum is a 5G industry engagement community platform to help 5G-pioneering operators and governments to collaborate, promote and foster the timely deployment and rollout of commercial 5G networks and services (B2C, B2B, B2G) through the promotion of active sharing of knowledge, experiences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

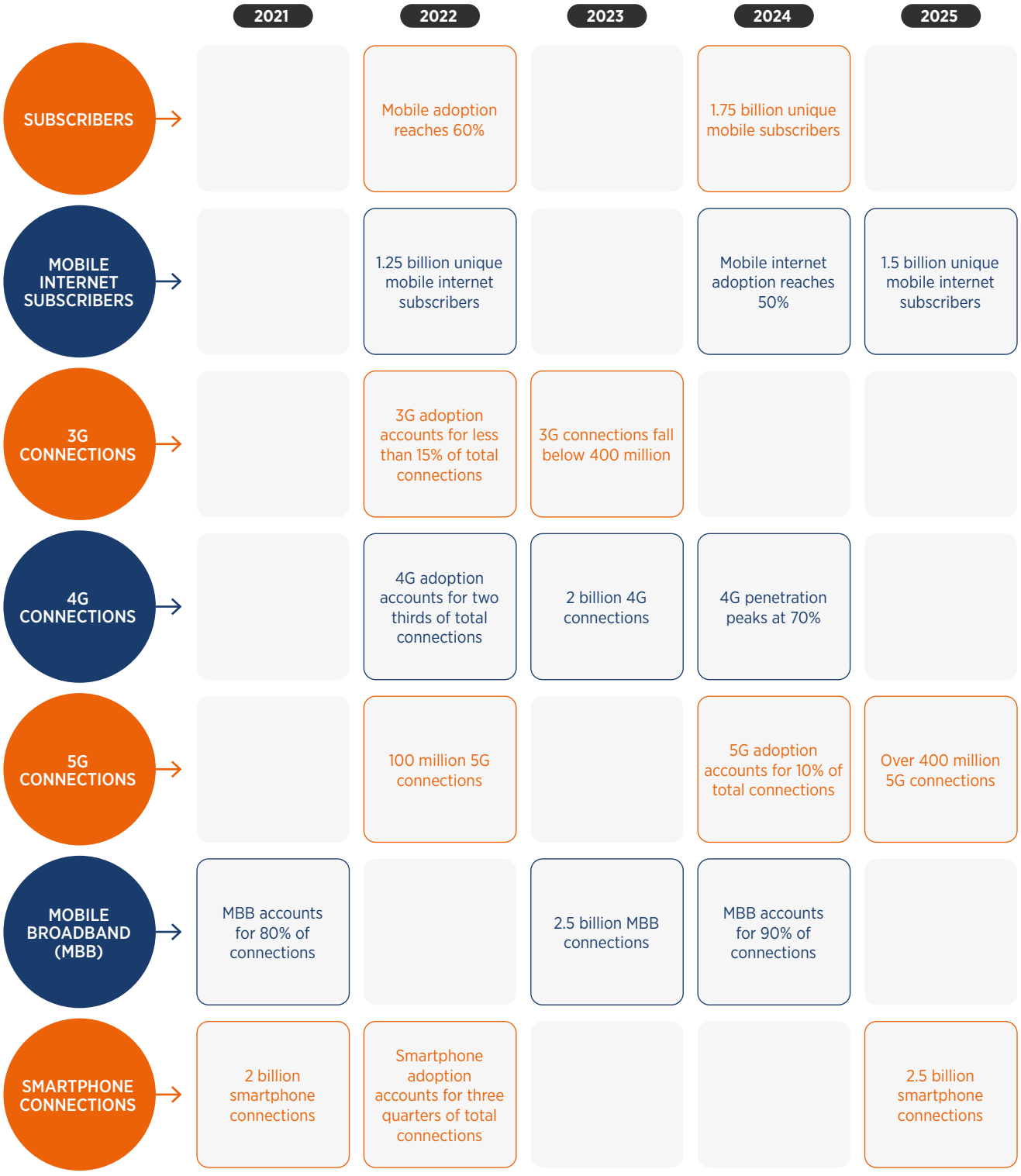
The mobile market in numbers

1.1 Subscriber growth continues, driven by South Asia

Source: GSMA Intelligence

Figure 1

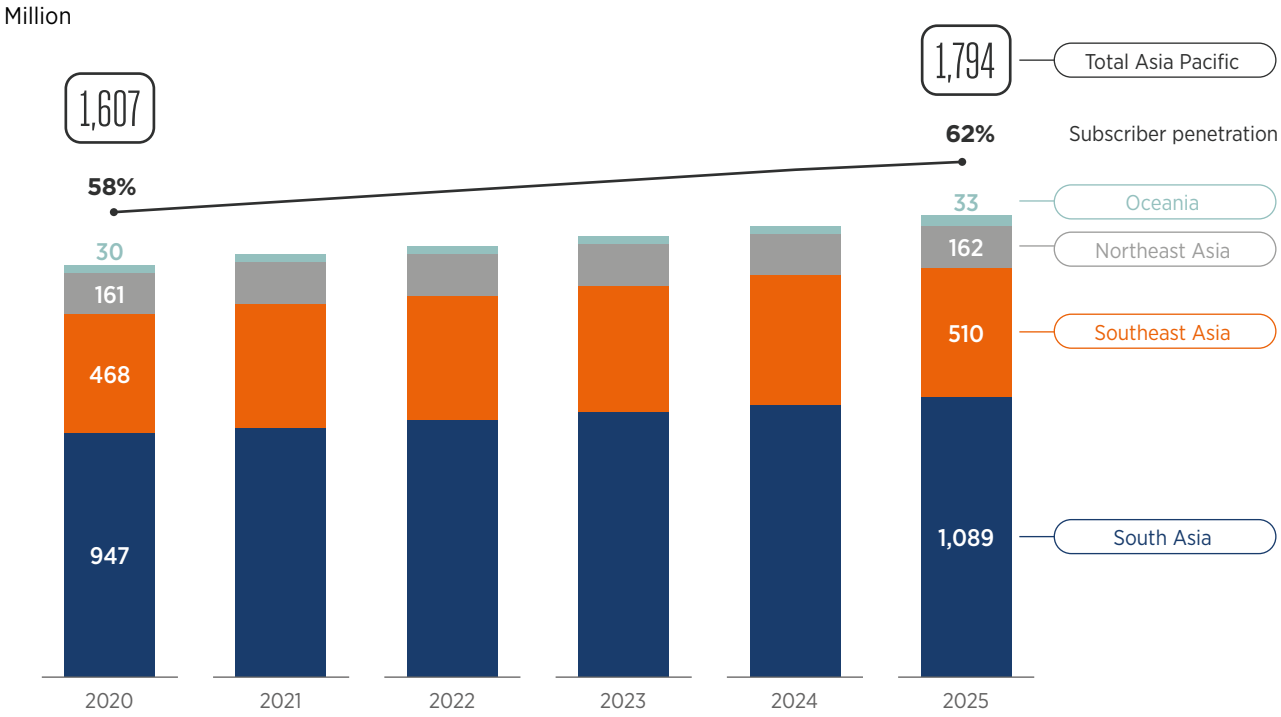
Key milestones over the next five years in Asia Pacific



Source: GSMA Intelligence

Figure 2

There will be nearly 200 million new subscribers by 2025, over half of which will be from India

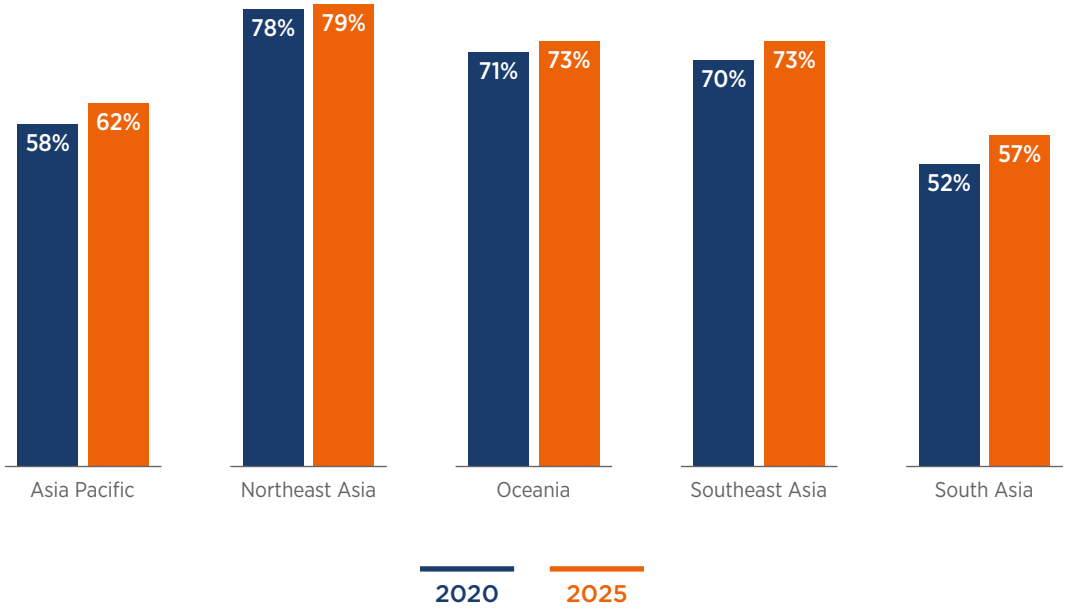


Source: GSMA Intelligence

Figure 3

Although mobile penetration in South Asia will grow the fastest, the region continues to lag behind the rest of Asia Pacific

Unique mobile subscriber penetration (percentage of population)



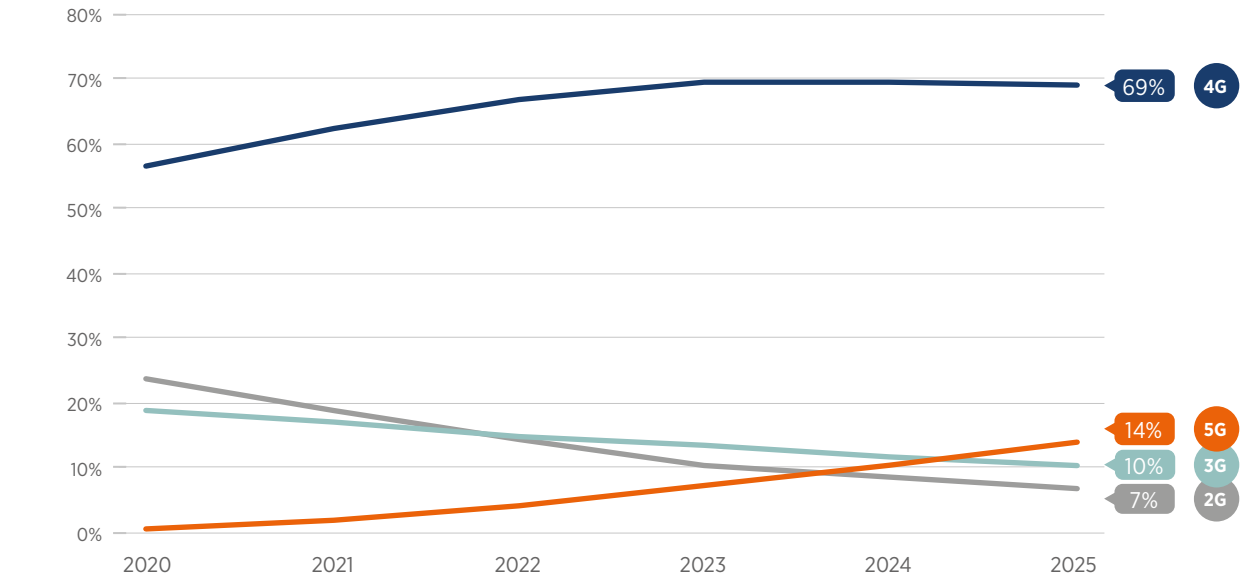
1.2 4G nears its peak, while 5G adoption gains momentum

Source: GSMA Intelligence

Figure 4

4G adoption will continue to rise until 2024; 5G will overtake 2G and 3G by 2025

Percentage of total connections (excluding licensed cellular IoT)

