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INDONESIA EMAS 2045

INDONESIA DIGITAL TRANSFORMATION STRATEGY

2025-2029

Indonesia Digital Transformation Strategy
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Executive Summary

The digital economy, a transformative economic paradigm, is rapidly gaining momentum worldwide, where Indonesia, in particular, has seen a remarkable surge in its digital economy, outpacing even its GDP growth. The period from 2017 to 2021 witnessed an astounding 414% increase in the digital economy, a figure that is set to multiply eightfold by 2025 compared to that of 2017.

By 2023, Indonesia had solidified its position as the second-largest digital investment hub in Southeast Asia. The country's allure for digital economy investments was evident, with a substantial influx of nearly US$22 billion, second only to Singapore's US$141 billion. With Indonesia already leading the digital economy in ASEAN, contributing 40% of the region's total digital economy output, and with significant untapped potential, the country's digital economy is forecast to be worth between US$210 billion and US$360 billion by 2030.

Despite the promising potential and robust growth of Indonesia digital economy, the country's digital facilities and services are hindered by its subpar digital infrastructure. There is a pressing need to enhance network coverage, particularly in rural areas where 4G network is not yet fully deployed, while 5G deployment is stagnant. Furthermore, our fixed broadband coverage and download rates lag significantly behind those of neighboring countries.

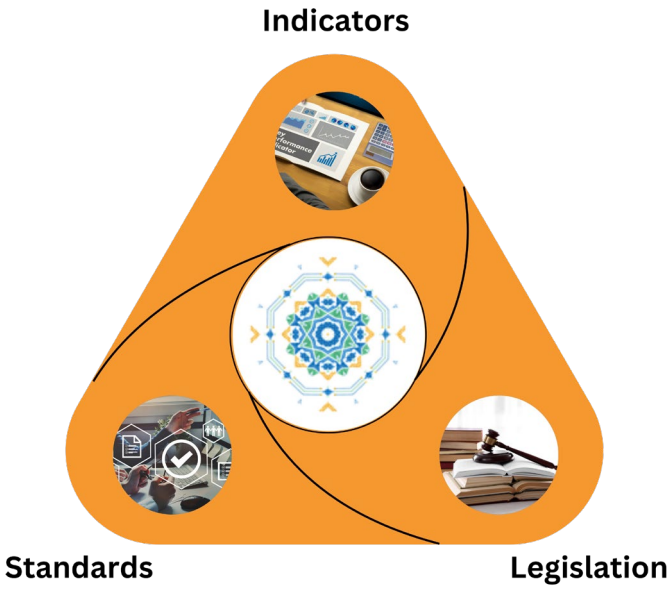
The document entitled "Indonesia Digital Transformation Strategy 2025-2029" explains achievements Indonesia has made until 2024 in terms of digital infrastructure development, e-government, cyber security, high-end R&D, super-Apps, which then also highlights the efforts of the Indonesian government in accelerating the country's digital transformation. This includes accelerating digital infrastructure construction, 5G deployment, national data center establishment, and the digital transformation of the public sector. Notably, the government is placing a strong emphasis on developing human resources for the digital industry, recognizing the crucial role of skilled professionals in driving Indonesia's digital future.

In building and realizing Indonesia's Digitalization 2025-2029, it is illustrated that there are many essential components that must be run simultaneously, from the development of digital infrastructure, digital applications, digital government, digital economy, and digital society. The supporting factors are digital talent, R&D innovation, cyber security, and policy.

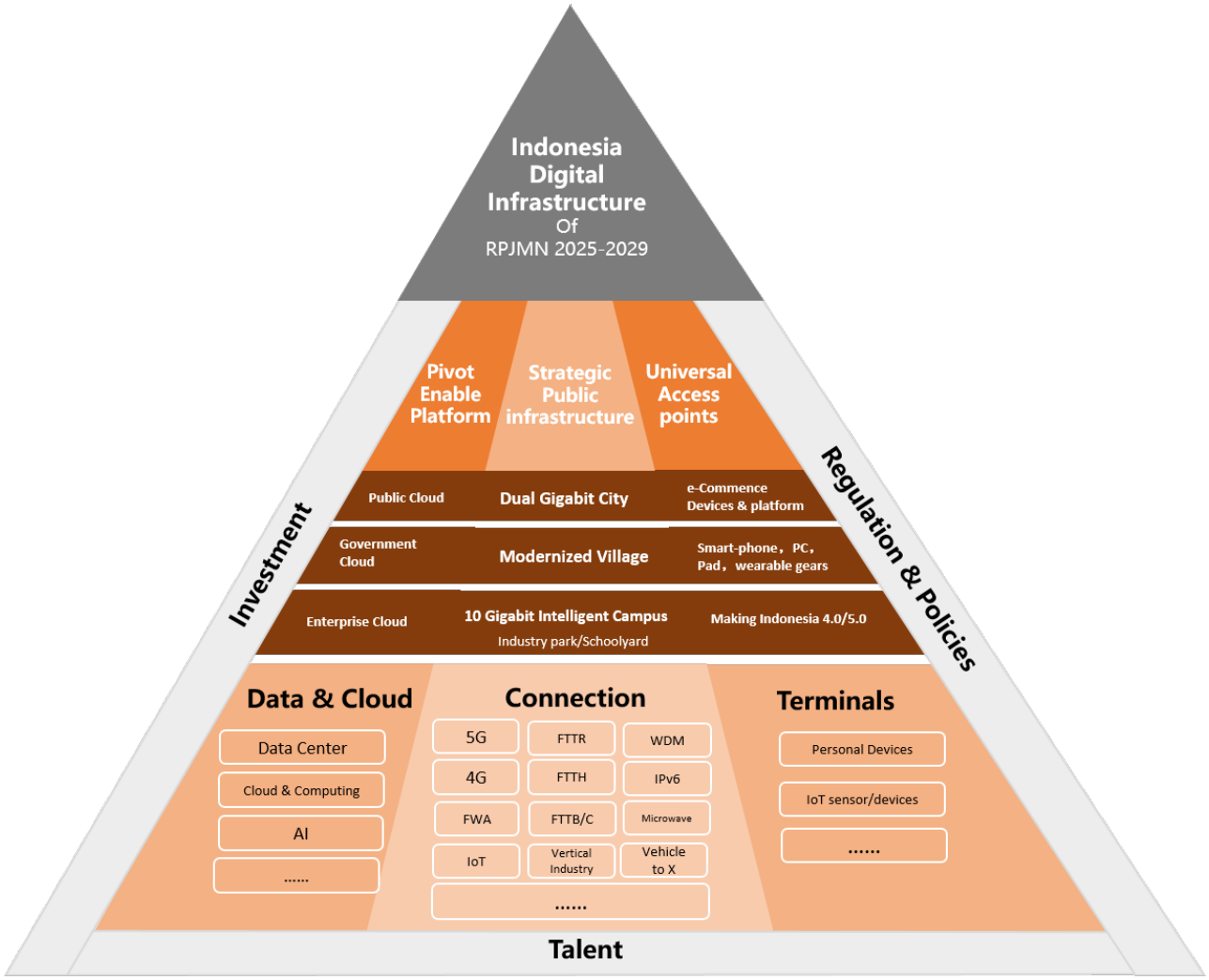
Digital Transformation Panorama Outlined in the Indonesia 2025–2029 National Medium-Term Development Plan

In the 2025-2029 National Medium-Term Development Plan, 16 indicators of digital infrastructure development are to be achieved, and 31 indicators related to digital applications. Some of these digital infrastructure indicators include a minimum broadband speed of 100 Mbps, 98 Gigabit cities (cities with ultra-fast internet connections capable of delivering speeds of 1 gigabit per second), 50% villages have received broadband internet access, Fiber to the Home (FTTH) coverage in urban areas reaching 80% and rural areas 50%, development of 1410 MW data center capacity, 5G user penetration reaching 50% with 80% coverage, IPv6 adoption reaching 40%, 1.06% ICT' sector share employment and Digital Government Index ranking at position 64. Meanwhile, digital applications will include digital government, digital education, digital health, digital agriculture, logistics, industry, digital tourism, culture, and digital energy.

By developing several national digitalization standards and policies, we can significantly improve efficiency and foster innovation. These standards and policies, e.g., wireless spectrum auction strategy that is more conducive to rapid 5G deployment, more adequate future wireless spectrum supply plan national standards for fiber pre-deployment, site infrastructure sharing, rent-free BTS in public areas, standards for simultaneous design, construction, and acceptance of digital infrastructure and leading projects, and the National digital infrastructure development monitoring platform, hold the promise of a more advanced and competitive digital landscape.



Systematic Goals Setting



Digital Infrastructure Architecture in the 2025-2029 National Medium-Term Development Plan

It is imperative to accelerate and strengthen Indonesia's digital economy and digital infrastructure. This requires not just changes, but the creation of laws and regulations in crucial areas such as artificial intelligence, digital economy, digital infrastructure, and digital communications and applications.

The National Digitalization Plan is projected to boost Indonesia's GDP significantly. A key driver of this growth will be the increasing broadband penetration in Indonesia, which is expected to impact GDP growth significantly from 2025 to 2029. By 2029, digitalization will push Indonesia's GDP to proliferate, reaching between US$1,19 trillion (low scenario) and US$1,34 trillion (high scenario) from the original RPJMN plan of US$1,07 trillion. This growth, fuelled by advancements in digital infrastructure, increased adoption of digital technologies, and the expansion of digital services across various sectors, will be a cornerstone of our economic development.

The digital transformation is anticipated to create a wealth of substantial employment opportunities. Currently Indonesia actually need more than 600K digital sector workers every year, digitalization initiative impact in 2029 will push our workers number from the original plan of 149,43 million towards 150,76 million (low scenario) up to 156.95 million (high scenario). This surge in demand for digital skills not only promises to reduce unemployment, offering hope for many, but also to enhance the overall quality of the workforce, fostering a more optimistic future for the labor market.

From 2025 to 2029, the digital investment initiative is not just a financial commitment but a key to unlocking Indonesia's economic potential. It is expected to unlock around USD 12,4 – USD 20,4 billion (low case) and USD 37,2 – USD 61,2 billion (high case) yearly in investments. These investments will be crucial in developing the necessary infrastructure and fostering innovation, ultimately contributing an estimated USD 270 billion to the GDP by 2029 which is in line with previous official expectations. This investment is a combined effort from the government and private sectors, with the central government investing 37%, the regional government & SOE ministry 21%, and the rest coming from private, FDI, and PPP.

The targets, indicators, and generated impacts shows that the RPJMN 2025-2029, focusing on digitalization, is set to transform Indonesia's economy, making it more resilient, inclusive, and competitive globally. The development of digital government, digital economy, and digital society is expected to create meaningful growth, improve the welfare of society without leaving anyone behind, and create a united and sustainable Indonesia.

Introduction

1.

1. Introduction

The digital economy is a major new economic paradigm, akin to the preceding agricultural and industrial based economies. Consequently, countries around the world are vigorously developing their digital economies. Indonesia's digital economy has grown rapidly over the past few years, with a growth rate far beyond that of GDP. From 2017 to 2021, the digital economy grew by an astonishing 414% and is expected to increase eight-fold by 2025 compared with 2017. The digital economy is already a vital engine for the country's economic growth. Indonesia also became the second largest digital investment destination in Southeast Asia in 2023. In 2023, digital economy investment in the country was nearly US$22 billion, second only to Singapore (US$141 billion).

Indonesia is already a digital economy leader in ASEAN as we account for 40% of ASEAN's total digital economy output while still holding huge potential for further growth. By 2030, Indonesia's digital economy is forecast to be worth between US$210 billion to US$360 billion.

Despite the digital economy's great potential and strong growth, Indonesia's digital facilities and services have been constrained by its sub-optimal digital infrastructure. Current network coverage in Indonesia is clearly inadequate. Our rural areas have not been fully covered with 4G, 5G network deployment is stagnant, and our fixed broadband coverage and download rates are far behind

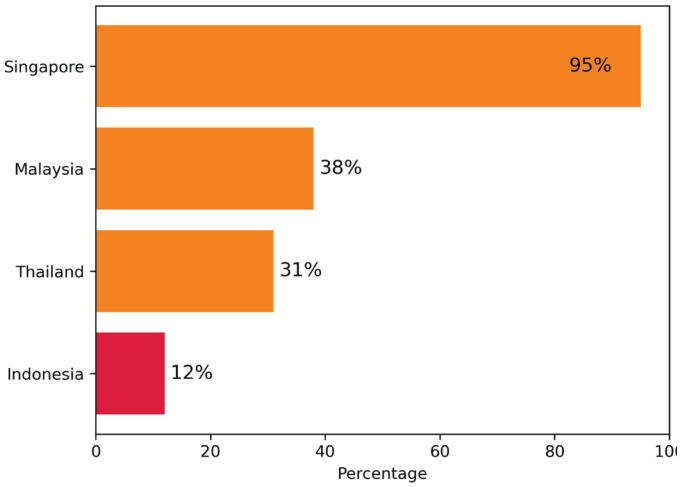


Figure 1.1 *FTTH Penetration in ASEAN Countries.*

those in neighboring countries such as Singapore, Malaysia, and Thailand. The speed (rate) is still around 20 Mbps or ranked below the top 100 in the world with our country's fiber optic coverage still below 30%, with 12,548 villages (15%) not yet covered by a broadband internet network (4G) and from 5,950 populated islands in Indonesia the fiber optic network has reached around 654 islands, which is still around 11%. Regarding data center development, although in recent years data center has been relatively rapid developed, in 2024 data center capacity in Indonesia is expected to reach 210 megawatts (MW), an increase of 44.83% compared to that of in 2023.

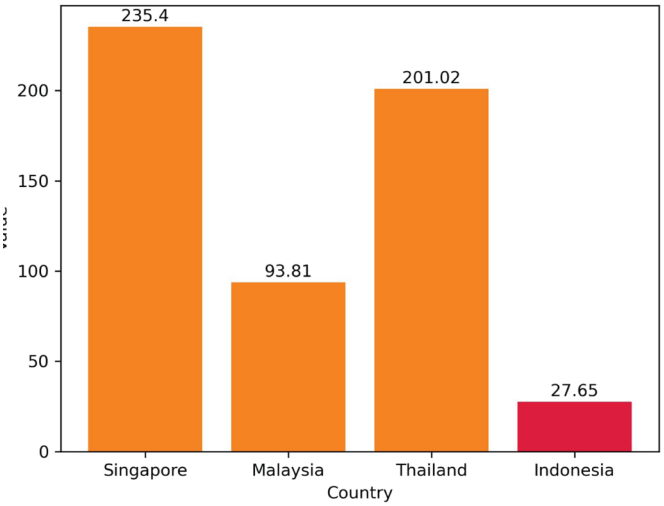


Figure 1.2 *Fixed Broadband Download Speed in some ASEAN Countries. Source: (Ookla, 2023)*

Data centers in Indonesia are spread across 23 cities, with a total of 107 data centers from 39 providers. Despite the rapid development of data centers in recent years, there is still much room for growth in terms of scale, tier and utilization. In 2030, data center needs in Indonesia are estimated to reach a total capacity of around 1.5 gigawatts (GW). This growth is driven by the rapid and necessary adoption of artificial intelligence (AI), cloud computing, and the rapid pace of digital transformation in various sectors in Indonesia.

1.1 Digital Infrastructure

! As the key foundation of the digital economy, digital infrastructure plays an increasingly fundamental and strategic role in national economic and social development.

According to a report released in August 2022, during the Covid-19 pandemic, 76% of Southeast Asian people viewed technology as an enabler rather than an obstacle, four percentage points higher than the global average. Fully 77% of people said that digitization had improved the way they work and live.

Correspondingly, ASEAN countries are increasingly focusing on the development of their digital economies, especially high-quality digital infrastructure. For example, in June 2023 Singapore launched its Digital Connectivity Blueprint. This aims to promote enhanced digital connectivity that creates better lives and exciting new opportunities for citizens and businesses. The national plan is focused on submarine cable connectivity, 10Gbps last-mile access, network flexibility and security, digital hubs and platforms for public affairs and e-Commerce.

According to Infocomm Media Development Authority (IMDA), as of February 2023, 93% of companies in Singapore have adopted some form of digital technology, an increase of 19% from 2018. The Singapore government has committed S$25 billion (US$18 billion) between 2021 and 2025 to research, innovation and the digital transformation of businesses. Singapore is also one of the most digitally advanced economies in the world in terms of digital infrastructure.

The government is committed to providing 1 Gb/s fiber-optic access (for residential and business) and its wireless broadband penetration rate is 200%. Cell phone penetration is 160.6%. Singapore is rolling out a 5G standalone network from January 2021, with full nationwide coverage expected by the end of 2025.

Thailand is accelerating investment in digital infrastructure to as part of its Thailand 4.0 plan, to promote the development of its services sectors and its digital economy. Thailand is one of the early deployers of 5G networks in the ASEAN region, with 5G penetration already exceeding 28.61%. Thailand is also promoting a Smart Cities program with the aim of building 100 Smart Cities in the country. Development is already underway in Bangkok, Phuket, and Chiang Mai.

South Korea has enacted its Digital New Deal to accelerate 5G, Gbps fixed broadband, and AI development. In 2020, the South Korean government announced plans to invest about 76 trillion won through to 2025, to directly support national digitization, sustainability improvements and new employment opportunities.

China has developed a set of polices for "new infrastructure", that will enable dual-giga cities roll-out and other widespread digital infrastructure investment programmes to spur nationwide digitalization. The country's total investment in 5G, for example, is expected to reach 730 billion CNY. This is estimated to have contributed 5.6 trillion CNY to GDP from 2019 to 2023.

The United States government has committed to connecting every citizen in America to affordable, reliable high-speed internet services, while creating well-paying jobs and boosting the American manufacturing sector. Under the administration's "Internet for All" initiative, made-in-America requirements and historic funding for high-speed internet infrastructure have already spurred significant progress towards that goal. Furthering the goals of the government's agenda to expand access to high-speed internet service across America, NTIA released a "Build America, Buy America (BABA)" waiver for the $42.45 billion Broadband Equity, Access, and Deployment (BEAD) programme.

1.2 E-Government

According to the United Nation's E-government survey report, e-government is currently undertaking a shift from the traditional technocratic e-government approach of the early 2000s to a digital development agenda that is policy oriented, data-centric and politically driven. This further illustrates how e-government has expanded and evolved from siloed approaches in a handful of high-income countries to whole-of-government and whole-of-society approaches in virtually all countries around the globe. The public sector needs to embrace digital technology and data to better transform its interaction with the users of public services, throughout the whole policy and service lifecycle.

An OECD report highlights that emerging technologies such as artificial intelligence (AI) and blockchain hold considerable potential for making the public sector smarter, i.e. more agile, efficient, user-friendly and, as a result, more trustworthy.

Governments worldwide are experimenting with emerging technologies to better meet the needs of public-service users and steward coherent use of resources to maximize public value. For example, Norway designed and released a new digitalization strategy for the public sector in June 2024, covering business, the public sector and society, as well as cross-cutting functions in terms of co-operation, financing, organization, regulation and governance.

The strategy addresses key developments around artificial intelligence, privacy and security, trust and openness, and the role of 'Big Tech'. It includes goals

and priorities, such as those for digital governance, digital government investments, GovTech, digital public infrastructure, data access, sharing and re-use, AI, digital talent, service design and delivery.

