# Accelerating Indonesia's digital economy:
## Assigning the 700 MHz band to mobile broadband

September 2018

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# Contents

# Ministerial foreword

High-speed connectivity is the basic building block of a digital economy. The digital economy leverages technology developments of the last 30 years to allow Indonesians to be part of the largest digital economy in South-East Asia and access government, e-commerce, education and information services and communicate with fellow Indonesians or across the world. In a country of over 17,000 islands and more than 260 million people, availability of spectrum is critical to ensuring connectivity is available across the nation, providing all Indonesians with reliable and fast access.

Indonesia's digital economy is demonstrating its world-leading capability, attracting billions in investments for digital ventures. It is critical that Indonesia is at the forefront of spectrum policy and allocation to ensure the digital economy continues to grow and achieve its potential for financial inclusion, economic contribution, digital citizenship and social equality.

700 MHz band spectrum, generally described as the Digital Dividend, is a core resource for high-speed broadband globally, delivering immediate GDP impact as the spectrum is reallocated from analogue TV to broadband services.

Securing agreement for a spectrum strategy creates the foundation for the Indonesian government to achieve its vision for the 700 MHz band and step forward confidently and also build spectrum policy and plans to ensure Indonesia's digital economy accelerates as further technology developments including 5G will provide a platform for innovation and economic growth for all Indonesians.

This Indonesia report highlights the key benefits Indonesia can expect from determining a plan for the Digital Dividend. Indonesia is emerging as the digital economy powerhouse of South-East Asia and the Digital Dividend creates an opportunity for all Indonesians to enjoy high-speed connectivity in the most remote areas, helping to accelerate participation in our nation's prosperity and economic growth.

**Rudiantara,**
Minister of Communication and Informatics of the
Republic of Indonesia

# 1. Executive Summary

Since the start of the century, the mobile sector in Indonesia has experienced years of growth and development. Several operators have launched 3G services, with each expanding coverage to much of the country. Some market restructuring has intensified competition and kept prices relatively low – though state-owned Telkomsel continues to have a market share advantage over its rivals. 4G take-up is beginning to increase, albeit later than some neighbouring countries, and smartphone adoption is rising in both urban and rural areas. Combined with an expanding middle class and a tech-savvy youth population, this strongly positions Indonesia to become a digital economy powerhouse in South-East Asia.

**Moving forward on the digitisation journey**

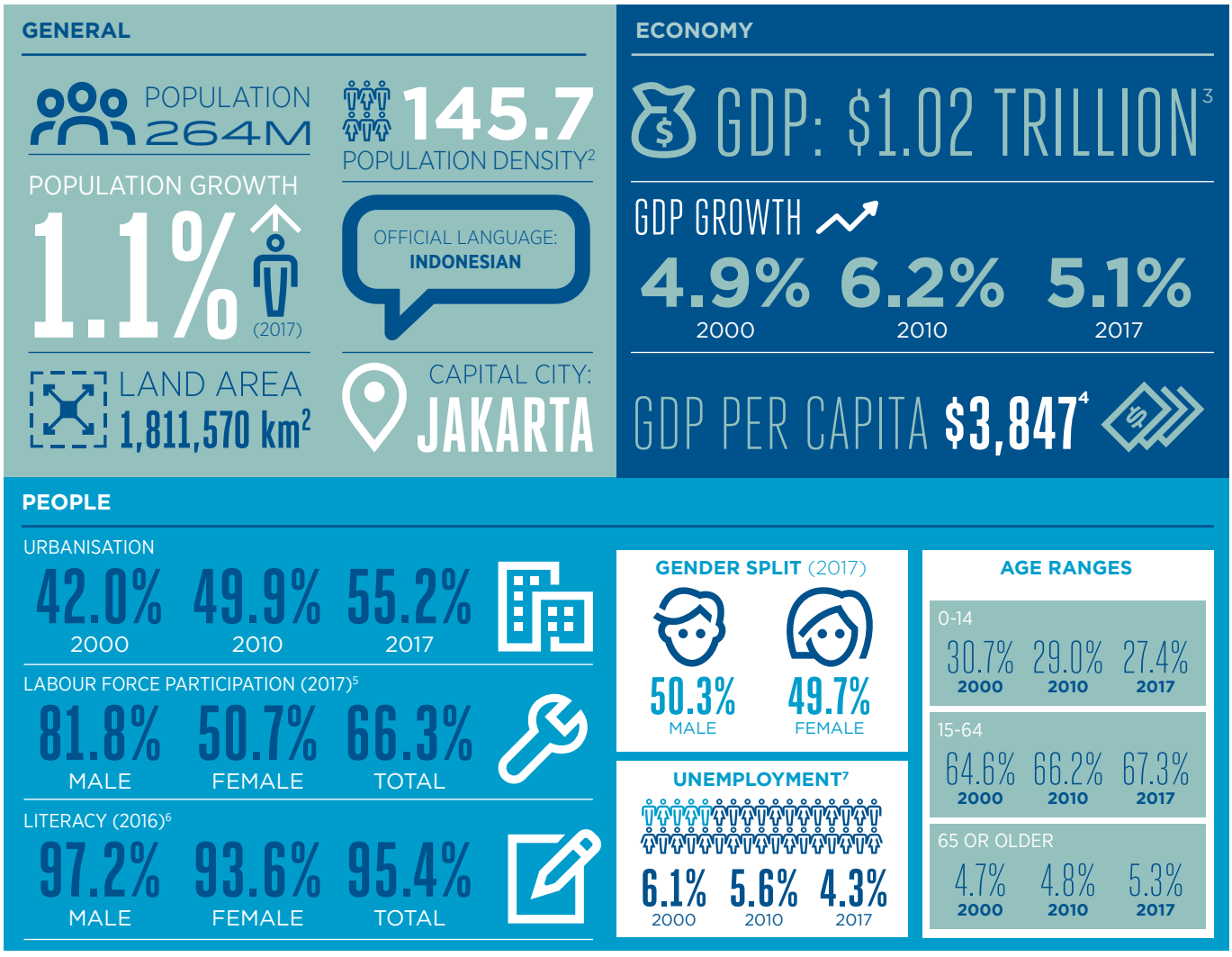
For Indonesia to realise its full potential, the mobile industry must secure access to vital spectrum bands. Internet access remains a key barrier for citizens' full participation in the country's digital society. While 3G (at 900 MHz) has been successful in extending basic mobile broadband to the unconnected, the technology will not be able to cope with the significant traffic growth expected over the next 10 years. Mobile network operators are predominantly using 1800 MHz spectrum for 4G rollout, but allocating the 700 MHz band quickly and in sufficient quantity would support their efforts to expand coverage, despite the geographical challenges, and help reduce the prevailing digital divide.

Policymakers should also consider rules to facilitate network sharing, which could boost high-speed mobile connectivity by lowering the costs and risks to deploying infrastructure, particularly in remote or topographically challenging areas. In addition, the appropriate tax regime needs to be in place so that while operators contribute a fair amount to government tax revenue, the burden does not become disproportionate. Such measures would help establish a policy environment that is conducive to operators making the considerable investments needed to take Indonesia's digitisation journey forward.

> **Assigning 700 MHz to mobile broadband would deliver economic benefits of $11 billion (IDR161 trillion) to the Indonesian economy over the period 2020–2030, equivalent to an incremental 1% of GDP.** GSMA Intelligence

# 2. Indonesia: the emerging digital economy giant

FIGURE 1: INDONESIA: KEY FACTS[1]

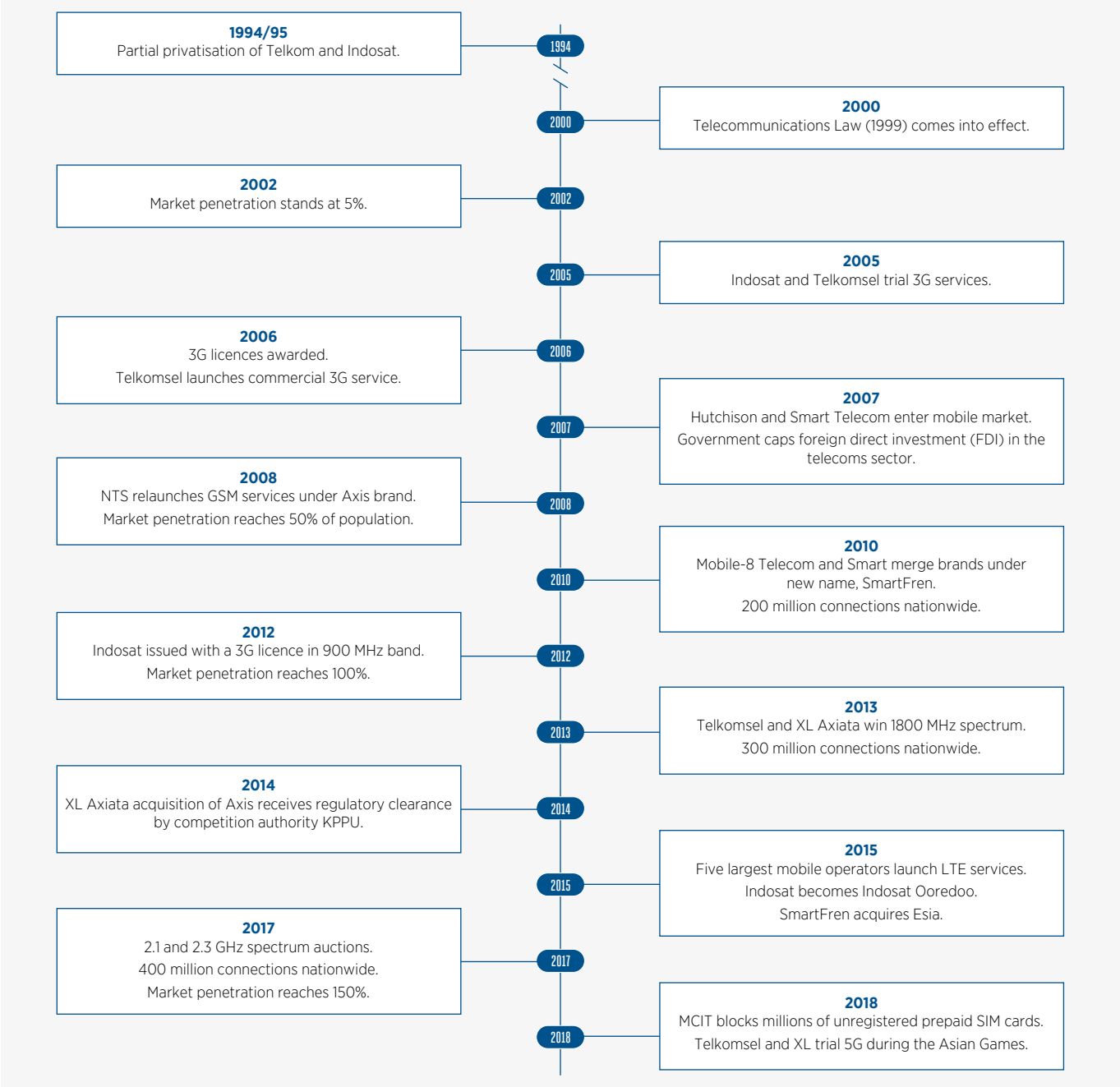



Source: World Bank

1. Data from the World Bank: http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#
2. People per square kilometre of land area.
3. Current US$.
4. Current US$.
5. People aged 15 and above. Modeled International Labour Organization (ILO) estimate.
6. People aged 15 and above.
7. Modeled ILO estimate.

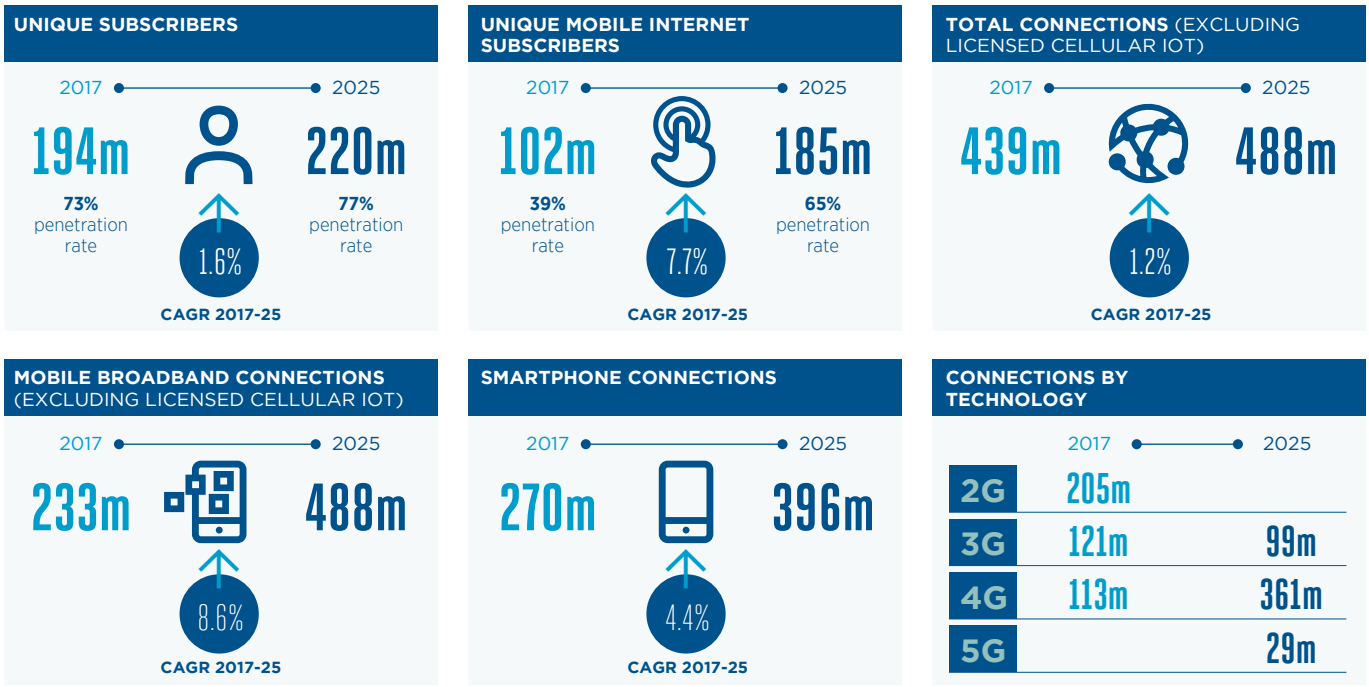
# 2.1 Mobile market evolution

FIGURE 2: MILESTONES OF THE INDONESIAN MOBILE MARKET




Source: GSMA Intelligence

FIGURE 3: INDONESIA: MOBILE MARKET SNAPSHOT AND FORECASTS




Source: GSMA Intelligence

**Years of subscriber growth have created a huge mobile market**

At the end of 2017, there were 194 million unique subscribers in Indonesia, making it the third largest mobile market in Asia Pacific and fourth largest in the world.[8] With subscribers owning on average 2.3 SIM cards, there were 439 million connections at year-end 2017, representing a market penetration of 165%.

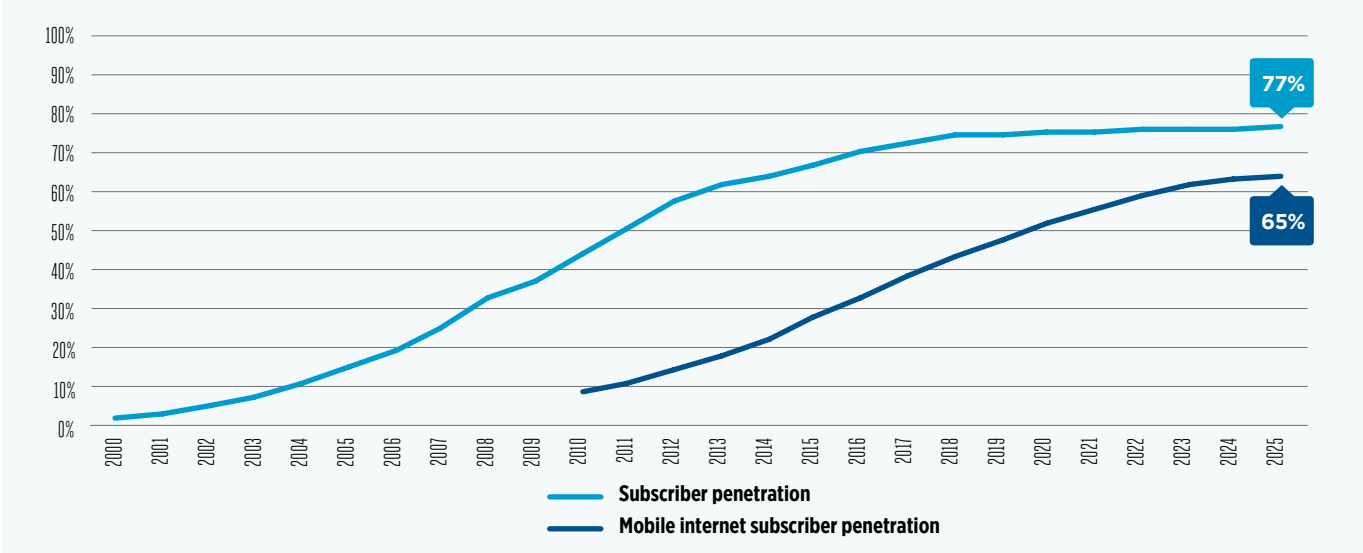
The exponential growth in uptake of mobile services since the beginning of the century has resulted in unique subscriber penetration levels in Indonesia rising from less than 3% in 2001 to just over 73% at the end of 2017. While growth has slowed in the past few years, penetration is still forecast to reach around 77% by the end of 2025, equivalent to 220 million individuals.