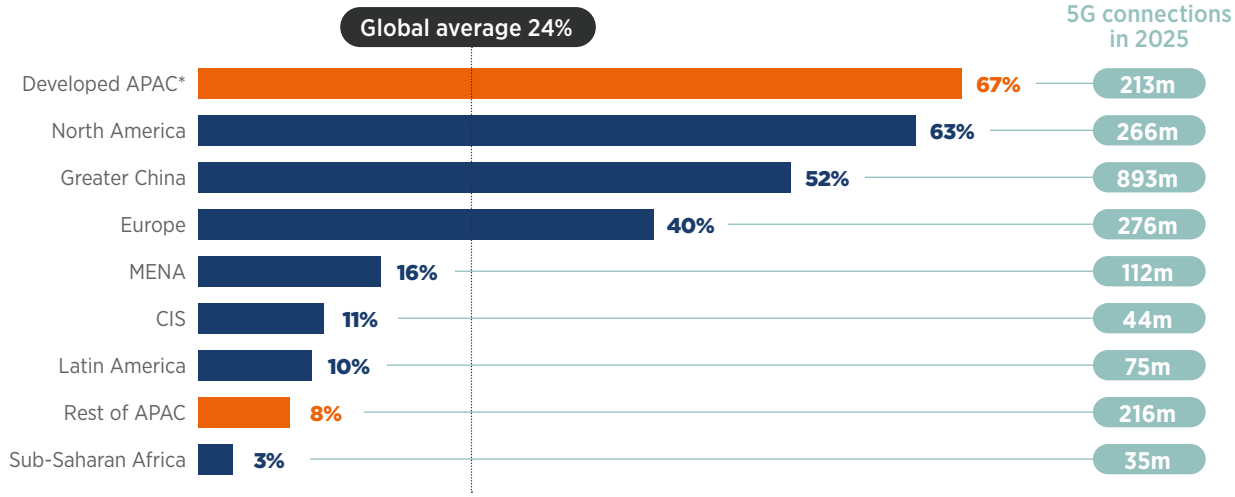


Source: GSMA Intelligence

Figure 5

Developed Asia Pacific will be the leading market in terms of 5G adoption; 5G remains a longer-term proposition for the rest of Asia Pacific

5G adoption in 2025 (percentage of total connections)



** Australia, Japan, Singapore and South Korea*

Source: GSMA Intelligence

Figure 6

Twelve markets have launched 5G commercial services, with at least nine more to follow before the end of 2025

Live	Australia	New Zealand
	Guam	Northern Mariana Islands
	Indonesia	Philippines
	Japan	Singapore
	Laos	South Korea
	Maldives	Thailand
Planned	Bangladesh	Pakistan
	Brunei Darussalam	Samoa
	Cambodia	Sri Lanka
	India	Vietnam
	Malaysia	

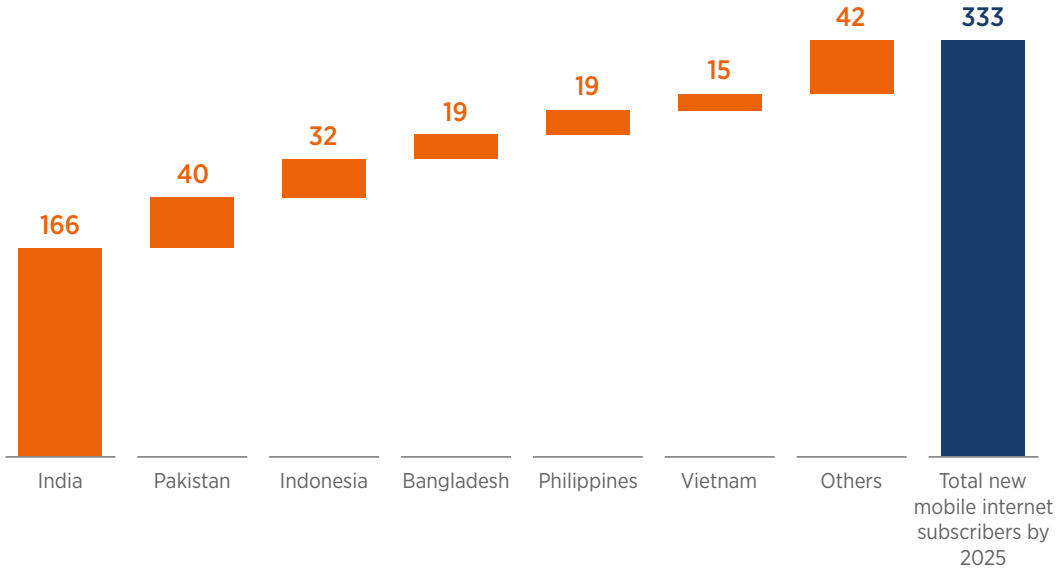
1.3 Consumers go digital

Source: GSMA Intelligence

Figure 7

India will account for half of new mobile internet users in Asia Pacific between 2021 and 2025

Million

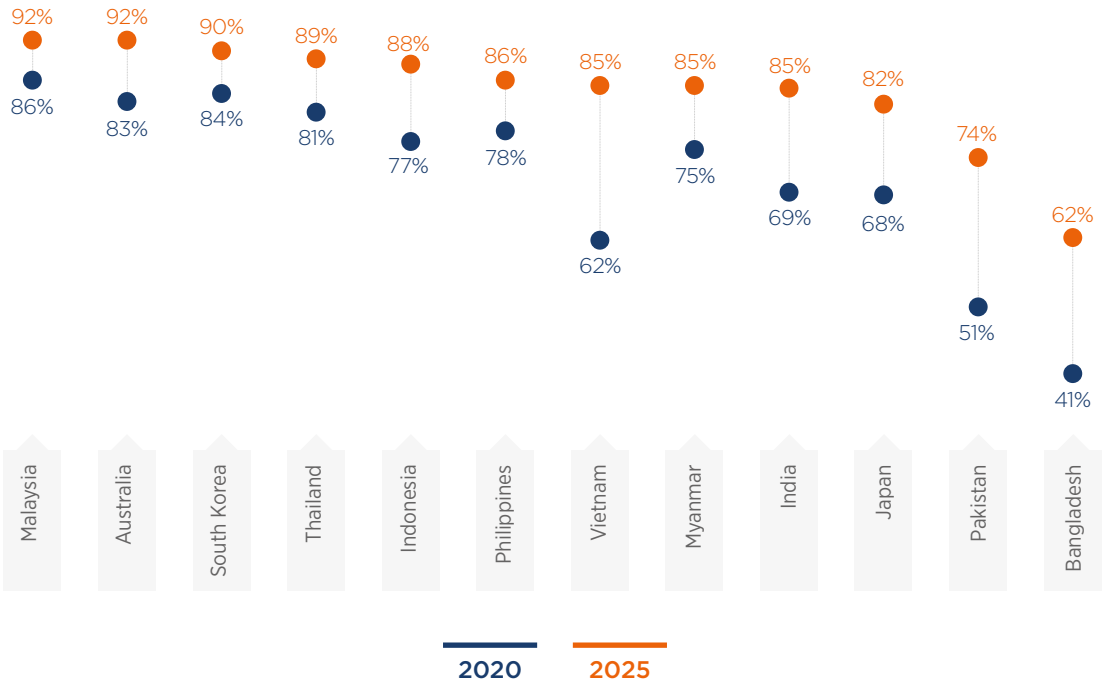


Source: GSMA Intelligence

Figure 8

More than 80% of connections in Asia Pacific will be smartphones by 2025, up from 68% in 2020

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

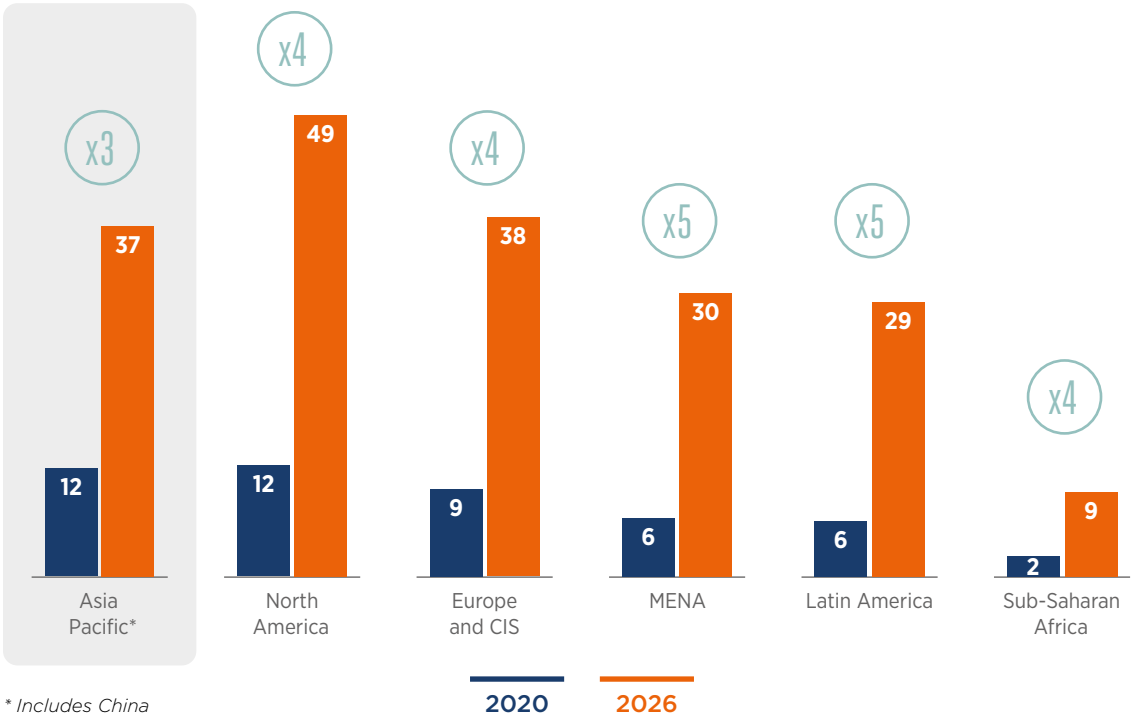


Source: Ericsson

Figure 9

Asia Pacific is home to some of the world's biggest users of mobile data

Mobile data traffic (GB per smartphone per month)



** Includes China*

Operators design 5G offerings to incorporate cloud gaming services

Nearly half of people playing games on their smartphones frequently find the enhanced gaming experience enabled by 5G appealing, especially among younger generations, according to the GSMA Intelligence Consumers in Focus Survey 2020. With this in mind, several operators around the world are designing their 5G offerings to incorporate cloud gaming services, which have strict latency and bandwidth requirements for seamless gaming experiences.

The three South Korean operators have launched cloud gaming propositions, leveraging their 5G networks. KT reached 100,000 users in November 2020 (well above its initial target) on its cloud gaming service, GameBox. SK Telecom's One Store – which has KT and LG Uplus as equity investors – is now the second largest mobile app store in South Korea, with gaming apps a prominent feature. In June 2021, SK Telecom announced that One Store has attracted investments from Microsoft and Deutsche Telekom Capital Partners, building on a partnership with the software giant in 5G-based cloud gaming.

In Singapore, Singtel is developing a cloud gaming proposition that will use its 5G standalone (SA) network to deliver a superior experience for users, and in Thailand dtac has launched Gaming Nation, a platform for mobile in-game purchases, in partnership with several gaming companies. These developments help improve the attractiveness of 5G for consumers, while providing opportunities for operators to accrue new revenue from both bundled and standalone subscriber net additions.