1.3 Cyber Security

As economies and societies continue to go digital, cybersecurity risks are growing. Many essential services like e-government, financing, education, and healthcare rely heavily on internet-connected systems and digital infrastructure.

New technologies – for example generative AI – can be easily utilized to increase cyberattacks, which poses new threats to both businesses and society. According to a World Economic Forum (WEF) report, geopolitics has at least moderately influenced 70% of an organization's cybersecurity strategies. An example of the intersection of geopolitical turmoil and artificial intelligence, deepfakes and sophisticated phishing campaigns have the potential to become weaponized to disrupt democratic election procedures. During Slovakia's September 2023 elections, a deepfake audio clip was released that purported to show a candidate discussing how to manipulate the election with a media representative.

These threats are rising faster than many developing countries are currently able to keep up with. International organizations such as the ITU, the World Bank, and the WEF, have collaborated with governments around the world to build capacity to protect critical infrastructure and systems, increase cyber awareness, and foster trust so that people, governments, and businesses can continue to thrive in the digital landscape.

1.4 High-end R&D

Switzerland, Sweden, the United States, the United Kingdom and Singapore are the world's most innovative economies in 2023, according to WIPO's Global Innovation Index (GII). In the past 10 years, Indonesia (61st) joins China (14), Turkey (39th), India (40th), Viet Nam (46th), the Philippines (56th) in the group of middle-income economies to have advanced the most through the GII rankings in recent years. R&D investment is a proven driver of the level of a country's innovation.

Global spending on R&D has now reached a record high of almost US$ 1.7 trillion. But only 10 countries account for around 80% of total spending. As part of the Sustainable Development Goals (SDGs), countries have pledged to substantially increase public and private R&D spending as well as the number of researchers by 2030. The three industries accounting for the highest share of R&D spending worldwide are information and communication technologies (ICT) software producers, hardware producers, and the health sector, accounting for over 60 percent of global R&D expenditure. The ICT sector currently invests the largest total sum, with ICT services as the fastest growing sector.

R&D-intensive industries also have differing levels of importance to different economies, with a high share of the major companies within the healthcare and ICT sectors based in the United States. Indonesia spends a mere 0.2 percent of its gross domestic product (GDP) on research and development (R&D) compared with 0.7 percent in India and 2 percent in China, the United States and Singapore.

1.5 Super App

Super-apps are all-in-one solutions which integrate services typically handled across more than a dozen discrete apps (i.e., digital wallets, ride-hailing, hotel booking, and loan payments) in a single app. Originating in China, the model has exploded in popularity across Asia, Africa, and Central America. In China, WeChat integrates its social media capabilities with financial services, online shopping, transportation, and more. WeChat has more than active 1.26 billion users on a daily basis, each using some of WeChat's more than 3.5 million "mini programs".

In Southeast Asia, Grab launched in 2012 and Gojek launched in 2015, both initially as taxi services. They subsequently added new features and expanded into surrounding countries. Grab has around 35 million monthly users across eight countries and over 500 cities. This success inspired other companies to explore similar approaches, leading to the global emergence of super apps. Companies like Meta, Microsoft, X, Revolut, and Uber have indicated plans to expand their services into super-apps. Super-apps are also used to deliver public services.

The Philippine government has rolled out the e-GOV PH Super App, which is an integrated mobile platform for local and national services, with transactions including SIM registration, local government unit (LGU) services, job application, healthcare assistance, job application, e-payments and banking services, and more.

In May 2024, the Indonesia government launched the GovTech initiative dubbed INA Digital. INA Digital marks the initial phase in expediting the digital service transformation for the Indonesian government, encompassing education, healthcare, business permits, taxation, and more.

Achievement from 2020 to 2024

2.

2. Achievement from 2020 to 2024

Indonesia's digital economy was estimated to be around US$77 billion in 2022, which was 22% more than in 2021. In 2023, its value was US$82 billion, up 8% compared with 2022. It is expected to increase to US$130 billion by the end of 2025, with a compound annual growth rate (CAGR) of 15%.

Major sectors of the country's digital economy include e-commerce (US$59 billion), online mobility and catering (US$8 billion), online media (US$6.4 billion), and online travel (US$3 billion). According to the International Monetary Fund (IMF), Indonesia's digital economy is expected to grow by 62% from 2021 to 2025.

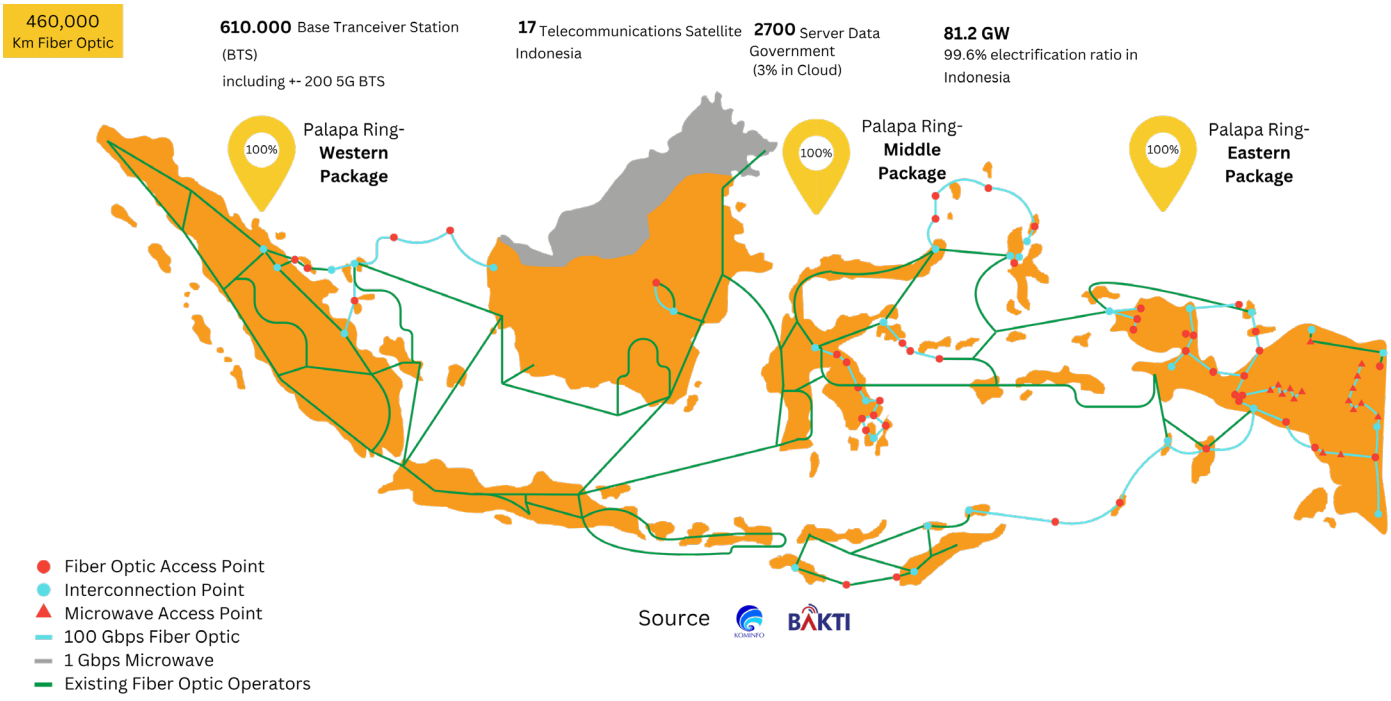


Figure 2.1 *Development of National Backbone Infrastructure*
Source: Kominfo & BAKTI

2.1 Mobile Broadband

Total allocated spectrum is expected to be up to 2047 MHz until 2024 (compared with 2019, 1310 MHz spectrum has been added) (source GSMA). Total Mobile phone penetration up to 99.4% to 2024 (3.4% increases compared to 96%) in 2020 (source speed Hootsuite).

Average Mobile download speed is 29.05 Mbps as of 2024 July, global ranking 82 (source Speedtest).
4G base stations up to 197.84K in 2023 (more than doubled the growth rate compared to 2019 of 79.83K) (source Statista). Number of mobile subscribers 185.2M in 2023 (35.4 million more people compared to 2019 of 149.8M) (source GSMA). 4G coverage of population is 98% in 2023 (3% increase compares to 95% in 2019) (source GSMA).

2.2 Fixed Broadband

Number of Fixed subscribers 14.7M in 2023 (3.62 million more people compared to 2019 value of 10.45 million) (source GSMA).

Fiber to the Home (FTTH) penetration up 12% (source OMDIA fiber development index).
Average fixed broadband download speed of 31.75 Mbps as of 2024 July, global ranking 121, (source Speedtest).

At the end of the financial year for 2023, the total length of the fiber-optic backbone network (both domestic and international) of PT Telkom Indonesia Group amounted to more than 176,000 kilometers.

2.3 Data Centers

Overview of the data center development in Indonesia from 2020 to 2023:

a. **Market Growth and Projections**
The Indonesian data center market has significant growth in market size reaching a total capacity of 514 MW by the end of 2023. The market of datacenter generated substantial colocation revenue with projections of US$ 4,012.7 million in 2024.

b. **Key Locations**
- Greater Jakarta area remained the hotspot for data center development, accounting for 33% of the market uptake.
- Data centers clustered around industrial estates adjacent to campuses or technology hubs.

c. **Operators**
- For the the public sector, the government initiatives and support were crucial in driving the development of data centers.
- On the other hands, for the private sector,Major private players included STT GDS and DCI Indonesia, which announced the construction of new hyperscale data center facilities.Data centers supported various public services, including e-government initiatives and digital infrastructure for public utilities.

d. **Recent Developments**
Recently, Microsoft Indonesia's data center project was supported by PT Gunung Raja Paksi (GRP), which provided high-strength steel for infrastructure projects.

In terms of cloud adoption, the surge in cloud adoption continued to drive demand for data center services, with multiple new cloud regions being created.

It is estimated in 2024 that data center capacity in Indonesia will increase by 44.83% compared to that in 2023. Data centers in Indonesia are spread across 23 cities, with a total of 107 data centers from 39 providers.

2.4 Cyber Security

Cybersecurity is a crucial foundation for Indonesia's digitalization and modernization. Our country has always attached great importance to it. In 2022, our country adopted the "Personal Data Protection Law" ("Law No. 27 of 2022 regarding Personal Data Protection", "PDPL") as its core.

In terms of international cooperation in network security,Indonesiacontinuestobeanactivepromoter and collaborator. In January 2021, Indonesia's BSSN and the Cyberspace Administration of China signed the "Memorandum of Understanding on the Development of Network Security Capacity Building and Technical Cooperation". Indonesia's Cybersecurity Index score has also improved compared to its previous rankings over five years (ITU Global Cybersecurity Index). This suggests that progress continues to be made in the country.

In 2024, cybersecurity condition in Indonesia shows significant development, but still faces various challenges. The following is a comprehensive overview of the cyber security situation in Indonesia this year:

a. Increased Cyber Attacks

In 2024, Indonesia experiences a significant increase in cyber attacks. According to a report from the National Cyber and Crypto Agency (BSSN), the number of recorded cyber attacks reached more than 360 million in the first ten months of 2023, almost approaching the total of 370.02 million attacks in 2022. These attacks include various types of threats, including ransomware, phishing, and Distributed Denial of Service (DDoS) attacks.

b. Data Leak

One of the major incidents that occurred was the leak of voter data from the General Election Commission (KPU) which involved more than 204.8 million voter data. The leaked data includes personal information such as full name, gender, date and place of birth, marital status, complete address, as well as national ID card (KTP) and family card numbers. This leak demonstrated a significant vulnerability in the government's data security system.

c. Cybersecurity Index

According to the National Cyber Security Index (NCSI), Indonesia's cyber security index in 2023 is 63.64 out of 100 points, placing Indonesia in 49th place out of 176 countries. Even though there has been an improvement compared to previous years, Indonesia is still ranked in the bottom ten among G20 countries

d. Main Challenges

1. **Human Vulnerability:** One of the biggest challenges is human vulnerability. Many cyberattacks succeed due to human error, such as clicking a malicious link or using a weak password. Cyber security education and training are critical to reducing these risks.

2. **Advanced Technology:** The use of artificial intelligence (AI) technology by cyber attackers is increasing. AI may be used to create highly realistic audio and video content to trick users into clicking on malicious links or downloading malware. Furthermore, the advancement of quantum computer with quantum algorithm, e.g., Shor alhorithm that can break the current cryptography scheme, mainly the River-Shamir-Adleman (RSA) algorithm and other cryptography algorithms, is becoming serious threats for security in future. World Economic Forum in 2023 studied that the year beyond 2030 is the danger zone, especially to those countries who are late in security migration.

3. **Security Infrastructure:**
   Despite improvements in cybersecurity policies, the security infrastructure of many government agencies and companies still needs to be improved. Attacks on the National Data Center (PDN), Inafis, and the Ministry of Transportation show that many systems are still vulnerable to attack. Since 2025 is the year of quantum, based on the UNESCO, it is a good time for Indonesia to develop this technology to strengthen the infrastructure security of Indonesia.

e. Effort and Initiative

To overcome this challenge, the Indonesian Government has taken several important steps:

1. **Strengthening Policy:**
   The Government continues to strengthen cyber security policies, including updating regulations and increasing international cooperation in combating cyber crime.
2. **Education and Training:**
   Cyber security education and training programs for Government employees and the general public are increasingly being encouraged. The aim is to increase awareness and skills in dealing with cyber threats.
3. **Technology Development:**
   Investments in cybersecurity technology continue to increase, including the using of AI to detect and respond to cyber threats more effectively.

2.5 Application & Regulation

2.5.1 Achievements of Digital Application Development

Internet user penetration vs total population is 66.5% in 2024 (compared to 64% in 2020) (source Meltawater). APJII survey results at the beginning of 2024 even stated that the internet penetration rate in Indonesia reached 79.5%, or around 221.5 million internet users in Indonesia, an increase of more than 5.8% from 73.7% in 2020.

Daily active users of large applications are dominated by social media users with a total of 139 million users or around 49.9% of the total population (source Meltwater). The number of homes equipped with smart home devices was 9.58 million, compared to 1.28 million in 2020 (source Meltwater).

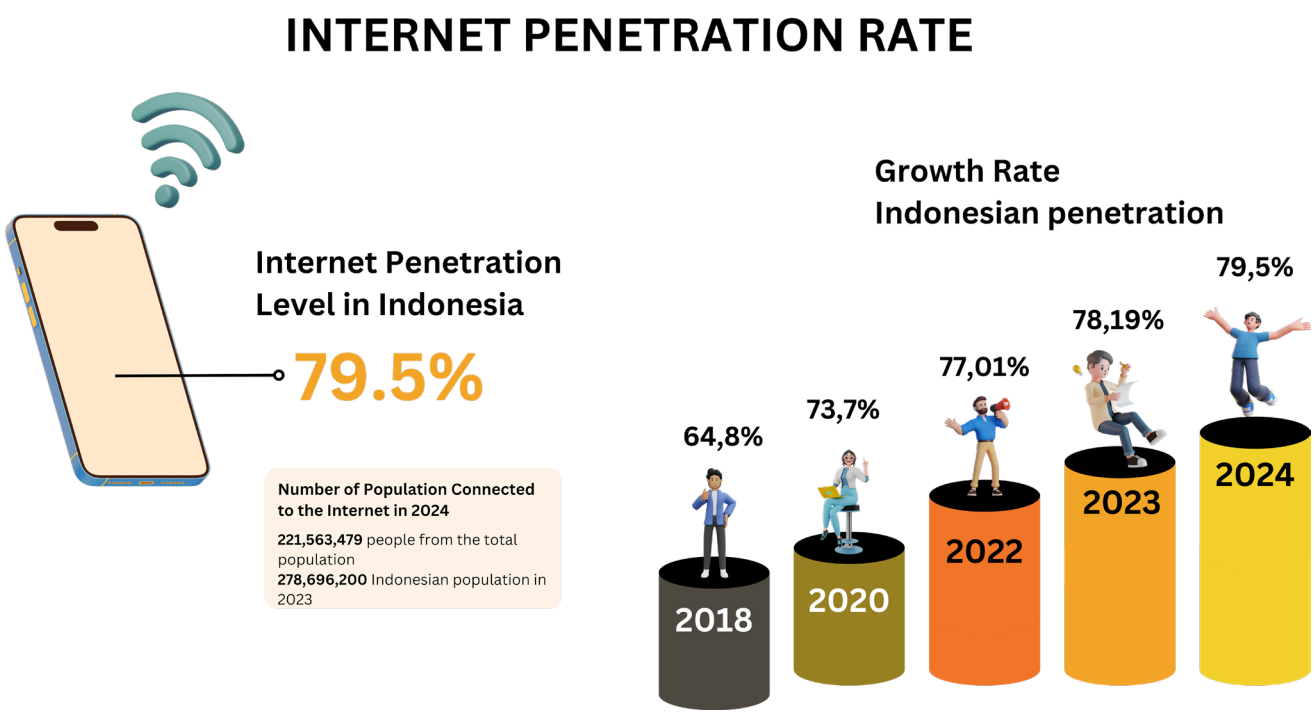


Figure 2.2 *Internet Penetration Rate*
Source: APJII Survey (2024)

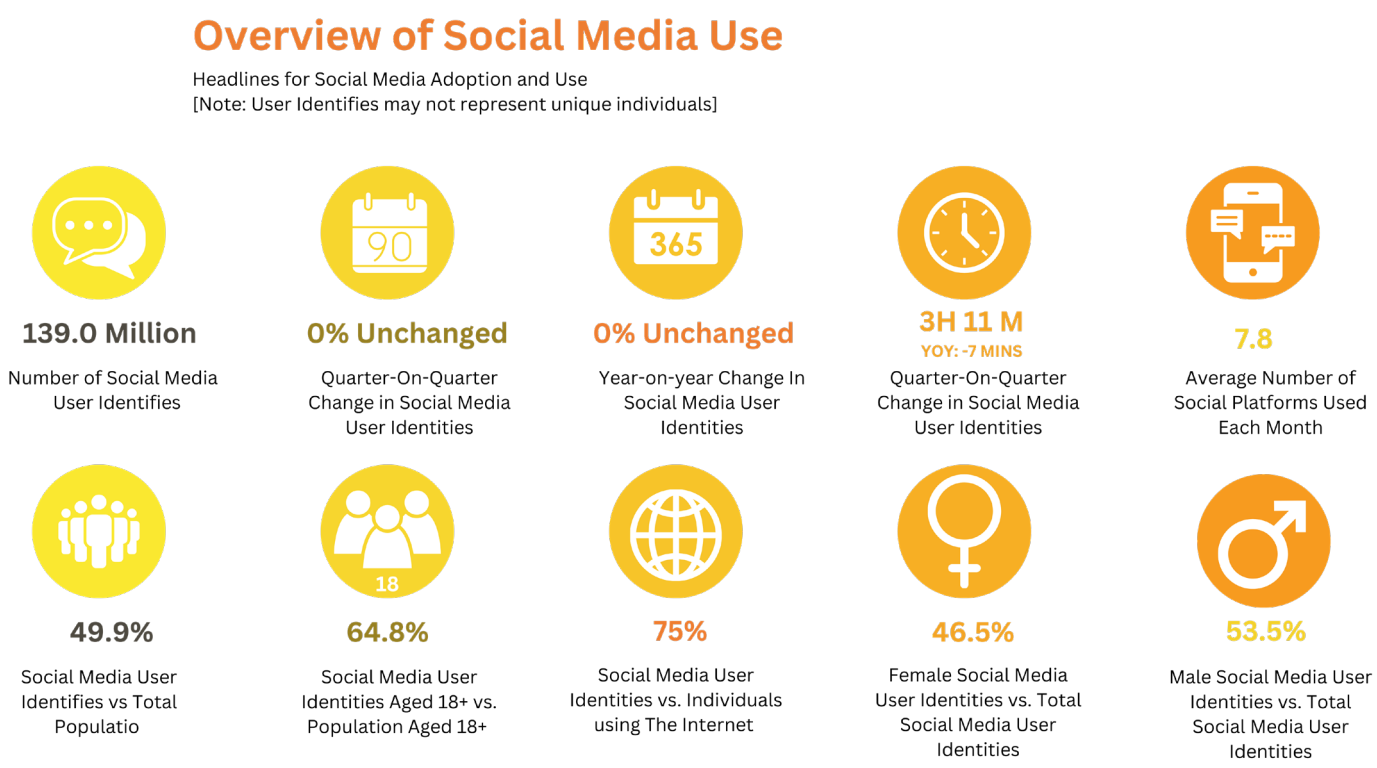


Figure 2.3 *Indonesia Overview of Social Media Use*
Source: Meltwater (2023)