Indonesia will therefore be one of the biggest single contributors to global mobile subscriber growth during the period to 2025, with more than 3% of global additions.

However, there remains a considerable digital divide between urban and rural citizens. Nearly 45% of people live in rural areas, which is considerably higher than more developed Asia Pacific countries, while the archipelagic nature of the country can make expanding coverage costly and/or difficult. GSMA research suggests that of the population that does not have access to a mobile phone in Indonesia, 97% is located in rural areas.[9] The number of unconnected individuals presents a huge opportunity for subscriber growth over the next decade.

8. By number of unique subscribers – unique users who have subscribed to mobile services at the end of the period, excluding machine to machine (M2M). Subscribers differ from connections such that a unique user can have multiple connections.
9. Internal 2016 GSMA report.

FIGURE 4: MOBILE SUBSCRIBER DYNAMICS IN INDONESIA[10]




Source: GSMA Intelligence

10. No data available for mobile internet subscriber penetration before 2010.

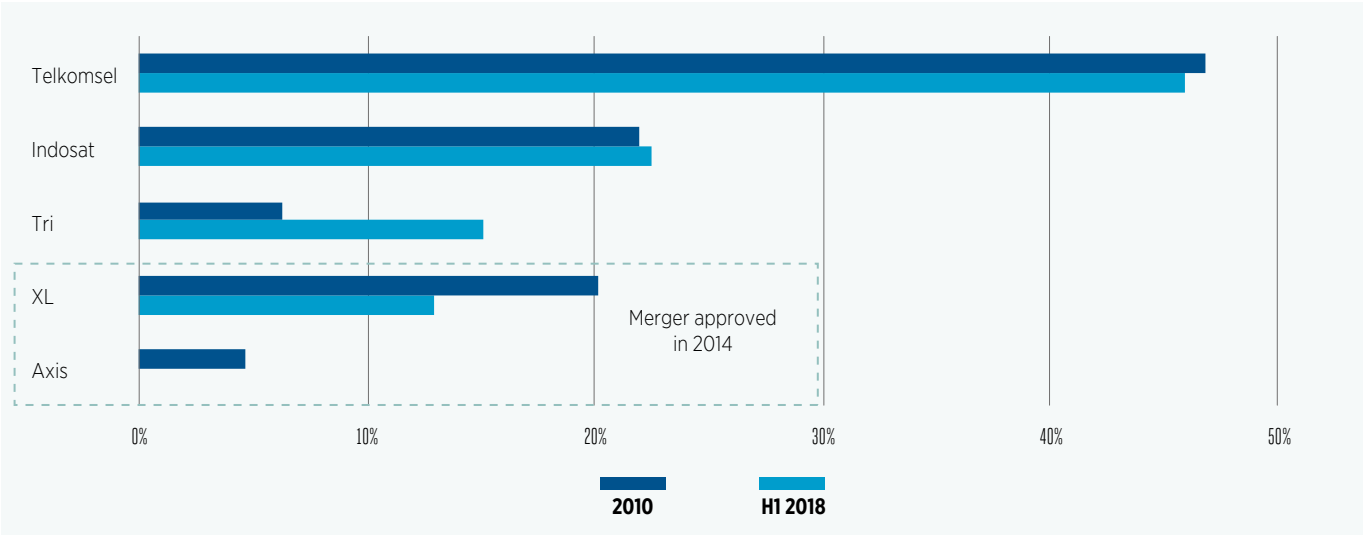
### Despite in-market mergers, Telkomsel remains the largest mobile operator

The Indonesia mobile market is dominated by five licensed network operators: Telkomsel, Indosat Ooredoo, XL Axiata, Tri and SmartFren. Telkomsel is majority state-owned, while the Indonesian government also retains a minority stake of around 14% in Indosat. As of H1 2018, Telkomsel held a 46% share of total connections, followed by Indosat (23%), Tri (15%), XL (13%) and SmartFren (2%). Local 4G (and former WiMAX) providers BOLT! and hinet are also present in the country, accounting for around 1% of the market between them.

In addition to these players, Net1, the brandname of Sampoerna Telekomunikasi Indonesia (STI),[11] operates an LTE network using an allocation of 450 MHz spectrum. It holds a nationwide licence but is currently only present in some of the country's most populated islands, such as Java and Sumatra. The Ministry of Communication and Information Technology (MCIT)[12] has considered the possibility of introducing mobile virtual network operators (MVNOs) into the market; however, perhaps due to unfavourable commercial conditions (relatively low average revenue per user and predominance of prepaid connections) or regulatory hurdles (no clearly defined rules for licence provision), an MVNO has yet to launch.[13]

The Indonesian mobile market has experienced a few instances of in-country consolidation in recent years, one example being the merger of Mobile-8, which used the name Fren, and Smart to create SmartFren. A strategically important consolidation was XL's acquisition of a 95% stake in smaller rival Axis for $865 million (IDR12.4 trillion) on a cash- and debt-free basis. The deal received regulatory approval in 2014 on the condition that XL conceded a number of blocks of 2.1 GHz spectrum. Meanwhile, Bakrie Telecom, which traded using the Esia name, was purchased by SmartFren in 2015. This provided SmartFren with additional customers and access to spectrum at 850 MHz, while Bakrie obtained 6% of the overall merged entity.

FIGURE 5: SHARE OF CONNECTIONS IN INDONESIA BY MOBILE OPERATOR[14]




Source: GSMA Intelligence

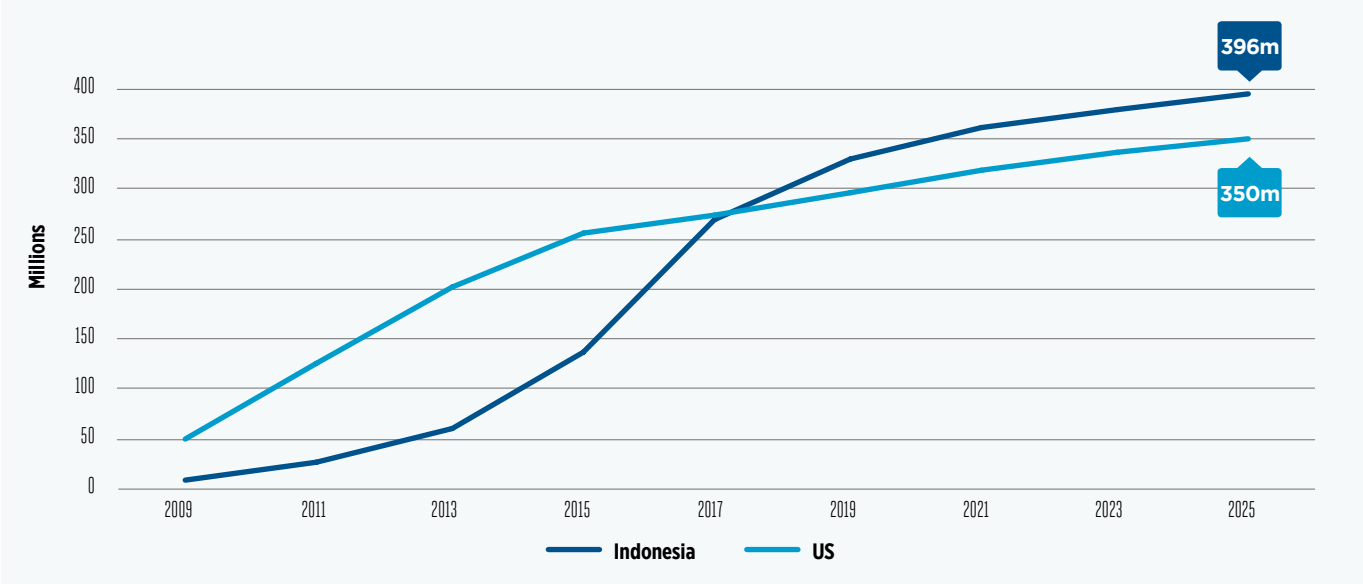
11. Net1 was known as Ceria until Q2 2017 when it rebranded to reflect its migration from CDMA to an LTE-based service.
12. Known locally as Kominfo (Kementerian Komunikasi Dan Informatika)
13. It has been reported that Circles.Life and MyRepublic will become MVNOs in Indonesia during 2018.
14. Including licensed cellular IoT.

### Indonesia will soon become the third largest smartphone market globally

While the likes of Australia, Macau, Singapore and South Korea account for four of the top seven nations worldwide in terms of smartphone adoption, Indonesia, along with China and India, has been responsible for driving growth in take-up across Asia Pacific. Indonesia alone added almost 75 million smartphone connections in 2017, while the total for the three countries combined was 348 million, accounting for 55% of new connections globally.

Smartphones, such as those from Indonesian brand Advan, are available for less than $100 (IDR1.4 million). It is estimated that 65% of all handsets sold in the country are manufactured domestically following the introduction of "Made in Indonesia" rules in 2017.[15] Adoption is expected to reach almost 90% by 2025 (396 million connections), up from 65% as of mid-2018. The number of smartphone connections in Indonesia is fast approaching that of the US and is expected to overtake it in 2018, making it the world's third largest smartphone market.

FIGURE 6: SMARTPHONE CONNECTIONS IN INDONESIA AND THE US




Source: GSMA Intelligence

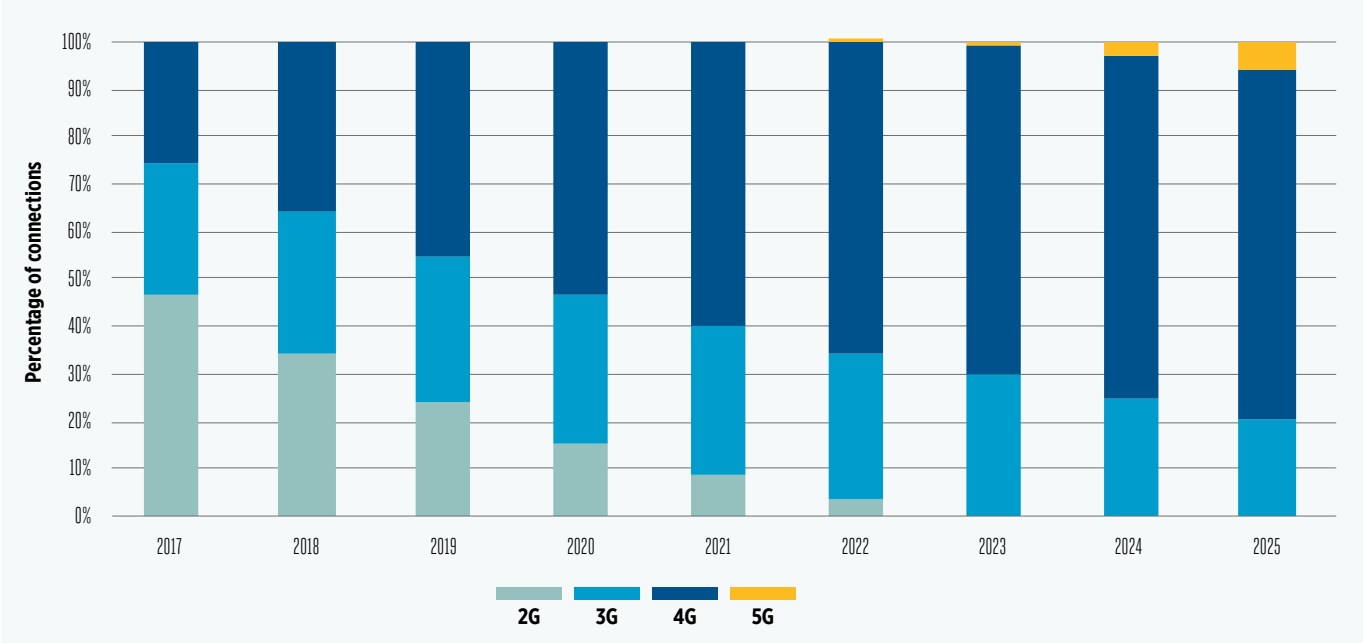
According to the GSMA's 2018 Global Mobile Engagement Index (GMEI), Indonesia ranks 35th out of 50 countries surveyed in terms of consumers' engagement with mobile services.[16] Indonesia has a relatively young population and many keen social media users.[17] Use of IP messaging is rising and is now used more frequently than SMS by over half the population. However, the index score suggests a lower level of engagement with paying utility bills online via their smartphones or with mobile applications to pay for goods. The 2018 score of 2.1 is an improvement on the previous year when Indonesia scored 1.4,[18] and should improve further with greater smartphone adoption and wider coverage of high-speed mobile broadband.

### Coverage of 4G is moving in the right direction but adoption lags

Indonesia is currently in a transitional phase away from a basic voice and SMS-based mobile market towards a more advanced digital society. The country consists overwhelmingly of prepaid subscribers, reflected in a monthly ARPU by connection of just $1.52 (IDR21,900) – well below the global and regional averages. 2G and 3G combined represented 69% of total connections as of mid-2018. Despite being considered a laggard 4G market, Indonesia (like Malaysia, Myanmar, the Philippines and India) is now beginning to see an accelerating migration to high-speed mobile broadband. This is driven for the most part by ongoing network investment and spectrum refarming by operators locked in fierce competition, and by a growing consumer appetite for higher speed mobile services.

15. "Going local: How Apple got back into Indonesia's smartphone game", South China Morning Post, April 2017
16. Consumer insights: Evaluating mobile engagement, GSMA, 2018
17. 130 million (23% growth on the previous year). See Digital in 2018: Southeast Asia, We Are Social, 2018
18. GMEI 2017, GSMA, 2017

FIGURE 7: FORECAST OF MOBILE CONNECTIONS IN INDONESIA BY TECHNOLOGY GENERATION[19]




Source: GSMA Intelligence

4G is not quite the dominant technology in Indonesia, and we do not expect the 3G lifecycle to reach maturity for several years. However, against a backdrop of favourable spectrum and investment policies from the government, 4G will continue to rise to 2025, accounting for an estimated 361 million connections (74% of total connections) by that point. Looking ahead, while commercial deployments of 5G services are planned in China, Japan and South Korea before the end of 2020, the market for this next-generation technology is likely to be at a fairly nascent stage in Indonesia five years on.

19. Excluding licensed cellular IoT.

# 2.2 Trends in media content delivery platforms

With increasing mobile broadband coverage and growing adoption of smartphones, delivery of content over mobile networks is rising in Indonesia. Findings from the GSMA's 2017 Consumer Survey indicate that 20% of phone owners in Indonesia consume free online video services, such as YouTube, on their device at least once per month, and a further 13% do so albeit infrequently (less than once a month). These figures increase to 45% and 29%, respectively, for smartphone owners. In addition, 30% of those aged 18–34 years old watch free online video content every month, while a further 17% do so less frequently.

While DVDs of the latest movies and TV series are available across Indonesia, and typically at affordable prices, the over-the-top (OTT) video market is still expected to grow to be worth $40 million (IDR576 billion) in 2019, with a forecast subscriber base of nearly 10 million.[20] This growth will be partly driven by the likes of Netflix, which was blocked by Telkom in 2016 on the grounds that the streaming service displayed violence and adult content.[21] This was reversed the following year, after the two parties agreed a partnership. As Indonesian consumers also have strong preferences for local-language content, OTT market growth will also materialise as a consequence of domestic players such as iFlix and Hooq, which offer more affordable alternatives to Netflix. For mobile operators, this presents an opportunity to boost content offerings, unveil new pricing schemes and potentially gain new customers.

Meanwhile, average daily use of the internet via a mobile phone (3 hours 55 minutes) and the use of social media via any device (3 hours 16 minutes) both now eclipse daily TV viewing time (2 hours 23 minutes).[22] TV viewership has been in particular decline among the younger demographic, who increasingly rely on press websites and social media platforms for news content, and stream non-linear programming. As advertising consumption and revenues shift away from traditional broadcasting and into digital channels (such as social networks), it is important the country maintains the pace of digitisation and that spectrum policy supports the demands on and needs of the mobile industry.