1.4 A modest revenue outlook amid 5G capex growth

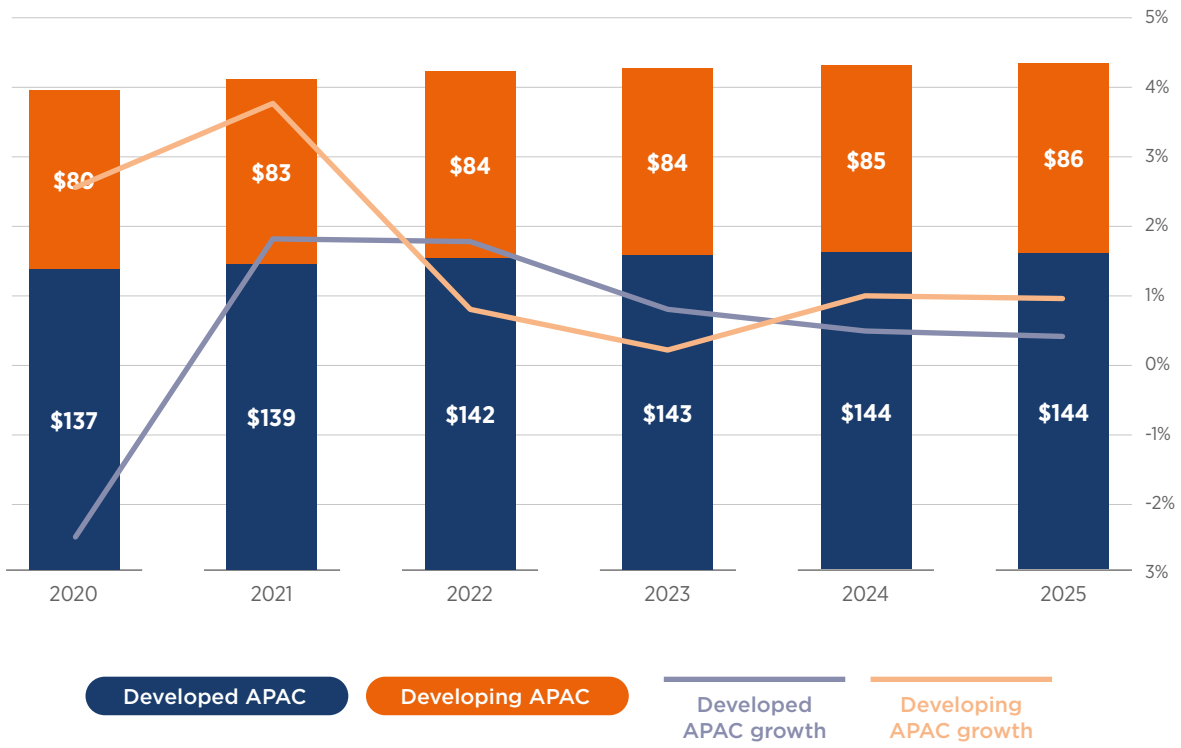
Mobile revenue growth was almost flat in 2020, as gains in developing Asia Pacific were offset by declines in developed parts of the region. Mobile revenue growth was most affected by a loss of roaming business (reduced travel), lower handset upgrades (retail store closures), and discounts and payment holidays afforded to customers facing financial difficulties. But a swift recovery is expected in 2021; beyond this, growth is expected to be modest despite the rise in new subscribers and migration to 4G and 5G services.

Source: GSMA Intelligence

Figure 10

Mobile revenue growth to recover in 2021, following a pandemic-induced slowdown

Mobile revenue (billion)



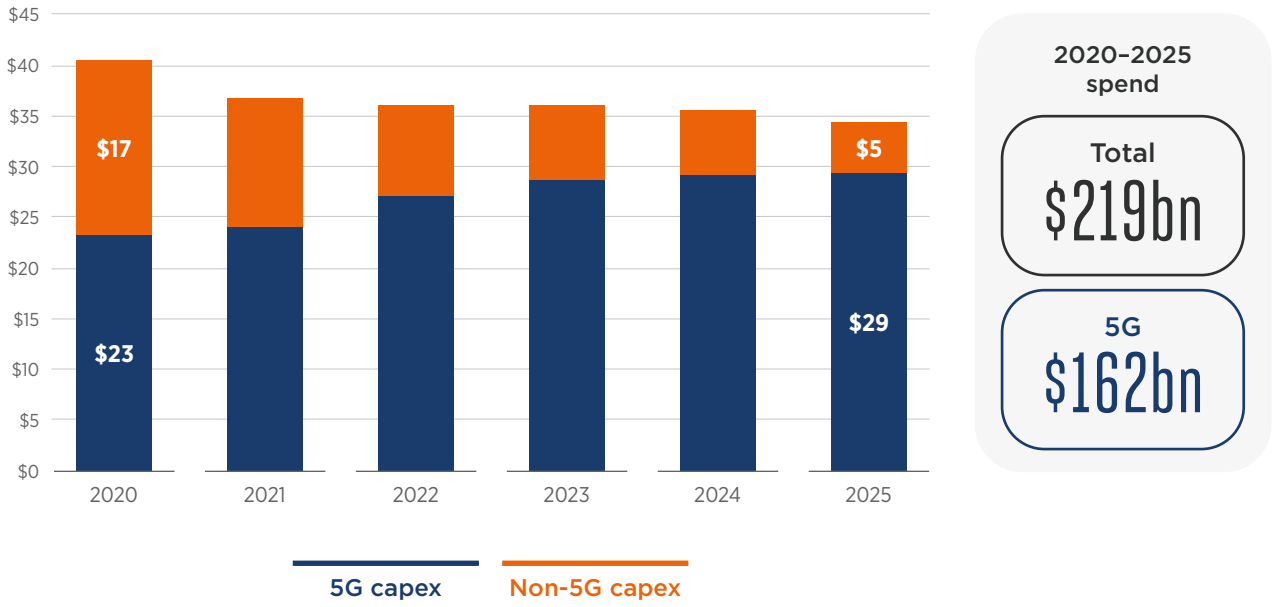
The pandemic has underscored the value of mobile networks, which remain the only form of internet access for many people in Asia Pacific. Despite the changing consumption levels and patterns during the crisis, mobile networks have remained resilient, reflecting the sustained investments by operators over several years. With usage of digital services likely to continue rising, operators' investments will only become more important. 5G will be a major part of this investment as commercial services are deployed in new parts of the region.

Source: GSMA Intelligence

Figure 11

5G will account for almost three quarters of mobile capex spent between 2020 and 2025

Capex (billion)



02

Key trends shaping the mobile industry

2.1 5G: making inroads into new markets

Asia Pacific is witnessing a second wave of 5G rollouts, with 5G activities gaining momentum in several new markets since the beginning of 2021. In May, Telkomsel launched commercial 5G services in Indonesia, followed soon after by Indosat Ooredoo. In India, Airtel and Reliance Jio have commenced 5G network trials ahead of planned commercial launches in 2022. In Vietnam, the government is expected to officially approve 5G services this year, following successful trials by operators. Meanwhile, the Malaysian government-owned special purpose vehicle Digital Nasional Berhad (DNB) plans to launch 5G services through a single wholesale network (SWN) by the end of 2021.

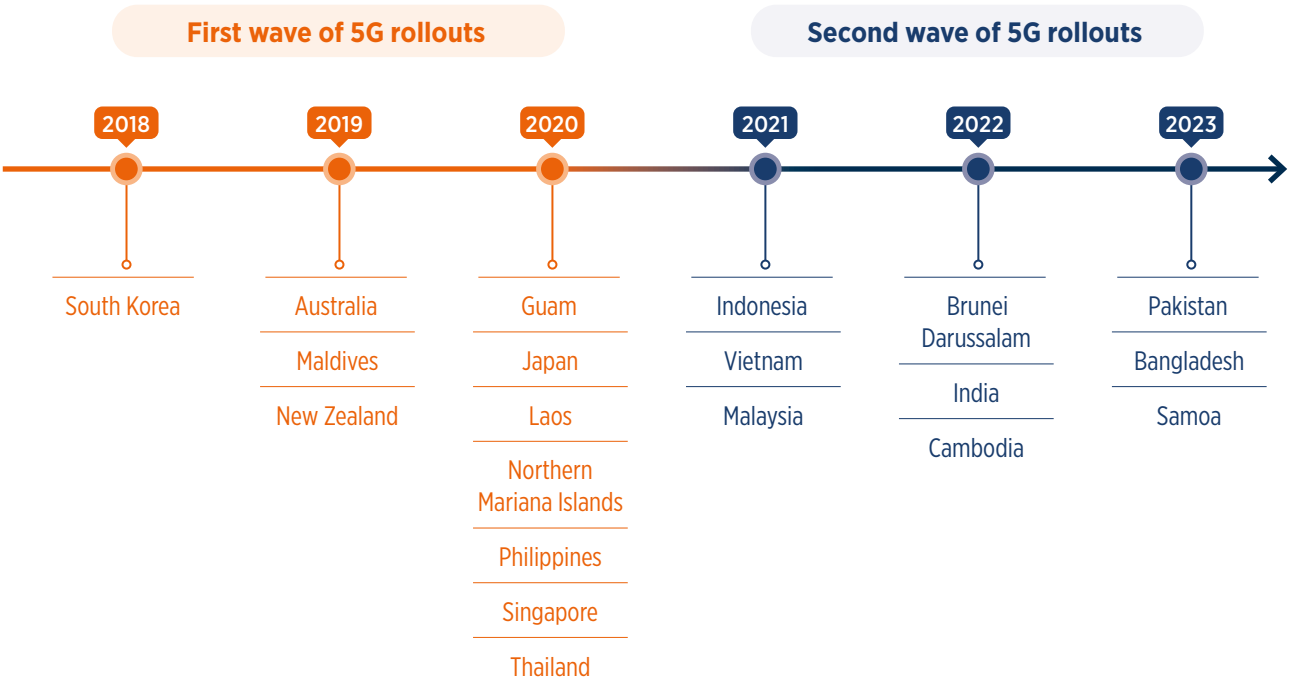
This new wave of 5G activities is significant in many ways:

- The arrival of 5G in large markets with modest average income levels could further incentivise the mass production of more affordable 5G devices to cater to consumers in lower-income brackets. Chinese smartphone manufacturer Realme plans to introduce sub-INR10,000 ($135) 5G-enabled smartphones in India by 2022, for example.
- It could drive the development of new 5G applications for consumers and enterprises in emerging markets, considering that the majority of solutions to date have been focused on more advanced markets.
- Malaysia's decision to award 5G spectrum and infrastructure buildout rights to a government-owned entity signals a departure from the approach to mobile market policy employed to date. Evidence from a handful of markets where the SWN approach has been used for network rollouts suggests that it risks stifling investment and raising costs for end users due to a lack of competition in the market.[5]

Source: GSMA Intelligence

Figure 12

The transition to 5G networks is gaining momentum in Asia Pacific



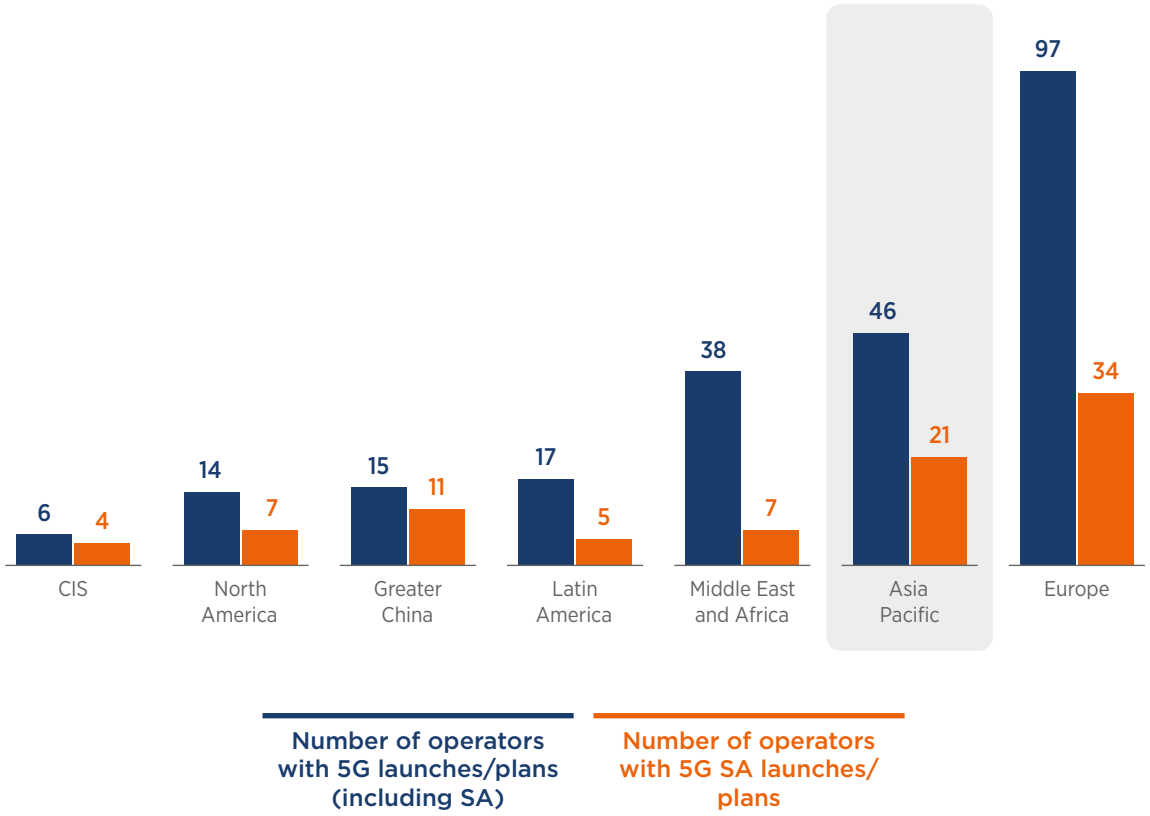
5. Single Wholesale Networks: Lessons From Existing and Earlier Projects, GSMA, 2019

These developments follow a first wave of 5G rollouts in the region between 2018 and 2020, which resulted in 23 commercial networks, including four fixed wireless access (FWA) networks in 12 countries. Today, Asia Pacific is home to some of the world's most advanced 5G markets, notably South Korea, where 5G accounts for more than a quarter of total mobile connections – higher than anywhere else in the world. Asia Pacific leads in commitments and commercial deployments of 5G mmWave bands (24 GHz and above) and 5G standalone (SA) networks. Japan is the first country where all operators have deployed commercial 5G services using mmWave spectrum, while live 5G SA services are now available in Australia, Singapore and South Korea.