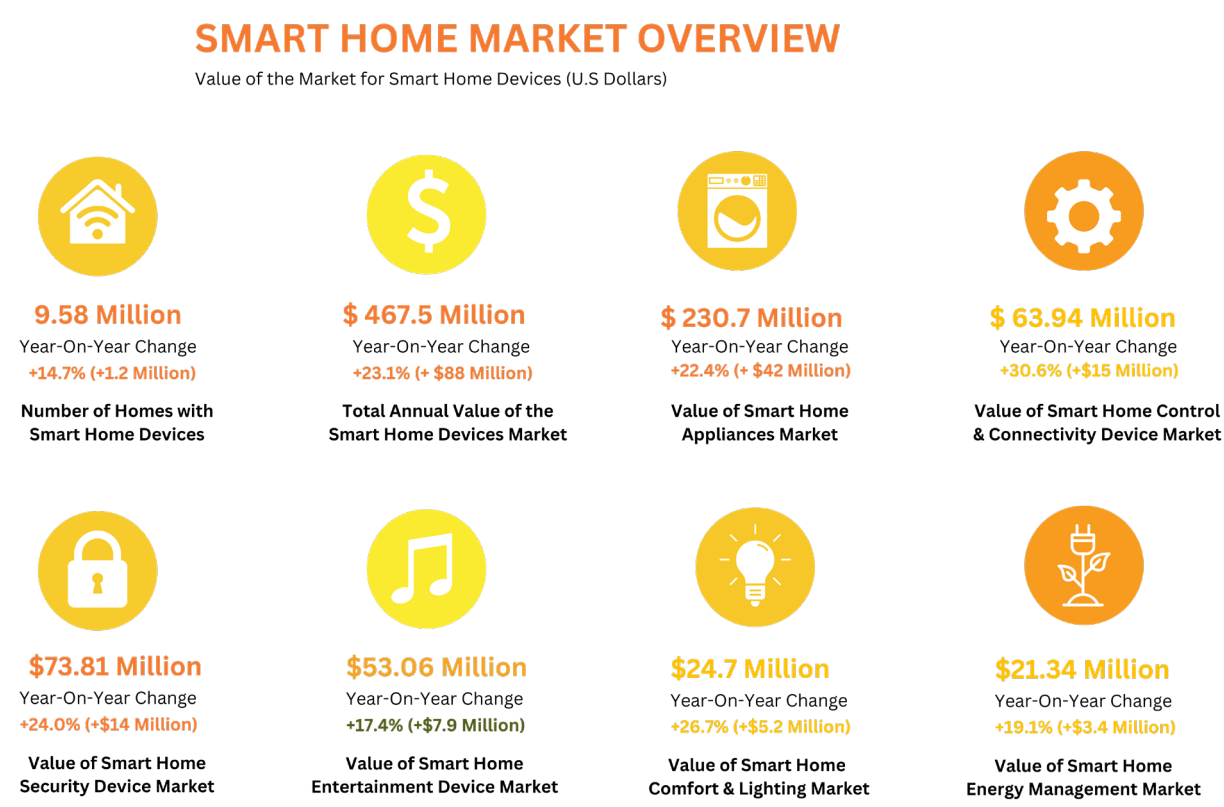


Figure 2.4 *Indonesia Smart Home Market Overview*
Source: Meltwater (2023)

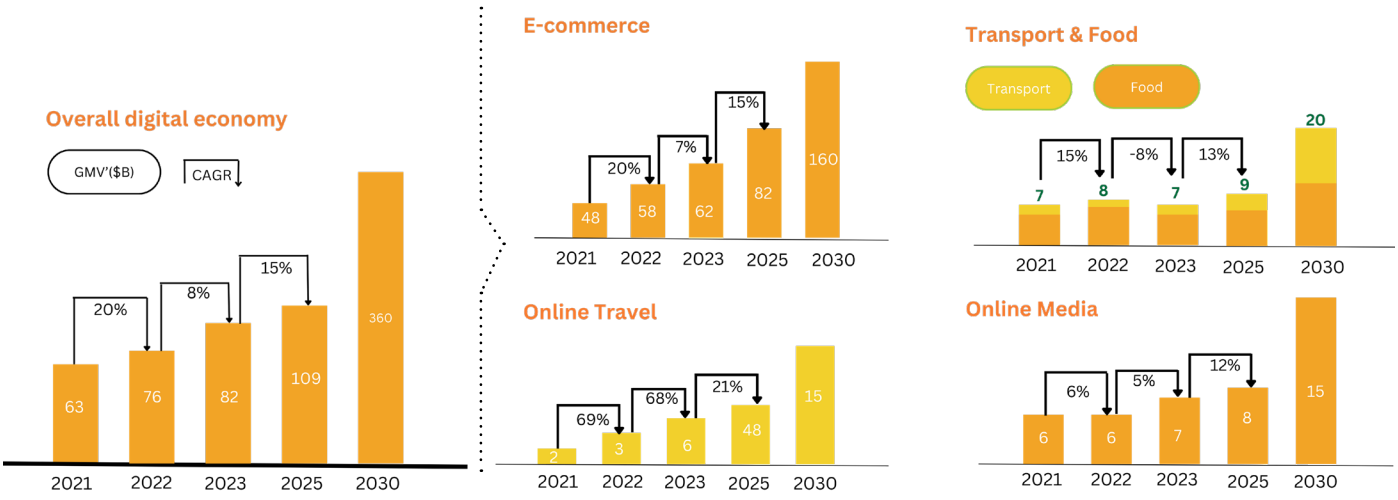


Figure 2.5 Indonesia Digital Economy Outlook
Source: Bain Analysis (2023)

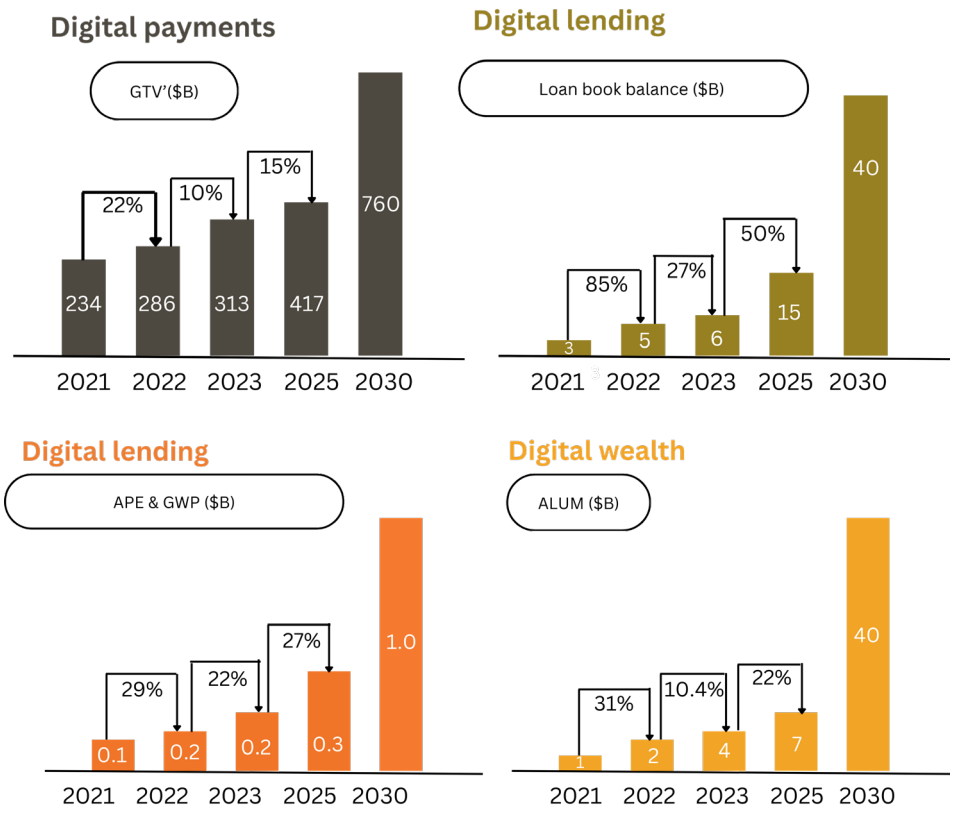


Figure 2.6 Indonesia Digital Financial Outlook
Source: Bain Analysis (2023)

Represented by E-commerce, Transport and food, Online travel, Online media, and Digital economy boosting in Indonesia. Digital Finance Services bring more convenience and market to Indonesia.

IMD World Competitiveness Ranking Indonesia has advanced to the 27th position in the 2024 IMD World Competitiveness Ranking (WCR), a significant improvement from its global rank of 40th in 2020

2.5.2 Digital Economy Policies and Improved Digital Regulations

Indonesia has released a series of digital transformation strategies, master plans, and roadmaps for finance, education, health, and other specific fields, comprehensive strategies for the digital industry and digital economy, and mid- and long-term AI strategies such as Indonesia' s National Strategy for Artificial Intelligence. The government is also actively promoting digital transformation by releasing the Digital Indonesia Vision 2045 (VID2045). The vision proposes to accelerate digital infrastructure development and digital transformation of industries for comprehensive digital transformation in Indonesia.

In October 2022, Indonesia will confirm the Personal Data Protection Law. The Law clearly defines the types of personal data, rights of data subjects, data processing, obligations of data processors and controllers, data transmission, use of personal data, and penalties for violators. It is of great significance for Indonesian citizens to protect their personal data security.

On September 26, 2023, Indonesia's Ministry of Trade issued the revised Ministerial Regulation No. 31/2023 to regulate the activities of e-commerce companies, including setting the minimum price of US$100 per piece for overseas goods directly sold to the country through cross-border e-commerce platforms. The Regulation contains a list of overseas goods that are allowed to enter the country "directly" through e-transaction platforms. It also specifies that social commerce can only be used for promotion of goods or services and cannot be used for payment transactions.

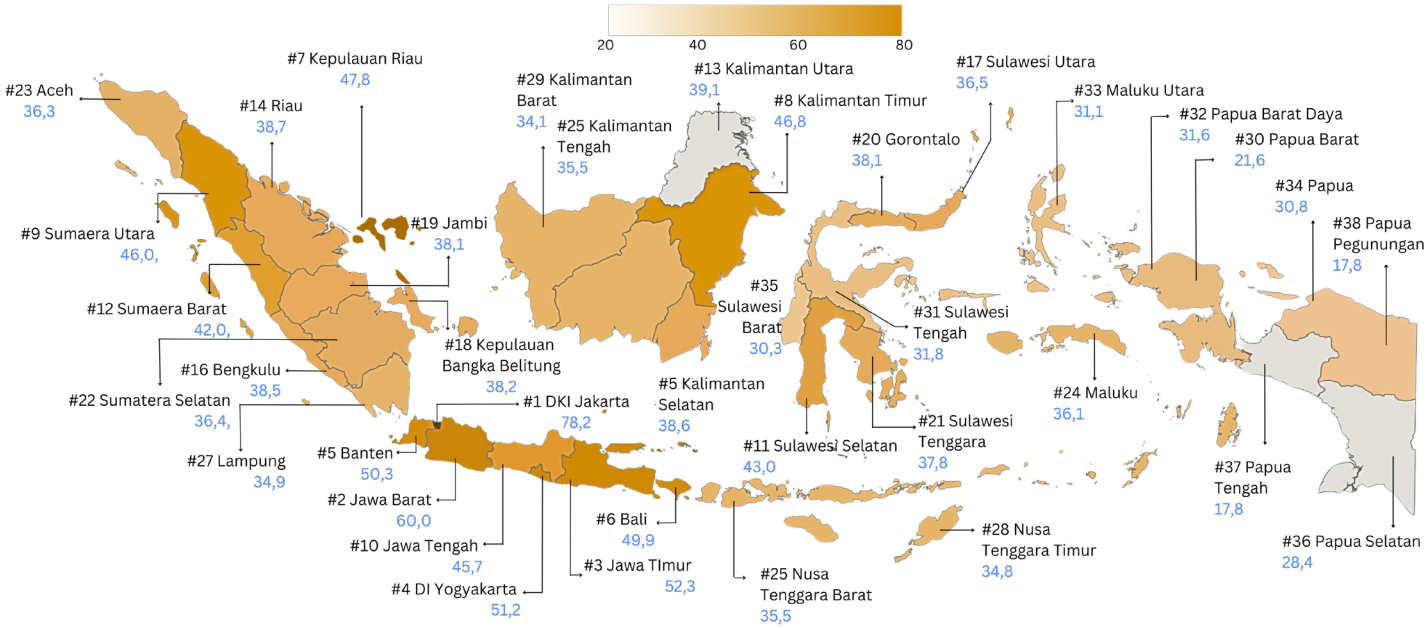


Figure 2.7 *EV-DCI 2024 Score Distribution Map by Province*

To strengthen digital talent development, the country's Ministry of Communication and Information Technology launched the National Digital Literacy Movement to provide virtual training on digital literacy for 12.4 million people in 2021.

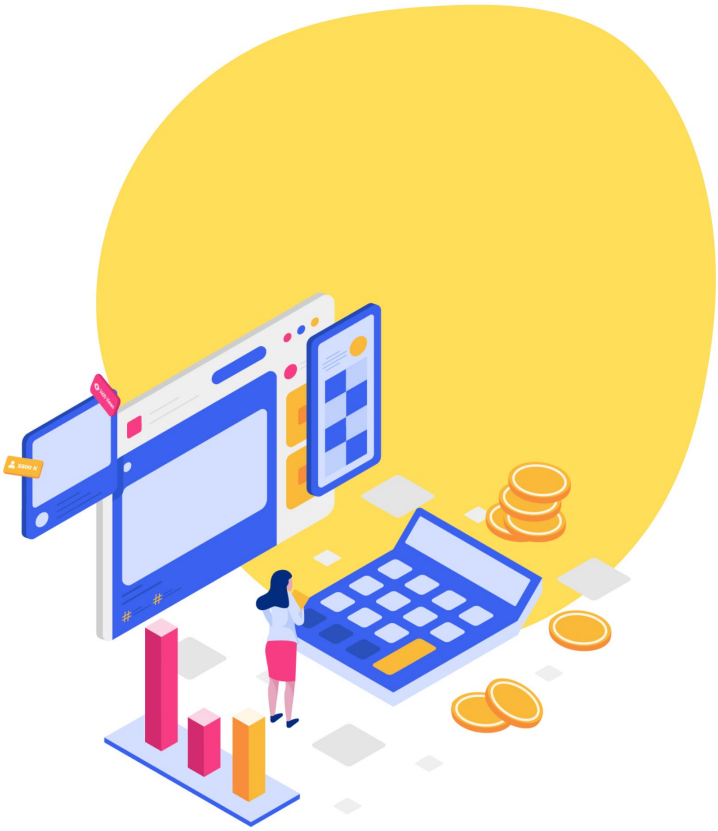
The Ministry also worked with key universities on Digital Talent Scholarship, providing intermediate digital skills training for young people. In 2021, 100,000 people participated in the training. In the same year, the Digital Leadership Academy program provided teaching for 50 leaders from the public and private sectors in collaboration with Tsinghua University, Harvard Kennedy School, Singapore National University, and other universities.

Indonesia's digital competitiveness index rose slightly from 37.8 last year to 38.1 in 2024. However, the score gap between Jakarta (78.2) and Papua Mountains (17.8) is widening.

Venture capital company East Ventures and Katadata Insight Center launched the East Ventures – Digital Competitiveness Index or EV-DCI 2024. The EV-DCI 2024 research report is a mapping of Indonesia's digital competitiveness with the theme 'Realizing Indonesia's digital sovereignty'.

EV-DCI 2024 presents digital competitiveness data in 38 provinces and 157 cities/districts in Indonesia. EV-DCI maps regional digital competitiveness through measurements of three sub-index, nine pillars and 50 indicators. The sub-indices that form it are input, output and support.

The sub-index is composed of the pillars of human resources, use of information and communication technology (ICT), ICT expenditure, economy, entrepreneurship and productivity, employment, infrastructure, finance, as well as local government regulations and capacity.



Strategy & Environment, Supply and Demand, & Related Issues

3.

3. Strategy & Environment, Supply and Demand, & Related Issues

The Indonesian government is accelerating the country's digital transformation and has developed a corresponding agenda. The agenda includes accelerating digital infrastructure construction, accelerating 5G and national data center construction, developing human resources for the digital industry, and digitally transforming the public sector.

3.1 Digital Infrastructure

As the key foundation of the digital economy, digital infrastructure plays an increasingly fundamental and strategic role in national economic and social development. The next-generation infrastructure, (represented by 5G, FTTH, and cloud), is developing rapidly around the world, driving innovation in production, life, and management modes and promoting the broader digital transformation of society.

In recent years, the government has increased its investment in digital infrastructure. According to the Ministry of Finance, the country's investment budget for digital infrastructure reached IDR75 trillion (about US$5.2 billion) between 2019 and 2022. Key digital infrastructure projects include the national data center project, Palapa Ring project, network coverage project in remote rural areas, high-throughput satellite communication project (SATRIA-1 and SATRIA-2), and 5G applications.

With the support of a series of policies, the country's network connectivity has been significantly improved, with more and more people enjoying stable and efficient Internet connections.

3.1.1 Mobile Broadband

5G construction is ramping up around the world. By March 2024, 299 carriers had launched 5G services across 177 countries and regions. 5G has become the mainstream mobile network access technology.

Mobile networks are one of the major broadband access modes in Indonesia with more than 610,000 BTS already deployed throughout the country, supporting 4G coverage for 98% of the population.

5G rollout has begun in cities such as the capital Jakarta, with sub-3 GHz frequency band as the main frequency band. IF bands such as 3.5 GHz and 2.6 GHz bands have not been allocated. In May 2021, our telecom company launched the country's first commercial 5G service. In 2022, the government launched a new 5G smart mining technology, making us the first country in Southeast Asia to launch this technology.

By 2030, we are going to increase our investment in 5G networks to IDR591 trillion (about US$41.6 billion) and IDR719 trillion (about US$50.6 billion) by 2035, creating 4.6 million and 5.1 million jobs by 2030 and 2035, respectively.