20. "Asia Pacific OTT market leaping ahead", Muvi, November 2017
21. "Netflix blocked by Indonesia in censorship row", bbc.co.uk, January 2016
22. Digital in 2017: Southeast Asia, We Are Social, 2017

# 2.3 Digital innovation

The combination of a large (young) population, expanding 4G coverage, and relatively affordable mobile services and handsets means Indonesia has the scale and market characteristics to stimulate sources of innovation. According to the MCIT, the country now has four unicorn start-ups,[23] which should become five by 2019.[24] Go-Jek is Indonesia's first unicorn and, according to a recent survey, the country's most popular ride-sharing or hailing application.[25] Launched in 2016, Go-Jek's Go-Car and its eponymous motorbike service have quickly become popular and are competing successfully with Grab and Uber – Grab has agreed to acquire Uber's South-East Asian assets. Go-Jek's Chief Marketing Officer also claims that the company has helped lower Indonesia's unemployment rate by 0.5 percentage points in 2016 and put $1 billion (IDR14.4 trillion) back into the economy by its drivers and merchants.[26]

Go-Jek has announced plans to spend $500 million (IDR7.2 trillion) expanding into other South-East Asian countries, while investors have offered a further $1 billion (IDR14.4 trillion) to fuel growth. In Vietnam, the firm has launched under the Go-Viet brand, covering an initial 12 districts in Ho Chi Minh City with on-demand motorbikes for personal transport and express courier services. A Thailand launch under the GET name is slated for September 2018, while Go-Jek hopes to go live in the Philippines by the end of the year and in Singapore soon after.

Go-Jek's expansion is likely to be limited to vehicle services at first and could be followed by food delivery service, Go-Food, which then provides a bridge to consumers using Go-Pay, its mobile payment system (the largest in Indonesia). According to reports, the prevailing market conditions in Go-Jek's target countries show that Grab has not established itself as a clear leader so there is scope for disruption, particularly as Uber ceases operating.[27] Competition between the two firms will be intense going forward; Grab has also diversified into adjacent markets and tailors its offerings by country – for example, tuk-tuks are available for hire in Cambodia, as are rickshaws in the Philippines. However, the Go-Jek app, which serves as a one-stop shop for 16 services, including ticketing and home cleaning, could result in a greater degree of user interaction and loyalty.

TABLE 1: OTHER DIGITAL START-UPS IN INDONESIA

| | |
|---|---|
| **Mata Rakyat** | A mobile app developed by InTouch, which translates as 'eye of the people', Mata Rakyat provides the verification of vote counts by coordinating reporting mechanisms from witnesses across thousands of polling stations. |
| **Ralali** | A business-to-business (B2B) firm that connects buyers and vendors by providing a marketplace for industrial supplies and maintenance, repair and operational equipment. |
| **Tokopedia** | Established in 2009, Tokopedia is one of the country's largest e-commerce marketplaces. Its platform is used by individuals and businesses to manage their own online stores, and facilitates millions of product sales every month. |
| **Traveloka** | An online travel agency that provides airline ticketing and hotel booking services. Traveloka was established in 2012 with a focus on business travel in Indonesia and across South-East Asia. |

Source: GSMA Intelligence

23. A privately held start-up with a valuation of over $1 billion (IDR14.4 trillion).
24. "Indonesia expects to have more than 5 unicorns by 2019: minister", Reuters, February 2018
25. "Go-Jek most popular ride-hailing app: Survey", The Jakarta Post, February 2018
26. "In Singapore, a preview of how Grab and Go-Jek will likely face off across Southeast Asia" South China Morning Post, June 2018
27. "Uber's south-east Asia exit can be Go-Jek's gain", FT, April 2018

An increasing number of mobile operators have sought to invest in or partner with start-ups to accelerate innovation and protect themselves from disruption. Telkom's venture arm, Metra Digital Innovation (MDI) Ventures is a $200 million (IDR2.9 trillion) fund with a focus on five major verticals: enterprise solutions, fintech, adtech, IoT and smart city solutions. Its 2016 investments included 'seven figures'[28] for Red Dot (an online payments company based in Singapore) and $25 million (IDR360 billion) for 10 Indonesian start-ups, while in 2017 MDI joined a $3.2 million (IDR46 billion) financing round for aerospace company Loft Orbital.[29] The government is keen to support such partnerships; Indonesia's "1000 Start-Up Digital National Movement" aims to foster 1,000 digital start-ups worth $10 billion (IDR142 trillion) by 2020.[30] In early 2018, a new regulation halved a 1% tax on SMEs with an annual turnover of less than IDR4.8 billion ($339,000).[31]

Tech hubs are also providing start-ups with business support and services to help them scale, usually by facilitating access to critical resources such as skills, funding, technology, networking and digital tools. GSMA research identifies 565 hubs active in emerging Asia Pacific markets, of which over 50 are in Indonesia (see Figure 8).[32] Jakarta is home to 27. The Telkom-backed Indigo Incubator and Indosat Ooredoo's IdeaBox are among the leading hubs in the country. In February 2017, IdeaBox announced three winners of its start-up boot camp: Andalin, Ayo Slide and Sevva. Each received $50,000 (IDR720 million) of early-stage funding, mentoring, access to an investor network and a dedicated facility for the duration of the 120-day programme.[33]

28. Amount undisclosed.
29. "Indonesia: Telkom's MDI Ventures joins $3.2m round in US startup Loft Orbital", Deal street Asia, November 2017
30. "KOMINFO Indonesia working on a number of initiatives to boost digital start-up ecosystem and support SMEs", OpenGov, May 2017
31. "Govt finalizes regulation on e-commerce", republika.co.id, February 2018
32. "Asia Pacific: a look at the 565 active tech hubs of the region's emerging economies", GSMA, March 2018
33. "Breaking tradition, Indonesia's Ideabox announces 3 startups to join its latest batch", E27, February 2017

FIGURE 8: NUMBER OF TECH HUBS IN ASIA PACIFIC, 2018


Source: GSMA Ecosystem Accelerator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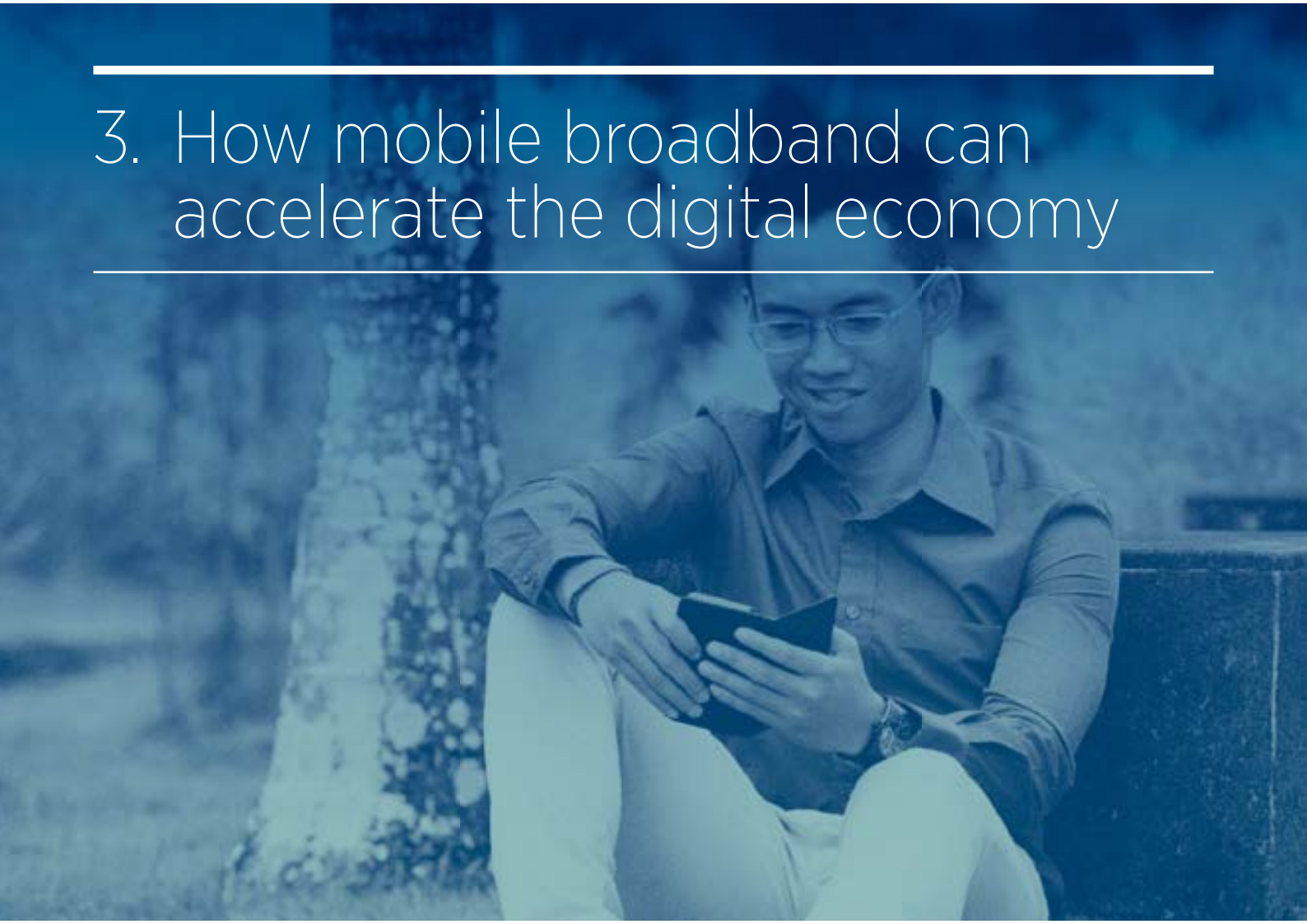
# 3. How mobile broadband can accelerate the digital economy



## 3.1 Digital citizenship

Connectivity is the foundation of a digital economy, allowing companies to distribute, and users to consume, digital applications and services. In many Asian countries, connectivity is often mobile-first. This is particularly true of emerging economies, such as Indonesia, as well as the more remote areas of developed economies. The availability of high-performance mobile internet network coverage is therefore fundamental to digital economy development.

Indonesia's digital economy is, for now, still in its infancy, though one estimate of the potential impact of digital technologies in the country suggests an increase in GDP of $150 billion (IDR2,160 trillion, which translates to 16% growth on current GDP) by 2025 and 3.7 million additional jobs.[34] The manufacturing and retail sectors, characterised by low adoption of technology and high reliance on labour, stand to benefit the most. Online transactions account for a small percentage of total retail transactions; however, a Google study estimates that the total first-hand e-commerce market in South-East Asia is expected to reach around $88 billion (IDR1,277 trillion) by 2025, with Indonesia representing a significant proportion of this figure.[35] Better connectivity to reliable high-speed mobile broadband will provide the impetus for its acceleration, and mobile operators are uniquely positioned to play a critical role in this process through infrastructure investment projects and the delivery of digital services.

34. Unlocking Indonesia's digital opportunity, McKinsey & Company, 2016
35. e-conomy SEA: Unlocking the $200B Digital Opportunity, Google and Temasek, 2016

Good connectivity is equally crucial to effective digital citizenry and the ability to fully utilise government services. Around the world, governments are increasingly using digital channels to deliver social welfare, provide healthcare and enable citizens to pay taxes online. Tens of millions of working adults in Indonesia fail to fulfil their tax obligations; the government is losing much-needed tax revenue that could be used to enhance the country's future prosperity. The 2016/17 tax amnesty was a step towards expanding taxpayer penetration, but the results were not as promising as the state would have hoped for. A total of IDR4,866 trillion ($348 billion) worth of assets was declared to Indonesia's Tax Office, surpassing the government's IDR4,000 trillion target ($286 billion). However, fewer than 200,000 brand new taxpayers joined the programme. Only IDR147 trillion ($10 billion) worth of assets was repatriated into specified investment instruments (compared to a target of IDR1,000 trillion or $72 billion).[36]

A more effective outcome could be achieved in the long term from facilitating a greater volume of digital transactions by improving the availability and speed of broadband services.

According to the Deputy Minister for Finance, VAT revenue has increased 30% in Sweden over the past five years as a result of digitisation, while income tax receipts also rose in India after the government implemented measures to make the country less cash-reliant.[37] Currently, Indonesian smartphone users typically purchase goods online using their mobile less than once a month, if at all, and cash on delivery remains a common payment mechanism for completing digital transactions for physical goods. Better connectivity enables more transactions to take place online, which can save time and money for businesses who may have to make frequent trips to the bank to make deposits. It also negates the potential losses from burglaries as they hold less cash on the premises. A greater volume of non-cash payments could help to restrict the shadow economy, increase tax revenue and curtail criminal activity by making it increasingly difficult to hold wealth outside the economic system.

## 3.2 Health

Developing countries continue to face poor healthcare funding, which affects access, quality of service, cost and key health outcomes. Mobile, particularly mobile broadband, is playing a key role in tackling various healthcare challenges in many of these countries – for example, by providing the tools and applications to connect marginalised communities to health services via video consultation, or by leveraging data analytics technology to determine the best location to establish teleclinics.

Indonesia is currently one of the most populous low- or middle-income countries where maternal mortality rates are greater than the United Nations target of less than 70 in every 100,000 births. In addition, there are fewer than three doctors, nurses or midwives available per 10,000 inhabitants – well below the 23 recommended by the World Health Organization (WHO).

Philips and Telkom Indonesia signed an agreement in 2016 with Sijunjung Regency in West Sumatra for full-scale commercial implementation of its Mobile Obstetrics Monitoring (MOM) telehealth service in the region. MOM is a software solution (app-based, delivered via smartphone) for community healthcare workers. Patients do not need to use the app. It is designed to help reduce maternal mortality rates through early monitoring and risk stratification. The government pays for the service at the district level as healthcare is decentralised in Indonesia. There is no charge for patients; the solution is designed for healthcare professionals. MOM is developed by Philips, but no direct relationship exists between Philips and the government. Telkom Indonesia sources the software from Philips and sells it to the government. As well as the distribution, the operator provides the backbone, ICT infrastructure and data capabilities. A year-long pilot involving 650 pregnancies in collaboration with the Bunda Medical Center in Padang delivered positive results, including a three-fold increase in the early detection of high-risk pregnancies and a 99% reduction in anaemia from the first to the third trimester through enhanced patient management. About 1,500 mothers were benefiting from the solution as of January 2017.[38]

According to the GSMA's mHealth Deployment Tracker,[39] a number of other initiatives in Indonesia are attempting to address the country's health-related issues. WorldVision, for example, is equipping midwives in Aceh Besar with mobile phones and phone credit to consult with specialists while providing obstetric care in remote locations. In addition, Indosat's Kesehatan Keluarga (Family Health) enables its customers to contact a doctor for consultation, while through Telkomsel's Dunia Wanita (World of Women) programme, customers can dial *468# from their phones to receive information on sexual health and pregnancy, as well as tips for a healthy lifestyle.

36. "Tax Amnesty Program Indonesia Ended, What Are the Results?", Indonesia Investments, April 2017
37. 'We don't take cash': is this the future of money? FT, May 2018
38. Scaling digital health in developing markets, GSMA, 2017
39. For more detail, see https://www.gsma.com/mobilefordevelopment/m4d-tracker/mhealth-deployment-tracker/

## 3.3 Education

Digital platforms are improving access to education and becoming an important pillar in building knowledge-based societies. E-learning can increase learning opportunities, act as a platform for skills building, and promote development in rural and remote areas. This can lead to an improved quality of life for individuals and their families, which in turn can fuel a virtuous cycle that boosts economic growth, creates more jobs and reduces poverty.

With over 50 million students and around 4 million teachers, many of whom are unqualified, Indonesia has the fourth largest educational system in the world. However, while government spending on education outweighs its budget for the nation's healthcare, it is also one of the lowest performing. The country ranked 62nd out of 72 countries in the 2015 Programme for International Student Assessment (PISA). Consequently, operators are working to help students and teachers integrate mobile technologies into the classroom. mEducation solutions already allow thousands of students in countries such as Indonesia to access course content through SMS and audio lessons.

According to the GSMA Intelligence Consumer Survey, 17.4% of those aged 18-24 in Indonesia access information to support their education or that of their children or relatives on a mobile phone on a monthly basis. Students can save much of their training costs versus a traditional classroom, mainly due to the elimination of the cost of travelling to attend courses. In 2015, Telkom, the MCIT and Indonesia's Ministry of Education and Culture (MoEC) embarked on an initiative that aims to replace physical textbooks in schools (which can be expensive and difficult to obtain and distribute) with tablets and ebooks.[40]

The first round of funding from the GSMA Ecosystem Accelerator Innovation Fund[41] resulted in funds being made available to Ruangguru from Indonesia. Ruangguru is a tech-enabled education provider that launched in 2014. Its flagship product, RuangKelas, is a freemium learning management system that helps students prepare for exams using content tailored to the national curriculum, and helps teachers crowdsource educational content and distribute it to students. It improves the learning experiences of students while also boosting access to resources for teachers. Ruanggurru received a grant in April 2017 to launch an online marketplace for personalised education where teachers and tutors generate content, and students access content for free or request personalised advice for a fee.[42] Ruangguru has now attracted more than 7 million registered users, with 900,000 active every month.

40. The tablet is called the 'e-Sabak'. See https://www.techinasia.com/indonesia-education-textbooks-ebooks-esabak
41. This is a programme aimed at building collaboration between start-ups and mobile operators. It is supported by the UK Department for International Development.
42. See Start-Up Portfolio, https://www.gsma.com/mobilefordevelopment/eainnovationfund/

In January 2018, Ruangguru deepened its partnership with Telkomsel, collaborating with the team from Telkomsel's prepaid youth brand, Loop. Through the partnership, Ruangguru and Telkomsel Loop launched a campaign in February 2018 — the Ruangguru Data Package — that gives users 1 GB of data, and 2GB of free data exclusively to access Ruangguru's educational content on the web and on mobile. Ruangguru has also started to feed its content into Telkomsel Loop's educational portal, Ensikloopedia. Ruangguru also announced it will be the exclusive organiser of online tests to select the prospective receivers of President University scholarship.