Source: GSMA Intelligence

Figure 13

Asia Pacific is at the forefront of the transition to 5G SA services



Data correct to July 2021

Immersive content emerges as a key focus area for 5G

Leveraging the low-latency and high-bandwidth capabilities of 5G networks, immersive content is gaining traction in both the consumer and enterprise segments. South Korea is a leader in this space, with all three operators offering a range of immersive digital content to consumers. LG Uplus has also begun to distribute its immersive 5G content outside of South Korea. In March 2021, the operator signed a deal to export augmented reality (AR) and virtual reality (VR) 5G content and solutions to Thailand-based operator Advanced Info Service (AIS), following previous deals with China Telecom, HKT, KDDI and Chunghwa Telecom.

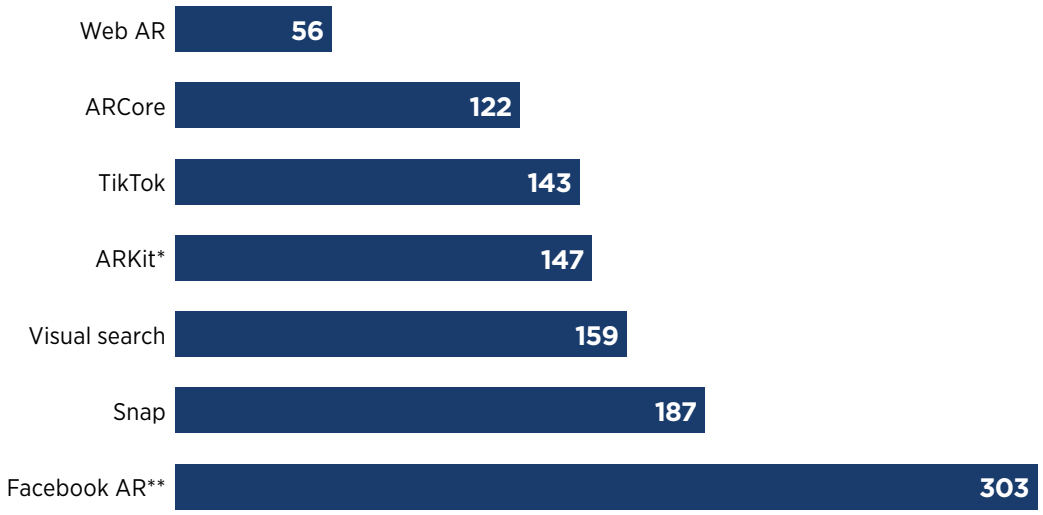
5G will also be a significant enabler of the use of AR and VR across different industries, including industrial production, e-commerce, real estate, home decor, culture, sports, tourism, healthcare and education. Demand for virtualised solutions is rising due to the enforcement of pandemic-related social distancing and travel restrictions. For example, in July 2021, SK Telecom launched Ifland, a virtual metaverse platform offering features for social interactions and conference meetings. Up to 130 participants can join a virtual room, with the number set for expansion to accommodate large-scale conferences.

Source: Statista

Figure 14

There are more than a billion AR users; 5G promises to provide a better experience for users

Number of active mobile AR users worldwide in 2020, by platform (million)



** Includes iPad*
*** Includes Instagram and Messenger*

Availability of devices is an important factor in the adoption of AR/VR solutions, particularly in the consumer segment, where cost is an important consideration. Device manufacturers in Asia Pacific and elsewhere, including Samsung, Oppo and Vivo, are increasingly integrating AR/VR capabilities into smartphones and developing products in other form factors, such as AR glasses and VR headsets. Nreal has recently partnered with LG Uplus and KDDI to launch AR glasses in South Korea and Japan, respectively.

5G will support the realisation of Industry 4.0 ambitions in Asia Pacific

The disruption from the pandemic to prevailing supply chains and business models has increased the urgency of digitisation in enterprises and strengthened the commitment of governments to achieve their Industry 4.0 ambitions. 5G will play a crucial role in the digital transformation of business processes and in enabling new solutions to increase productivity. To this end, mobile operators around Asia Pacific are collaborating with enterprises from different industries to develop relevant applications and solutions:

- Singtel and Optus are expanding their 5G ecosystems by allowing enterprises and startups to make low-latency 5G products on their multi-access edge computing (MEC) infrastructures. The MEC infrastructures, leveraging AWS Outposts, will enable 5G products such as robotics, drones, autonomous vehicles and AI to operate at ultra-low latency, closer to end users.
- KT and Hyundai are trialling 5G-enabled autonomous sailing solutions, which would allow cruise ships and large commercial vessels to be operated remotely. This follows a partnership between both companies to develop a 5G-connected smart factory industrial robot, designed to take on manufacturing tasks too dangerous for human workers.
- Telstra and Ericsson have partnered to provide Australian enterprises with an industrial-grade on-premise 5G wireless platform that will help businesses to drive innovation and productivity.
- Dtac has announced the launch of its proof-of-concept 5G private network solution to unlock the full potential of 5G for enterprises in Thailand. The solution has been developed in collaboration with AWS to realise the power of cloud through edge computing integration.
- NTT Docomo has formed a consortium with global enterprises to provide 5G solutions, first in Thailand and later in other Asia Pacific countries. Members of the 5G Global Enterprise Solution Consortium (5GEC) include Activio, AGC, Advanced Wireless Network, Exeo Asia, Fujitsu and NEC.
- ABB and Dtac Trinet have signed an MoU to jointly develop robotics and machine automation solutions enabled by Dtac connectivity. The first two solutions to be built under the partnership will use Dtac's mobile broadband and 5G private network. ABB Robotics will support humans working in manufacturing, while ABB Remote Insights will allow real-time monitoring of supply chains.

Realising the full potential of 5G requires considerable investment in both infrastructure rollout and applications development. Public funding for targeted projects will therefore go a long way in complementing the efforts of private-sector players. In July 2021, Singapore announced a $50 million investment in the Future Communications Research & Development Programme, which includes plans for testbeds to support the development of 5G applications. In October 2020, the Australian government announced an investment of AUD30 million ($21.2 million) to accelerate adoption of 5G in industries, including 5G commercial trials and testbeds in key sectors such as agriculture, mining, logistics and manufacturing.

2.2 Telco of the future: open RAN gains momentum

The mobile industry is experiencing a paradigm shift in network infrastructure models: both large and small operators are increasingly considering open RAN solutions for network deployment and operation. Although open RAN is still in its infancy, with vendors competing to build out their solutions, operator commitments, trials and deployments signal growing momentum behind the technology. Open RAN has become the native approach to 5G networks for a number of high-profile operators, notably Rakuten in Japan and Dish in the US.

In Asia Pacific, the motivations behind the implementation of open RAN vary among operators. These include reducing the cost of deploying and operating networks, especially in low ARPU scenarios such as in rural areas; flexibility and diversification of the network equipment supply chain; and stronger bargaining power in negotiations with suppliers. For pioneering operators, open RAN is viewed as an opportunity to reduce vendor lock-in and have the flexibility to innovate and deploy key elements of the network more quickly.

Source: Public announcements, Telecom Infra Project

Figure 15

In Asia Pacific, 22 operators in nine markets have disclosed intent, trialled or commercially deployed open RAN technology

Single operator with open RAN trial or deployment

- Bangladesh
- Malaysia
- Sri Lanka

Multiple operators with open RAN trial or deployment

- Australia
- India
- Indonesia
- Japan
- Singapore
- South Korea

Examples of recent open RAN developments in Asia Pacific

- Axiata Group plans to launch commercial open RAN networks by the end of 2021, with large-scale deployments targeting rural locations in Malaysia, Indonesia and Sri Lanka to reduce the digital divide in those areas. Mavenir, Parallel Wireless and systems integrator Infosys are among Axiata's partners in its open RAN strategy.
- Airtel has announced a partnership with Tata Group to build 5G networks based on open RAN technology, and aims to conduct 5G trials with Mavenir in the Punjab circle using the open RAN technology.
- Reliance Jio is testing 5G open RAN solutions in several Indian cities, having partnered with Qualcomm and NXP to make virtualised RAN and small cells to support its 5G network build.
- Indosat Ooredoo has partnered with the Telecom Infra Project (TIP) and Parallel Wireless to conduct a 4G OpenRAN field trial as part of efforts to upgrade and expand its 4G LTE network.
- NTT Docomo has partnered with Samsung on open-RAN-compliant solutions for its 5G networks to bring improved 5G services to users.
- State-owned National Telecom (NT) has partnered with Mavenir, 5GCT and Cisco to launch a 5G open RAN smart city project in Ban Chang, Thailand.

Not without its challenges

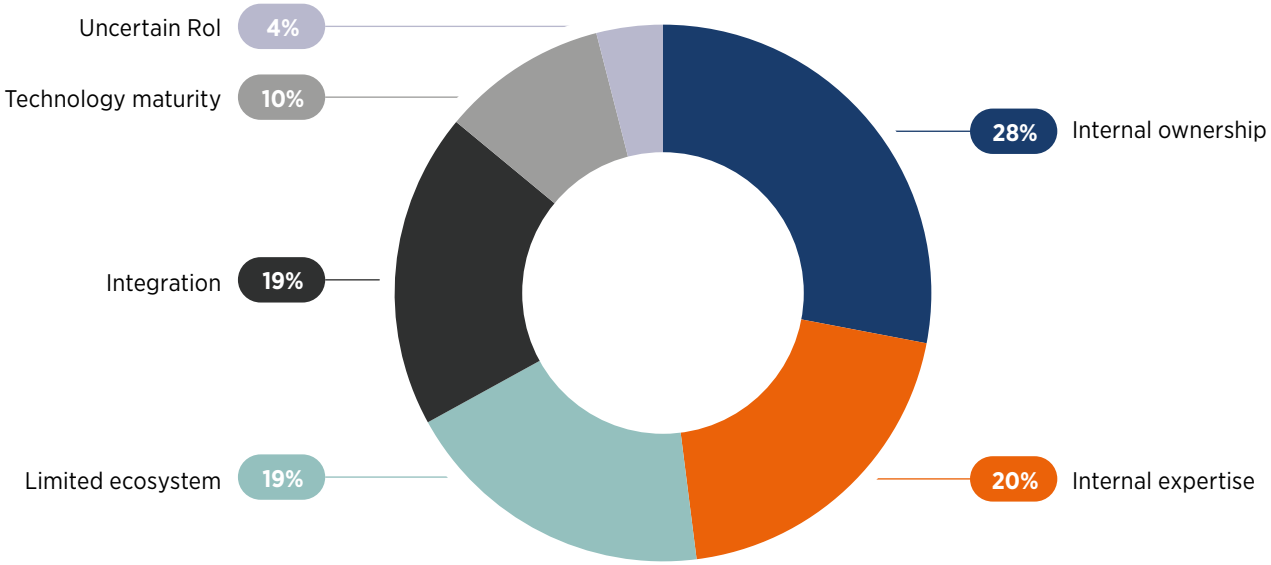
Every new technology faces challenges to its deployment and adoption; open RAN is no different in this regard. GSMA Intelligence research, based on a survey of 100 operators globally, revealed that the top challenges include uncertainty around internal ownership, the integration of solutions in a multi-vendor scenario and limitations in terms of supplier diversity. Vendors should seek to address these challenges to drive greater scale of open RAN deployments.

Source: GSMA Intelligence Network Transformation Survey 2021

Figure 16

Most operators view uncertainty around internal ownership as the top obstacle to open RAN deployment; interestingly, only 4% highlight uncertain RoI

What is the greatest obstacle to deploying open RAN in your network? (Percentage of respondents)



Rakuten expands open RAN ambitions

Japan's Rakuten has relied on open RAN to deploy its greenfield mobile network. The operator's 4G network reached 96% of the population by the middle of 2021, three years after it started rolling out its network. Building on this momentum, Rakuten has shifted focus to partnerships with vendors and operators to scale its open RAN experience globally and to leverage this experience to accelerate the rollout of its 5G network. This is borne out by recent developments, including MoUs with NEC and Fujitsu to promote open RAN in global markets and expand their domestic collaboration on 4G and 5G open RAN systems, and MoUs with global operators Telefónica, Etisalat and STC.