The 5G penetration rate in Indonesia is only 1.74%, lagging behind that of neighboring countries such as Singapore (47.95%), Thailand (28.61%), and Malaysia (11.22%). The download rate of Indonesia's mobile broadband is 23.98 Mbps, lagging behind that of neighboring countries such as Singapore (76.48 Mbps), Malaysia (47.72 Mbps), and Thailand (40.8 Mbps).

One of the reasons for the low penetration of 5G is because until 2024 there has not been a frequency allocated that can be used for 5G, whereas so far other frequency ranges have been refarmed for use with 5G technology. According to the annual reports of telecom companies, there were about 352 million mobile network users (including users who have more than one telephone number) in Indonesia in 2022. About 83.5% of the users used 4G, about 9.5% used 2G or 3G, and only about 7% used 5G. One of the reasons was that the country's spectrum allocation was not as fast as expected.

By December 2023, Telkomsel had deployed more than 470 5G base stations across 48 cities in Indonesia. By July 2023, Indosat Ooredoo Hutchison had provided 5G networks through 90 base stations. XL Axiata also obtained the 5G network operator license in 2021.

These three major carriers have jointly promoted 5G construction in the country. With the release of new spectrum such as C-band, 700 MHz band, and millimeter-wave band, U6G etc. it is expected that Indonesia's mobile broadband will develop more rapidly in the next five years.

3.1.2 Fixed Broadband

Ultra-high-speed FTTH is an important trend in global fixed broadband development, and some countries are promoting FTTR. Point Topic's data of 30 major fixed broadband markets and of other countries show that FTTH is gradually replacing DSL. It is predicted that fiber users (FTTH/P/B) will comprise 75% of all fixed broadband users by 2030.

The optical broadband penetration rate in the top 10 countries will generally reach over 80%. High download rates will become a key feature of future fiber broadband. Based on universal fiber coverage, countries such as China and Saudi Arabia are promoting the evolution towards 10-gigabit fixed broadband access.

In terms of FTTH penetration, Indonesia's rate was only 12% in 2023, significantly lagging behind neighboring countries: Singapore (95%), Malaysia (38%), and Thailand (31%). As for fixed broadband download speeds, Indonesia's average was 27.65 Mbps, far behind that in neighboring countries: Singapore (235.4 Mbps), Malaysia (93.81 Mbps), and Thailand (201.02 Mbps).

Regarding campus and enterprise access, Indonesia has enabled broadband network access in 156 industrial parks and bonded industrial parks, with an access speed up to 1 Gbps.

Formulate and adopt national standards for fiber to the home (FTTH) and fiber to the room (FTTR) pre-deployment in buildings, promote FTTH and FTTR deployment, and improve network deployment efficiency.

As for IP address adoption part, Indonesia's IPv6 Adoption Rate in 2025 has increased by nearly 200 times compared with five years ago. Since 2023 IoH and XL started to deploy 400GE, the IPv6 advanced technology.

3.1.3 National Digital Backbone Networks

2019 witnessed the completion of the Palapa Ring project, Indonesia's US$1.5 billion national optical fiber development initiative. This project was divided into west, central, and east regions. 12,000 kilometers of fiber-optic cables were laid to provide Internet access to nearly six million people across 57 cities and districts.

Later, Indonesia launched Palapa Ring Integration, which aims to lay an additional 11,000 kilometers of fiber-optic cables to connect the existing West Palapa Ring, Central Palapa Ring, and East Palapa Ring networks and integrate them with the national telecom network system. This project is expected to cover 16.4 million people. However, 654 islands with permanent populations in Indonesia are still not connected to the fiber optic backbone network, which has an impact on 5 million people who cannot be served by high-speed broadband internet services.

Ultra-high-speed, high-performance networks help enterprises ensure the reliability and stability of key services. Currently, large government and enterprise organizations are building dedicated networks to provide deterministic bandwidth, low latency, and high reliability for key services and applications.

As new computing power, AIGC, and other services and applications thrive, Indonesia is emerging as a preferred location for data center construction in the Asia-Pacific region. The demand for high-bandwidth, low-latency, and high-reliability connections continues to grow rapidly, accelerating the evolution towards all-optical networks. Technologies such as 400G and OXC are being used to build an all-optical base in the world underpinned by computing power. Telkom and IOH already started to deploy 400G ultra-high bandwidth all-optical transport networks. At the same time, 90% of IOH and XL devices has already support SRv6(Segment Routing over IPv6), and 61% of Telkom devices support SRv6.

3.1.4 Data Centers and Computing Power Networks

The fast-growing digital economy is a key driver of data center market growth in Indonesia. As more enterprises embrace e-commerce, online banking, and digital services, the demand for data centers continues to rise. This is evidenced by the strong growth of the data center market in Greater Jakarta. Data illustrate that the Indonesian government is accelerating the construction of data centers. Currently, the central and local governments in Indonesia run more than 2,700 data centers. As of 2022, there were nearly 25 tier-3 data center facilities in the country, followed by eight tier-4 data centers. The data center market size is estimated at 220 MW in 2024, and is expected to reach 1,500 MW by 2029, growing at a CAGR of 16.92% during the forecast period (2024–2029).

PT DCI Indonesia Tbk's JK1 facility was the first data center in the country to receive the tier 4 certification in 2013. Since then, NTT and Digital Edge (Singapore) Pte Ltd have had to build tier-4 data centers in the country. The growing demand from customers is expected to drive the construction of high-tier data centers in the country in the coming years. Tier-3 and tier-4 data centers are projected to dominate the Indonesian market over the next five years (2024–2029). The tier 3 segment had a market share of over 50% in the Indonesian data center market in 2022. It is further projected to register a CAGR of 15% to reach an IT load capacity of 652.6 MW by 2029. On the other hand, the tier 4 segment is expected to witness the highest growth of 25.9% by 2029.

3.1.5 Cloud and Applications

Indonesia's cloud service market size is estimated at US$2.13 billion in 2024, and is expected to reach US$4.21 billion by 2029, growing at a CAGR of 14.52% during the forecast period (2024–2029). The major drivers that fuel the Indonesian cloud market growth are expanding digital transformation across firms, increasing Internet and mobile device adoption around the country, and increased consumption of data and information.

94% of cloud service users in Indonesia hope to increase their investment in cloud technology by 2023, while 92% of other businesses in Indonesia plan to complete cloud migration in two years. More than half of the companies plan to increase investment in cloud computing, underlining the importance of cloud infrastructure in supporting business growth.

In Indonesia, the focus of investment is on data and AI analytics (62%) and cloud computing (62%), followed by automation (58%) and the metaverse (51%). Moreover, enterprises are using a hybrid cloud to host their e-commerce website within a private cloud, where it is secure and scalable. For other uses, such as placing brochure sites, they utilize a public cloud, which is more cost-effective, and security is less of a concern for such data. This indicates the new cloud strategy is gaining traction in the cloud market. A mix of cloud and multiple cloud solutions is expected to emerge as a strong solution in the future.

The global cloud computing market was valued at US$586.4 billion in 2023, recording a year-on-year growth rate of 19.4%. This market is expected to exceed US$1 trillion by 2027, driven by the strong demand for generative AI, foundation models, computing power, and their applications. Cloud computing offers high flexibility, scalability, sustainability, and other benefits, which can drive the digital upgrade and transformation of companies.

Cloud computing helps companies improve production efficiency and quality by enhancing supply methods, production modes, production tools, and more. According to statistics, the cloud adoption rate for US companies exceeds 85%, and for EU companies, it is around 70%. In contrast, the overall cloud adoption rate in the Asia-Pacific region remains low, with the adoption rate in Indonesia currently only 67% for the public sector and 29% in the MSME sector.

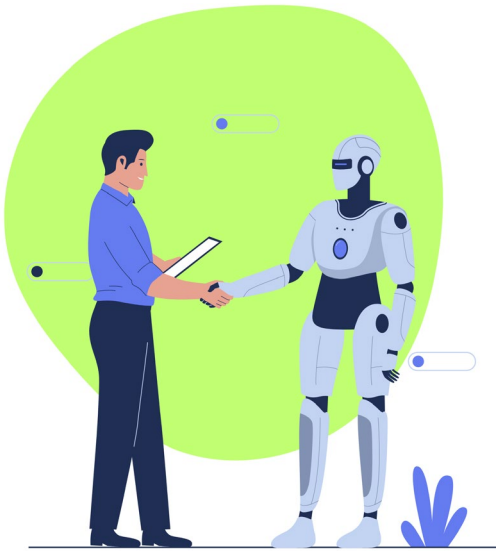
Indonesia's online applications are growing rapidly, with the digital economy maintaining a growth rate of over 10% (in GMV). E-commerce, in particular, is expanding swiftly. Specifically, transport, food delivery, and online media are experiencing steady growth, while online travel is expanding at a remarkable annual growth rate of over 50%. Digital financial services, including digital lending, digital insurance, and digital wealth management, are also growing rapidly on a large scale. Notably, electronic payments are projected to reach US$760 billion in GMV by 2030.

Currently, various digital applications and platforms are developed and run primarily based on cloud architecture. The growth of digital applications and platforms in Indonesia is expected to significantly drive the development of cloud and data centers.

3.1.6 Artificial Intelligence (AI)

Indonesia announced its National Strategy for Artificial Intelligence (Stranas KA) in 2020, making it the second ASEAN country after Singapore to do so. Indonesia has made AI a crucial part of its national strategy and one of its five priority areas.

The establishment of the Artificial Intelligence Center Indonesia has also helped promote the development of AI in the country. At present, AI has been widely adopted in many fields in Indonesia, especially in the retail and logistics (supply chains) industries.



E-commerce platform Tokopedia for example, has used AI to improve its business results and worked with universities to bring cloud, AI, and data technologies to 97% of the regions across Indonesia. Gojek, a ride-hailing service provider, has become a unicorn in the country and now spans Southeast Asia, which would be impossible without the support of AI. In 2021, Gojek and Tokopedia merged to become leaders in AI development and implementation.

Nodeflux is also a strong player and ranked 25th during the face recognition algorithm evaluation of the US National Institute of Standards and Technology. In addition, there are nearly 200 AI startups in Indonesia, including many tech companies such as Akulaku, Qlue, Kata.ai, KoinWorks, UangMe, Eureka, and Rey. The AI market has shown promising signs of growth.

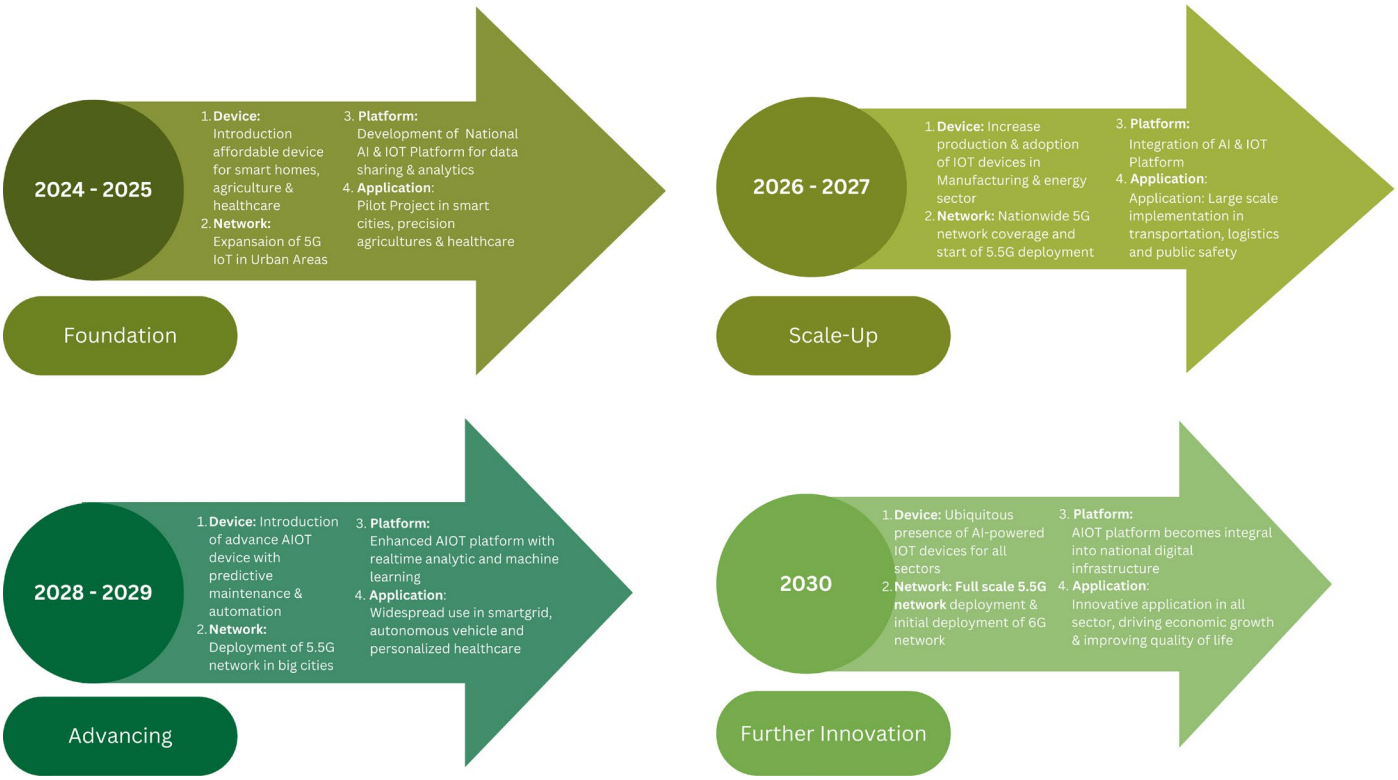


Figure 3.1 *Indonesia AIOT Roadmap 2025-2030*
Source: Mastel & ASIOTI Analysis (2024)

Year	Main focus	Initiatives and Projects	Targets and Results
2024	AI Infrastructure	Construction of national AI data centers, 5G network upgrade	Increase computing capacity and connectivity
2025	Education and Training	AI training programs for the work-force, AI curriculum at universities	Improving workforce skills in AI
2026	Research and Innovation	Funding for AI research, collaboration with global Institutions	Increase the number of AI publications and patents
2027	Implementation in the Public Sector	The use of AI in healthcare, transportation, and Government	Improve the efficiency of public services
2028	AI Startup Ecosystem	Incentives for AI startups, incubators, and accelerators	Increasing the number of AI startups and Investments
2029	AI Regulation and Ethics	Development of AI regulations	Ensuring safe and ethical use of AI
2030	AI for the Digital Economy	AI Integration in e-commerce, fin-tech, and creative industries	Increasing AI's contribution to national GDP

3.1.7 Industrial Internet

Indonesia attaches great importance to the implementation of Industry 4.0, as it is crucial to automate and digitize production and enable connectivity and interaction between humans, machines, and other resources. In 2018, Indonesia launched the Making Indonesia 4.0 roadmap, which focuses on integrating latest Industry 4.0 technologies to digitalize the manufacturing industry.

These core technologies include the Internet of Things (IoT), AI, human-machine interface, robotics, sensor technologies, and 3D printing, among which IoT is a key pillar for implementing Industry 4.0 in the country. In addition, the Ministry of Industry initiated the construction of the Center for Indonesia Digital Industry 4.0 (PIDI 4.0) as a one-stop solution for the adoption of Industry 4.0 in the country. This center is used for demonstration, training, collaboration, assistance, and other purposes.

The introduction and implementation of the Making Indonesia 4.0 roadmap has further advanced the Industrial Internet. In 2024, the growth of Industrial IoT (IIoT) in Indonesia is expected to continue to increase significantly. Based on the latest report from ASIOTI and Ministry of Information & Communication (Kominfo), the IoT market potential in Indonesia is predicted to reach around IDR 572.7 trillion in 2025.

This growth is driven by the adoption of IoT technology in various industrial sectors such as manufacturing, logistics, smart cities, and smart home (smart home). In fact, one of the IoT startups in the fishery and aquaculture sector in Indonesia has become a unicorn with a valuation reaching USD 1.4 billion or around Rp. 22.4 Trillion.

In addition, with the development of 5G networks and government initiatives to encourage Industry 4.0, IIoT adoption is expected to increase operational efficiency and productivity in various sectors.

Although we have made some progress in the construction of new digital infrastructure, we are still in the early stages and have not yet built robust digital infrastructure. Our progress in developing such infrastructure is slow. At the very beginning, we thought digital infrastructure such as 5G was not economical or necessary.

We didn't change our approach until we realized we had lagged behind regional competitors and that digital infrastructure is essential to our economic and social development. That was also when we made 5G part of our national strategic plan and regarded it as a catalyst for the implementation of Industry 4.0. Since then, we have been working actively to promote the construction of 5G infrastructure and its ecosystem. However, our slow progress in new digital infrastructure development has left us behind in the global digital economy, which is increasingly underpinned by technologies like 5G.

3.1.8 Blockchain

Blockchain is a technology that links records, called blocks, in a sequence using cryptography. Each record contains a set of information including a timestamp, who is participating in the transaction, and two unique identifying codes called a hash. A record contains the hash of the previous record as well as a hash for the current record, thus establishing a chain. It is a type of distributed ledger which is composed of digitally recorded data arranged as a successively growing chain of blocks with each block cryptographically linked and hardened against tampering and revision (ITU 2019).

The distributed verification process makes blockchains resilient and nearly impossible to tamper with since there is no single point of failure. Even better, it becomes increasingly difficult to alter as further blocks are added to the chain. An important distinction is between private and public blockchains. A public blockchain is also referred to as open or permissionless and allows anybody to join the network as a node and store a local copy of the ledger (Michels 2018). In contrast, in private blockchains (permissioned), data processing is restricted to a closed group of nodes.

Blockchain technology is a decentralized and secure way of storing and sharing data. It has the potential to transform a range of industries in Indonesia, from financial services to supply chain management to government services. While Indonesia is still in the early stages of blockchain adoption, the government has shown a keen interest in exploring its potential. In 2020, the government launched the Indonesia Blockchain Hub, a collaborative platform aimed at fostering blockchain innovation and adoption.

Financial institutions are also investigating blockchain for cross-border payments and remittances, aiming to reduce costs and enhance efficiency. Many startups and organizations in Indonesia are working on implementing blockchain in various sectors. These startups are focused on a range of applications, from supply chain management to financial services to identity verification.

As an example, Pundi X, a blockchain-based point-of-sale system. In the private sector, startups like HARA are using blockchain to create a transparent and secure platform for agricultural data, benefiting both farmers and consumers. In supply chain management, companies in the palm oil and seafood industries are exploring blockchain solutions to certify the origin and sustainability of their products.

In agriculture, the government is working with a blockchain startup to track the shipment of rice from farmers to consumers. This can help in creating a more transparent and efficient supply chain for agriculture products.

In financial services, fintech companies are working to provide secure and accessible digital financial services to the unbanked and underbanked populations in Indonesia. This includes digital wallets, peer-to-peer lending, and microfinance platforms, which can empower individuals and small businesses economically.

Crypto adoption in Indonesia has experienced a significant increase in terms of cryptocurrency investment, with a total of 18.51 million investors recorded in 2023. The government has also made supportive regulations to encourage the growth of the crypto ecosystem in Indonesia and there are around 501 crypto assets officially registered with 33 candidates. Registered and regulated Crypto Asset Physical Trader (CPFAK).