## 3.4 Smart cities and the Internet of Things

Asia Pacific is uniquely positioned to benefit from the Internet of Things (IoT), given the presence of a number of innovation centres across the region, and local populations' appetite to rapidly adopt new technologies. The number of smart city initiatives is growing, with innovative solutions emerging in countries such as South Korea, Singapore, Thailand, China and Indonesia. The latter's increasing mobile penetration rate and large population present a significant opportunity to leverage IoT to solve urbanisation issues and drive economic growth. Its smart city plans will revolutionise the way citizens and businesses access services in the urban environment, increase living standards and ensure sustainable resource management.

For example, since late 2014 residents of Jakarta have been able to report issues or complaints directly to the city's disaster management agency through a mobile app called Qlue, and view updates from others on their smartphones. People can share updates on rainfall, river levels and flooding; attach location-tagged photos to their reports; share their reports on Twitter and Facebook; and receive early warnings from the city's disaster information system.[43] The service has now expanded to six other cities in Indonesia. According to the GSMA Intelligence Consumer Survey, of those who had personally experienced a crisis or natural disaster in Indonesia in the past year, almost a fifth used a mobile phone to access or receive information, or to communicate with someone to provide or receive assistance in 2017.

The Jakarta administration's smart city initiatives also include CROP (Cepat Respon Opini Publik, or Public Opinion Rapid Response), a system designed to enable city officials to respond to public reports. In addition, given the considerable traffic congestion in the capital city,[44] the government has employed Google's Waze mobile app for drivers to update and share traffic information, and has explored the use of IoT-integrated road-use management systems to replace traffic toll booths.

At the 2017 Indonesia Smart City Summit, the MCIT launched a "movement towards 100 smart cities". So far, the ministry has identified 25 cities to be part of this initiative, with 75 more expected to be named by 2019.[45] A pioneer of the movement is Bandung, which has begun the task of integrating data between government divisions and agencies to increase reliability, efficiency and effectiveness. Also, in April 2018, Indonesia proposed three of its cities (Jakarta, Makassar and Banyuwangi) to be included in the ASEAN Smart Cities Network (ASCN) cooperation programme, which aims to address the challenges of urban areas through technological and digital development in line with the needs and potential of the region.[46]

The second Indonesian firm to receive money from the GSMA Ecosystem Accelerator Innovation Fund was eFishery.[47] Indonesia is the second largest aquaculture producer in the world; however, inefficiencies and a lack of skills and data are forcing Indonesia's 3.5 million fish and shrimp farmers to cope with high feeding costs.[48] eFishery offers an IoT-based smart fish-feeding machine for commercial aquaculture. The feeder senses the appetite of fish through motion sensors that analyse their behaviour. The proprietary software also allows fish farmers to remotely manage feeding in real-time from their phones. eFishery received a grant in February 2018 to extend its value proposition to fish farmers by adding more features to the service and conduct a pilot project on narrowband IoT (NB-IoT) with a mobile operator partner.

43. Building Digital Societies in Asia, GSMA, 2015
44. "Indonesia's Capital Has World's Worst Traffic", The Diplomat, February 2015
45. "Ministry launches 100 smart city movement", Republika, May 2017
46. "Indonesia expands smart city network to ASEAN", Antaranews, April 2018
47. See Start-Up Portfolio, https://www.gsma.com/mobilefordevelopment/eainnovationfund/
48. 60–90% of total production costs.

# 3.5 Consumer base growth increasing the addressable market

Increasing the coverage of, and expanding access to, mobile broadband services can encourage consumers to progress from basic technologies and grows the number of users and amount of activity online. This expands the addressable market for digital services, which can be a significant driving force behind many economies.[49] Moreover, encouraging the use of mobile services enhances the diversity of consumers connected, which provides new business opportunities and models for telecoms providers.

For example, in 2017, Telkomsel signed a memorandum of understanding (MOU) with Habibi Garden and Eragano to develop Peduli Tani Anak Negeri (PETANI), a digital agriculture programme. The partnership aims to empower farmers, increase their productivity, minimise failures to plan and reduce costs. It will combine Telkomsel's rural mobile network footprint with Habibi Garden's ability to monitor real-time plant conditions and Eragano's agricultural market access, financial support and capacity-building solutions. Similarly, XL's mFish initiative promotes the use of digital technology to improve the productivity and safety of Indonesian fishermen, while preserving the country's environment and marine ecosystems.

In Indonesia, the growth in mobile broadband network coverage and smartphone adoption is leading to a surge in the use of data, which, in turn, is leading to rapid growth in data revenues for the country's operators. For instance, XL's use of its 900 MHz spectrum for 3G has significantly improved coverage and quality outside of Java. In light of growing smartphone adoption and mobile internet subscribers, data revenue in Q4 2017 was more than double the figure in Q4 2015. In addition, data accounted for 52% of Indosat's total revenues in Q4 2017, up from 39% a year earlier.

Over the medium term, the ongoing migration to 4G in this highly populated market will incentivise uptake by new consumers and upgrades (and potentially ARPU uplifts) from existing subscribers, which will increase data traffic and help to offset the decline in traditional revenue (from sources such as voice and SMS). Indonesia, as well as Bangladesh and Thailand, will contribute to overall growth in revenue for the wider region, which has declined in some Asia Pacific countries due to weakening subscriber growth (particularly in the region's developed markets), intensifying competition (e.g. the launch of Jio in India), cuts to regulated termination charges and challenging macroeconomic climates.

49. "UK digital technology sector outpacing wider economy" FT, May 2018


BNI

# 4. The mobile industry's role in achieving the Sustainable Development Goals

## 4.1 Mobile addressing social challenges

Like other UN member states, Indonesia has adopted the 17 Sustainable Development Goals (SDGs) which seek to end poverty, protect the planet and ensure prosperity for all. Some 169 targets sit behind the SDGs' high-level ambitions and provide greater direction, quantification and timing for each goal. Mobile is playing a key role in tackling various social and economic challenges outlined by the SDGs, including poverty, health, education, gender equality, employment, safer cities, climate change and identity. Mobile technology provides access to tools and applications that help address these issues, and enables innovative approaches to building more efficient and environmentally sustainable societies.

**SDG 4:** Quality education – ensure inclusive and equitable quality education and promote lifelong learning opportunities for all


**Mobile operators are working to help students and teachers integrate mobile technologies into the classroom, which can enable access to greater learning opportunities for youth populations in the poorest villages and most remote locations.**

### Integrated Digital School (IDS)

IDS is a programme to digitise schools' information systems (particularly those in suburban and rural areas), which can facilitate the checking of pupil attendance through face recognition technology and radio frequency identification, and allow students access to intra- and extra-curricular activities, and the electronic book library. It has been running since 2012 and was implemented in 87 schools across Indonesia at the end of 2015.[50] The IDS programme is one of Telkomsel's key corporate social responsibility activities, aiming to provide adequate education to school communities with the supporting technology infrastructure. Telkomsel has provided training, networks, hardware and applications, including digital information and smartphones that are integrated with the teaching materials, to enhance school management and enrich the teaching/learning process.

50. Annual report 2015, Telkomsel, 2015

### Future Leaders E-Learning Portal

XL is committed to nurturing young talent in Indonesia and supporting the government's education strategy through its XL Future Leaders (XLFL) programme. Since the scheme began in 2011, XL has built a free digital learning platform, eLearn, which has allowed thousands of young adults across the country to access online training opportunities to develop their leadership skills. eLearn now has 17,000 active users.[51] As part of its 1000 Broadband Schools initiative, XL has collaborated with the MoEC to expand high-speed internet services to more than 400,000 students and teachers in 42 municipalities/districts in 20 provinces.

## **SDG 5:** Gender equality – achieve gender equality and empower all women and girls


**In low- and middle-income countries, women often have less access than men to mobile technology. Closing the gap in mobile ownership and internet use today could generate an incremental revenue of $15 billion (IDR216 trillion) over the coming year.[52] The mobile industry is working to close this connectivity gap and deliver socioeconomic benefits to women, such as increased access to financial, health, education and employment services.**

### T-Cash

T-Cash, a mobile money product from Telkomsel, has been empowering women in Indonesia since its launch in 2015. To accelerate the formation of the digital financial services ecosystem, Telkomsel has worked together with Muslimat Nahdlatul Ulama (MNU) to introduce T-Cash to Perempuan Nusantara (Women of Indonesia) community members as a non-cash solution for transactions. This collaboration enables women, especially those who work in small- and medium-sized enterprises (SMEs), to act as T-Cash merchants, with all transactions carried out through the service. The women also received guidance to become T-Cash agents.[53] By the end of 2017, T-Cash had accumulated more than 10 million registered users in 34 provinces in Indonesia.[54]

### Sisternet

Sisternet is XL's digital platform for Indonesian women, introduced to empower and enrich women's online experience, and to encourage and inspire their participation in the digital economy. At the end of 2017, the Sisternet community had more than 15,000 registered users.[55] The XL portal contains information and advice on health, careers, finance, family life and parenting, as well as offering mentorship through the Sisternet Academy.

## **SDG 16:** Peace, justice and strong institutions – provide access to justice for all and build effective, accountable and inclusive at all levels


**In Asia Pacific, around 850 million people (20% of the population) are estimated to be unregistered, including around 65 million children under the age of five.[56] Given its high global penetration levels and population coverage, mobile has the potential to be leveraged as a trusted and robust digital identity solution for the underserved, leading to greater social, political and economic inclusion, and making individuals more visible to their governments.**

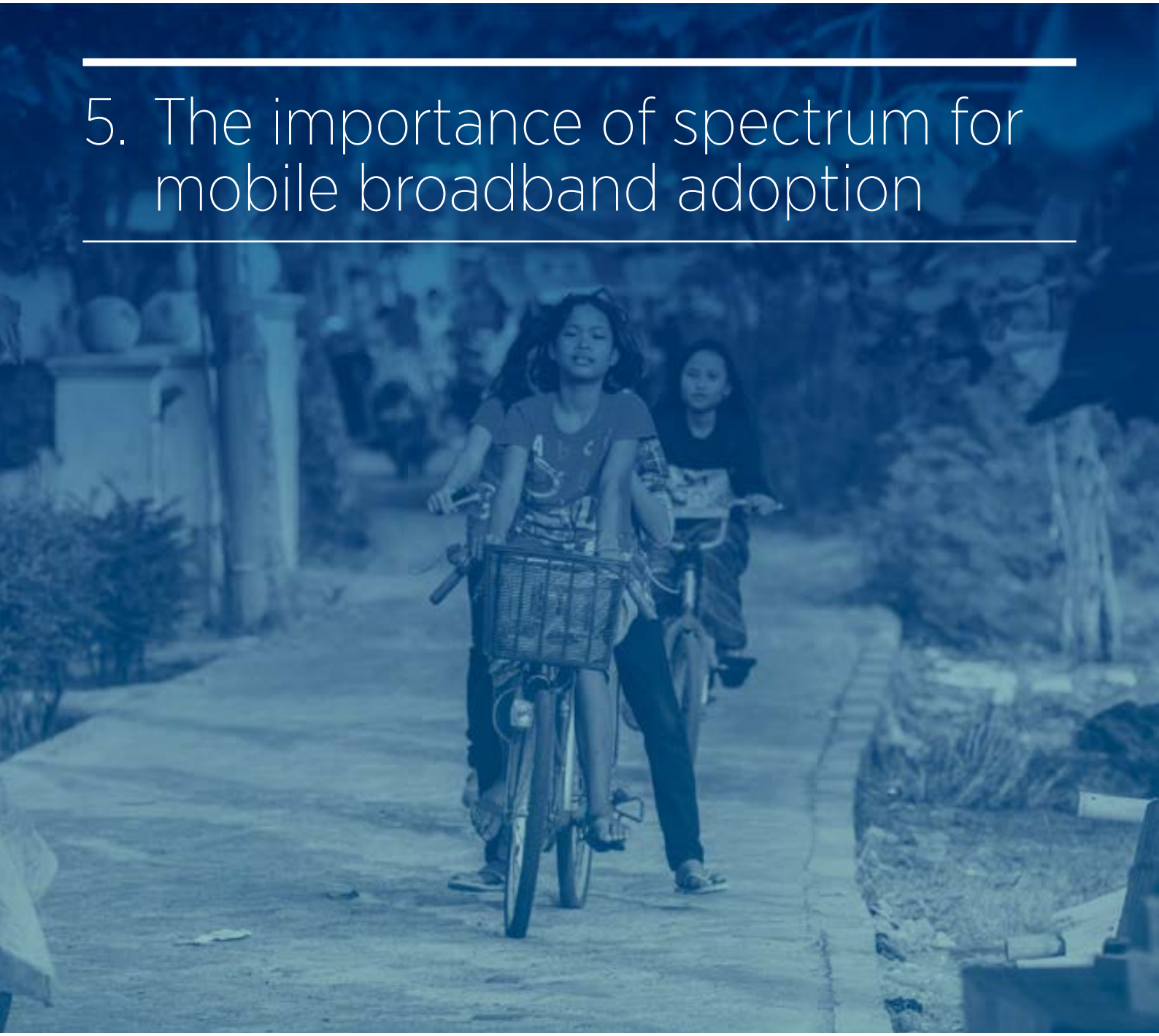
### Identity initiatives

Indonesia represents a progressive adopter of electronic identity credentials and technologies in light of the launch of its ambitious e-KTP (Kartu Tanda Penduduk Elektronik, or Resident Identity Card) programme in 2011. It has been able to rapidly scale up enrolment in the programme, reaching 100 million people during the programme's first year and 140 million by 2012.

Since 2015, child-development organisation Plan International has been working with the Ministry of Home Affairs (MoHA) to identify ways to increase the coverage of birth certificates in Indonesia.[57] As part of the Medium Term Development Plan 2015-19, Indonesia's president has set a target of 85% of children to have a birth certificate by the end of the period. One social protection programme is therefore using a mobile app to complete birth registration for applications and marriage certification. SIAK, MoHA's population database, validates the application using the unique ID numbers of the parents, which then triggers the creation of an identity-card number as well as a birth certificate for the child.

51. Annual report 2017, XL Axiata, 2017
52. The GSMA estimates that, in low- and middle-income countries, 184 million and 327 million fewer women than men own a mobile phone and use the mobile internet, respectively. The $15 billion estimate assumes that this gender gap would be closed during 2018, and represents the subsequent 12-month incremental revenue opportunity. For more information, see The Mobile Gender Gap Report 2018, GSMA, 2018
53. Annual report 2016, Telkomsel, 2016
54. "Tcash on being an agnostic product and its plan to spin-off from Telkomsel", E27, December 2017
55. Sustainability & National Contribution Report 2017, Axiata, 2018
56. World Bank ID4D database
57. Birth registration for all in Indonesia: A roadmap for cooperation, Plan International, 2016

# 5. The importance of spectrum for mobile broadband adoption



## 5.1 The need for spectrum

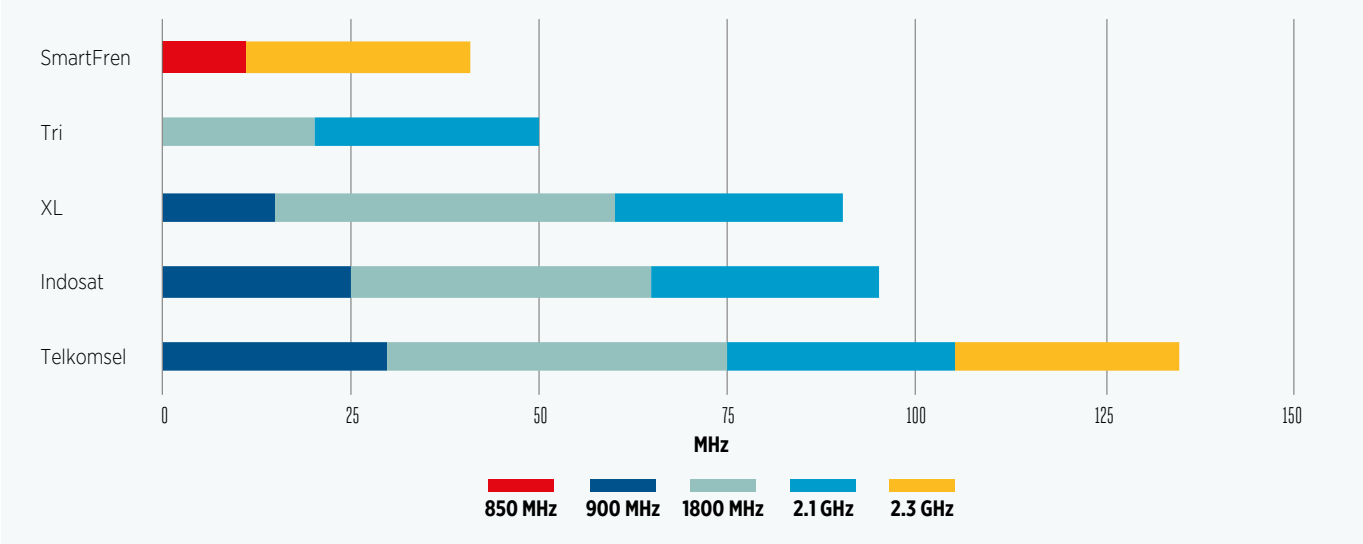
The internet has been the most important enabler of social development and economic growth of the last generation. Yet, despite significant mobile internet penetration growth in recent years, 2.4 billion mobile subscribers in Asia Pacific remain offline. These consumers, mostly in low- and middle-income countries, are therefore unable to benefit from the opportunities of the internet. When considering how to reduce the digital divide, each of these nations faces challenges around some key enablers of mobile internet connectivity, including affordability, consumer readiness and availability of locally relevant content.