Rakuten has recently developed a hybrid telco model, which allows it to function as an operator and also a vendor, selling products to other network operators looking to explore open RAN opportunities in the deployment of mobile networks. In August 2021, Rakuten acquired US-based technology company Altiostar Networks for $1 billion. Altiostar supports a diverse open RAN ecosystem and its O-RAN-compliant solution has been deployed globally.

2.3 IoT: enterprise solutions drive post-pandemic recovery

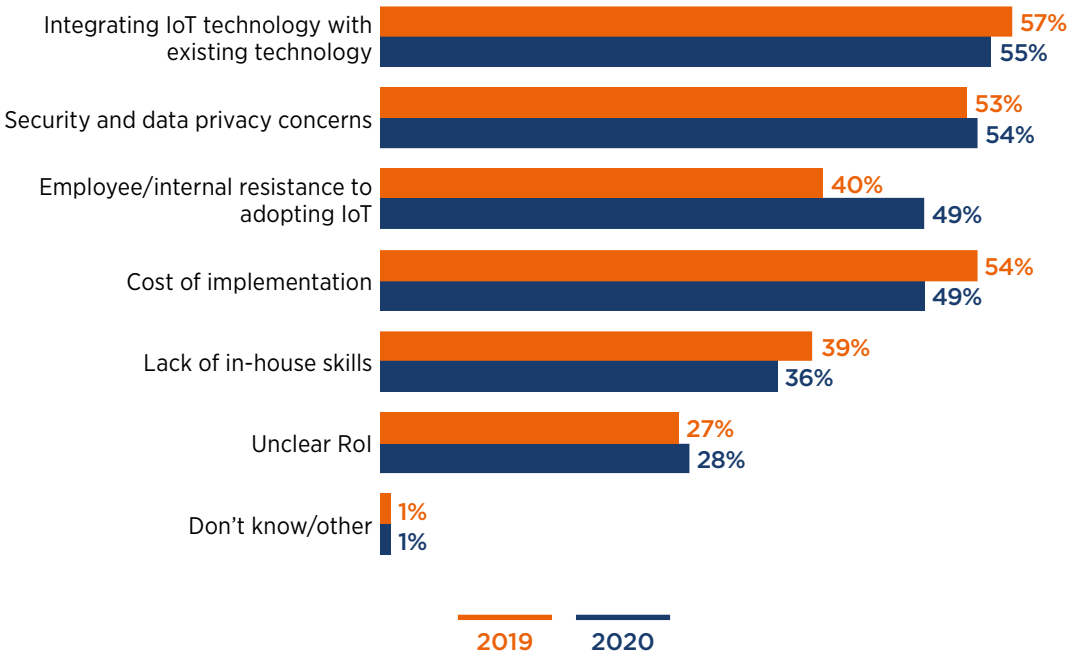
Covid-19 has affected IoT plans in the short term, often through cancelled projects and supply-chain disruptions due to social and travel restrictions. However, the increasing urgency for enterprises to embrace digital transformation will lead to greater adoption of IoT, AI and 5G in the medium to long term. Based on the GSMA Intelligence Enterprise in Focus Survey 2020, 63% of enterprises have deployed IoT as part of a digital transformation initiative, up from 60% a year earlier.

Source: GSMA Intelligence Enterprise in Focus Survey 2020

Figure 17

Integration remains the biggest challenge to IoT implementation in Asia Pacific, but employee resistance has seen the biggest increase recently

Which of the following challenges did/would your organisation face in deploying IoT solutions? (Percentage of respondents)



Tackling the integration challenge

The IoT ecosystem is complex and fragmented, with a multitude of players (traditional and new) vying for mindshare among enterprises. The challenge of integrating IoT solutions with legacy infrastructure further adds to the complexity of the overall landscape. When it comes to IoT integration, 60% of enterprises in Asia Pacific (up from 51% in 2019) still find information technology (IT) systems tough to tackle, while a quarter point to operational technology (OT) as a difficulty.

In this context, IT and OT convergence, as well as interoperability between systems, is key to ensure data can be effectively exchanged to enable business benefits. Indeed, standardisation enables economies of scale. The newly created Industrial Digital Twin Association (IDTA) has shared its goal of driving standardisation of digital twins to make digital value creation more efficient.[6] A plug-and-play approach is only possible if machines work together. As such, industrial vendors should adopt a joint industrial standard, shared data models and open industrial communication protocols to enable interoperability. Moving away from customisation to a standardised modular approach will drive scale and reduce costs.

While integration, security and cost continue to be the top challenges for enterprises when it comes to IoT adoption, internal resistance is the obstacle that has increased the most in recent years. In the GSMA Intelligence Enterprise in Focus Survey 2020, nearly half of respondents in Asia Pacific identified employee/internal resistance as a challenge, up from 40% in 2019, reflecting the fact that education on the benefits of IoT needs to extend beyond senior management to across the entire organisation. To fully embrace digital transformation, companies need to undergo a change management process to get buy-in from staff that will be directly impacted by the introduction of new and transformative technologies.

Operators count on partnerships to scale IoT services

In their quest to expand product portfolios beyond connectivity, operators are looking to IoT as a revenue driver. In many cases, this involves co-creating solutions with enterprises to demonstrate value and building partnerships to reach customers in new markets, including the following examples:

- Telstra is collaborating with the Queensland government and the Bureau of Meteorology to run an IoT pilot programme to help local farmers gain access to more accurate weather forecasts.
- Smart Axiata has partnered with electronics producer Nine to launch a variety of IoT home products focused on security and automation.
- KDDI has launched Global IoT Access, a connectivity service that enables roaming for IoT in many countries and regions, and serving multiple industries, including manufacturing and automotive.
- Dtac has collaborated with Cartrack to enable its fleet management platform with domestic and global IoT SIM solutions for providing services to SME customers across Thailand.
- KDDI has partnered with Orange Business Services, Toyota and Mazda to support the rollout of a connected cars service in Europe. KDDI expects to equip more than 1 million vehicles across the continent with connected IoT services under the partnership.
- Reliance Jio has deployed a commercial NB-IoT service for Tata Power Delhi Distribution's (Tata Power-DDL) smart meters.
- Singtel has signed an MoU with Hyundai to collaborate on a range of ventures to support smart manufacturing and automotive solutions, combining the operator's IoT and 5G services.
- Telstra will provide IoT services to Melbourne-based water utility Yarra Valley Water as it seeks to collect data in near real time from a range of sensors to better manage leaks. The 15-year deal will cover 1 million industrial IoT connections.

6. Ten years in the making: Industry 4.0 meets 5G at Hannover Messe 2021, GSMA Intelligence, 2021

03

Mobile contributing to economic growth and addressing social challenges

3.1 Mobile's contribution to economic growth

In 2020, mobile technologies and services generated 5.1% of GDP across Asia Pacific, a contribution that amounted to over $750 billion of economic value added. The mobile ecosystem also supported more than 8 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with more than $70 billion raised through taxes on the sector.

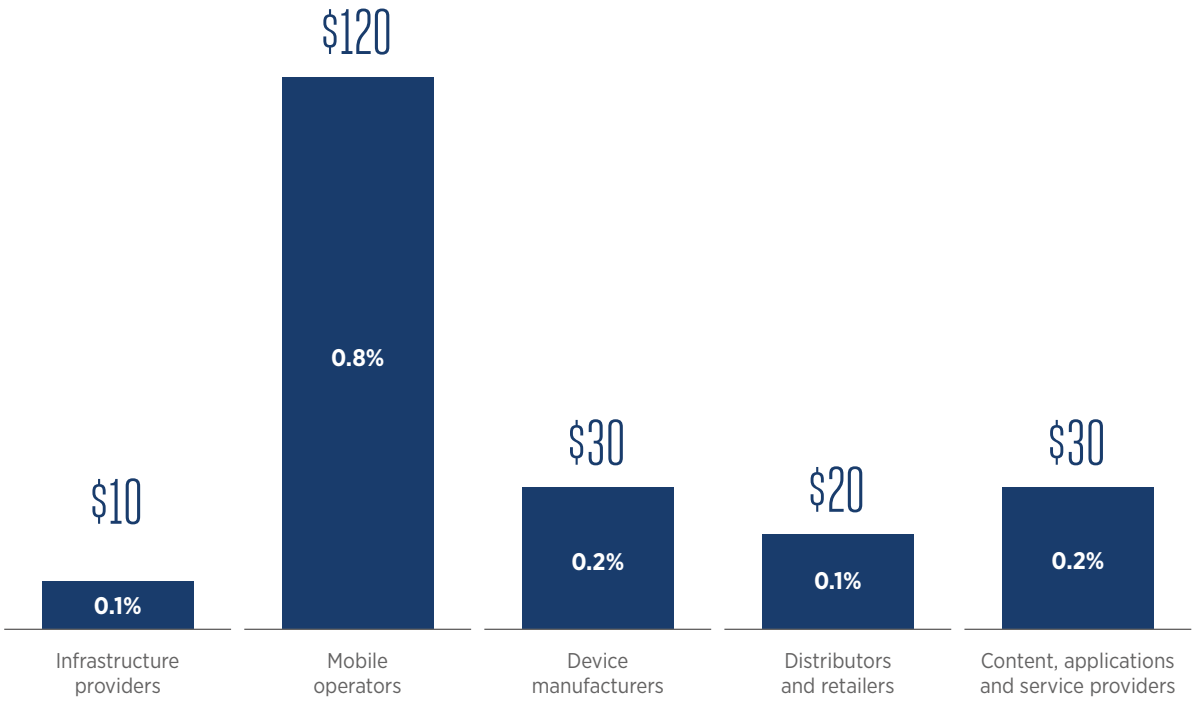
By 2025, mobile's contribution will grow by $110 billion (approaching $860 billion), as the countries in the region increasingly benefit from the improvements in productivity and efficiency brought about by the increased take-up of mobile services.

Source: GSMA Intelligence

Figure 18

The Asia Pacific mobile ecosystem directly generated around $200 billion of economic value in 2020, with mobile operators accounting for the majority

Billion, percentage of GDP

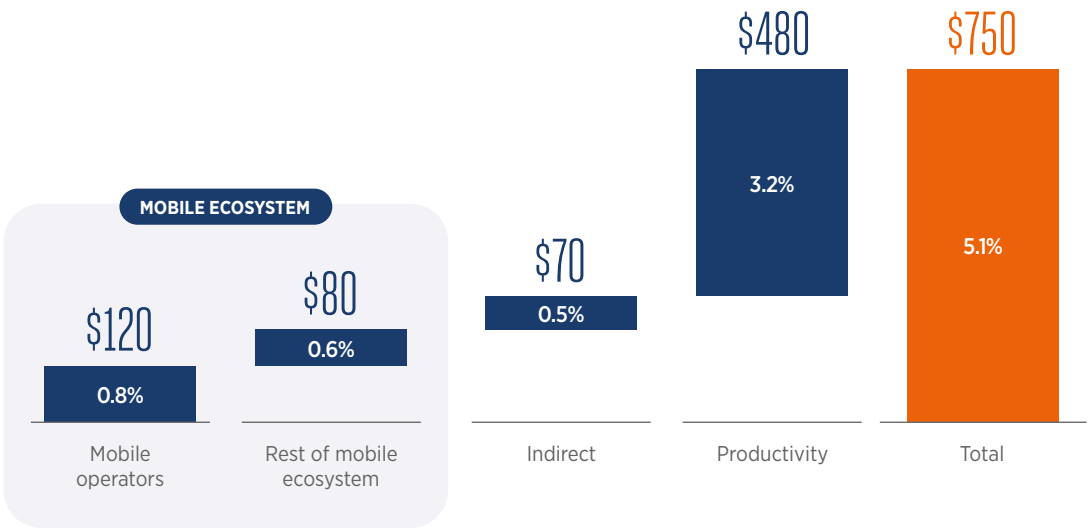


Source: GSMA Intelligence

Figure 19

Additional indirect and productivity benefits bring the total contribution of the mobile industry to the Asia Pacific economy to over $750 billion

Billion, percentage of GDP (2020)