With its expanding blockchain ecosystem in Indonesia, the country is well-positioned to become a leader in blockchain implementation in Southeast Asia

Figure 3.2 *Crypto Adoption in Indonesia*
Source: Crypto Asset Physical Trader (CPFAK) (2023)

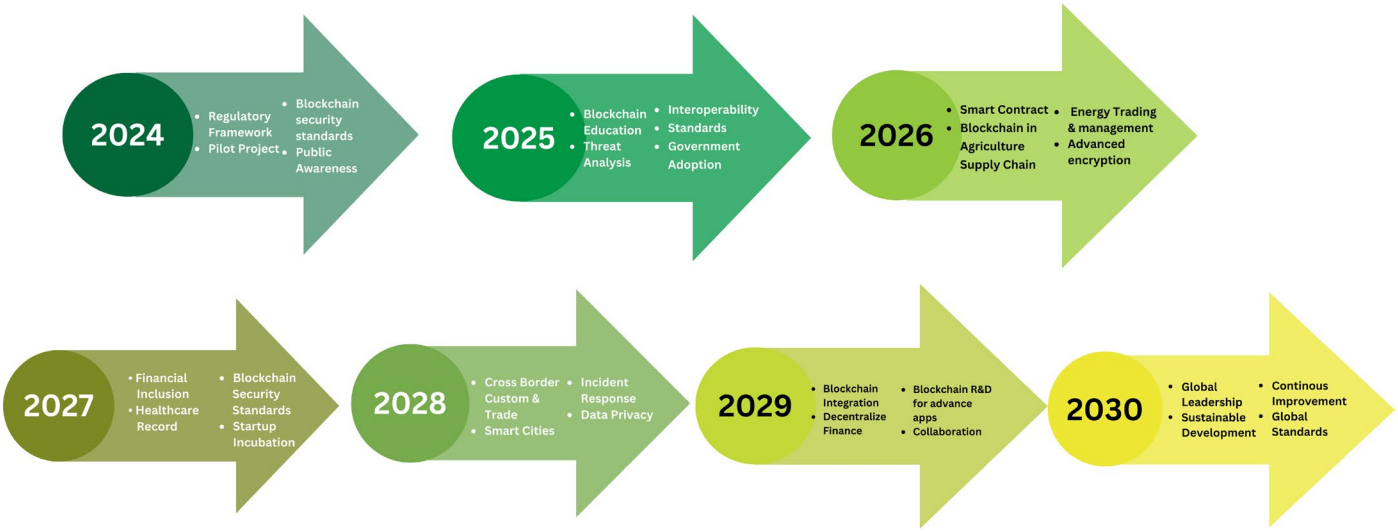


Figure 3.3 *Indonesia Blockchain Roadmap 2025-2030*
Source: Mastel & ASIOTI Analysis (2024)

3.1.9 Cyber Security

With the rapid development of the Internet, network security has become an important factor affecting the safe operation of the global economy and political stability.

Recently, the cyber security threatscape in Indonesia has become increasingly challenging.

1. Critical information infrastructure security risks have intensified.

Critical information infrastructure relates to national security, the economy, people's livelihoods, and public interests. High-level cyber-attacks are occurring more frequently. Large hacker organizations have been attacking the country's network infrastructure through distributed denial-of-service (DDoS) attacks, system vulnerabilities, and phishing. Fraud, ransomware, malicious code injection and other methods damage critical information infrastructure, steal sensitive data, destroy data integrity, or create service denials. These individually and serially undermine the normal operation and data security of critical information infrastructure.

2. New technologies and new applications bring new risks.

With the widespread application of big data, cloud computing and other new information technologies, new digital applications continue to emerge. In the scenario of massive data collection, new technologies and new applications bring new risks in terms of privacy protection and data security. For example, the use of artificial intelligence technology, QR codes, etc. to conduct phishing attacks results in greater potential leakage of user information. Also, the use of niche programming languages with fewer security analysis tools to develop malware causes the rapid spread of ransomware. From 2022 to 2024, ransomware activity has soared and software data breaches have been frequent.

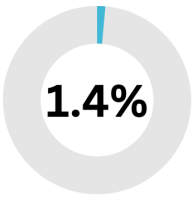
3. Network security talents are in short supply

Indonesia's network security industry is developing rapidly. According to data from Modor Intelligence, Indonesia's network security market will be approximately US$1.15 billion in 2022, and the market size is expected to exceed US$3.39 billion by 2028.

As a result, there is a shortage of network security personnel. Jakarta media data show that currently the country's annual shortage of cybersecurity personnel could reach 600,000. Concurrently, the scale of talent training in colleges and universities is inadequate. Consequently, many Indonesian industries are facing the worrying dilemma of a lack of cybersecurity talents. Data show that 72% of security threats that occurred after Covid-19 were caused by insufficiently skilled personnel.

4. Weak awareness of network security prevention.

The general public lacks sufficient digital awareness skills to identify and prevent network security risks. There are still a large number of users who easily leak personal information, click on unknown links or QR codes at will, download files from unknown sources, fail to regularly update security software, and fail to regularly back up important personal data. According to Global Data Breach statistics, there have been as many as 89,110 recorded data leakage cases in the first quarter of 2023. Falling into the trap of a fraud group can cause significant financial losses to individuals as well as stress and mental health problems.

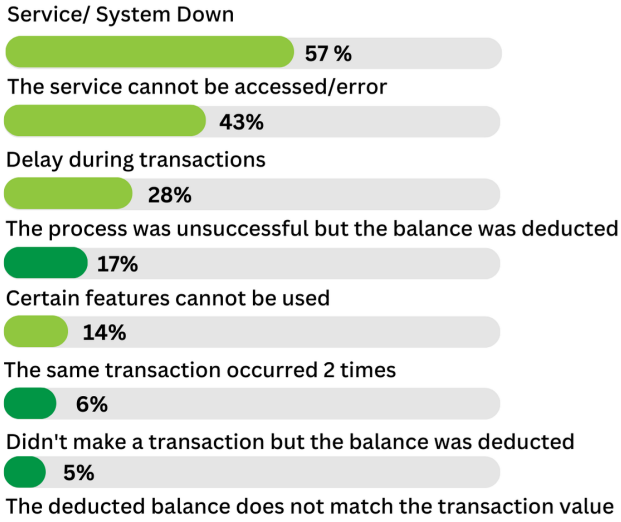


According to the Sharing Vision Survey respondents consider Mobile Security/ Digital Banking Less and Very Less

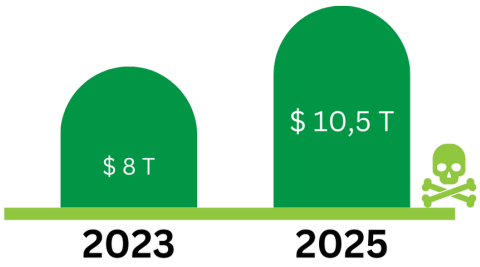
Source: Survey eChannel, Fintech, eCommerce dan eLifestyle Sharing Vision, Nov 2023, N=10167

This means that there are around **1,5 million** bank customers who consider Mobile Banking/Digital Banking in Indonesia to be inadequate/unsafe

There are still quite a lot of complaints regarding balances being deducted when the process is unsuccessful and even when transactions are not made when using e-channel services



Meanwhile, losses due to Cybersecurity will increase 15% every year in the next 3 years and are estimated to reach $10.5 trillion in 2025



Source: Cybersecurity Venture

Losses due to online fraud in Indonesia

Rp 18,7 Trillion
2017-2021

As well as available

1.730 number of cases online fraud

(august. 2018-Feb 2023

And

72.618 number of compla

related to the fraud mode in th form of skimming, phishing, social engineering & sniffing

Figure 3.4 *Overview of Cyber Security Threat*
Source: Kominfo (2023)

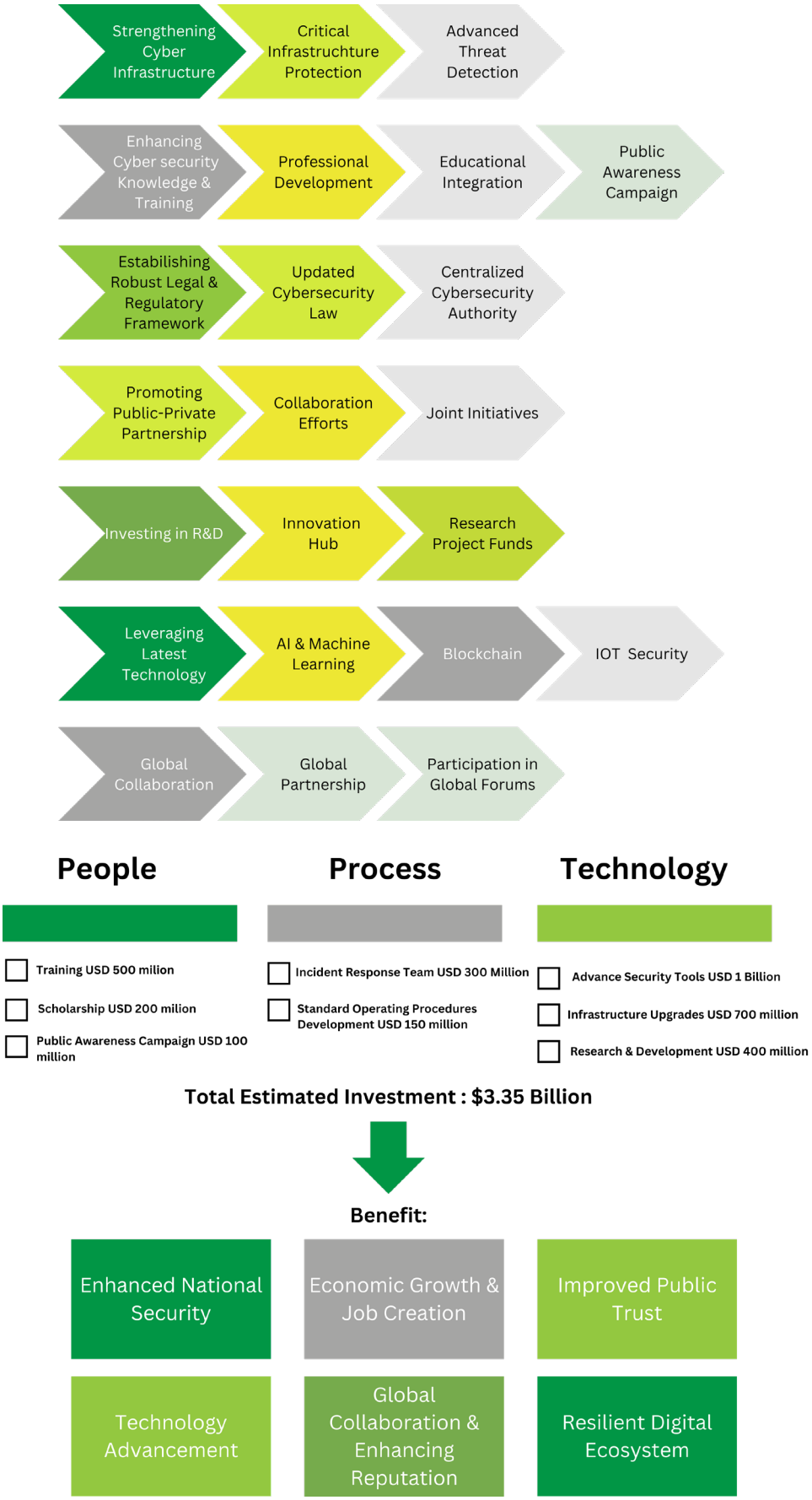


Figure 3.5 *Cyber Security & Investment plan 2024-2030*
Source: Mastel & ASIOTI Analysis (2024)

3.2 Digital Application

3.2.1 Digital Government

As for public services, all countries around the world are racing to promote e-government with unified infrastructure and one-stop-shop services. Integrated online government services have become a global trend. According to the EGDI Report 2022, government services are becoming more digital, and almost three quarters of the UN member states use "one-stop-shop" portals for the online provision of different government services. Among the 22 online transactional services assessed, the provision of 16 types is the global average, but 115 of the member states offer more.

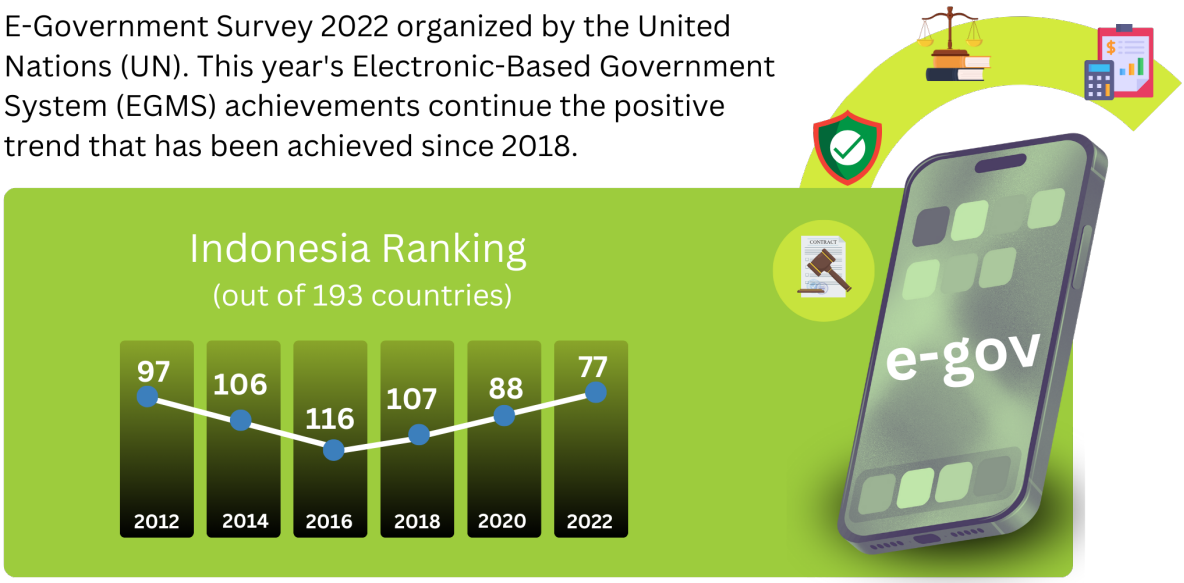
Global online government services are witnessing cross-department and cross-level integration. Indonesia is actively promoting the development of digital government. Indonesia has a higher EDGI value than the global average, and its online service index (OSI) is also at a very high level. The country's EDGI ranking has risen from 107th to 77th in 2022. Indonesia currently has about 27,000 government applications.

The Ministry of Health alone contributed about 400, while one ministry appeared to have the largest number – 5,000. This has actually hindered government services and data exchange given the large number of applications and lack of interoperability. INA Digital, which will be operational in September 2024, has integrated various public services such as education, health, business licensing, tax, social assistance, and driving license into one unified portal. Different ministries, agencies, and local governments are required to integrate and interoperate their data and services. This will allow people to access different government services with a single digital ID.

INA Digital will provide three main services, namely INA GOV, INA PAS and INA KU. INA GOV aims to digitalize all sectors including the state civil apparatus (ASN) to work under the auspices of INA Digital, INA PAS provides Single Sign On (SSO) for access to the national Digital ID portal and INA KU will unite various public services such as health, education to population administration

THE QUALITY OF INDONESIA'S E-GOVERNMENT

Indonesia ranks 77th in the biennial United nations (UN) E-Government Survey 2022 organized by the United Nations (UN). This year's Electronic-Based Government System (EGMS) achievements continue the positive trend that has been achieved since 2018.



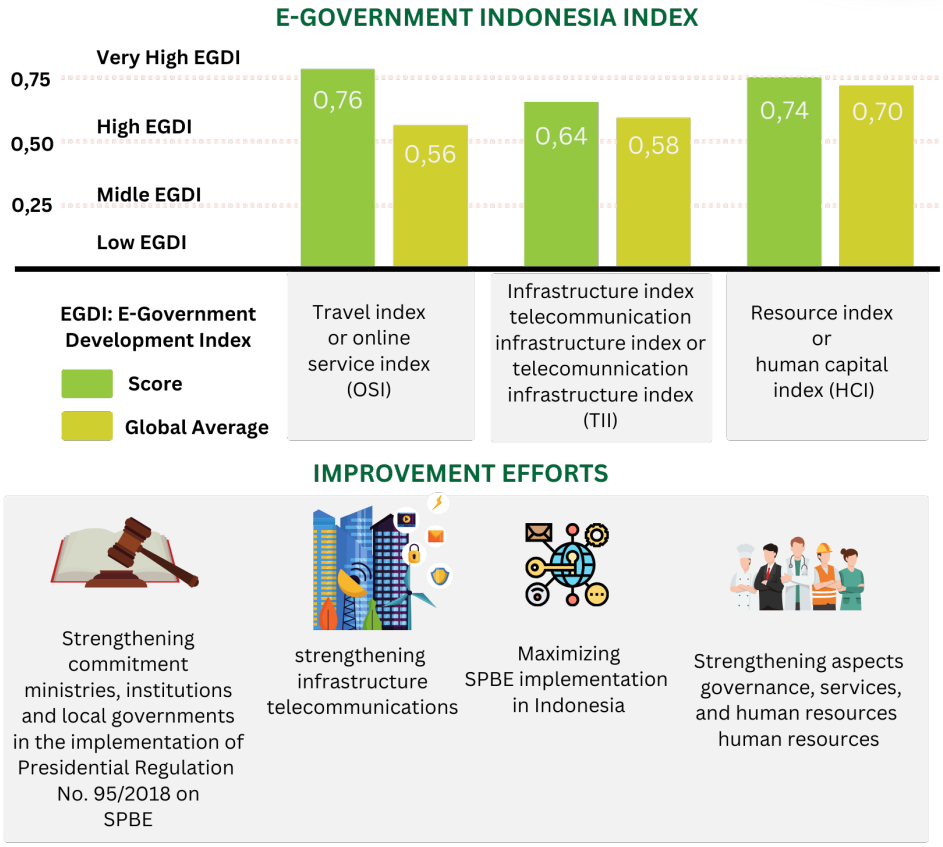


Figure 3.6 *Indonesia E-Goverment Quality*
Source: KEMENPAN RB

INA Digital Roadmap 2025-2029:

1. **2025: Foundation and Initial Integration**
   Q1-Q2: Needs Analysis and Planning
   - Identify the needs of public services to be integrated.
   - Establish interoperability and data security standards

   Q3-Q4: Infrastructure Development
   - Development of national cloud infrastructure to support super apps.
   - Initial integration of priority services such as e-KTP, health services (SATUSEHAT), and education (Merdeka Mengajar).

2. **2026: Development and Testing**
   Q1-Q2: Service Module Development
   - Development of additional service modules such as social assistance, police services, and business licensing.
   - Trial of service integration in several pilot areas.

   Q3-Q4: Evaluation and Adjustment
   - Evaluation of trial results and adjustments based on user feedback.
   - improved data security and privacy features

3. **2027: Launching and Implementation**
   Q1-Q2: National Launching
   - Official launch of INA Digital as the government's super app.
   - Educational and socialization campaigns to the community.