For Indonesia, one of the biggest barriers to the adoption of mobile services is the availability of high-performance mobile internet network coverage. It is the world's biggest mobile-first market, but according to the GSMA's Mobile Connectivity Index Indonesia scores 61 overall with a score of 43 for the infrastructure component.[58] The infrastructure score may be higher than some of its regional peers, such as Bangladesh (35) and Pakistan (34), but is well below countries such as Australia (84) and South Korea (78) – and below the average result of 51 for Asia Pacific.

Despite rising industry investment, one of the primary causes of a low total score (and, in particular, a relatively poor performance on the infrastructure metric) is a lack of spectrum availability for use by mobile providers. This is reflected in a score of 18 for the spectrum dimension in the index, which feeds into Indonesia's overall ranking. The key drivers of this score are limited rural 4G coverage, slow download/upload speeds and an incomplete digital switchover.

Effective spectrum licensing is critical to support the investment required to further expand mobile access, as well as enhance the quality and range of services offered to citizens. Allocations of licensed spectrum guarantee the protection of the large and necessary investments for nationwide network rollouts, encouraging long-term financial commitments for the benefit of a connected society. With a future 'spectrum crunch' expected as data traffic increases, additional bandwidth will be needed, as will more tower sites and improved efficiency (through technology upgrades).

FIGURE 9: SPECTRUM HOLDINGS OF INDONESIAN MOBILE OPERATORS[59]



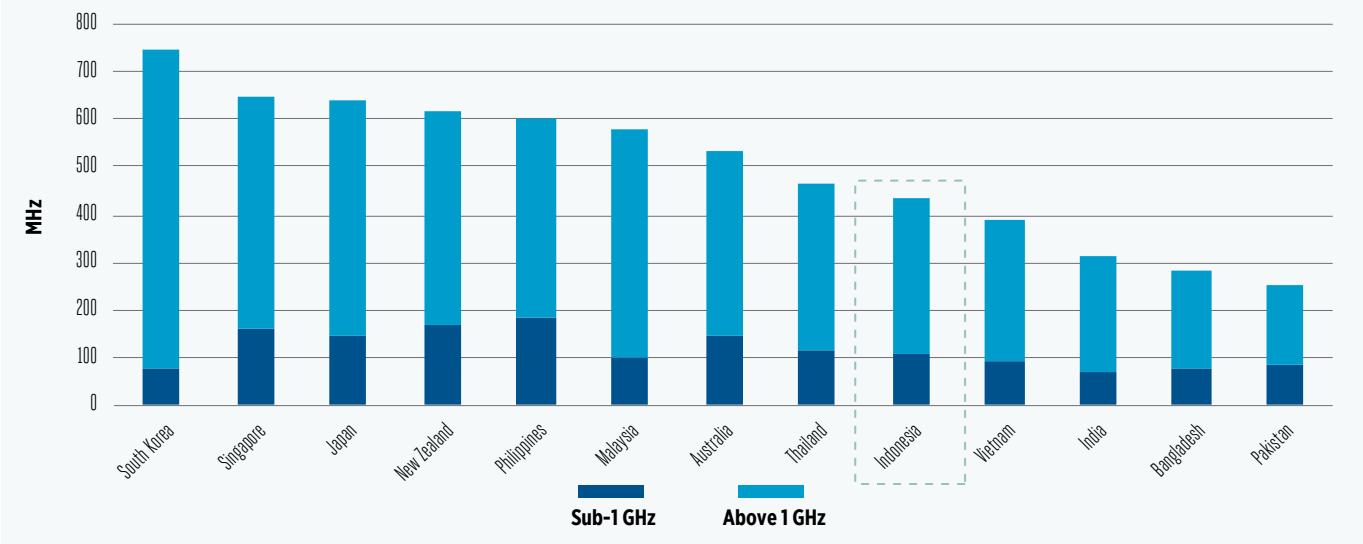

Source: GSMA Intelligence

As shown in Figure 10, the majority of spectrum currently available in Indonesia is at frequencies above 1 GHz. Much of the spectrum assigned to Asian mobile operators in the past five years or so has been in higher capacity bands, which are less suited to providing 4G coverage in remote areas. Operators typically use these frequencies to cover densely populated areas where data traffic is concentrated and substantial capacity is needed to avoid network congestion. Lower frequencies (below 1 GHz) provide greater geographic coverage at a lower cost as fewer base stations are required, making these coverage bands ideal for use in rural areas.

58. See https://www.mobileconnectivityindex.com/

59. Net1 also holds 15 MHz in the 450 MHz band, while a number of regional operators, including BOLT!, hold spectrum at 2.3 GHz

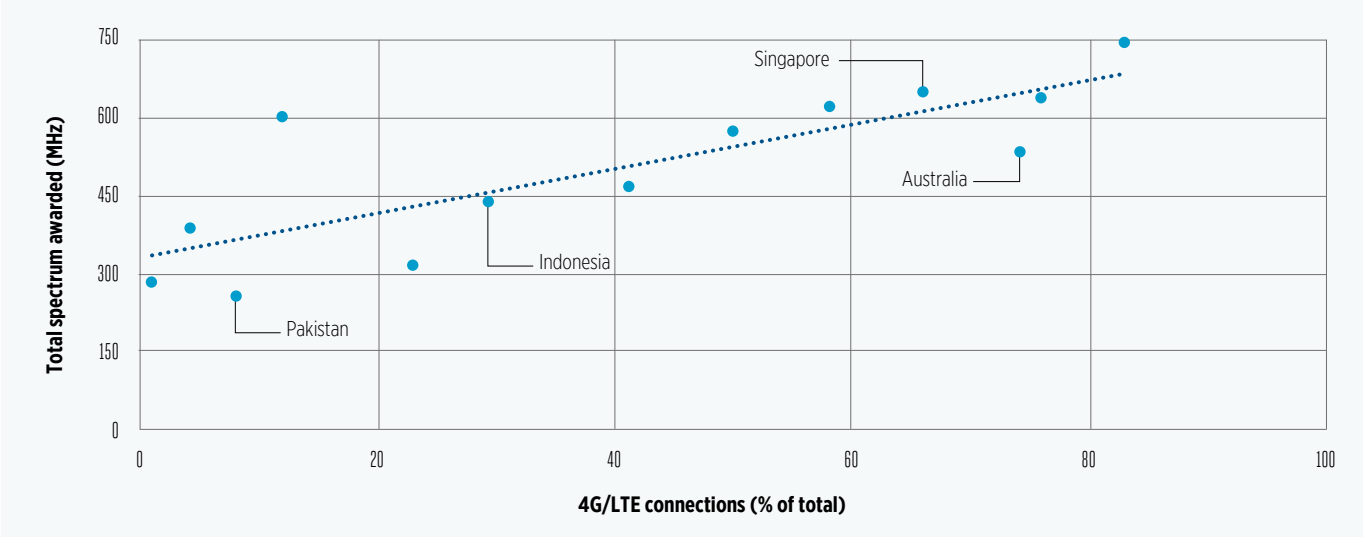
FIGURE 10: SPECTRUM ALLOCATIONS ABOVE AND BELOW 1 GHZ[60]




Source: GSMA[61]

When analysed against several relevant comparator countries, Indonesia lags well behind many of the developed Asian markets – as well as behind the Philippines – in terms of spectrum availability for mobile operators. According to studies by the International Telecommunication Union (ITU),[62] the estimated spectrum requirement for mobile services for 2020 is between 1300 MHz and 1960 MHz of bandwidth. This requirement is much higher than the current 437 MHz assigned in Indonesia.[63] Accordingly, the Mobile Connectivity Index scores Indonesia below the regional average for per-operator spectrum availability at both sub-1 GHz[64] and between 1-3 GHz for each of the four years studied (2014, 2015, 2016 and 2017).

FIGURE 11: SPECTRUM AWARDED VERSUS 4G ADOPTION IN ASIA PACIFIC[65]




Source: GSMA

60. South Korea excludes 28 GHz spectrum awarded in June 2018.
61. See https://www.gsmaintelligence.com/networks/
62. Report M.2290, ITU, 2013
63. A similar story is transpiring in Central America. For more detail, see Assessing the impact of market structure on innovation and quality, GSMA, 2018, https://www.gsma.com/latinamerica/competition-centralamerica
64. Excluding the digital dividend (700 MHz) band.
65. GSMA Intelligence data for Indonesia, Australia, Bangladesh, India, Japan, Malaysia, New Zealand, Pakistan, the Philippines, Singapore, South Korea, Thailand and Vietnam. Data correct as of H1 2018.

While some Asia Pacific countries, including Indonesia, have launched LTE networks at frequencies below 1 GHz, only a fraction of available spectrum in the region is in this range. While the 450, 800, and 1800 MHz bands have been successfully refarmed for 4G use, assigning more low-frequency spectrum is key to improving rural coverage. The ongoing deployment of 1800 MHz for 4G services by Indonesian mobile operators will only be feasible in urban areas. In rural parts of the country, using the 1800 MHz band for 4G will at some point become financially unsustainable; sub-1 GHz spectrum will be required to efficiently serve a wide population. Given Indonesia's digital society ambitions, mobile infrastructure and services need to meet future demand.

## 5.2 Releasing the digital dividend in Indonesia

While certain 2.6 GHz frequencies should become available for mobile in the coming years once the current licences expire, a more practical and effective way the Indonesian government could increase mobile broadband coverage and adoption in the country is to quickly release 700 MHz spectrum for use by mobile operators.

There have been coordinated efforts in the region – specifically, a joint commitment from Malaysia, Indonesia, Brunei and Singapore in 2013 to align with the Asia Pacific Telecommunity (APT) 700 MHz band plan.[66] However, while the likes of the Philippines have reallocated this spectrum to mobile, Indonesia has still not completed its digital switchover process and is therefore yet to allocate spectrum in the digital dividend band (700 MHz) to mobile services.

On 1 August 2018, the MCIT issued a consultation on digital TV broadcasting, but made no announcements of timelines for when the band is to be released to operators. As this band is key to bringing affordable 4G mobile broadband services to all parts of Indonesia, from dense urban areas to communities living more rurally, and realising numerous socioeconomic benefits, it is critical that planning for the release of the band moves forward.

As many of the people who will become connected during the next few years live in rural areas, this band's technical characteristics support better coverage with less infrastructure compared to higher bands, which are typically used for boosting capacity in hotspot areas. This efficiency enables operators to reduce capital and network costs, benefiting consumers through faster rollouts and lower retail prices. With millions of Indonesian citizens unserved by any type of broadband, the 700 MHz band, and spectrum below 1 GHz in general, will continue to be important as operators strive to connect everyone. By gaining access to 700 MHz spectrum, operators will be well placed to tackle the prevailing coverage gap, resulting in higher mobile penetration and improved access to services, such as education and healthcare, in rural areas. Mobile operators, other ecosystem companies, governments and regulators all have a role to play in ensuring that Indonesia reaps the benefits as soon as possible.

66. "GSMA welcomes decisions by Brunei, Indonesia, Malaysia and Singapore to harmonise spectrum for mobile broadband", GSMA, June 2013


# 5.3 Effective spectrum pricing

Effective pricing is a key feature of spectrum policy that supports better quality and more affordable mobile broadband services. High spectrum prices have been linked to more expensive, slower services, with worse coverage.[67] It has also been shown that governments appear to be playing an active role in driving up spectrum prices to pay off short-term national debt.[68] Governments should assign spectrum to support their digital connectivity goals rather than as a means of raising revenue.

High spectrum prices increase operator costs, which reduces their financial ability to deploy mobile networks and therefore put the spectrum to use, as funds are diverted towards licensing instead of infrastructure rollout. They may also be passed through to consumers, which can acutely affect affordability for rural users. If they are set too high, spectrum can go unsold, which causes an irrecoverable loss of commercial and public value.[69]

When considering how to award spectrum (such as the 700 MHz and 2.6 GHz bands) to mobile operators, it is vital that the government and regulator consider the need for effective and affordable pricing. Mismanagement could have a detrimental impact on operators' ability to formulate strategy and invest, putting the growth of the Indonesian mobile market at risk.

In spectrum auctions, reserve prices are used to help discourage non-serious bidders and ensure a floor price for spectrum in case competition for the licences is weak. Regulators should set reserve prices below a conservative estimate of market value to ensure scope for competition and price discovery in the auctions. A modest reserve price will deter frivolous entry of non-competitive firms while ensuring that winners pay at least the 'opportunity cost' of having denied the next best use for the spectrum. Pricing rules – whether by auction or beauty contest – should also offset any onerous coverage obligations with commensurate concessions via a discounted final price.[70]

Myanmar provides a prime example of the positive outcomes from pricing spectrum to expand coverage rather than to maximise revenue from an auction. Despite a late liberalisation of the telecoms market, Myanmar has leapfrogged other emerging markets to

67. Spectrum pricing in developing countries, GSMA, 2018, and Effective Spectrum Pricing, GSMA and NERA, 2017
68. Spectrum pricing in developing countries, GSMA, 2018
69. Enabling Rural Coverage: Regulatory and policy recommendations to foster mobile broadband coverage in developing countries, GSMA, 2018
70. Effective Spectrum Pricing: Supporting better quality and more affordable mobile services, GSMA and NERA

deploy 4G services, with mobile connections reaching 55.7 million as of H1 2018 compared to 5.4 million at year-end 2012. The upfront cost of the 900 MHz band, guaranteed tenure of spectrum licences and clear roadmap for future spectrum releases helped give new entrants Telenor and Ooredoo the confidence to invest rapidly in the expectation of gaining market share.

The cost of spectrum usually includes annual fees in addition to upfront costs. Annual fees can represent considerable expenses for operators and prove another barrier to mobile broadband coverage and adoption. Annual spectrum fees for Indonesian mobile operators are calculated using a formula based on the frequencies and transmitters that are in use. This formula makes spectrum in Indonesia particularly expensive and discourages network investment. A historical analysis by the GSMA shows that these fees are approximately 10% of gross revenue.[71] Indonesia charges the highest gross fee for spectrum among the neighbouring ASEAN countries. This directly affects the industry's net present value (NPV) and hence telecoms service delivery. GSMA findings suggest that reducing spectrum fees to a ceiling of 5% of gross income would increase fiscal revenues by $47 billion (IDR677 trillion) over a 10-year period.

## 5.4 Benefits of a long-term spectrum roadmap

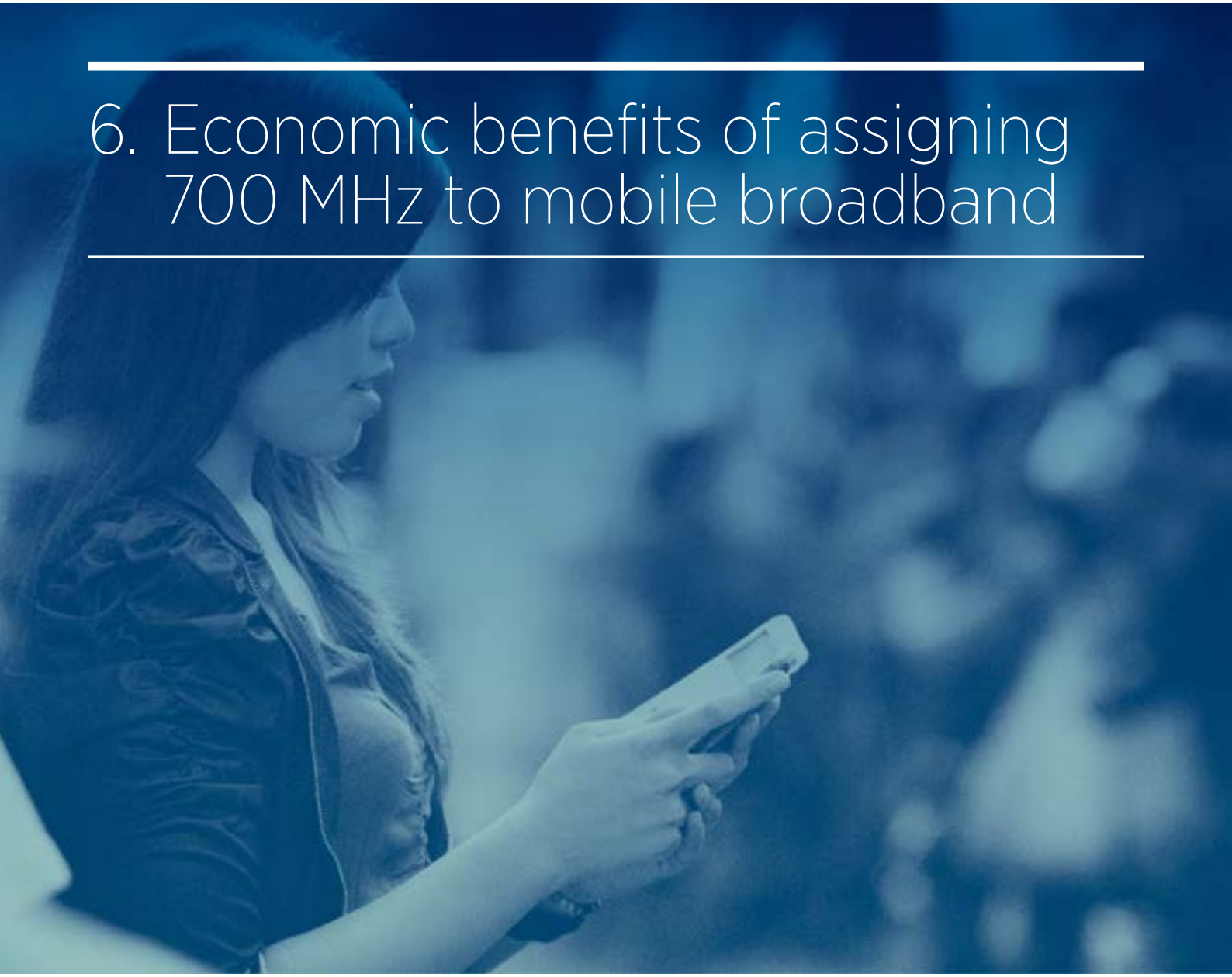
Governments can maximise the social gains from national spectrum resources by developing a management framework that supports investment, the efficient use of spectrum and competition. This framework should ensure that sufficient spectrum is available for the services that will deliver the greatest benefits to society, establish clear rights to avoid interference and avoid unnecessary restrictions and conditions of usage.