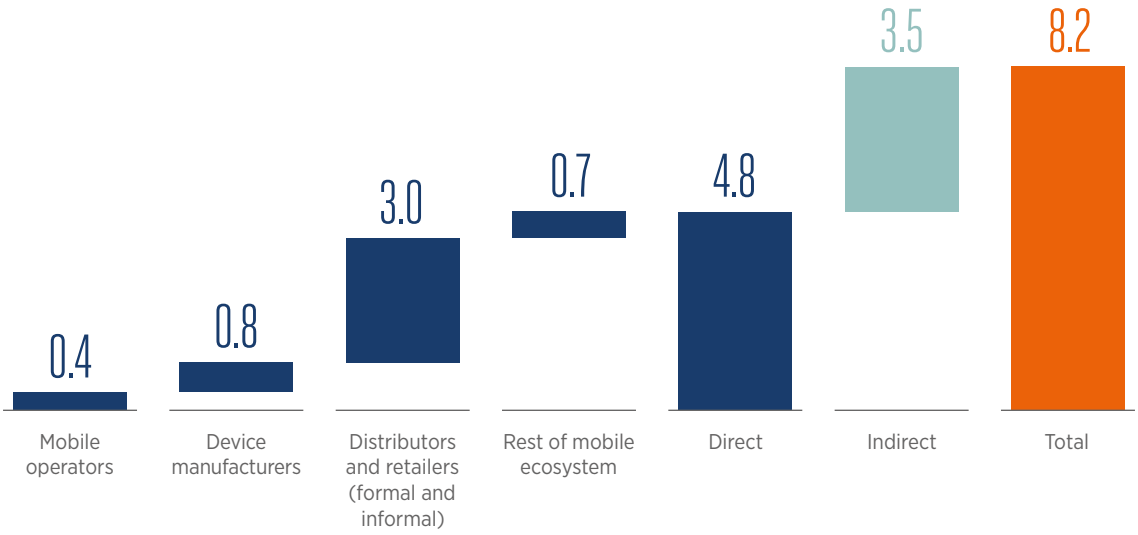


Source: GSMA Intelligence

Figure 20

The Asia Pacific mobile ecosystem directly employed almost 5 million people in 2020, plus another 3.5 million indirectly through adjacent industries

Jobs (million)



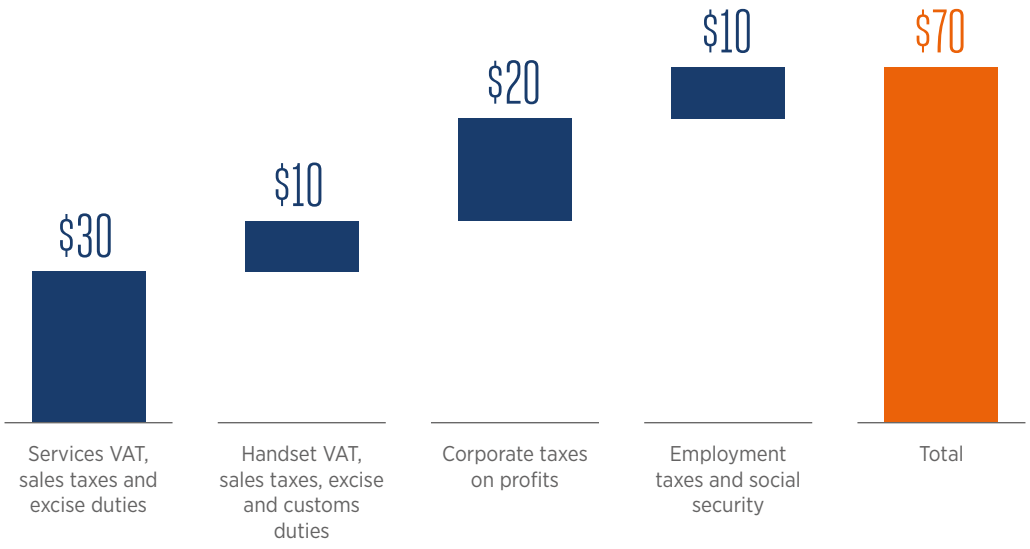
Note: Totals may not add up due to rounding

Source: GSMA Intelligence

Figure 21

In 2020, the mobile ecosystem contributed more than $70 billion to the funding of the public sector through consumer and operator taxes

Billion

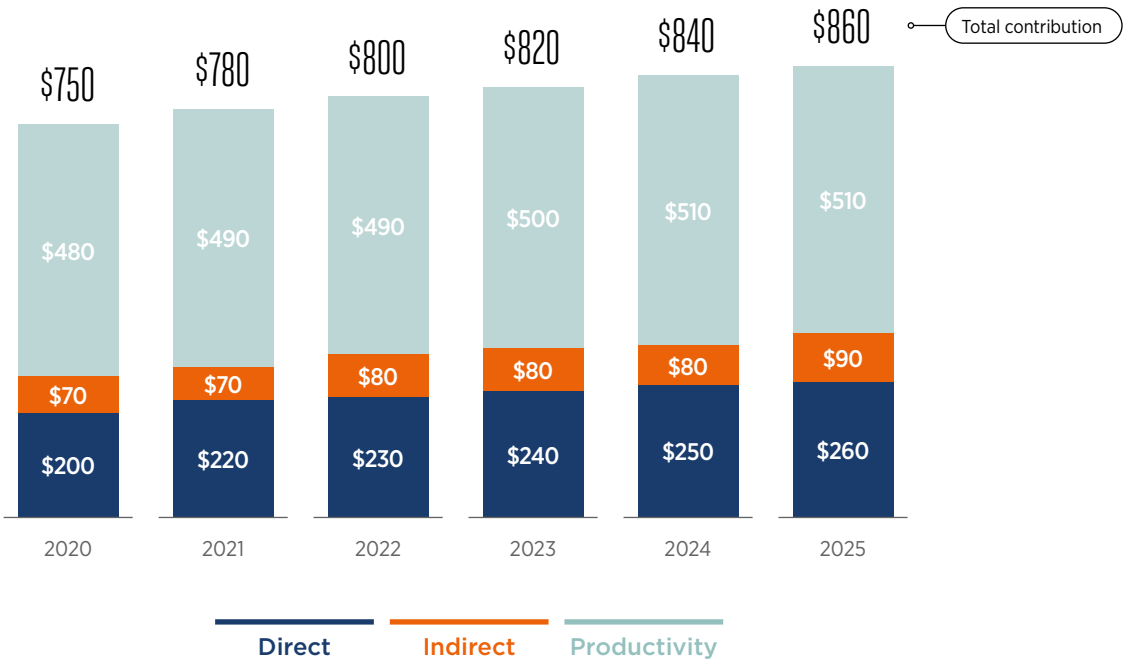


Source: GSMA Intelligence

Figure 22

Driven mostly by continued expansion of the mobile ecosystem, the Asia Pacific economic contribution of mobile will increase by $110 billion by 2025

Billion



3.2 Enabling a more inclusive society

Asia Pacific countries were among the first to be impacted by the Covid-19 pandemic, given their proximity to the epicentre of the outbreak. Countries in the region have experienced second and third waves of infections and mortalities. Throughout this period, mobile technology has served as a lifeline for society by enabling many business activities to continue, supporting social interactions during lockdown and helping governments to effectively manage the pandemic.

The efforts of mobile operators at the early stages of the pandemic to keep people and enterprises connected, and to provide targeted support for vulnerable individuals and communities, are well documented. More recently, mobile operators have adopted measures to help society recover, such as supporting vaccine rollout initiatives and helping people and small businesses leverage digital technologies in challenging times. Examples of these include the following:

- SK Telecom has partnered with the Korea Disease Control and Prevention Agency (KDCA) to develop and operate Nugu Vaccine Care Call, an AI-based service designed to notify people of the inoculation schedule and monitor side effects of the Covid-19 vaccines.
- Dtac has launched its Net-for-Living programme, a digital upskilling initiative to help small businesses affected by Covid-19 develop a digital presence and to enable them to use digital services to explore offline-to-online business opportunities amid challenging times.
- Airtel provided benefits worth INR270 crore ($35 million) to help 55 million low-income customers on its network stay connected during the peak of the spread of the Delta variant of Covid-19.
- Mobile operators in Malaysia have partnered with the Malaysian Communications and Multimedia Commission (MCMC) to create awareness of the vaccination programme at community internet centres nationwide. Operators also assist with registrations via e-government app MySejahtera and issue reminders through social media and SMS.
- Viettel has launched a Covid-19 vaccination management platform in Vietnam. The platform comprises four systems: an e-health record app, a Covid-19 vaccination information portal, a national vaccination support system and a response centre.

Enhancing digital inclusion

At the end of 2020, 1.2 billion people across Asia Pacific were connected to the mobile internet, equivalent to a 42% penetration rate. This also represents an increase of 69 million compared to the previous year and close to a fourfold increase since 2010. Operator investments in the rollout, upgrade and maintenance of mobile networks have been central to increasing digital inclusion and reducing the 'coverage gap' (people with no access to mobile broadband services i.e 3G and above).

However, nearly 1.4 billion people in Asia Pacific remain offline. With mobile broadband networks reaching around 93% of the region's population, this 'usage gap' (people who live within the footprint of a network but do not use mobile internet services) suggests there are pressing issues to address, which extend beyond infrastructure, in order to increase take-up.

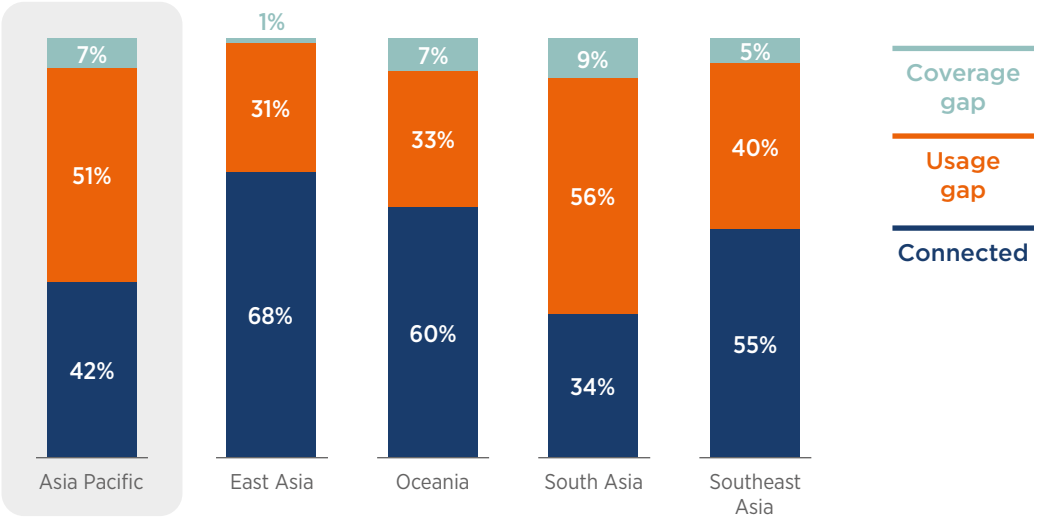
Nevertheless, as the enablers of mobile internet adoption (affordability, consumer readiness and availability of content/services) improve, the usage gap will continue to close. By 2025, over 333 million people across the region will start using mobile internet for the first time. At this point, around 1.5 billion people in Asia Pacific (52% of the population) will be mobile internet subscribers.

Source: GSMA Intelligence

Figure 23

Mobile internet penetration has almost quadrupled in the last decade, although non-users still account for the majority of the population

Percentage of population (2020)



Note: Totals may not add up due to rounding

As indicated by the GSMA's Mobile Connectivity Index (MCI),[7] Asia Pacific is a diverse geography comprised of several 'Emerging' mobile markets (e.g. Laos, Papua New Guinea) and some of the world's most advanced digital societies (i.e. 'Leader' countries such as Australia and Singapore). The region's MCI score is above the global average, having seen consistent improvements over the 2014–2019 period. Asia Pacific's digital development has been driven by a combination of factors, namely operator investments in network coverage and performance, reductions in handset prices and improvements in the availability of locally relevant content.[8]

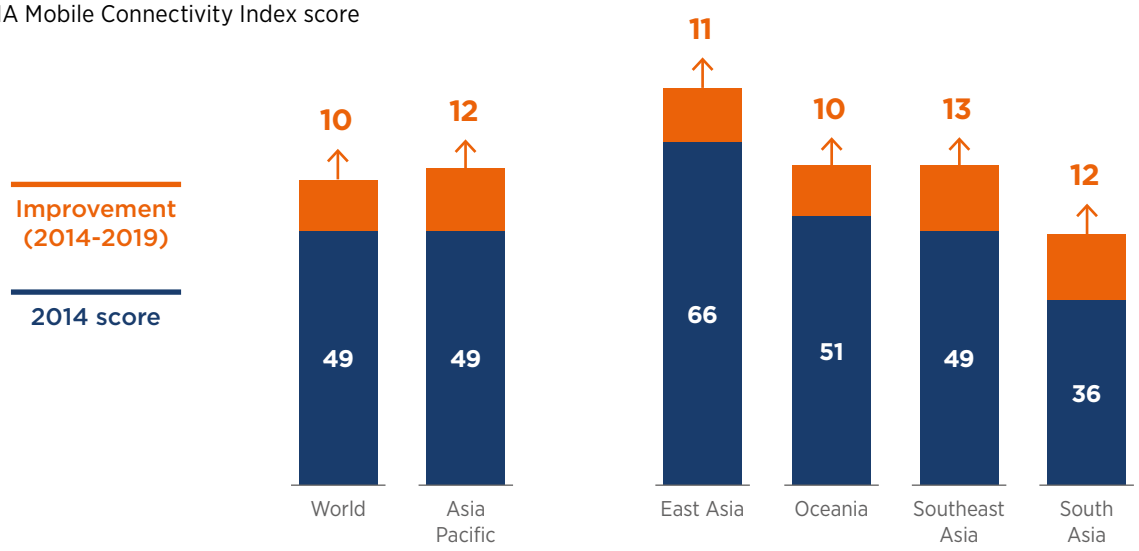
7. https://www.mobileconnectivityindex.com/
8. For information on how policymakers can make the best use of the MCI, see Using the GSMA Mobile Connectivity Index to drive digital inclusion: Guidelines for policymakers, GSMA, 2021

Source: GSMA Intelligence

Figure 24

Asia Pacific overall MCI performance remains above the world average, masking subregional differences

GSMA Mobile Connectivity Index score



Mobile at the heart of Pakistan's digitisation journey

Pakistan's mobile market has significant potential, but current levels of mobile internet adoption, smartphone take-up and usage of digital services lag behind those of other countries in the region. Certain policy decisions may have hindered Pakistan's digital development and hampered growth of the online economy.