   Q3-Q4: Advanced Implementation
   - Implementation of services throughout Indonesia.
   - Monitoring and evaluation of application performance

4. **2028: Optimization and Expansion**
   Q1-Q2: Service Optimization
   - Optimizing application performance based on data usage.
   - Adding new features according to community needs.

   Q3-Q4: Service Expansion
   - Service expansion to other sectors such as transportation and tourism.
   - Cooperation with the private sector for additional service integration.

5. **2029: Evaluation and Continuous Development**
   Q1-Q2: Comprehensive Evaluation
   - Comprehensive evaluation of super apps implementation.
   - Strategy adjustment based on evaluation results.

   Q3-Q4: Continuous Development
   - Continuous development to ensure apps remain relevant and innovative.
   - Long-term development plan for 2030 and beyond.

INA Digital Progress and Follow-up :

1. **Formation of Special Team:**
   Formation of a special team consisting of technology, cybersecurity, and project management experts to oversee the implementation of the roadmap.

2. **Inter-Ministry Collaboration:**
   Enhance collaboration between ministries and institutions to ensure seamless integration.

3. **Training and Education:**
   Training and education programs for government employees and the public to maximize the use of super apps.

4. **Periodic Monitoring and Evaluation:**
   Periodic monitoring and evaluation to ensure that goals are achieved and make adjustments if necessary.

5. **Public Data Security:**
   a. Encryption Technology Implementation: Use the latest encryption technology to protect public data.

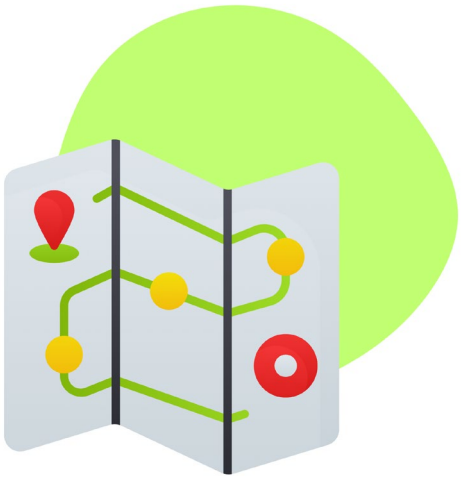
b. Periodic Security Audit: Conduct periodic security audits to identify and address potential vulnerabilities.
c. Security Awareness Enhancement: Cybersecurity awareness campaign for the public and government employees.

6. **Collaboration with the Private Sector:**
   a. Strategic Partnership: Form strategic partnerships with technology companies for the development of innovative features.
   b. Additional Service Integration: Integration of additional services from the private sector such as digital payments, logistics services, and e-commerce.
   c. Incubator and Accelerator: Supporting incubators and accelerators for startups that can contribute to the development of super apps.

With this addition, the INA Digital roadmap is expected to provide safe, efficient, and innovative services, as well as increase collaboration between the government and the private sector for the welfare of the community. To improve Peruri and its supporting ecosystem, several strategic steps can be taken:

1. Enhance Digital Security Solutions
- *Innovative Products*: Develop new digital security products to address emerging threats.
- *Collaboration*: Work with tech innovators and startups through initiatives like the Peruri Sandbox to foster innovation.

2. Expand Government Technology Services
- GovTech Indonesia: Continue to support the digital transformation of public services.
- Public Services: Focus on improving digital identity, education, health, and digital payments.



3. Strengthen Cybersecurity Measures
- High-Level Security: Maintain and enhance high-security standards for all digital products.
- Regular Audits: Conduct regular security audits to identify and address vulnerabilities.

4. Promote Sustainability
- Sustainable Practices: Implement eco-friendly practices in operations and product development.
- Corporate Governance: Strengthen corporate governance to ensure transparency and accountability.

5. Foster Talent Development
- Training Programs: Provide continuous learning and development programs for employees.
- Digital Readiness: Equip employees with the skills needed for the digital era.

6. Engage with Stakeholders
- Community Engagement: Actively engage with communities to understand their needs and incorporate feedback.
- Partnerships: Collaborate with government agencies, private sector, and other stakeholders to create a robust digital ecosystem.

By focusing on these areas, Peruri can continue to evolve and support Indonesia's digital transformation effectively.

3.2.2 Platform Economy

According to the latest data released by Bank Indonesia, the e-commerce transaction value in Indonesia amounted to IDR454 trillion in 2023, and is expected to grow 7.2% in 2024. Compared with 2022, the number of e-commerce transactions also increased significantly to 3.71 billion. Indonesia has a huge consumer market, a large young Internet user base, and a growing penetration rate of smartphones and the Internet, which lays a solid foundation for the rapid development of e-commerce.

According to the latest data from the Indonesian Internet Service Provider Association, the number of Internet users in Indonesia reached 215 million in 2024, with young people accounting for nearly 70%. The country's overall Internet penetration rate stood at 79.5%. Indonesia accounts for more than half of the total Southeast Asian e-commerce market, making it by far the largest e-commerce market in the region.

In recent years, the Indonesia government has helped upgraded the e-commerce industry with improved policies and regulations and new support initiatives. In 2017, Indonesia unveiled the e-commerce roadmap, aiming to promote and regulate online consumption. Measures have been taken to address issues such as logistics, financing, consumer rights protection, information infrastructure construction, and talent cultivation during e-commerce development.

In 2019, Indonesia enacted an e-commerce law to regulate e-commerce enterprises' market activities and strengthen the supervision of e-commerce platforms. The Indonesian government has also introduced various policies, including tax exemptions and loans, to encourage enterprises both in and outside the country to increase investment in e-commerce and attract more e-commerce consumers.

According to a report by Bank Indonesia, in 2023, the value of digital banking transactions increased 13.48% year-on-year to reach IDR58 trillion, and the transactions utilizing digital payment platforms surged by 43.45% year-on-year to hit IDR836 trillion. As the Indonesian government continues to advance the digital economy, the use of QR codes in domestic and cross-border transactions in Indonesia increased by 130% year-on-year. To further digitalize payment systems, Bank Indonesia launched the Indonesia Payment Systems Blueprint 2025 (BSPI 2025) in 2019, which covers the Quick Response Indonesian Standard (QRIS), BI-FAST (a real-time payment system), and the national open API payment standard (SNAP).

Since its launch in August 2019, QRIS has connected 31 million users and 25 million merchants by March 2023. In 2022, the number of transactions using QRIS reached 993 million, and the value of such transactions amounted to IDR98.45 trillion (about US$6.54 billion). The rapid expansion of the Indonesian e-commerce market has attracted many international e-commerce platforms.

The Indonesian government has also encouraged international enterprises to dive deep into the local market. Amazon, for example, invested US$87 million in an Indonesian startup, the first of its investment in e-commerce in Southeast Asia. Chinese e-commerce enterprises are also seeking to strengthen cooperation with their counterparts in Indonesia in a bid to increase their market share in the country.

The outbreak and prolonged impact of the COVID-19 pandemic greatly accelerated the growth of e-commerce in Indonesia, with an overall increase of over 50%. Numerous small and medium-sized enterprises (SMEs) – unable to conduct normal sales during the pandemic – resorted to e-commerce. SMEs in Indonesia contribute 60% of the nation's GDP and account for 97% of total employment, yet

only make up 16% of national exports. Therefore, enhancing the export capabilities of SMEs is a key focus for the government, and a significant objective of digital transformation to reduce costs and eliminate export barriers for SMEs. A similar trend is observed across ASEAN, where approximately 75% of SMEs realize the opportunities in the digital economy, while only 16% have genuinely adopted digital technologies.

Indonesian SMEs still face obstacles in digital transformation, including a lack of financial support, limited understanding of digital technologies, reluctance to change business processes, and a shortage of digital talent. Among them, funding is one of the most critical factors for successful digital transformation for SMEs. Only a small number of SMEs in Indonesia have begun to utilize advanced tools or novel technologies, including big data, artificial intelligence, and blockchain, to drive innovation, as such advancement largely relies on the SMEs' access to funding.

Currently, most SMEs only adopt basic digital tools, selling products through digital platforms, and engaging and communicating with customers on social media platforms like Facebook and WhatsApp. With little emphasis on production, research, and development, their main goals of digital transformation are to boost marketing and enhance communication efficiency by optimizing marketing and operational methods.

3.2.3 Digital Ocean

Indonesia, the world's largest archipelago, consists of over 17,000 islands with a coastline exceeding 108,000 kilometers. In 2017, Indonesia released the Comprehensive Maritime Strategy and Short-Term Action Plan, highlighting three key areas: maritime highways, marine economic zones, and marine tourism, with ports and infrastructure being central to the maritime highways.

Indonesia has two of the world's top 100 ports measured by container throughput, second to Vietnam within ASEAN. However, with regard to the overall container port throughput, Indonesia ranks lower than neighboring countries like Singapore, Malaysia, and Vietnam. The country's port operational efficiency is below the global average. For instance, the average time a container ship spent in port worldwide is 0.8 days, whereas in Indonesia, it is around one day.

This indicator, closely linked to the level of IT adoption, primarily reflects the operational efficiency of ports during docking. According to the OECD Digital Services Trade Restrictiveness Index (DSTRI), Indonesia lags in ICT infrastructure and connectivity, which is a key factor constraining its competitiveness.

Additionally, fishery is a vital part of the marine economy. Leveraging 5G-based geographic information systems, Indonesia can digitally manage fishing grounds to improve fishing efficiency and reduce the risk of overfishing. Marine forecast and warnings are particularly important for an archipelagic state like Indonesia.

By creating an efficient marine warning system that integrates satellite remote sensing, buoy monitoring, model-based predictions, and other technologies, Indonesia can promptly forecast natural disasters, giving coastal communities early warnings to

reduce casualties and property damage. Another critical area is ocean exploration. Indonesia is rich in marine resources, such as oil, gas, and minerals that lie underneath the ocean.

Digital marine technologies, such as remotely operated deep-sea exploration equipment, 3D modeling of seabed topography, and big data analysis for resources, can make ocean exploration more accurate and efficient. These technologies can also help assess the environmental impact of development activities on the ocean, striving for a balance between economic growth and ecological protection.

3.2.4 Digital Mining

Indonesia boasts abundant natural resources, and is reputed as the "Tropical Treasure Island". The country is rich in oil, natural gas, and various mineral resources, including coal, tin, bauxite, nickel, copper, gold, and silver. These resources have attracted significant foreign investment in the upstream mining industry for stable raw material supplies.

In May 2012, the Indonesian government began to impose a tax of 20% on exports of 65 mineral products and required foreign investors to establish smelting and processing plants in the country. This policy has as a result stimulated foreign investments in the downstream mining industry. As a result, the mining sector has attracted the most foreign investment in Indonesia.

In recent years, the mining industry has reshaped itself with advanced digital technology, 5G, and AI. This has led to safer and more efficient exploration, extraction, refining, and transportation management. For example, Pamapersada Nusantara (PAMA) has employed an intelligent mining solution to significantly enhance its information management, as well as mining efficiency and safety.

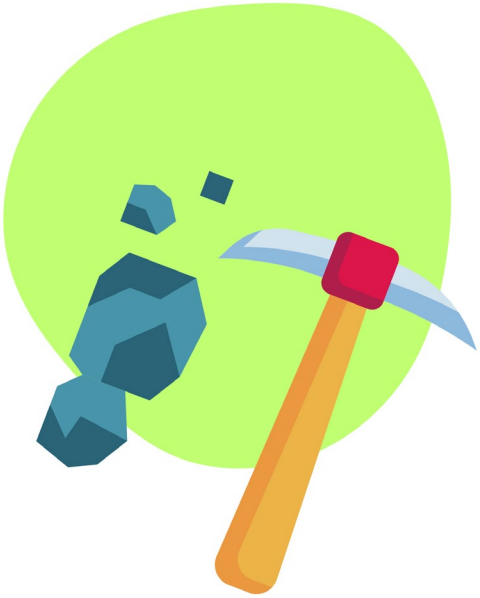
This innovative solution optimized traditional manual processes and delivered real-time monitoring and intelligent management. Thanks to this solution, PAMA has become a forerunner for modern operations of open-pit coal mines in Indonesia. Similarly, Freeport Indonesia has adopted the country's first 5G smart mining solution, marking Indonesia as the first Asian country to implement smart mining technology.

The development of digital mining in Indonesia from 2024 to 2030 is expected to experience a significant transformation with the application of advanced technologies such as 5G, AI, IoT and Big Data. Here are some important points regarding this development:

- **Digitalization and Smart Mining:** Companies such as MIND ID and PT Freeport Indonesia have begun implementing 5G Smart Mining technology to increase automation and remote control, aiming to increase work safety and productivity.
- **Challenges and Opportunities:** Despite challenges such as poor internet quality at mine sites and low digital skills, efforts to increase digitalization continue. This includes the development of digital applications such as Mastermine by MIND ID for more effective mine waste management.
- **Economic Prospects:** Prices of mining commodities such as nickel and gold are expected to increase, driven by downstream policies and expectations of interest rate cuts by world central banks. This will have a positive impact on the performance of mining companies in Indonesia.

- **Digital Transformation:** In line with the direction of national digital transformation, the mining sector is expected to contribute to Indonesia's digital economic growth which is targeted to reach 3.17% to 4.66% in 2024.

With these steps, it is hoped that the mining industry in Indonesia can become more efficient, productive and environmentally friendly, and able to compete in the global market.



3.2.5 Smart Manufacturing

Manufacturing is a key industry in Indonesia, with continuous growth driven by its Special Economic Zones (SEZs) and industrial parks, contributing 18% to GDP. Indonesia is one of the world's top 10 manufacturing countries, accounting for 1.4% of global manufacturing output, with multiple world-leading segments such as food products, textiles, leather & related products, tobacco products, and wearing apparel.

In 2015, Indonesia launched its Industry 4.0 plan to boost exports and enhance manufacturing competitiveness. However, compared to Singapore, Malaysia, and Thailand, manufacturing in Indonesia is relatively less competitive, ranking 39th in the UNIDO Competitive Industrial Performance (CIP) Index. The country's exports are heavily resource-based (47.4%) and low-tech value-added (23.9%), whereas resource-based exports from China, another major manufacturing nation, account for only 9.3%.

The implementation of Indonesia's Industry 4.0 plan has been slow, with only two factories currently being recognized by the World Economic Forum as Factory Lighthouses. The building of 5G fully-connected factories has yet to begin. Digitalization is crucial to enhancing the technological sophistication and competitiveness of Indonesia's manufacturing industry. The country needs to accelerate its digital transformation in manufacturing.

The development of smart manufacturing in Indonesia between 2024 and 2030 is expected to experience significant growth. Here are some key points regarding this development:

- Increased Automation and Efficiency: Smart manufacturing in Indonesia is driven by the need to increase automation and efficiency in production processes. Technologies such as IoT, AI and automation help industries optimize production, reduce operational costs and improve product quality.

- Adoption of Advanced Technologies: The integration of advanced technologies such as industrial sensors, industrial robots, industrial 3D printers and machine vision systems is becoming increasingly common. Solutions such as SCADA, MES and industrial security systems are also increasingly being used.

- Government Support: The Indonesian government strongly supports the adoption of smart manufacturing by introducing various initiatives to encourage manufacturers to adopt this technology. This includes improving infrastructure and attracting foreign investment.

- Challenges and Opportunities: One of the main challenges is changing organizational culture and workforce training. The transition to smart manufacturing requires a cultural change and upskilling the workforce to operate and maintain advanced technologies1. However, the opportunities for growth are huge as the sector is still in its infancy and continues to develop.
- Impact of the COVID-19 Pandemic: The COVID-19 pandemic accelerated the adoption of smart manufacturing technology in Indonesia. This technology enables remote monitoring, predictive maintenance, and automation, which have become critical to ensuring business continuity during the pandemic.

3.2.6 Digital Agriculture

Agriculture holds a vital place in Indonesia's economy. Driven by optimized planting techniques and improved land use, Indonesia's agricultural output has increased steadily, contributing significantly to 14% of GDP.

Agriculture digitalization and modernization are key goals for Indonesia. In 2021, the Indonesian government released the Indonesia Digital Roadmap 2021–2024, outlining 10 key sectors for development, including digital agriculture. In March 2023, the Indonesian Ministry of Agriculture and the United Nations Food and Agriculture Organization jointly developed an e-agriculture national strategy that promotes digital agriculture through big data analysis of information related to cultivated areas, productivity, disaster warning and responses, and marketing channels.

Indonesia has stepped up research in smart agriculture and produced great results so far. For example, IoT sensors are used to track parameters that are crucial to plant growth, such as temperature, humidity, moisture, and pH values. We also use smart fertilizer systems to analyze soil nutrients and support targeted cultivation approaches for higher yields and efficiency. We have developed digital platforms that provide warnings for bad weather. Smart agriculture applications deployed in Jakarta and Bali monitor plantation conditions on farms and enable remote controls. However, there are still considerable challenges to agriculture in the country.

Due to low digital adoption, agriculture is still a labor-intensive industry with high production costs. This can be attributed to a lack of digital infrastructure in rural areas, where both network coverage and quality fall short. Of the 120 million people living in rural areas, only 29.5% of them have Internet access. In some areas, fewer than 50% of people have a smartphone. Other factors that affect digital adoption in agriculture include people's inability to use digital technology and the high costs of digital transformation.

The development of smart agriculture in Indonesia between 2024 and 2030 is predicted to experience significant growth. Here are some important points regarding this development:

- Technology Adoption: Technologies such as IoT, drones and AI-based analytics are increasingly being integrated into agricultural practices. This helps in optimizing resource use and increase agricultural productivity and sustainability.
- Government Support: The Indonesian government provides support and incentives for the modernization of the agricultural sector, including the application of precision agriculture technology and data analytics.
- Consumer Demand: There is increasing demand for local, organic and traceable products, which is driving the adoption of smart farming solutions.

- Challenges: Key challenges include technology access in rural areas, adoption by farmers, and data management. Overcoming connectivity barriers and ensuring technology solutions fit the needs of the diverse agricultural sector is critical.

- Key Players: Some of the key players in the smart agriculture market in Indonesia include agtech startups such as Sayurbox and TaniHub, as well as companies providing precision agriculture solutions such as John Deere and Trimble.

- Research and Development: Universities and research institutions such as IPB (Bogor Agricultural Institute) and Gadjah Mada University (UGM) are actively developing smart agricultural technology, including precision agricultural technology, to increase production in tropical areas.

To support the successful implementation of smart agriculture in Indonesia in 2025-2029, the government needs to consider the following incentives and support:

1. **Fiscal Incentives and Subsidies:**
   - Technology Subsidies: Provide subsidies for the purchase of smart agricultural technology such as sensors, drones, agricultural equipment and IoT devices.
   - Tax Incentives: Offer tax incentives for companies that invest in smart agricultural technology and related research. Related fertilizer and agricultural seed subsidies are also needed, especially in pilot areas for underprivileged farmers.

2. **Digital Infrastructure Development:**
   - Internet Network: Expand high-speed internet access in rural areas to support the use of digital technology in agriculture.
   - Digital Platform: Build a digital platform to facilitate farmers' access to the latest market, weather and technology information.

3. **Training and Education:**
   - Farmer Training: Organize training programs for farmers on the use of smart agricultural technology and best practices.
   - Collaboration with Universities: Encourage collaboration between universities, research institutions and industry to develop relevant curricula and training programs.