With respect to planning and certainty, it is essential for the evolution of a country's mobile sector that a clear and comprehensive spectrum roadmap is in place. This sets out the steps and timings in making available unused spectrum and better utilising existing allocations. Spectrum roadmaps are also important for ensuring sufficient spectrum will be available to meet the requirements driven by changing technology and demand. Mobile operators' business plans are intrinsically linked to the availability of spectrum and the conditions under which it is made available, while the complexity and cost of decisions to acquire spectrum mean they should be provided with as much notice as possible of forthcoming assignment processes, especially in the case of spectrum renewals. A holistic roadmap that outlines the government's strategy for the release and renewal of spectrum protects against an asymmetry of information. It reduces uncertainty by allowing operators to assess the long-term value of their infrastructure investments and more accurately value spectrum lots when they are auctioned.

Short licence duration should be avoided so as not to create uncertainty on the long-term return on investments, making them less attractive, especially towards the end of the licence term. The longer the duration of a licence, the greater the certainty provided for operators to undertake investments in rolling out networks and deploying new services. These factors combined with an investment-friendly regulatory environment will enhance stability, reduce risk and encourage Indonesian operators to develop business cases and make positive network investment decisions.

71. Internal 2016 GSMA report.

# 6. Economic benefits of assigning 700 MHz to mobile broadband

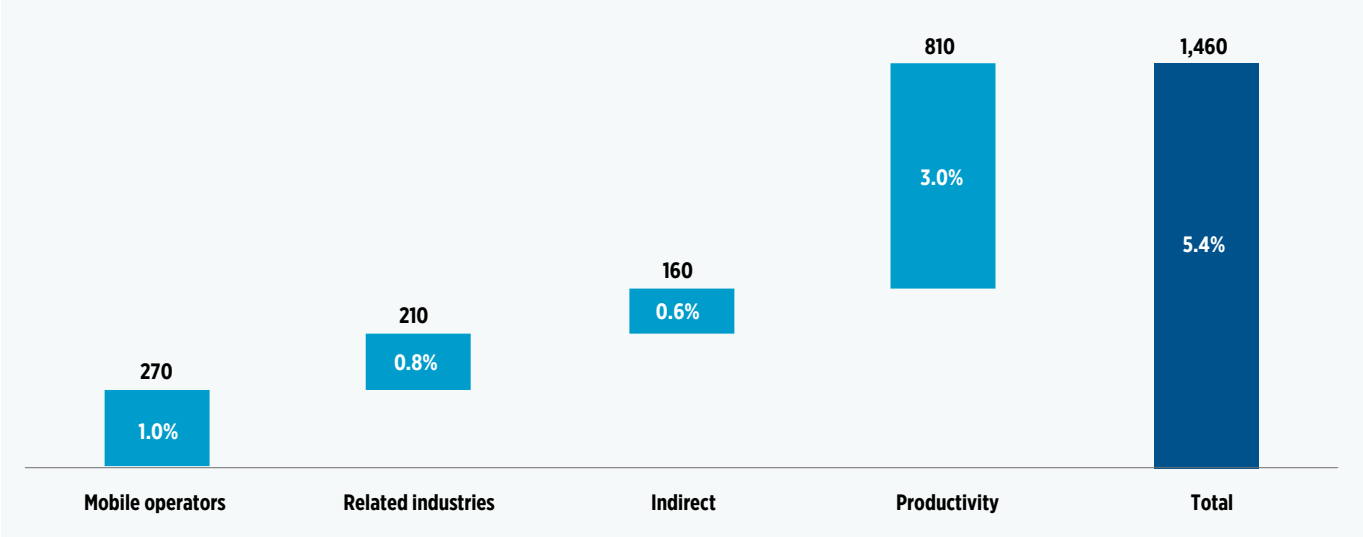


The internet has allowed economic growth to take a new direction in many countries. As a result, a burgeoning digital economy has grown, which has supported related industries and millions of jobs worldwide. The large-scale adoption and use of digital technologies is a key driver of measurable social and cultural value, increased productivity, improved security and greater capacity to tackle social and environmental issues.

In 2017, the mobile ecosystem[72] contributed $1.5 trillion to the Asia Pacific economy, equivalent to 5.4% of the region's GDP.[73] Mobile has been instrumental in expanding the reach of the internet for a large number of people, particularly in the areas that are hardest to reach. However, as more people become able to access mobile internet, providing good capacity will be crucial to ensuring the continued growth of Asia Pacific's – and Indonesia's – digital economy.

72. This includes mobile network operators; infrastructure service providers; retailers and distributors of mobile products and services; device manufacturers; and mobile content, application and service providers.
73. The Mobile Economy: Asia Pacific 2018, GSMA, 2018

FIGURE 12: MOBILE (DIRECT, INDIRECT AND PRODUCTIVITY) CONTRIBUTION TO GDP IN ASIA PACIFIC (2017 $ BILLION, % 2017 GDP)




Source: GSMA Intelligence (note: totals may not add up due to rounding)

# 6.1 There will be a capacity constraint with the current provision of spectrum

As a fast-growing digital economy, Indonesia's citizens will demand more and more data over the next 10 years and beyond. Cisco estimates that Indonesians will download 3.5x more in 2021 than they did in 2017.[74] At the same time, the number of mobile broadband users in Indonesia will grow from 39% of the population in 2017 to 56% in 2021. This demand for data will need to be met with improved capacity for mobile networks.

Moves towards providing additional capacity are underway in Indonesia's main urban centres, with the widespread provision of 3G services and recent investment in 4G. However, rural Indonesia, where just under half the country's population lives, struggles with existing mobile broadband capacity in comparison. With typically low fixed broadband coverage, rural areas depend on mobile internet to access basic services relating to finance, healthcare, government services and social media. Mobile broadband more generally enables consumers and businesses in rural areas to stay connected and participate in digital commerce and society. Yet, as rural Indonesia is sparsely populated, providing wide coverage of good quality mobile broadband can be expensive. A recent GSMA report[75] highlights the issues faced by operators in tackling rural coverage:

- Population density: people are more spread out in rural areas, making it hard to efficiently cover a commercially sustainable number of consumers with a mobile network. This is stark in Indonesia, where urban density is 4,159 people per square kilometre, compared to 72 people per square kilometre in rural Indonesia.
- Difficult terrain: there are many geographical features such as mountains and dense forests in rural areas, which make network design difficult. Indonesia's particular issue is the sheer number of small islands that are common in its rural parts, making it difficult to plan efficient sites and roll out backhaul.
- Lack of basic infrastructure: power provision, road access and public buildings are all important to identifying areas suitable for the rollout of networks. Rural areas often lack one or more of these features.
- Low per-capita income levels: the three above factors mean it is significantly more costly to build networks in rural areas than urban areas. Rural consumers tend to also have lower incomes than their urban compatriots.[76] Coverage is meaningless if it cannot be achieved efficiently to enable lower prices.

74. VNI Mobile Forecast Highlights, 2016-21, Cisco
75. Unlocking Rural Coverage: Enablers for commercially sustainable mobile network expansion, GSMA, 2018
76. For example, 13.8% of the rural population live below the poverty line, compared to 8.2% of urban Indonesians. See Summary of Indonesia's Poverty Analysis, Asian Development Bank, 2015

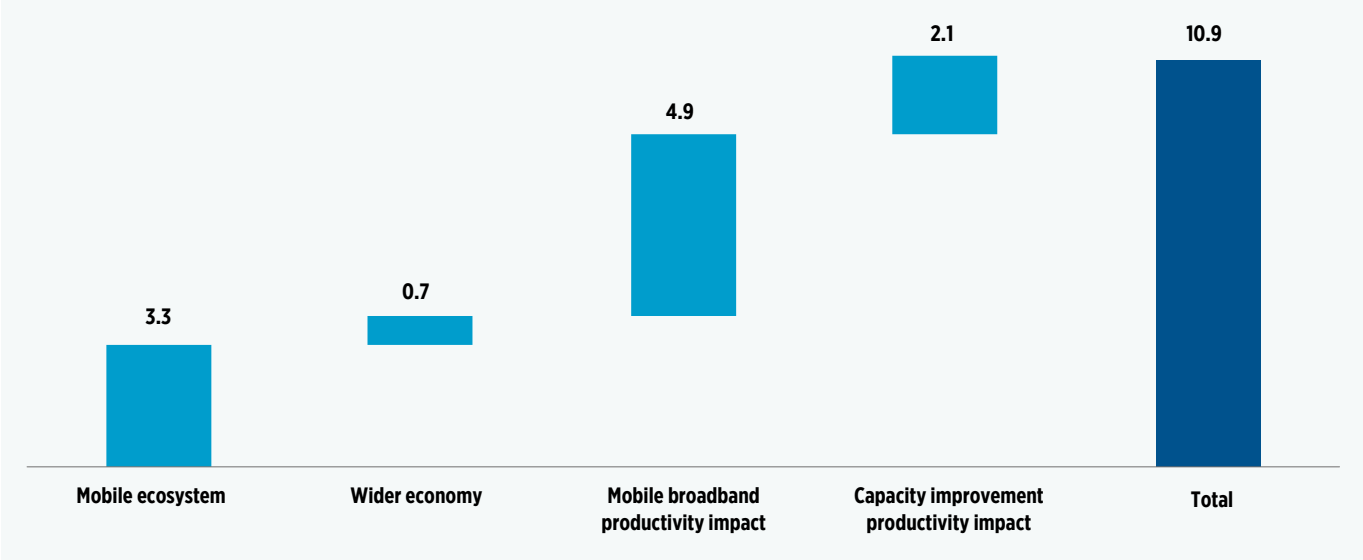
While 1800 MHz and 2.1 GHz has been effectively used in Indonesia for deploying 3G and 4G in urban areas, success in rural areas is dependent on spectrum from lower bands to gain coverage over a wider area. To provide mobile broadband in rural areas, operators are currently relying on 850 and 900 MHz frequencies, which are already used for 2G services. Some Indonesian operators have successfully used these bands to increase the reach of mobile broadband to almost 90% of the country. However, with significant data growth expected over the years, more sub-1 GHz spectrum is needed to continue serving rural areas effectively.

In countries across the region, sub-1 GHz spectrum has been used to provide mobile broadband coverage in rural areas. The Asia Pacific Telecommunity (APT) agreed to a technical allocation of the spectrum in the 700 MHz band, which has since been adopted by many countries in the region including Japan, India and Australia for future use. Indonesia will also benefit from the use of sub-1 GHz spectrum for mobile services – not only mobile broadband, but also vital services such as public protection and disaster relief (PPDR), and education.

## 6.2 $11 billion in additional economic benefits for Indonesia

If 700 MHz spectrum is allocated to mobile broadband, the Indonesian economy will experience economic benefits over the 10-year period between 2020 and 2030 of $11 billion, adding 1% to total the country's GDP by the end of the period. This figure is estimated by calculating three economic impacts: on the mobile ecosystem, on the wider economy and on economic productivity.

FIGURE 13: ECONOMIC IMPACT OF ALLOCATING 700 MHZ TO MOBILE (10-YEAR IMPACT, NPV $ BILLION)




Source: GSMA Intelligence (note: totals may not add up due to rounding)

### Impact on the mobile ecosystem

The mobile ecosystem consists of mobile operators and infrastructure providers, mobile handset manufacturers, retailers and distributors of mobile products and services, and mobile content, application and service providers. The direct economic contribution to GDP of these firms is estimated by measuring their value added to the economy, including employee compensation, business operating surplus and taxes.

The availability of more sub-1GHz spectrum will mean that it will become more technically and commercially feasible for operators to roll out 4G in sparsely populated rural areas. As a result, mobile broadband can be delivered to rural Indonesians more efficiently. This will drive the accelerated adoption of mobile internet by residents in these areas. The impact varies over the years, but in some years mobile broadband will be used by 10 million more people (4% of the population) than in the base case.

The Indonesian mobile ecosystem will benefit from the improved adoption. The markets for mobile operators, manufacturers of smartphones and content providers will grow. This growth will add value to the economy, worth $3.3 billion in the 10-year period following 2020.

### Impact on the wider economy

In addition to their direct impact on the economy, firms in the mobile ecosystem purchase inputs from their providers in the supply chain. For example, handset manufacturers purchase inputs from microchip providers, and mobile content providers require services from the broader IT sector. Furthermore, some of the profits and earnings generated by the mobile ecosystem are spent on other goods and services, stimulating further economic activity in those sectors.

This multiplier effect trickles through the economy. Consequently, a further $700 million is added to the Indonesian economy over a 10-year period as a result of the impact of the expanded mobile ecosystem on the wider economy.

### Impact on economic productivity

Indonesian productivity can be boosted by $7 billion in the 10-year period. This is due to two impacts:

- With the faster take-up of mobile broadband, the Indonesian economy will benefit from productivity effects resulting from the 10 million Indonesians that will become new mobile broadband users. Access to mobile broadband improves access to information and services, which in turn drives efficiency in business processes across many industries, including finance and health. This impact of mobile internet is particularly significant in rural areas of Indonesia, where fixed infrastructure is poor and mostly confined to Indonesia's large cities and business and industrial districts. This will result in an impact of $4.9 billion over the 10-year period.
- The improved capacity provided by a larger allocation of spectrum and effective use of 4G technology allows current mobile broadband users better access to the internet (faster download speeds). Academic studies show that this leads to economy-wide productivity benefits, as users are able to access a wider range of services that are not possible with lower download speeds. This will have an economic impact of $2.1 billion over the 10-year period.

There are additional benefits to using 700 MHz for mobile broadband that we have not quantified in this assessment but that are equally important:

- **Indoor coverage improvements:** As well as the benefits of improved and more efficient coverage for rural areas, all Indonesians will benefit from improved indoor signals from the use of low-band spectrum for mobile broadband. This is because low-frequency spectrum has good propagation characteristics; signals are better able to penetrate walls to indoor users. This will benefit businesses in Indonesian cities in particular and could have significant productivity effects associated with the use of mobile for work and business.
- **Reduction in cross-border interference:** Indonesian territory borders Malaysia, Singapore and Papua New Guinea. Allocating 700 MHz to mobile broadband will mean the enacting of the APT 700 plan, which will ensure that all users in the region are unaffected by potential cross-border interference issues relating to mobile broadband. The ultimate benefit is improved service quality to those living closer to international borders with Indonesia, and those in Indonesia who live close to the border of neighbouring countries.

## 6.3 The benefits of 700 MHz can be realised under certain conditions

The economic benefits above have been estimated based on the current regulatory environment and an assumption that the spectrum will be made available for use from 2020 onwards. The government could consider the following to ensure that the benefits are fully realised:

- **Avoid delays in the allocation of the spectrum:** Based on our modelling, even a short delay by three years to 2023 could cost the Indonesian economy $3 billion in lost benefits. This is because of restricted speeds and the inefficient expensive build-out of base stations during the delayed years.
- **Ensure the full allocation of 700 MHz to mobile broadband:** The benefits of 4G are enhanced when large blocks of contiguous spectrum are allocated to mobile operators. Reducing the proposed allocation of 700 MHz would reduce the potential capacity of mobile broadband and therefore the benefits described above.
- **Support streamlined planning and administrative processes:** In a recent study,[77] the GSMA highlighted how Indonesian operators are often required to ask two or three administrative bodies for permission before building out a site. A fast-track process could speed up the process of mobile broadband rollout and enable consumers to enjoy higher speed broadband earlier.