However, by 2023, it is projected that the economic contribution of the mobile industry in Pakistan could reach $24 billion, accounting for 6.6% of GDP.[9] Encouragingly, authorities appear committed to achieving this growth and increasing citizens' access to high-quality connectivity. This is reflected by decisions in 2021 to initiate mobile-sector tax reforms and introduce right-of-way policies for infrastructure deployments. Further, at MWC21 Barcelona, the GSMA and the Pakistan Telecommunication Authority signed a cooperation agreement to further strengthen work on fulfilling the Digital Pakistan Vision.

The GSMA will also collaborate with the country's universal service fund (USF) body on reducing the digital divide and usage gap. Pakistan has a well-designed USF, which has played an important role in expanding network coverage in remote areas of Pakistan, characterised by mountainous terrains and sparsely populated communities. During the last decade, the USF has made contractual obligations of around PKR85 billion ($526 million) to support the expansion of telecoms infrastructure and services to underserved areas of the country. In FY 2020–2021, the USF made contractual commitments of over PKR23 billion ($142 million) to service providers to help extend coverage to an additional 10 million citizens following the Covid-19 outbreak. These efforts have the potential to increase Pakistan's economic well-being and competitiveness, contribute to the realisation of SDG 9 and empower communities through broadband penetration among the masses. Efficient and affordable ICT infrastructure and services allow citizens to participate in the digital economy, with significant impact in the areas of financial inclusion, poverty reduction and improved health.

9. Pakistan: progressing towards a fully fledged digital economy, GSMA, 2020

Closing the mobile gender gap

Growth in mobile internet access has been remarkable in Asia Pacific. However, although it is the primary way most people in the region access the internet, mobile access and use remain unequal, particularly across its low- and middle-income countries (LMICs). In South Asia, for example, women are still 19% less likely than men to own a mobile phone compared with 1% in East Asia and the Pacific. This represents the largest mobile gender gap in ownership in any part of the world.[10]

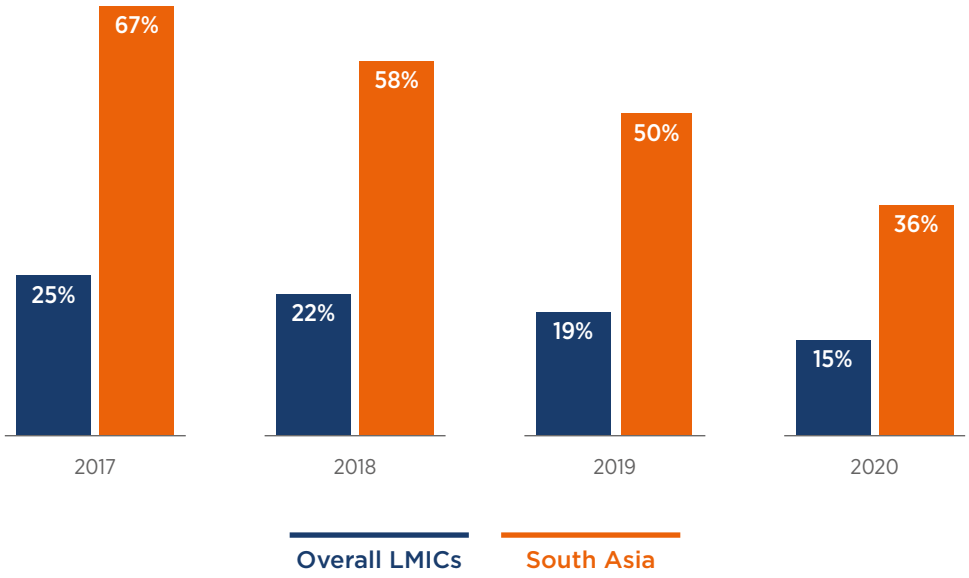
Nevertheless, there is promising evidence that the widest gender gaps are beginning to close. For instance, the disparity in mobile internet use in South Asia has narrowed from 67% to 36% since 2017, bringing millions more women online. Much work remains to be done, but this highlights that mobile gender gaps can be reduced and the benefits of connectivity can be distributed more equally.

Source: GSMA Intelligence

Figure 25

The gender gap in mobile internet use in South Asia has nearly halved since 2017, but it remains considerably higher than the average across LMICs

Mobile internet use gender gap[11]



10. The Mobile Gender Gap Report 2021, GSMA, 2021
11. Mobile internet use is defined as having used the internet on a mobile phone at least once in the last three months. Mobile internet users do not have to personally own a mobile phone. The gender gap in mobile internet use refers to how much less likely a woman is to use mobile internet than a man. Regional averages were calculated from country-level data. Based on survey results and modelled data for adults aged 18+.

While changing market dynamics and price erosion (i.e. further improvements in the affordability of internet-enabled handsets and data) have likely contributed to the reduction of the mobile internet gender gap in South Asia, pandemic-related restrictions and lockdowns have also played a role.

In 2020, the number of women in India who reported using mobile internet and owning a smartphone grew rapidly, and even faster than for men. Among Indian women, 25% now own a smartphone, compared to 14% in 2019, and 30% use the mobile internet, compared to 21% in 2019.

Operator efforts to reduce the gender gap

Several operators in Asia Pacific have made formal commitments as part of the GSMA Connected Women Commitment Initiative to improve digital and/or financial inclusion for women over the 2020–2023 period:

- Grameenphone has revamped its GPAY app, driving a surge in daily active users and bill payment volumes, as well as a sharp increase in the number of female users.
- Indosat Ooredoo launched SheHacks in 2020, with the goal of increasing the proportion of women connected to the mobile internet in Indonesia to 48% by 2023.
- Robi Axiata has delivered a number of community engagement programmes to encourage women to get connected to the internet, including an online safety campaign, Wi-Fi access points in 1,000 places and a special bundle offer for working women.
- As part of its internal immersive learning programme, Telenor Pakistan is in the process of training 1,000 female entrepreneurs on design thinking skills as a part of its commitment to the World Bank's Girls Learn, Women Earn initiative.

3.3 Addressing social challenges

As the first industry to have committed fully to the UN Sustainable Development Goals (SDGs), the mobile industry continues to have substantial positive effects on lives and livelihoods.[12]

Source: GSMA

Figure 26

Mobile's impact on the SDGs in Asia Pacific, 2019

Supporting environmental goals through investment and technology

Mobile operators and technologies contribute positively across the SDGs by providing critical and resilient telecoms infrastructure, promoting inclusive societies and offering a platform for innovation. They also enable equitable access to online education content and tools, which has become vital during the Covid-19 pandemic, when many students have relied on communications and video conferencing applications to learn remotely. Moreover, mobile connectivity facilitates technological advancements and productivity gains in a range of other industries, from manufacturing to mining.

This support for adjacent verticals has knock-on effects on the mobile sector's impact on SDG 13 (Climate Action), complementing operators' own environmental initiatives. Mobile technology contributes to SDG 13 by improving energy efficiency, effecting changes in behaviour and reducing greenhouse gas (GHG) emissions. Research from the GSMA and the Carbon Trust shows that mobile technologies can help avoid 10× more emissions than they cause.[13]

Mobile operators and the GSMA are taking collaborative action to be fully transparent about the industry's own carbon emissions and have developed an industry-wide climate action roadmap to achieve net-zero GHG emissions by 2050, in line with the Paris Agreement. More than 50 mobile operators now disclose their climate impacts and GHG emissions via the internationally recognised CDP global disclosure system.[14] In Asia Pacific, this includes operators Axiata, Bharti Airtel, Globe Telecom, KDDI, KT, LG Uplus, NTT Docomo, Reliance Jio, Singtel, SKT, SoftBank, Spark, StarHub and True.

12. 2020 Mobile Industry Impact Report: Sustainable Development Goals, GSMA, 2020
13. The Enablement Effect: The impact of mobile communications technologies on carbon emission reductions, GSMA, 2019
14. For more information, see https://www.cdp.net/en

Mobile industry leads on climate change action

Operators in Asia Pacific are heeding calls for urgent steps to combat climate change and its impacts, and are committed to supporting national decarbonisation policies and the global transition towards a zero-carbon economy:

- Grameenphone aims to halve CO_2 emissions by 2030 (taking 2019 as the baseline). In 2020, Grameenphone took steps to reduce emissions and fossil fuel consumption by converting base stations from generator power to solar.[15]
- In October 2020, Reliance Jio announced that it had joined TED's Climate Change Countdown initiative to cut GHG emissions in half by 2030. Parent company Reliance Industries aims to reach net zero by 2035.
- In June 2020, Globe Telecom began its commitment to reduce its carbon footprint by supporting the Race to Zero campaign, which is spearheaded by the United Nations Framework Convention on Climate Change (UNFCCC) and COP26 Presidency and backed by the GSMA. In December 2020, Globe Telecom achieved carbon neutrality for electricity consumption in seven of its corporate offices and critical facilities. Its headquarters earned the Gold Standard Verified Emission Reductions for 100% offsetting of carbon emissions associated with electricity consumption.[16]

15. Annual Report 2020, Grameenphone
16. Mobile Net Zero – State of the Industry on Climate Action, GSMA, 2021

04

Policies for digital advancement

Covid-19 has emphasised the need for connectivity and the critical role of mobile technology. Around the world, the exceptional scale and utility of mobile networks and services have enabled people to work and learn remotely, stay in touch with loved ones and perform many other everyday activities online. They have also supported innovative health solutions, provided a platform for people to access digital financial services, generated valuable insights on mobility patterns of users to inform government responses and offered many other invaluable uses. In Asia Pacific, more than 1.6 billion people use mobile technology to access life-enhancing services.

As the region continues to contend with, and ultimately emerges from, the pandemic, connectivity will be crucial to rebuilding economies and making them more resilient to future shocks. 5G networks, cloud services, edge computing, AI, big data and IoT will all play a key role in realising the full potential of a post-pandemic digital economy. Now is the time for governments to reassess the business and regulatory environment for mobile services in order to accelerate investment and innovation for a digitally inclusive society. Specifically, policymakers should take steps to:

- cultivate an enabling regulatory environment to bolster connectivity, which in turn supports digital transformation and innovation
- adopt policies that facilitate infrastructure deployment and create a sustainable investment climate
- create safe and trustworthy internet environments as more people come online
- establish an effective spectrum policy that allows for timely and transparent allocation of harmonised spectrum to meet future connectivity demand.

Actions taken today by policymakers should be seen as an investment into future economic growth, societal development and technological innovation.

4.1 Cultivating an enabling regulatory environment

Taxation

Keeping mobile internet affordable allows more people to start realising the benefits of connectivity while also allowing existing users to utilise advanced, data-intensive technologies and innovative use cases. Despite this, governments in many countries are increasingly imposing taxes, both general and sector-specific, on consumers, devices and mobile operators. For example, a 2021 GSMA study has revealed that despite the expansion of mobile coverage, about half of Bangladesh's population remains unconnected to a mobile network partly owing to mobile taxation.[17] In 2019, the total tax contribution of the mobile sector, amounting to BDT119 billion ($1.4 billion), represented about 44% of total sector revenue.[18]

Mobile-specific taxes reduce operators' incentive and ability to invest, while specific taxes on network equipment negatively affect network expansion, which is key to improving coverage and service quality. High tax levels and uncertainty can create poor environments for operators considering investments in the deployment of new technologies and networks, including 4G and 5G.[19] GSMA studies have also revealed that markets with higher tax uncertainty score lower on infrastructure provision.[20] A fair and balanced approach to collecting revenues through taxes and fees has the potential to create favourable conditions for investment and improve affordability.