4. **Financial Support:**
   - Business Credit: Provides low-interest credit schemes for farmers and startups who want to adopt smart agricultural technology.
   - Research and Development Fund: Increase funds for research and development of smart agricultural technology.

5. **Regulation and Policy:**
   - Legal Certainty: Provides clear regulations and legal certainty for the use of new technologies in agriculture.
   - Data Protection: Ensures the security of farmer data and protection against cyber threats.

6. **Market Promotion and Access:**
   - Market Access Opening: Opens domestic and international market access for agricultural products produced through smart technology.
   - Export Promotion: Encourage exports of agricultural products with high added value through smart agricultural technology.

With this combination of incentives and support, it is hoped that the implementation of smart agriculture in Indonesia can be successful and provide significant benefits for the agricultural sector and the national economy.

Here are some smart agricultural technologies that can be applied to increase efficiency and productivity in the agricultural sector:

1. **Internet of Things (IoT):**
   - Soil and Plant Sensors: Using sensors to monitor soil moisture, nutrients, and plant conditions in real time.
   - Automatic Irrigation and Fertilization Systems: Using data from sensors to automatically regulate irrigation and fertilization, making water and soil fertilizer use more efficient.

2. **Artificial Intelligence (AI):**
   - Agricultural Data Analysis: Using AI to analyze weather, soil, and crop data to provide appropriate recommendations for farmers.
   - Crop Prediction: AI can predict crop yields based on historical data and current conditions.

3. **Drones and Robotics:**
   - Land Monitoring: Drones are used for aerial monitoring of agricultural land, helping to identify problems such as pests or plant diseases.
   - Planting and Harvesting Robots: Robots can be used to automatically plant and harvest crops, reducing the need for manual labor.

4. **Big Data and Analytics:**
   - Land Management: Using big data analytics to manage farmland more efficiently, including crop rotation and fertilizer use.
   - Market Monitoring: Analyzing market data to help farmers determine the best time to sell their crops and planting according to market needs and land suitability and season.

5. **Blockchain:**
   - Supply Chain Transparency: Using blockchain to ensure transparency and security in the agricultural supply chain, from farmers to consumers.
   - Product Tracking: Enabling tracking of agricultural products from origin to consumer, increasing food trust and security.

6. **Vertical Farming and Hydroponics:**
   - Vertical Farming: Using vertical farming techniques to grow crops in tiered layers, saving space and increasing yields.
   - Hydroponics: Growing crops without soil using nutrient solutions, suitable for areas with limited land.

By adopting these technologies, the agricultural sector in Indonesia can become more efficient, productive, and sustainable.

3.2.7 Digital Supply Chain

As with some other noteworthy peer countries in the south-east and east Asia region, Indonesia has undergone a rapid process of industrialization and urbanization over the past 50 years. Manufacturing as a share of GDP rose from around 12% in 1982 to a high of 32% by the early 2000s (it has fallen back slightly since). Several decades of increasing trade openness and engagement with the global economy has also witnessed Indonesia's increasing participation in global supply chains.

Since 2020 a new set of shocks has arrived. COVID-19, inflation, contractionary U.S. monetary policy, and rising commodity prices have all impacted the Indonesian economy. At the same time, developments in geopolitics are creating new opportunities in global supply chain participation.

Indonesia's strategic location, rich natural resources, and a young, talented workforce place it in an advantageous position to capitalize on these new opportunities. But in the eyes of industry insiders, Indonesia's shortcomings as a potential leading participant in global supply chains are as prominent as its advantages.

The first is the country's sub-optimal infrastructure outside of the metropolitan Jakarta region. Indonesia is an archipelagic country with its territory scattered across the ocean. This raises the average cost of transport and logistics well above regional competitors (the World Bank's 2023 Logistics Performance Index (LPI) ranked Indonesia 63rd out of 139 countries). Although Indonesia's infrastructure shortcomings have improved in the past decade, they have not kept pace with economic growth or the demands of global trade. For example, the total operating mileage of Indonesian railways is about 7,900 kilometers (Java 4.700, Sumatera 3.200), the electrification rate is 99.63%, and the digitalization rate is even lower.

In terms of water transportation, our waterway length ranks seventh among countries in the world, but the level of automation and transportation efficiency are not satisfactory. In the 3T area our roads and communication networks do not provide sufficient coverage. Secondly, in 2023 Indonesia's share of the population with tertiary education is only around 6%. The relative paucity of high-skilled workers inhibits Indonesia's potential to rise up the value-added chain of economic development.

3.2.8 Digital Tourism

Indonesia's tourism sector is recovering from the Covid-19 pandemic. ROI in this sector continues to increase in line with the increase on the number of tourists, the number of foreign tourist visits is estimated to reach 7-9 million in 2023. The use of digital technology in the tourism sector, such as online booking and digital marketing, helps increase efficiency and attract more tourists and trends Eco-friendly tourism is increasingly in demand, which can attract tourists who care about environmental issues.

In 2024, the average expenditure of foreign tourists in Indonesia is estimated to reach around $1,443.70 per visit, or around IDR 23.45 million assuming an exchange rate of IDR 16,243 per US dollar. These expenses cover various aspects such as:

- Accommodation: Contributes around 36.03% of total expenses.
- Eating and Drinking: Contributes around 19.39% of total expenditure.
- Shopping and Souvenirs: Contributes around 11.04% of total expenditure.

This sector contributes 4.5% of GDP and 9.5% of employment in Indonesia. However, Indonesia is below the global average in terms of the share of tourism in GDP. In 2023, global tourism represented 9.1% of the global GDP, which was more than twice that number in Indonesia and a sign that the country's tourism sector has huge untapped potential.

Since the outbreak of Covid-19, Indonesia has been lagging behind neighboring countries when it comes to the number of international tourists. Between 2022 and 2023, Thailand and Singapore saw their international tourists grew 154% and 155%, respectively, far outpacing Indonesia in both the quantity and growth rate of international tourists.

According to the Travel & Tourism Development Index (TTDI), Indonesia is high on the ranking list, but lags far behind in terms of ICT readiness, tourist services & infrastructure, and openness to T&T measures. The country is way behind Singapore and Malaysia in information infrastructure availability. To close these gaps, Indonesia needs to employ digital technology at scale.

Building one-stop digital service platforms can make travel easier for international tourists, with services like electronic visas for cross-border travel, smart customs, smart entry services, and online tax refunds. Further optimization and integration of travel facilities and resources, such as hotels, transportation, scenic spots, performances, and exhibitions, can take travel experiences to new levels. In addition, digital technology can help boost the influencer economy in Indonesia. This requires more efforts to build new social media platforms and attract more online influencers, to enhance the country's reputation and appeal as a great tourist destination.

Technologies like big data and AI, coupled with precision marketing programs that involve online influencers and key opinion leaders, are helpful for Indonesia's growth in both tourism and the influencer economy.

3.2.9 State-Owned Enterprises

Indonesia is advancing the reform of state-owned enterprises (SOEs) with five priorities: business model innovation, technology leadership, talent development, investment acceleration, and economic and social value. The reform spans three stages: Resilience & survival, Restructure & recover, and Reimagine & innovate. Structural downsizing and digital capability development are key goals of the reform.

Since 2020, the number of SOEs has decreased from 111 to 41, and the number of clusters has reduced from 27 to 12. SOEs' total assets amount to 11,149.93 trillion IDR Rp, and their total net profit is 351.02 trillion IDR Rp, which is still growing rapidly. SOEs have more than one million employees and play a crucial role in providing public services, funding, and support for people's daily lives. Digitalization in the finance sector, especially digital banking, has been a key driver that enables the growth of SOEs in recent years.

The finance and energy industries are very open to digital technology, so SOEs in these industries are ideal forerunners for digital transformation. The formation of the SOE Holding is a strategic planning for the management of the SOE, including the company's children, grandchildren and great-grandchildren, to continue to focus on the core business, so that it is hoped that the SOE's performance will be more optimal and support the creation of a more conducive business climate in the private sector.

The main objective is rightsizing SOE, namely restructuring/rearranging SOE by means of sharper

mapping and regrouping/consolidating to achieve a more ideal number and scale of SOE businesses. The general objectives of establishing a holding include:

1. Increasing the company's market value creation (market value creation);
2. Creating flexibility for holding subsidiaries in carrying out corporate actions;
3. Increase competitive advantage because it will provide focus and a more economical business scale and be able to create corporate leverage;
4. Make SOE bigger, stronger and more agile for the greatest prosperity of the people;
5. Implementation of policy discussions for business development is only carried out at the parent holding level; And
6. Strengthen the synergy and strategic role of SOE in supporting Government programs to achieve national goals

Figure 3.7 *BUMN Sectoral Holding*
Source: KEMENKEU (2022)

There are several countries that have successfully implemented the super holding model for their state-owned enterprises. Two examples that are often mentioned are:

1. **Singapore - Temasek Holdings**
   Temasek Holdings was established in 1974 by the Singapore government to manage state investments in various sectors such as financial services, telecommunications, technology, transportation, and energy1. Temasek has grown into one of the largest investment companies in the world with a portfolio spanning more than 30 countries.
2. **Malaysia - Khazanah Nasional Berhad**
   Khazanah Nasional Berhad is a Malaysian government-owned investment company established in 1993. Khazanah manages the country's strategic assets in various sectors including infrastructure, healthcare, and technology2. This model allows Malaysia to optimize the management of state assets and increase global competitiveness.

This super holding model allows these countries to manage their assets more efficiently and strategically, as well as increase competitiveness in the international market and facilitate its globalization

The formation of a super holding for State-Owned Enterprises (BUMN) in Indonesia is being initiated by the government. This modelling aims to group several BUMNs under one large parent entity, similar to the model used by Khazanah in Malaysia and Temasek in Singapore.

Benefits of BUMN Super Holding

1. Operational Efficiency: With centralized management, super holding can reduce bureaucracy and unify management processes, so that company operations become more effective.
2. Increased Competitiveness: More flexible capital management and innovation allow BUMN to compete better in the global market with a stronger structure.
3. Optimization of Asset Management: Super holding allows efficient asset management on a large scale, so that the potential return on BUMN assets can be maximized.

Policies to be Consider :

1. Tightening Regulations: To avoid negative impacts such as covert privatization and shifting focus from public interest to profit, the government needs to establish strict regulations.
2. Social Role of BUMN Policies must ensure that BUMN continue to carry out their social and economic responsibilities, especially in the development of disadvantaged regions.

Challenges of BUMN Super Holding:

1. Disguised Privatization: There are concerns that grouping companies under a super holding company could increase the involvement of private companies or foreign investors in managing the country's strategic assets.
2. Shifting Focus: A more dominant profit orientation in a super holding company could reduce the social role of SOEs, such as affordable public services.

The formation of this super holding company is expected to make SOEs more efficient, well-coordinated, and able to compete in the global market. However, its implementation must be carried out carefully and gradually to avoid possible negative impacts. Finance is a critical sector that can boost Indonesia's industry development, innovation, and talent development.

The country has strong demand for digital payment services. With close to 275 million people, the country has a large underserved and underbanked population: About 48% of adults do not have any bank accounts. At present, Indonesia is experiencing a boom in both fintech and mobile payment. Fintech is expanding beyond payment to other services, such as loans, wealth management, and insurance. From 2011 to 2022, the number of fintech companies soared from 51 to 334.

Indonesia has experienced rapid growth in the financial technology sector in recent years, especially with the emergence of various platforms and services that make access to financial services easier. Fintech in Indonesia includes various services such as digital payments, online investment, digital insurance (insurtech), as well as online loans, especially through peer-to-peer (P2P) lending.
This growth is driven by:

- Low levels of traditional financial inclusion: Many Indonesians, especially in rural areas, do not have access to conventional banking services. So the government has set a financial inclusion target by the end of 2024 to reach 90% of Indonesians having access to financial services.

- Growth in internet and smartphone use: Increased internet accessibility and use of mobile devices have made it easier for people to use fintech services. With increasing internet access and mobile phone use, access to digital finance has also become easier.

- Supportive regulations: The Financial Services Authority (OJK) and Bank Indonesia (BI) have provided a regulatory framework that allows fintech to develop safely.

From existing developments, several important trends can be seen emerging in the Indonesian fintech sector, such as:

- P2P Lending: P2P lending platforms allow users to get loans directly from individuals or other institutions without going through traditional financial institutions. This type of fintech has developed rapidly, especially for segments of society that have not been served by banking.
- Digital Payment Systems: Digital wallets and online payment applications such as OVO, GoPay, DANA, and LinkAja are becoming popular, even used in everyday transactions from transportation payments to online shopping.
- Digital Banking: Conventional banks are starting to switch to digital by offering mobile application-based services that are easier and faster.
- Crowdfunding and Crowdlending: Fintech-based crowdfunding allows small and medium enterprises (SMEs) and startups to obtain funding from the wider community.
- Blockchain and Cryptocurrency: The use of blockchain technology and digital assets such as cryptocurrency is also starting to gain attention in Indonesia, although it is still limited by regulations.

The development of the fintech market and technology in Indonesia from 2024 to 2030 is expected to experience significant growth.

If we look at various fintech services, P2P lending has become one of the most developed fintech subsectors in Indonesia. This allows borrowers, especially SMEs and individuals, to access loans that would be impossible to obtain through traditional banks. As an alternative financing, P2P lending is an attractive option for many people, especially because the process is faster and easier than conventional bank loans.

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Based on data from the Financial Services Authority as of June 2024, Profit (Loss) as of June 2024 IDR. 337.15 billion, an increase compared to May 2024 which was IDR. 277.02 Billion. The number of lending accounts is 7,422,532 accounts with a total value of IDR 24,868 trillion, the largest of which are in Jakarta, Banten, West Java, East Java and Central Java. For loan recipients, there are 11,323,825 accounts with a total value of IDR 24,836 trillion, where the largest loan recipients are in West Java, Jakarta, East Java and Banten and Central Java. Meanwhile, the total outstanding loan is IDR. 66.988 trillion where TWP90 was 2.84% down from May where TWP90 was 2.91 with a value of IDR 64.556 trillion.

The following is the financial performance of P2P Lending for the period June 2023 to June 2024.

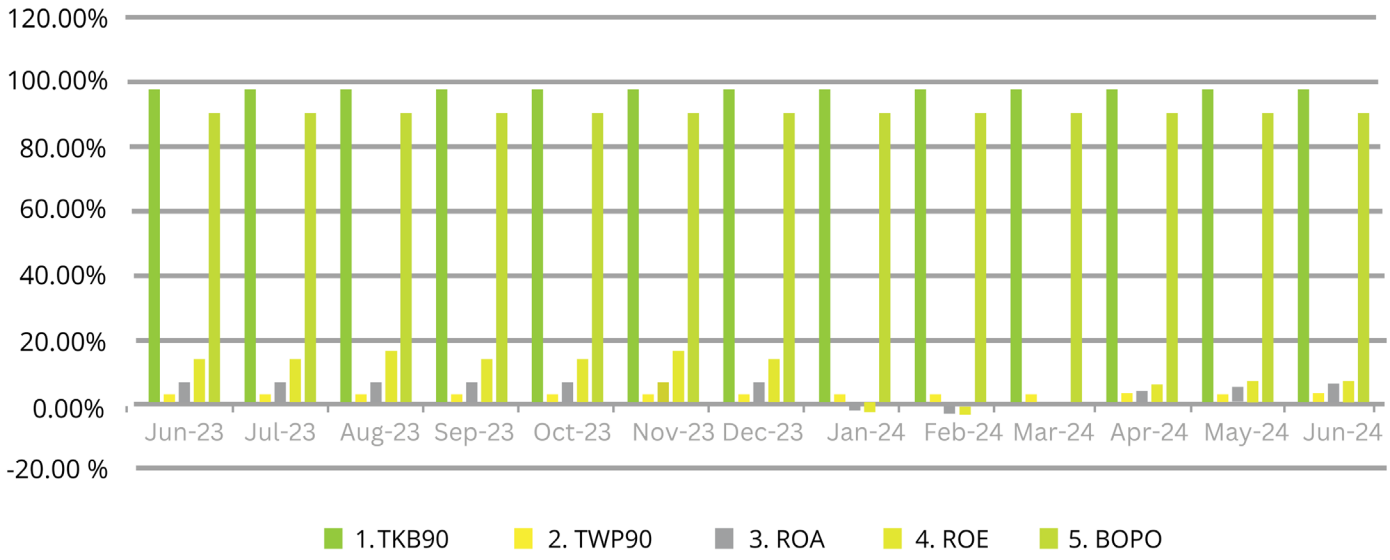


Figure 3.8 *The financial performance of P2P Lending for the period June 2023 to June 2024.*
Source: Financial Services Authority (June 2024)

The number of P2P lending organizers or platforms, which reached 161 in 2021, is now decreasing. According to OJK records, until early 2024 there will be 98 registered P2P lending providers.

The development of online loans also brings a number of challenges and problems:

- High interest rates: Some P2P lending platforms offer loans with quite high interest rates, which can be burdensome for borrowers.
- Default risk: Due to the ease of access to loans, there is a higher potential risk of default compared to loans from traditional banks.
- Unethical billing: Many complaints about unethical billing methods by some P2P lending platforms, including intimidation and harassment.
- Lack of financial literacy: Many users of these platforms lack financial literacy, and therefore do not understand the risks and obligations associated with online loans.

Even though fintech is developing rapidly, there are several challenges that must be faced to ensure its sustainability. Existing challenges include:

- Regulation and Oversight: Appropriate regulation is essential to maintain consumer confidence and avoid abuse. OJK continues to update related regulations to ensure fintech runs in accordance with sound financial principles.
- Data Security: As digitalization increases, cyber-security risks also increase. Fintech must be able to protect users' personal data from leaks or theft.
- Financial Inclusion: Even though fintech makes access to financial services easier, there are still some people, especially in remote areas, who have not been reached by fintech services.
- Financial Literacy: Another big challenge is increasing people's financial literacy. Many users still don't understand how fintech works, especially regarding the risks that may arise from using digital financial services.

Here is an in-depth description of the various aspects that will affect and shape the fintech sector in Indonesia during this period.

1. Growth of the Digital Economy

Indonesia's digital economy is projected to grow rapidly, reaching a value of around Rp 4,500 trillion by 2030. This growth is driven by increasing financial inclusion and improving digital literacy. The government and various associations continue to strive to improve public access to digital financial services, which in turn will drive the adoption of fintech technology.

2. Financial Inclusion and Literacy

The level of digital financial inclusion in Indonesia has shown a significant increase. However, financial literacy is still a big challenge. In 2019, the Financial Literacy Index only reached 30.03%, while the Financial Inclusion Index reached 76.19%. Efforts to improve financial literacy will be the main focus to ensure that people not only have access to financial services, but also understand the risks and benefits.

3. Innovation and Diversification of Fintech Services

The fintech sector in Indonesia has evolved from just online payment services to a variety of more complex financial services. Innovations in digital payments, such as e-wallets and mobile point-of-sale (POS) payment systems, have helped increase financial inclusion in tier 2 and 3 cities. In addition, online lending platforms (pinjol) and Buy Now Pay Later (BNPL) services have emerged as solutions to address the banking access gap.

4. Investment and Funding

Investment in Indonesia's fintech sector continues to increase. Between 2021 and 2022, funding to the sector increased by 83%, demonstrating investor optimism towards opportunities in the sector. This investment does not only come from domestic, but also from international investors who see great potential in the Indonesia market.