77. Unlocking Rural Coverage: Enablers for commercially sustainable mobile network expansion, GSMA, 2018

# 7. Other factors to support the development of the digital economy

## 7.1 Network sharing can lower risks and costs of infrastructure deployment

Infrastructure, or network, sharing is an area for Indonesian policymakers to consider when looking at how to increase high-speed mobile connectivity and foster digital inclusion and engagement. The high upfront investment required to deploy mobile infrastructure and the long repayment cycle present operators with a number of risks and challenges. Network sharing can lower the cost of expanding 4G coverage in remote areas by allowing operators to jointly use masts, buildings and antennas, avoiding unnecessary duplication of infrastructure. It can also help reduce the carbon footprints of mobile networks.

For example, in April 2018, South Korea announced that the current infrastructure sharing regulation in place for fixed networks will be extended to mobile and will see operators participate in the co-deployment of infrastructure, including base stations. The government's action aims to accelerate 5G commercialisation while reducing rollout costs: the potential capex savings are estimated at KRW1 trillion ($923 million) over the next 10 years.[78] In India, Indus Towers, controlled by Vodafone and Idea, announced its intention to merge with Bharti Infratel to create the world's largest tower company outside China. The three companies expect the combination to support their continued rollout of 4G networks and their preparations for the 5G era.[79]

78. "Korea operators to build shared 5G infrastructure", Mobile World Live, April 2018
79. "Bharti Airtel seals Infratel, Indus Tower deal", Mobile World Live, April 2018

Indonesia's MCIT began the process of devising new rules to encourage passive sharing of network elements, including ducts, poles, towers and cabinets. The ministry considered passive sharing in areas that already have infrastructure in place ('brownfield' sites) and areas where new infrastructure will be built ('greenfield'). It also explored the potential for active infrastructure sharing (e.g. multi-operator radio access networks, MORANs) and has indicated that clear guidelines may also be released in future concerning such arrangements. While a favourable decision would allow Indosat and XL to deepen their existing LTE network cooperation programme, little progress has so far been made in moving this issue forward.

If network sharing agreements were realised, the MCIT considers Indonesian mobile operators could save 40–60% of their capital and operating expenditure, allowing them to focus efforts on extending services, strengthening their sales and marketing activities, and potentially reducing end-user prices.[80] For these efficiencies to materialise though, officials would also have to take steps to streamline network sharing rules on a national basis. The fees charged for access to various network components vary greatly from place to place. The Indonesian government should take a national-level view and put revenue raising by regions or districts aside in favour of supporting development of the country's digital economy.

Entering into a shared infrastructure deal has important strategic and financial implications for mobile operators, including lower costs due to more efficient use of infrastructure, lower risk due to co-investment, and growth opportunities from expanding coverage to new areas.[81] By reducing the risk and costs of investing in network expansion, sharing deals can have a positive effect on network coverage, especially in rural areas, thereby driving participation in the digital world. Indonesia's regulatory framework must support investment to ensure that infrastructure develops at a rate in line with the needs of the country's people.

The government should seize this opportunity by enacting regulations that allow for full active and passive infrastructure sharing, and should encourage commercially negotiated cooperation where market conditions allow, without mandating sharing that might stymie investment. For the government, the potential positive outcomes of infrastructure sharing include optimising scarce resources, less duplication of investment, higher service quality in areas where deployment of new masts is difficult, and product and technological innovation as operators compete on service differentiation.

## 7.2 Market consolidation to maintain healthy industry economics

Network deployment remains a key source of competitive advantage in mobile markets around the world. However, operators may instead look to acquire or merge with rivals to expand their footprints, acquire spectrum and/or subscribers, gain scale, realise synergies, or become a stronger market player to compete more effectively.

For policymakers, facilitating the right market structure can incentivise operator investment in mobile broadband technologies that supports the growth of the digital economy and can deliver lower unit prices and/or improved quality. A GSMA review of four economic papers[82] indicates that, due to economies of scale and a stronger financial position, in-market concentrations lead to greater investments at the company level.[83] A reduction in the number of mobile operators from the status quo could encourage investment by allowing the remaining players to benefit from scale economies and better recover network costs; this could be important in Indonesia given the relatively low ARPU levels.[84] A merger may also present opportunities for spectrum aggregation, for partnerships to develop non-traditional services, or for external financing. Investment in existing and new technologies to improve coverage and capacity would benefit consumers by enhancing network performance and increasing digital inclusion – both crucial considering the low penetration of fixed broadband.

80. "KemKominfo formulating passive infrastructure sharing rules", Telegeography, September 2017
81. Enabling Rural Coverage: Regulatory and policy recommendations to foster mobile broadband coverage in developing countries, GSMA, 2018
82. CERRE (2015), Frontier (2015), Houngbonon & Jeanjean (2015), Houngbonon & Jeanjean (2016), HSBC (2015), WIK (2015)
83. Mobile Policy Handbook, GSMA, 2017
84. Assessing the case for in-country mobile consolidation in emerging markets, GSMA, 2015

## Indonesia's push for consolidation[85]

The Indonesian mobile market has experienced rapid growth over the past decade, with market penetration increasing from 58% at the end of 2008 to 165% at the end of 2017. However, with many operators in competition, smaller players have attempted to scale up, which sparked price wars in the late 2000s, degraded ARPU and caused significant operating losses.

The MCIT has long recognised the need for consolidation in the market. Early in 2016, Minister Rudiantara of the MCIT renewed the public campaign to encourage mergers or exits among the operators. In January 2016, he threatened to revoke licences if the holders did not move soon to build out their networks, and encouraged smaller operators without sufficient resources for network investments to merge with one another or with larger operators. Rudiantara considers that by 2019 Indonesia should have only four mobile network operators.[86]

Earlier in 2013/14, XL Axiata completed its acquisition of smaller rival Axis. The MCIT approved the merger in November 2013. As required by Indonesian law, XL had to return Axis' spectrum allocations in the 2.1 GHz bands. The MCIT allowed the retention of Axis's 1800 MHz spectrum. In March 2014, the KPPU gave its post-closing opinion that the merger should be approved without permanent conditions, noting that the merger would not risk creating a monopoly, considering its 21% projected market share compared to the much larger market shares of operators Telkomsel and Indosat and finding this a tolerable delta in the Herfindahl-Hirschman Index (HHI). In its assessment, the KPPU also considered that consolidation would be beneficial as the market was too fragmented, meaning the available spectrum had to be split between many operators.

The KPPU imposed a remedy of requiring the merged entity to produce quarterly reports for a period of three years on the development of the mobile market, as well as on their products and tariffs.[87]

To encourage consolidation, the sector would benefit from having more comprehensive merger and acquisition guidelines, which would help provide clarity on the prescribed assessment process, treatment of spectrum assets post-merger and range of possible remedies considered.

A GSMA assessment of the impact of the 2012 merger between Hutchison and Orange in Austria on network quality and coverage found that the combination intensified competition in quality-related aspects and had a significant positive impact for consumers.[88] Hutchison was able to accelerate population coverage of its 4G network by 20–30 percentage points as a result of the merger, with this taking effect after two years. Hutchison's 4G network quality also increased significantly, with 4G download and upload speeds increasing by 7 Mbps and 3 Mbps, respectively, two years after the merger. The study also found positive effects on the quality of mobile networks in the Austrian market as a whole, with 4G download and upload speeds increasing by more than 13 Mbps and 4 Mbps in 2013 and 2014, respectively, after the merger, and 3G download speeds increasing by 1.5 Mbps after 2014.

However, while policymakers typically establish regulatory frameworks to facilitate competition, protect consumers and encourage innovation in the telecoms industry, they may not always appreciate the sector's role in the wider digital economy. Telecoms markets have become increasingly integrated with adjacent markets; for example, the spillover effect of economic activity in the mobile ecosystem indirectly generates employment by device manufacturers, distribution firms and infrastructure vendors. Service providers from different sectors also increasingly co-operate and compete with each other, which can make long-standing market definitions less relevant, and in some cases obsolete.[89]

85. For more information, see Competition Policy in the Digital Age: Case Studies from Asia and Sub-Saharan Africa, GSMA, 2016
86. "Build Network or Lose License, Indonesia Telecom Minister Says", Bloomberg, January 2016
87. Assessing the case for in-country mobile consolidation in emerging markets, GSMA, 2015
88. Assessing the impact of mobile consolidation on innovation and quality: An evaluation of the Hutchison/Orange merger in Austria, GSMA, 2017
89. Competition Policy in the Digital Age Case Studies from Asia and Sub-Saharan Africa, GSMA, 2016

Consolidation has frequently been looked at with suspicion, with authorities concerned that mergers could lead to higher prices for consumers. Accordingly, their merger reviews have tended to focus more on short-term price distortions and less on quality, innovation and investment. However, the mobile industry experiences frequent technology cycles, with each new generation of technology delivering a significant increase in speed and capacity, supporting the development of a digital society. Dynamic efficiencies then drive reductions in the costs of delivering services, which in turn lead to lower prices and increases in demand and volumes. With the backdrop of an effective application of competition law, merger assessments should avoid myopia and preconceived ideas of market power, and consider longer term abilities and incentives to invest. Evidence shows that efficiency effects can be significant, but they can take time to benefit consumers directly.

### The importance of asset certainty

It is essential that two parties exploring a combination are aware of the consequences for their spectrum assets if a merger is to proceed with certainty. It can often be the case that the bulk of the value in some of these potential transactions is the amalgamation of the operators' spectrum holdings. As undertaking an acquisition or a merger project is typically expensive and risks distracting management, a lack of certainty around ownership of the main asset can make it difficult for mobile operators to justify such a project at the outset. Although spectrum reassignment may be appropriate in some cases, such action must be considered carefully as it has the potential to undo some of the benefits resulting from mergers.

To that end, spectrum reallocation, in particular that which aims to ensure symmetric assignments between operators, could undermine the investment incentives of the merging parties and thereby lead to worse consumer outcomes. In contrast, a merger that provides additional spectrum may enable the enlarged entity to refarm spectrum for a new use, such as delivering LTE at the best possible speeds or with greater capacity.

Further, spectrum divestment is a time-consuming process that could also lead to the under-utilisation of a scarce resource. Consumer benefits could also be reduced if spectrum is allocated to a new entrant that has no existing customer base and may not necessarily provide an effective competitive force in the market. Should Indonesian mobile operators consider merging with or acquiring rivals in the future, the KPPU should complete a full analysis of whether or not a spectrum divestment is in the overall interests of society and the likely effects of the divestment on competition and the efficient use of spectrum.

## 7.3 Other regulatory obligations to support the digital economy

Policymakers across Asia Pacific have devised regulations that aim to create incentives for, or sometimes oblige, market players to invest in unprofitable areas. A typical solution is a universal service fund (USF), which functions by collecting levies on mobile operators and using those funds to finance connectivity initiatives determined by the government. However, while no doubt well-intentioned, inadequate governance, a lack of political independence, or ill-conceived objectives can impair a USF's effectiveness.[90]

A further means of expanding mobile broadband coverage in Indonesia and supporting the digital economy could be to introduce a 'pay or play' incentive for universal service fund (USF) contribution. Since 2009, the annual contribution to the USF has been calculated at 1.25% of each licence holder's gross revenue.[91] Under a pay or play arrangement, mobile operators would be allowed to withhold their USF contributions so long as they commit to, for example, building a number of sites in a certain area – in other words, they opt to 'play' rather than 'pay'.

90. Enabling Rural Coverage: Regulatory and policy recommendations to foster mobile broadband coverage in developing countries, GSMA, 2018

91. Payments may be made quarterly, bi-annually or annually via a mechanism of self-assessment based on the operator's annual financial statements.

## 7.4 Enhancing connectivity and inclusion through the appropriate tax system

Despite the positive contribution of the mobile sector to socioeconomic growth, countries do not always align their sector-specific taxes with best-practice principles of taxation, thereby distorting the industry's continued development.[92] Sector-specific taxes on the mobile economy have a negative impact on the industry's consumers and its operators – for example, by widening the digital divide and causing exclusion as services become too expensive for some lower income users.

In Indonesia, sector-specific taxes account for well over half of the mobile sector's total tax payments, with the mobile industry and its consumers contributing nearly a quarter of market revenues in tax. In turn, the mobile sector's contribution to government tax revenue in 2014 was almost double the industry's share of GDP. Strict regimes that divert large proportions of revenue from operators to governments can have a negative impact on connectivity. When operators retain a higher percentage of their revenue, mobile connectivity in the country is higher because the operators have more funds to spend on investment in better infrastructure, which in turn promotes increased penetration of mobile services. A recent survey by the Asia Internet Coalition similarly concluded that adopting the correct tax approach acts as an important policy lever for a country to become a digital nation.[93]

The growth in digital services provided by OTT service and content[94] providers has challenged analogue tax systems. The local impact of OTTs typically means governments must try to collect taxes from companies that do not have a legal presence or facilities in the country, but instead sell or provide intangible cross-border services. This nebulous jurisdiction of many OTTs makes it difficult for governments to raise taxes such as VAT and creates a tax asymmetry compared to taxation on local firms providing similar services.

92. Taxing mobile connectivity in Asia Pacific: A review of mobile sector taxation and its impact on digital inclusion, GSMA, 2018
93. 83% of executives in 300 digital start-ups, investment firms and multinational businesses across 11 Asia Pacific countries expressed this position.
94. In broadcasting, OTT content refers to the delivery of audio, video and other media over the internet without the involvement of a multiple-system operator in the control or distribution of the content. The internet provider may be aware of the contents of the Internet Protocol packets but is not responsible for, nor able to control, the viewing abilities, copyright and/or other redistribution of the content.

Over the past three years, five countries[95] in Asia Pacific have begun applying local taxes on OTT and e-commerce services. Indonesia has been considering imposing regulation on OTT providers, such as Whatsapp, Skype and WeChat, to create a level playing field between foreign online messaging providers and domestic operators, under the supervision of the MCIT.[96] The new rules would require OTTs to establish a permanent presence in the country, which would consequently necessitate the payment of local taxes, including corporation tax. It is likely that the regulation would also require OTTs to comply with legislation around trading standards and consumer protection, and may include restrictions on what content can be delivered via OTT services, possibly requiring ISPs to filter out any content not favoured by the MCIT, such as pornographic or terrorism-related material.

## 7.5 Identity as a foundational element of a digital economy

A digital identity is a collection of electronically captured and stored (biographic and biometric) identity attributes that uniquely describe a person within a given context. It provides a potentially transformative solution to the global identity challenge but also represents a cornerstone of the development of a digital society, enabling electronic transactions and delivering benefits to governments, citizens and businesses.[97]

Beyond utilising public services, a secure digital identity is essential for individuals to participate in a full digital lifestyle. This concept centres on the use of smart devices to access a range of locally relevant content and services. The combination of connected devices, such as mobile phones and wearables, with digital identification is enabling people to transform the way they work, communicate and play. Indonesia has one of the youngest, largest and arguably most digitally savvy populations in the world. Online news consumption and social media use have been growing rapidly in recent years; more tweets were sent from the country's capital, Jakarta, in 2014 than from any other city in the world, accounting for 2.4% of the global total.

Like connectivity, digital identity is also an enabler of commerce and payments over digital channels, which has a positive impact on the online economy and cross-border trade. In August 2017, the government of Indonesia launched a Roadmap for the National Electronic Commerce System for 2017–2019, which aims to accelerate the growth of e-commerce in Indonesia,[98] with a vision of becoming the largest digital economy in South-East Asia by 2020, with an e-commerce sector worth $130 billion (IDR180 trillion).[99] The National E-commerce Roadmap sets out 31 initiatives across seven different sectors, namely education and human resources, funding, tax, consumer protection, cybersecurity, communications infrastructure and logistics.[100]

Digital identification can have a have a profound effect on financial inclusion by overcoming physical barriers and creating opportunities for citizens to access various essential services, such as savings, credit and insurance, at a cost affordable to them. With widely available access to 3G mobile connectivity and an improving picture in terms of access to 4G, combining digital identity with mobile technology has the scope to change the landscape of financial inclusion in Indonesia. It is important that Indonesia refocuses efforts on the e-KTP project and accelerates registration and issuance to equip all citizens with a digital ID for passports, driving licences, SIM card registration, taxpayer identification numbers, insurance policies, land ownership certificates and other identity documents.

95. Australia, India, Japan, New Zealand and South Korea.
96. "Minister says Indonesian govt. to publish OTT regulation 'this year'", Telegeography, October 2017
97. Digital identities: advancing digital societies in Asia Pacific, GSMA, 2018
98. "Government Releases E-Commerce Roadmap", Amcham Indonesia, August 2017
99. "Digital Economy of Indonesia", Kominfo, October 2016
100. "Strengthen Momentum Indonesia as The Digital Energy of Asia" Indonesia E-commerce Summit and Expo, April 2017

# 7.6 A forward-looking regulatory environment for the data economy

The experiences of different markets around the world show that digital economies can take root and grow under all kinds of circumstances if several basic factors are in place. A key foundational element of any digital economy is high-speed, reliable and robust broadband infrastructure. However, just as important are digitally capable consumers, digitally competent and engaged companies and a labour pool with the requisite digital skills.