17. Accelerating digital transformation in Bangladesh: Recommendations for mobile-sector taxation reform, GSMA, 2021
18. Ibid.
19. Rethinking mobile taxation to improve connectivity, GSMA, 2019
20. As per the GSMA Mobile Connectivity Index, markets where consumer taxes were changed four times or more over the period 2011–2017 (e.g. Bangladesh, Brazil and Egypt) have an infrastructure rating that is on average 17 points lower than markets where consumer taxes were not changed.

The usage gap

A usage gap continues to persist in Asia Pacific, as half of the population live in areas covered by mobile broadband networks but do not yet use mobile internet services. Key barriers to mobile internet adoption include affordability, knowledge and digital skills, relevance, safety and access.[21]

Along with these barriers, family approval is a critical barrier preventing female mobile users from using mobile internet. Ensuring that there is a focus on gender equality, setting specific gender equity targets and explicitly addressing women's needs, circumstances and challenges in the design and implementation of mobile-related products, services, interventions and policies could help to address this gap.[22] A recent GSMA report provides guidelines for policymakers on how to use the Mobile Connectivity Index to understand where to focus efforts in order to drive increased mobile internet coverage, adoption and usage.[23]

EMF harmonisation

Despite regular statements from the World Health Organization (WHO) and other public health agencies, misinformation around electromagnetic fields and its impact on health persists. Both the WHO and International Telecommunications Union (ITU) recommend the human exposure guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). In its recently updated guidelines, the ICNIRP states that there is no evidence that additional precautionary measures will result in a benefit to the health of the population. The updates to the limits are based on improved scientific accuracy and provide limits for exposure that were not considered in the ICNIRP (1998) guidelines.

The ICNIRP has developed more detailed exposure guidance for some cases, in particular for the frequency range above 6 GHz, including 5G mmWave. It confirms that the international limits remain protective of all people, including children, against all established health hazards.[24] Disparities between national limits and international guidelines can foster confusion for both regulators and policymakers, increase public anxiety and provide a challenge to manufacturers and operators of communications systems. A harmonisation of national rules with the internationally studied standards would be beneficial in this regard.

4.2 Adopting policies that facilitate infrastructure deployment

Right of way

Many countries have adopted policies to ease the deployment of network infrastructure. However, in several instances, effective implementation is yet to be seen. Right of way (RoW) represents one of the main challenges in rolling out network infrastructure in many countries and is one of the essential regulatory frameworks enabling ease of doing business. Furthermore, small cells are growing in importance in the deployment of 4G and 5G. Small cells are viewed as a significant driver for the growth of 5G networks and digital revolution.

A uniform policy with an enabling framework designed to identify the best sites for small cells, provide access to street furniture, expedite the approval process for their use and keep deployment costs in check can remove hurdles and accelerate infrastructure deployment. Additionally, RoW policies should be updated to address small-cell deployment and effective steps should be taken towards their implementation.

21. Accelerating mobile internet adoption: Policy considerations to bridge the digital divide in low- and middle- income countries, GSMA, 2021
22. The Mobile Gender Gap Report 2021, GSMA, 2021
23. Using the Mobile Connectivity Index to drive digital inclusion: Guidelines for policymakers, GSMA, 2021
24. EMF Exposure Guidelines, GSMA, 2020

Infrastructure competition

It is commonly understood that competitive markets are crucial for innovation. However, in select instances, infrastructure sharing on a voluntary basis may significantly save costs, enhance efficiency and be helpful, especially in promoting connectivity in rural and remote areas.

GSMA studies have shown limited success with single wholesale networks, as such models often require significant public subsidies and other forms of support, which are typically not available to competing network operators, and even then have failed to deliver the planned connectivity.[25] Lessons from countries that are adopting such an approach will be instructive to policymakers considering how best to encourage the rollout of 5G.

4.3 Creating safe and trustworthy internet environments

Balanced rules on data privacy

Data privacy regulations are crucial to boosting consumer confidence in digital services. At the same time, data flows, including personal data, across borders is fundamental to the growth of countries on both a regional and global level. A recent GSMA study shows some negative repercussions associated with data localisation rules on economic growth and gains generated from IoT adoption.[26] Regulators should opt for a framework that facilitates a good balance between national consumer privacy and cross-border data flows. To mitigate the negative impact of these measures, action should be limited to the most essential policy objectives and be imposed in a way that is minimally trade restrictive.

Safe and secure connectivity

As mobile connectivity has become ever-more embedded in daily life, there is a corresponding need to ensure people continue to use these increasingly essential services safely and securely. Indeed, as Covid-19 has made working from home the norm, attackers have targeted this broadened territory. Given that risks are dynamic and not confined to national borders, sustained and international multi-stakeholder cooperation is key in all areas of security to manage risks. As new innovations come online, the entire value chain must adopt robust security measures. Globally recognised and industry-led voluntary consensus security standards are best suited to manage risk while allowing new innovations to thrive.[27]

Whole-of-government approach

Underpinning the abovementioned regulatory frameworks, a holistic whole-of-government approach (WGA) has the potential to speed up digitisation and adoption of new technologies in a more efficient manner.[28] A WGA could more efficiently harness the capabilities of intelligent mobile connectivity by removing barriers caused by siloed efforts from different ministries. As digitisation continues to cross and combine sectors, a WGA is crucial to ensuring the realisation of the benefits that mobile connectivity, and especially 5G, can offer.

25. Single Wholesale Networks: Lessons Learned From Existing and Earlier Projects, GSMA, 2019
26. Cross-Border Data Flows: The impact of data localisation on IoT, GSMA, 2021
27. Mobile Telecommunications Security Landscape, GSMA, 2021
28. Advancing digital societies in Asia Pacific: a whole-of-government approach, GSMA, 2020

4.4 Establishing an effective spectrum policy

Meeting the future demand for connectivity

Positive decisions that help drive the availability of spectrum are crucial for governments and regulators that want to realise high-performance networks and services, particularly for 5G. Making sure the necessary spectrum resources are available at the right time, the right price and under the right conditions helps lower mobile broadband costs, increases coverage and boosts connectivity.

Spectrum availability and timing

Successful 5G networks and services depend on a significant amount of new harmonised mobile spectrum. However, there are several essential policy actions 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. This includes but is not limited to right sizing the spectrum blocks in legacy bands, bringing more confidence and transparency in the process through spectrum roadmaps, moving towards a unified licensing regime, keeping licences technology and services neutral, and permitting operators to have end-to-end control of their networks for better quality of service.

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 wider coverage areas, mid-band frequencies have been used as the basis for the first commercial 5G networks all over the world. The initial focus has been on the 3.5 GHz range, which has become the birthplace of commercial 5G, as it produces the scale needed to bring down the cost of network equipment and mobile devices.

The timely release of spectrum bands is also crucial. An early release of spectrum leads to better consumer outcomes, which is important in markets where long-term value, innovation and cost reductions are driven through relatively short technology cycles. More mid-band spectrum beyond the initial 80–100 MHz per operator 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.

Lack of sufficient quantity of spectrum, unreasonable spectrum pricing and limited spectrum for backhaul would lead to unnecessary delays of mobile broadband service rollouts and risk leaving more people unconnected in a post-pandemic world. Non-harmonised spectrum carve-outs for vertical industries are creating a barrier to meeting this demand and should be avoided in priority 5G bands (i.e., 3.5, 26 and 28 GHz). Voluntary sharing approaches such as leasing may work in these situations.

Refarming 2G, 3G and 4G spectrum bands can, in time, contribute to meeting future spectrum requirements, but adding new bands will be necessary to keep up with demand. A number of frequency ranges have the potential to help support future mid-band needs. Mobile use within the 3.5 GHz range (3.3–4.2 GHz) is being maximised in some countries, while additional capacity in both 4.8 GHz and 6 GHz benefits from harmonised equipment ecosystems.

The momentum behind mmWave spectrum is growing. As of June 2021, five countries in Asia Pacific – Australia, Japan, Singapore, South Korea and Thailand – had assigned mmWave spectrum to operators, with more countries soon to follow. The first commercial mmWave 5G networks are showing the significant potential these bands have.

Spectrum pricing and conditions

Beyond spectrum availability, the cost of spectrum also has a major impact. Spectrum assignments should support digital connectivity goals, rather than simply serving as a means of maximising revenues. Affordable, reliable and resilient connectivity should be seen as a critical infrastructure pillar during and after the pandemic. The numerous socioeconomic benefits of reasonable spectrum prices should not be ignored.

Regulators should 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 will help maximise consumer benefits and ensure 5G is available for all. The speed, reach and quality of these services depend on governments and regulators supporting timely access to the right amount and type of affordable spectrum, under the right conditions.

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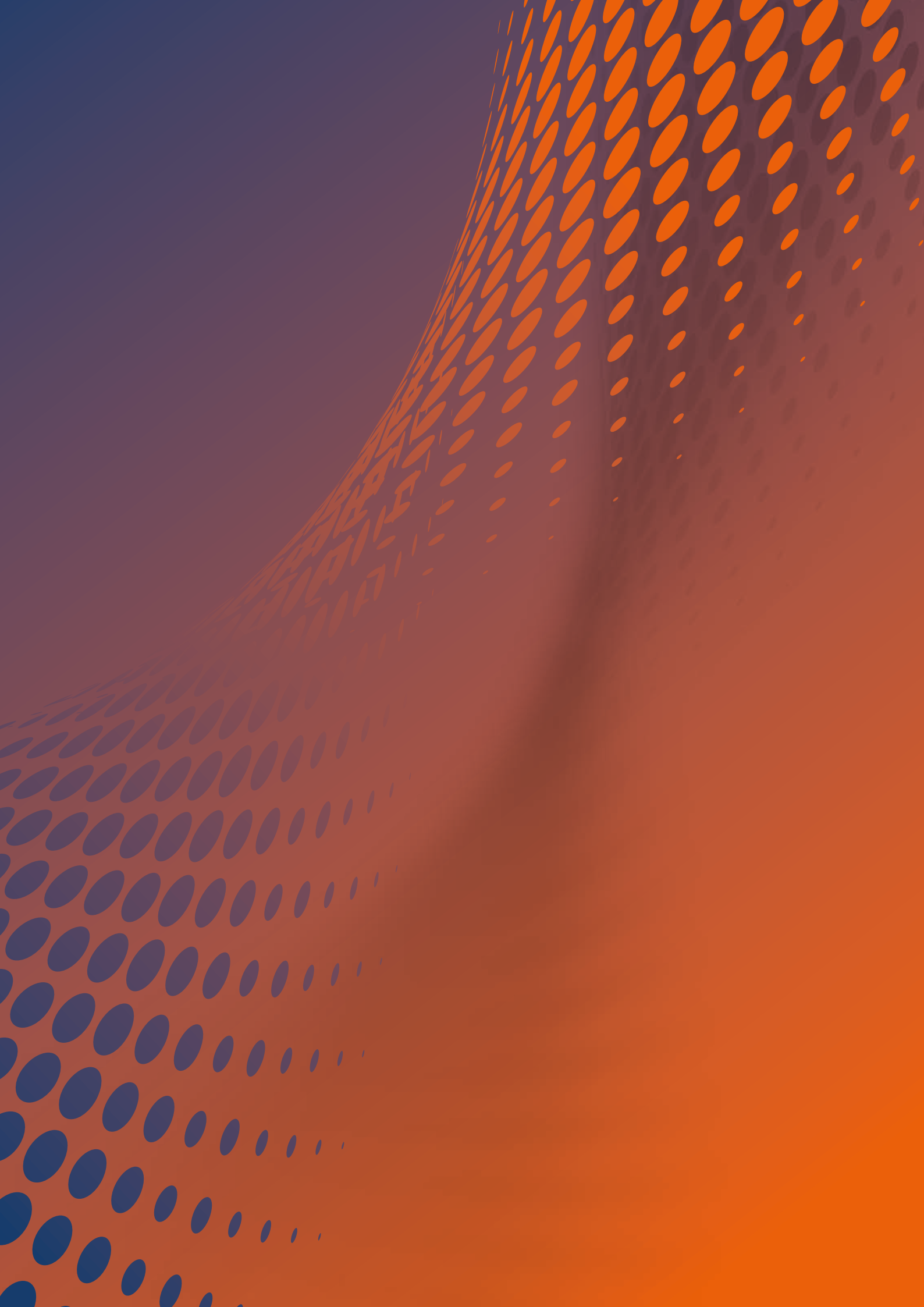

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