FIGURE 14: PRIMARY ENABLERS OF A DIGITAL ECONOMY


Source: GSMA

A holistic policy framework that reflects the changing digital landscape while reducing costs and barriers to network deployment will deliver the best outcomes for society and the economy.

A forward-looking regulatory environment must promote market dynamism, competition and consumer welfare. Policy objectives are best met by focusing on the services delivered to consumers, rather than the type of company or technology that delivers them. Prescriptive (ex-ante) regulations should be replaced, where possible, with measurable, performance-based approaches.

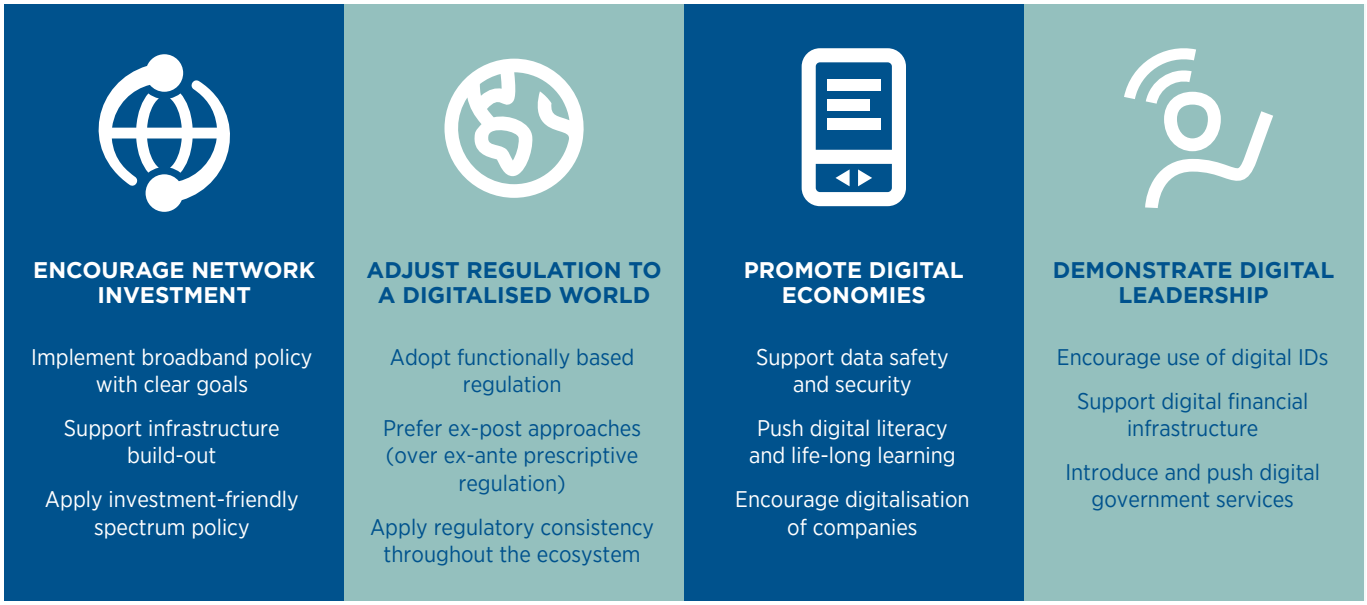
In particular, competition policy is an effective and versatile tool to ensure the proper functioning of markets, and should be updated to reflect a number of characteristics of the digital economy. For example, control of data can confer a competitive advantage, and digital market assessments should not focus solely on price but also consider other dynamic effects on quality of service and performance. A better balance is required between telecoms sector regulation and competition law, with the latter augmented by better procedures and faster decision making.[101]

Regulatory frameworks for privacy are critical to facilitate cross-border data flows in Indonesia. There is much to be gained; for example, the expected productivity improvements from digitising processes and using cross-border data flows in Indonesia's manufacturing and retail sectors is estimated to lead to an additional $34.4 billion and $24.5 billion contribution to GDP, respectively, by 2025.[102] The government has enacted various laws which relate to data privacy in a number of specific areas, but there are some gaps. The government should therefore develop and implement a privacy framework that can effectively protect the data of citizens, while also allowing data to flow across borders in ways that support trade and innovation.

101. Resetting Competition Policy Frameworks for the Digital Ecosystem, GSMA, 2016
102. Unlocking Indonesia's Digital Opportunity, McKinsey & Company, 2016

The rules designed to protect society should be applied evenly across the digital economy and not be so prescriptive that opportunities to innovate are blocked. In the dynamic digital environment, industry and businesses need the freedom and responsibility to figure out what works best. Being too prescriptive in regulation and enforcement can get in the way of the best outcomes for consumers.

FIGURE 15: KEY POLICY LEVERS TO PROMOTE WIDESPREAD DIGITAL BENEFITS AND INCLUSION




Source: GSMA

# 8. Appendix

## 8.1 Methodology for the estimation of benefits of assigning 700 MHz to mobile broadband

Our economic impact model comprises two main blocks:

1. **High-level base stations model:** Based on a number of technical assumptions, we estimated the optimum number of base stations serving the rural Indonesia population according to the amount of low-band spectrum available for mobile broadband. We changed the input to this model to estimate the new optimum number of base stations when 90 MHz of 700 MHz spectrum is made available from the vacation of broadcasters from the spectrum bands.
2. **Economic impact model:** The change in the number of base stations led to a theoretical change in the operating costs for the mobile operators in rural Indonesia. We assume that operators pass these cost savings to consumers in the form of lower prices. With this model, we then estimated:
    a. the aggregate gain in economic value added for the mobile ecosystem as a result of a higher number of mobile broadband users
    b. the gain for the wider economy through multiplier effects as a result of the expanded mobile ecosystem
    c. the gain in economic productivity from the higher number of mobile broadband users
    d. the gain in economic productivity from the improved speeds (capacity) enjoyed by mobile broadband users.

All impacts in this model are presented in 2017 prices. Future values are also discounted by a social discount rate of 3% per annum, to account for society's preference for consumption today versus consumption tomorrow.

### Methodology: high-level base stations model

A large part of the cost of providing mobile services is determined by the infrastructure costs incurred in setting up base stations and renting or building sites. The number of base stations required depends on the local population's demand for mobile data. In our model, we estimate this using the following:

- forecasts of data use per subscriber – Cisco publishes estimates[103] for Indonesia which we have used for rural Indonesian consumers as well. We assume straight-line growth in data traffic use from the end of the Cisco forecasts in 2021
- population growth – using UN population (World Population Prospects) forecasts
- mobile broadband subscriber growth: GSMA Intelligence estimates for Indonesia until 2025, with 2% annual growth assumed thereafter.

Using this data, we estimate that data traffic growth in rural Indonesia will be 8× in 2025 compared to 2018 and 13× in 2030 compared to 2018.

The number of base stations required to meet the demand for this data depends on a number of technical factors. These base stations must meet the requirements of demand at the busiest time of day to ensure that data use is not significantly impaired at these times. We estimated the optimum number of base stations using the same methodology employed in a previous GSMA report:[104]

**Optimum number of BTS** = number of distinct networks x busy hour downlink traffic / [downlink spectrum holdings x spectral efficiency x number of sectors x traffic distribution per BTS x maximum allowed load per BTS]

(For which busy hour downlink traffic = [average monthly traffic (bits) / seconds per month] x peak hour share x downlink share) The assumptions used for these factors are set out in Table 2.

103. Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021, Cisco

104. Assessing the socio-economic impact of identifying the L Band for IMT services, 2014, BlueNote for the GSMA. The modelling in this report was informed by optimal models set out in Mobile broadband with HSPA and LTE – capacity and cost aspects, Nokia Siemens Networks, 2010

TABLE 2: ASSUMPTIONS USED FOR OPTIMAL BASE STATION MODELLING

| Assumption | Value | Source |
|---|---|---|
| **Supply factors** | | |
| Total paired spectrum to be allocated: 700 MHz | 2 x 45 MHz | Input assumption |
| Total paired spectrum allocated: 850/900 MHz | 2 x 46 MHz | Research |
| Share of 900 MHz spectrum used for 2G services | 50% | Assumption based on minimum spectrum required for mobile broadband |
| Spectral efficiency, downlink, 3G – bps/Hz/sect. | 1.50 | 4G Capacity Gains, Final Report, Real Wireless for Ofcom, 2011 |
| Spectral efficiency, downlink, 4G – bps/Hz/sect. | 2.40 | LTE to 5G: Cellular and Broadband Innovation, 5G Americas/Rysavy 2017 |
| Number of sectors per BTS | 2.5 | Previous GSMA modelling work for rural areas |
| Traffic distribution per BTS | 0.25 | Industry assumption: 20% of cells carry 80% of traffic |
| Maximum allowed load per BTS | 70% | Mobile broadband with HSPA and LTE – capacity and cost aspects, Nokia Siemens Networks, 2010 (assumed 50–70%) |
| Number of distinct networks | 2 | Assumes that on average two distinct networks will be built in rural areas in the absence of active network sharing |
| **Demand factors** | | |
| Peak hour share of total traffic | 7% | Mobile broadband with HSPA and LTE – capacity and cost aspects, Nokia Siemens Networks, 2010 |
| Downlink share of total throughput | 77% | Mobile broadband with HSPA and LTE – capacity and cost aspects, Nokia Siemens Networks, 2010 |

Source: GSMA Intelligence

In order to use the optimal base station approach, we note three fundamental assumptions:

1. We assume that rural Indonesia is poorly served by base stations using 1800 MHz and 2.1 GHz for mobile broadband. This is because of the propagation characteristics for these bands, where signals would struggle to reach a wide range of the population in sparsely populated rural areas. We therefore assume that rural Indonesians are broadly served by sub-1 GHz spectrum: a portion of the 2 x 46MHz of spectrum in the 850 MHz and 900 MHz bands that is not used for 2G services.
2. We assume that the new 700 MHz spectrum would only be used on sites already using 850/900 MHz given the similar propagation characteristics of the spectrum at those bands. There would be a small gain in population coverage from using 700 MHz over 850/900 MHz, but we did not model this. In addition, given the existence of 2G base stations at these locations, we also did not model operating expenditure changes as we could not be certain about whether new mobile broadband base stations are additional or replacement – and therefore assume all new base stations to be replacements. We consider that these two assumptions make our estimates conservative.
3. As a result of this final assumption, we assume a limited ability for operators to densify networks – the majority of all new base stations in this model are replacements for current 2G base stations. We therefore applied a cap on the number of base stations built in rural Indonesia. We assume this number to be 65,000 per distinct network, partly based on previous modelling undertaken for the GSMA,[105] which estimated 25,000 sites for the last 30% of the population and a base station per site assumption of two; as well as a densification allowance of +30% of the current number of base stations.

We then calculated the cost of the base stations. We assumed a capital cost of $90,000 per base station based on previous research, and an efficiency saving of 4% every year, reflecting the improvements in manufacturing of network equipment. We reflected these costs as an annual cost. This can either be interpreted as the depreciation of the capital expenditure plus financing costs in any given year or the theoretical annual rental of the equipment. Both are based on an eight-year assumed asset life and a 12% cost of capital.

105. GSMA commissioned analysis from Coleago to understand the costs of rural infrastructure in Indonesia.

Our counterfactual cost estimate was based on the continued use of 50% of the 2 x 46MHz of 850/900 MHz spectrum to deliver mobile broadband using 3G technology. Our scenario cost estimate was based on the counterfactual spectrum use plus the use of 2 x 45MHz of 700 MHz to deliver mobile broadband using 4G technology. The greater spectral capacity and efficiency delivered cost savings in our model that fed through to the economic impact model.

### Methodology: economic impact model

We estimate the economic impact of allocating 700 MHz to mobile broadband on the back of the cost savings estimate.

#### Impact on the mobile ecosystem

We assumed that mobile operators pass on the cost savings estimated in the spectrum efficiency model above to consumers. Cost savings are passed on in the form of prices being lower than in the base case. We assumed a natural annual decrease in price per GB in the counterfactual of 4%, to match the natural reduction in the capital costs of network equipment. Consumers in rural Indonesia will be more attracted to mobile broadband and more will take up the service. We apply a price elasticity of demand of –0.4, which is based on the lower end of estimates from our literature review. The resulting accelerated take-up of mobile broadband represents an expansion in the operations and gross value added for the mobile ecosystem.

We report on the economic contribution of various parts of the mobile ecosystem in GSMA Mobile Economy reports.[106] These industries are directly affected by the change in the number of mobile broadband users. We set out how they are affected below:

- **Mobile operators:** The net value added impact of mobile operators is determined by the gross margin of mobile operators applied to the increase in revenue from new mobile broadband subscribers.
- **Handset manufacturers:** New mobile broadband subscribers require smartphones. We estimated value added by handset manufacturers by estimating the gross margin on new smartphone production. We adjusted to ensure that we only included domestic production (imports were excluded).
- **Distributors and retailers:** The new smartphones produced above are distributed and sold to new subscribers through retail outlets. We estimated value added by distributors and retailers by estimating the gross margin on the smartphones and removed the proportion that would be sold directly by mobile operators.
- **Content and application providers:** The new mobile broadband users would then use more content and purchase add-on services as a result of their new connections. We estimated value added by these providers by estimating the gross margin of the content and application production based on the average content revenue per subscriber.

All gross margins were informed by our research into benchmark company financial statements.

#### Impact on the wider economy

In addition to these direct impacts on the mobile ecosystem, we estimated the knock-on impacts to the wider economy. We estimated a multiplier based on input-output table produced by the OECD for the aggregate of non-OECD countries. We removed the interactions between the ecosystem and telecommunications, which resulted in a multiplier of the entire ecosystem on the rest of the economy of 0.2. These indirect impacts therefore represent 20% of the direct economic value added by the mobile ecosystem.

#### Mobile broadband user productivity impacts

The use of 3G and 4G technology allows workers and firms to use mobile data and internet services (improving access to market information, for example). The impact of mobile internet is particularly important in developing rural areas where a significant proportion of the population can only access internet via a mobile platform.

106. The Mobile Economy 2018, GSMA, 2018

There is a significant body of research that establishes the link between ICT and growth, a subset of which focused on mobile technology specifically as well as the internet. These studies are typically based on econometric and regression-based analysis and try to isolate the effect of mobile usage as a factor that drives GDP. There are a large number of studies but only very few are robust. In our modelling we only use the results/parameters from those studies we judge to be sufficiently robust. A selection of those includes:

- Broadband infrastructure and economic growth (Czernich, Falck, Kretschmer, Woessmann, 2009)
- The economic impact of broadband on growth: a simultaneous approach (Koutrompis, 2009)
- Economic impacts of broadband (Quiang, Rossotto, 2009)
- Mobile telecommunications and the impact on economic development (Gruber, Koutroumpis)
- Does broadband internet access actually spur economic growth? (Scott, 2012)
- What is the impact of mobile telephony on economic growth? (GSMA, Deloitte, 2012)
- Unlocking the potential of the Internet of Things (McKinsey, 2015)

We draw on this literature to estimate the productivity benefits to Indonesia as a result of more rural citizens being able to access the internet using their mobile. The focus here is on new access to 3G and 4G technologies. We used a more conservative estimate of this relationship with economic growth: based on GSMA (2012),[107] an increase in mobile broadband penetration was estimated to improve GDP by 1.5% in developing countries. We apply this estimate to the growth in mobile broadband consumers in rural Indonesia to estimate the overall productivity impact.

### Capacity improvement productivity impacts

In addition to access enjoyed by the new consumers, all users gain in productivity from improved speeds as a result of the improved spectrum capacity and efficiency. Again, a range of recent studies have looked at the relationship between broadband speeds and economic growth.

- Impact of broadband speed on economic outputs: an empirical study of OECD countries (Kongaut, Bohlin, 2014)
- The benefits of ultrafast broadband deployment (WIK-Consult / Ofcom, 2018)
- Does broadband speed really matter for driving economic growth? Investigating OECD countries (Rohman, Bohlin, 2012)
- Economic impact of broadband internet service / Impacto económico del servicio de internet banda ancha (Department for Planning / Departamento Nacional de Planeación, Colombia, 2017)
- Broadband access in the EU: an assessment of future economic benefits (Gruber, Hätönen, Koutroumpis, 2013).

We estimated the improvement in speed by calculating the percentage change in the busy hour capacity resulting from the allocation of 700 MHz spectrum compared to the counterfactual. We then weighted this improvement by the population affected (i.e. the rural population) as we assume no impact on the urban population[108] between the scenario and the counterfactual.

Based on a conservative assumption from the review of the literature above (from Rohman and Bohlin, 2012), we multiplied the percentage point change in capacity by 0.003% and the GDP for that year to calculate the GDP impact of the capacity increase for Indonesia.

107. What is the impact of mobile telephony on economic growth?, GSMA, Deloitte, Cisco, 2012

108. While the allocation of 700 MHz to mobile broadband will have a positive impact in urban areas, this population is already well served by densely built 4G networks using 1800 MHz and 2.1 GHz spectrum. The step change is therefore likely to be different in nature to the impact on the rural population, with quality impacts (e.g. greater indoor coverage) likely to dominate benefits.

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