5. Regulations and Policies

Supportive regulations will be the key to the development of fintech in Indonesia. The Financial Services Authority (OJK) and Bank Indonesia (BI) continue to develop adaptive regulatory frameworks to accommodate fintech innovations. Clear and supportive regulations will help create a healthy and sustainable ecosystem for fintech growth.

6. Blockchain Technology and Security

Blockchain technology is expected to play an important role in the development of fintech in Indonesia. Blockchain can improve the transparency and security of financial transactions, which is crucial in building public trust in fintech services. In addition, this technology can also be used for various other applications, such as smart contracts and digital identities.

7. The Role of MSMEs and Startups

MSMEs and startups will be the main drivers in the adoption of fintech technology. Many MSMEs in Indonesia do not have access to traditional banking services, so fintech can be a solution to overcome this gap[2]. Fintech startups will also continue to innovate to provide more affordable and easily accessible services for MSMEs.

8. Future Trends

Some of the trends that are expected to dominate the fintech sector in Indonesia include:

- Integrated Financial Services: The integration of various financial services in a single platform will be a major trend. Users can access various services, such as payments, loans, investments, and insurance, within a single app.
- Artificial Intelligence (AI) and Machine Learning (ML): AI and ML will be used to improve service personalization, risk analysis, and fraud detection.
- Quantum Finance : The algorithm for predicting the dynamic of finance is optimized using the emerging quantum machine learning operating on quantum computing.
- Open Banking: The concept of open banking, where financial data can be accessed by various parties with the user's permission, will encourage innovation and competition in the fintech sector.
- Green Finance: Fintech will play an important role in supporting green finance initiatives, such as financing green projects and sustainable investments.

9. Challenges and Opportunities

Although the growth prospects of fintech in Indonesia are very promising, there are several challenges that need to be addressed:

- - Data Security and Privacy: With the increasing adoption of fintech services, data security and privacy issues will become increasingly important. Fintech service providers must ensure that user data is properly protected.
- - Digital Literacy: Increasing digital literacy among the public will be a big challenge. The government and the private sector need to work together to provide adequate education and training.
- - Adaptive Regulation: Regulations that are too strict can hinder innovation, while regulations that are too lax can increase risk. OJK and BI need to find the right balance to support fintech growth.

The development of the fintech market and technology in Indonesia from 2024 to 2030 is expected to be very dynamic and full of opportunities. With the support of the right regulations, increased financial literacy, and technological innovation, the fintech sector in Indonesia has the potential to become one of the world's leaders. Existing challenges must be overcome by collaboration between the government, the private sector, and the community to create an inclusive and sustainable fintech ecosystem.

Four of the country's top 10 SOEs are banking businesses. Digital banking is a key catalyst for the finance sector. By embracing digital technology, this sector will be better positioned to support the digital economy; meet the financial needs of individuals and micro-, small-, and medium-sized enterprises; attract and boost foreign investment; propel the development of digital infrastructure, digital finance, and digital services; and lay the groundwork for broader digitalization across society.

In Indonesia, about 30 million people do not have adequate access to electricity. Some remote areas are powered by off-grid solar systems, without any access to PLN's power grids. According to World Bank data, average electricity consumption per capita is lower in Indonesia than in neighboring countries. To address current electricity shortages and gear up for future development, Indonesia has been using digital technology to shift to green energy. Good outcomes have been achieved thus far.

In November 2023, the Cirata floating PV plant connected to the power grid and began to operate at full capacity. It is the first floating PV plant in Indonesia and the biggest one in Southeast Asia, and also the world's deepest floating PV plant under construction. With an estimated annual output of 300,000 MWh, this plant helps save 117,000 tons of standard coal annually, and supplies sufficient electricity to 500,000 households. Owing to this plant, electricity shortage has become less severe in regions around West Java. In 2022, Indonesia ranked as the world's second-largest geothermal power producer with a total installed capacity of 2,356 MW, trailing only the US and surpassing the Philippines.

To keep up with growing demand for electricity, the Ministry of State-Owned Enterprises expects that PLN will purchase new and renewable energy up to more than 1 GW in 2024. According to PLN's plans, the country's newly installed geothermal generator capacity will grow to 3,355 MW by 2030, with an additional 141 MW by 2024 and 870 MW by 2025. PLN is also aiming to build a digital super grid that will connect the power systems of islands. The goal is to both keep up with the rapid advancement of renewable energy, and address the mismatch between the distribution of clean energy and centers of electricity demand.

In addition, Indonesia is researching and rolling out smart grid projects. Developing and using clean energy is beneficial in two aspects. First, it contributes to the country's energy conservation and emissions reduction goals, as well as green and sustainable economic growth. Second, the country will become less reliant on imported oil and natural gas, and the domestic coal reserve will last longer.

3.2.10 Digital Healthcare

Indonesia has a population of more than 278 million, and has a huge demand for imported medical equipment and supplies. There are 1,562 public hospitals, 20,000 small health center in villages (PUSKESMAS), 228,431 community healthcare (POSYANDU) and 666 private hospitals. According to a conservative estimate, an additional 500,000 hospital beds are needed. Indonesia's healthcare spending accounts for 3% of GDP, compared with 17% in the US. Its per capita healthcare spending is US$100, lagging behind smaller ASEAN countries such as Thailand (US$200) and Malaysia (US$300), and far behind the US (US$8,500). There are 0.2 physicians and 1 hospital bed per 1,000 people, compared with the global average of 3.2 and 3, respectively. These statistics show that Indonesia needs a large amount of funds and resources for its healthcare system to keep pace with the global average.

In 2024, Indonesia is implementing an ambitious health digital transformation strategy. The Ministry of Health of the Republic of Indonesia has published the "Blueprint of Digital Health Transformation Strategy 2024" which provides guidance for stakeholders in the Health industry.

This strategy highlights several key challenges, such as data fragmentation due to the large number of health applications and the lack of standard regulations and data exchange. Currently, around 80% of health facilities are untouched by digital technology, and health data is spread across hundreds of different applications. Some of the key priorities in this transformation include:

- Health data system integration and development: Implementation of a single medical record and integration of electronic system services between health institutions and the government.
- Health application system development: Expansion of telemedicine facilities and development of an AI-based big data ecosystem.
- Health technology ecosystem development: Improving business processes and human resources in health informatics.

In addition, this strategy also emphasizes the importance of effective leadership and governance, with the formation of a digital transformation management team consisting of various working sub-groups.

Revenue in the digital health market in Indonesia is projected to reach USD 2,296 million in 2024, with an annual growth rate of 9.70% until 2029.

Some health applications that are popular in Indonesia currently include:

- Halodoc: This application allows users to consult doctors, buy medicine, and carry out laboratory tests online.
- Alodokter: Provides doctor consultation services, health information and trusted medical articles.
- Mobile JKN: The official application from BPJS Health which makes it easier for participants to access health services and information related to BPJS.
- SATUSEHAT Mobile: Application developed by the Ministry of Health for the integration of health data and telemedicine services.
- Sehat Indonesiaku: Application from the Ministry of Health that provides health information and telemedicine services.
- Medi-Call: Connects healthcare providers with patients who need home visit services

Smart healthcare and telemedicine powered by emerging digital technologies can help alleviate the shortage of healthcare resources in Indonesia.

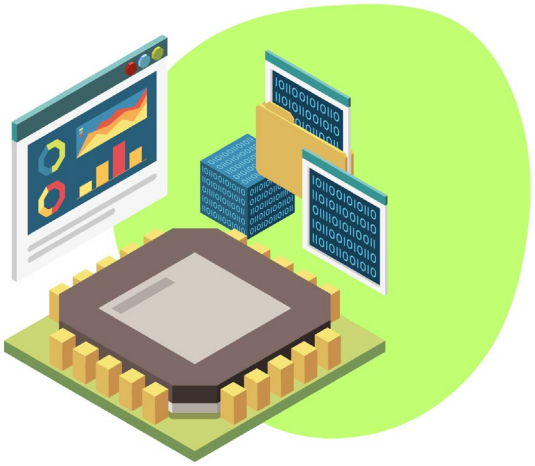
1. Healthcare data silos caused by technical limitations and data security and privacy concerns are an important factor that hinders the development of the healthcare industry in Indonesia and the world. In recent years, technologies have been rapidly evolving, driving up the adoption of wearables, AI, robotics, 5G, fiber optic network, and blockchain technologies in the healthcare industry.

   This has given rise to new ways of diagnosis and treatment, and also helped collect and integrate healthcare data such as genetic, diagnosis and treatment, consumption, and behavioral data. Nowadays, many consumers are used to wearing wearables that track and monitor exercise, sleep, heart rates, and other data. Many medical technology companies around the world are working to integrate always-on biosensors and software into devices to generate, collect, and analyze data.

   Based on medical big data, these companies can use advanced cognitive technologies to analyze massive parameters and provide personalized health status analysis for users. They can also use AI to enable real-time health detection and micro-intervention, making it possible to prevent, detect, and intervene with diseases early on. In the future healthcare ecosystem, the healthcare data of Indonesian people will be the most important digital asset. It is a cornerstone for healthcare model innovation, healthcare service improvement, and the R&D of digital healthcare products.

2. The telemedicine solution, powered by high-bandwidth and low-latency networks, makes it possible to provide equal access to healthcare for Indonesian people, especially those in underserved communities. This solution provides remote monitoring and early intervention, which helps cut medical costs for patients. It also helps provide the best possible medical solution based on environment changes, optimize the staffing of the healthcare workforce, and digitalize medical regulation. Ultimately, the solution can help patients recover faster and give consumers a better healthcare experience.

3.2.11 Science, Education, and ICT Talent Development



New information technologies, such as mobile communications, cloud computing, big data, IoT, and AI, are making smart education a reality. This includes smart teaching, smart education management, and smart education services, which are well-tailored to meet diversified and personalized requirements. Smart campuses are the critical infrastructure for smart education, but they are also posing new challenges to networks. For example, online classrooms require a large number of interactive devices such as multimedia devices, IoT terminals for sensing, and HD cameras, which will increase the number of indoor information points. Immersive teaching needs a large number of VR terminals that require higher resolution, frame rates, and bit rates than 4K video services. A cloud VR classroom with 30 to 50 people, for example, requires 1 to 10 Gbps bandwidth.

High-performance computing of scientific research platforms in universities requires a network packet loss of no more than 10% and a latency of no longer than 10 ms. In high-density wireless scenarios, such as lecture halls, auditoriums, stadiums, and libraries, there can be 100 people accessing the network concurrently. A lecture hall, for example, needs to provide wireless access for 60 to 150 people, and a larger auditorium may need to provide wireless access for more than 300 people.

Indonesia has a large number of islands and their economic development remains unbalanced. The country's basic education has encountered many difficulties in digital transformation.

Due to capital and infrastructure restrictions, Indonesia lags behind many ASEAN countries such as Singapore, Malaysia, and Thailand in terms of Internet penetration. Around 42,159 schools do not have Internet access (32,194 elementary schools, 7,178 middle schools, 1,144 high schools, 923 vocational schools) especially in remote and border areas. 8522 schools still lack electricity supply.

Some students cannot learn online due to weak network and power infrastructure in their regions. Teachers are also facing challenges in using digital technologies. Some of them cannot find suitable digital resources and information to improve their teaching.

3.2.12 Digital Culture

Indonesia is a culturally diverse country with multiple ethnic groups speaking more than 300 languages, each with its unique language, religion, traditions, and customs. Indonesia has a rich cultural heritage. However, due to a lack of effective digital communication tools, the country's traditional cultural heritage including music, dance, handicrafts, and architecture is facing significant disruption from Western culture.

But when it comes to cultural exports, Indonesia does not have anything like Japanese anime, Korean dramas, or Hollywood movies. Therefore, Indonesia needs to make full use of digital media platforms for cross-cultural communication, promote and protect its rich cultural heritage, create new opportunities for economic growth, and promote cultural and economic cultures.

By providing innovative digital media content and a diversified cultural experience, Indonesia has the potential to establish a solid presence in the global cultural market and inject new vitality into the sustainable development of traditional culture. This will allow other parts of the world to better understand and appreciate Indonesia,- -and also help the country demonstrate its uniqueness and cultural value in global competition. Through international collaboration, Indonesia can promote its stories and culture around the world while establishing a unique cultural brand.

3.2.13 Digital Energy

The development of digitalization of the energy sector in Indonesia is very important to achieve increased efficiency, sustainable economic growth and increased productivity. With digitalization, the energy sector can optimize resource use, reduce operational costs, and increase transparency. Technologies such as big data, AI, and IoT can be used to monitor and manage energy infrastructure in real-time, thereby minimizing risk and improving response to disruptions.

Collaboration between governments, the private sector, academia, and civil society is urgently needed to achieve this goal. Governments need to provide supportive regulations and adequate infrastructure, while the private sector can invest in technology and innovation. Academics can contribute through research and development, while civil society can support through active participation and awareness of the importance of the energy transition.

With strong collaboration and synergy, Indonesia can achieve sustainable economic growth and achieve a lower carbon emission target by 2030.
Here are strategies that can be implemented to achieve these goals:

Optimizing Digital Infrastructure by building strong digital infrastructure, such as fiber optic networks and smart grids, is very important to support the digitalization of the energy sector. The government needs to ensure that this infrastructure is available throughout the region, including remote areas.

The implementation of Advanced Technologies such as big data, AI, and IoT can help in monitoring and managing energy infrastructure in real-time. This technology can be used to predict energy needs, optimize distribution, and reduce the risk of disruptions.

Multi-Sector Collaboration such as collaboration between government, private sector, academia, and civil society is essential. Governments can provide supportive regulations and incentives for technology investment. The private sector can invest in innovation and new technologies, while academics can contribute through research and development. Civil society can support through active participation and awareness of the importance of the energy transition.

Human Resource Development through training and skill development for the workforce in the energy sector is essential to ensure they are ready for technological change. Training and certification programs can help improve workforce competencies.

Regulations and Policies that Support This, the government needs to develop regulations and policies that support the digitalization of the energy sector. These include incentives for the use of renewable energy, regulations for data security, and policies to support technological innovation.

Raising Awareness and Public Participation on the importance of digitalizing the energy sector and how they can contribute. Educational campaigns and

community participation programs can help achieve this goal. There are several examples of successful energy digitalization projects in Indonesia:

PLN's Digital Transformation: PT Perusahaan Listrik Negara (PLN) has carried out a significant digital transformation. They implement technologies such as Advance Metering Infrastructure (AMI) in Jakarta, Digital Substations in Sepatan II and Teluk Naga II, as well as the Reliability Efficiency Optimization Center (REOC) and Remote Engineering, Monitoring, Diagnostic and Optimization Center (REMDOC) in systems owned by Indonesia Power and PT Pembangkitan Jawa Bali (PJB).

[RE] Energize Indonesia: This program supports renewable energy innovation through a virtual hackathon. One of the winners is Microlab Lab with a digital smart microgrid controller solution for energy cost optimization in 3T areas (frontier, outermost, disadvantaged).

AI Integration in West Sumbawa: PLN launched a smart grid pilot project that uses AI to integrate solar power plants into the local grid. This system enables automatic monitoring and control of production and energy distribution. These projects demonstrate how digitalization can improve the efficiency and sustainability of the energy sector in Indonesia.

Goals and Indicators

4.

4. Goals and Indicators

4.1 Index System

Table 4.1 *Digital Infrastructure Indicators*

Category	Indicator	Goal (by 2029)	Remarks
Digital Infrastructure	Number of gigabit cities	98	Refer to Vision 2045 (Kominfo) Detailed valuation criteria refer to China's experience
	Percentage of villages with broadband access	50%	Further discussion is needed on the Number of villages covered/ number of total villages (100% achieved in China within six years/batches, 2015-2020, 4G+-fiber) coverage.
	Data center capacity (MW)	1410	Estimated based on the current 650 MW standard (refer to Modor intelligent forecast & the research results from CAICT)
	Large Date Center quantity	188	Large Date Center indicates a capacity >7.5 MW
	Data Center PUE	Less than 1.4	2023 Global average PUE is 1.58. Indonesia's best PUE is 1.24, China average is 1.2
	5G user penetration rate	50%	ITB Indonesia, GSMA
	5G population coverage	80%	ITB Indonesia, GSMA

Category	Indicator	Goal (by 2029)	Remarks
Digital Infrastructure	FWA home broadband user penetration rate	25%	Refer to ITB Indonesia
	Number of FTTH users	22,000,000	Based on the existing 13,625,367 fiber users and their expected migration to FTTH in the future
	FTTH coverage	Urban: 80% Rural: 50%	Indonesia Digital Infrastructure Best Practice, Giga City Initiative Towards the Digital Vision 2045
	National minimum broadband speed	100Mbps	Completed 2027
	Number of gigabits fixed broadband users	2,000,000	
	IPv6 adoption rate	40%	Further discussion is needed to clarify whether the indicator is mobile, MAN, or for campus networks. Relevant policies in more digitally advanced countries (like China) can be referenced: for mobile networks, IPv6 traffic accounts for 70%, and for MANs it is 20% (by 2025)
	Backbone node Upgrade IPv6 Ehance 400GE/800GE + 400G/800G OTN	40%	Refer to China's experince (https://www.gov.cn/zhengce/zhengceku/2023-04/23/content_5752858.htm), Uzbekistan and other governments have also issued relevant documents. Refer to Market Research Reports (https://www.delloro.com/market-research/telecommunications-infrastructure/service-provider-router-and-switch/) Uzbekistan and other governments have also issued relevant documents. Refer to the Shanghai Government's material (https://mp.weixin.qq.com/s/SNp14mK-2PVnniJ2jHXJQlw)

Category	Indicator	Goal (by 2029)	Remarks
Comprehensive indicators	The ICT sector's share of employment	1.06%	Refer to Vision 2045
	Digital Government Index Ranking	100%	Refer to Vision 2045

Table 4.2 *Digital Application Indicators*

Category	Scenario	Indicator	Goal (by 2029)	Remarks
Digital Application	**Digital Government**	Standardization of electronic certificates	200	(Such as ID cards, marriage certificates, business licenses, etc.) can refer to China's experience
		Data sharing among Government departments	38	38 provinces, data includes: 1 Basic population database, 2 Enterprise legal person database, 3 macroeconomic database, 4 natural resources and spatial geography database
		Share of Government services that are fully online	95%	Refer to EGDI online service index (=number of online service/number of all services)
	Digital Education	E-government population coverage	70%	=INA-digital APP registered population / overall population (adult proportion around 70%)
		Share of all schools with internet connection	90%	3293 college and university 20205 senior high school 38960 junior high school ? Primary school It is accepted that schools in the 3T area will find it difficult to connect
		5G campus coverage of universities and high schools	90%	3293 college and university & 20205 senior high school Refer to the 5G population coverage criteria
		Ratio of schools with multimedia classrooms	90%	Number of schools that have multimedia classrooms/number of overall schools It is accepted that schools in the 3T area will be difficult to cover
		Online vocational education high-quality courses	10000	Refer to China's experience

Table 4.3 *Digital Application Indicators*

Category	Scenario	Indicator	Goal (by 2029)	Remarks
Digital Application	Digital Health	Share of digital medical insurance application users	100%	Indonesia launched a universal health care plan in 2014. (Indonesian: Jaminan Kesehatan Nasional (JKN), National Health Insurance) and has achieved universal coverage.
		Village telemedicine coverage (network + application)	90%	A total of around 65,000 villages in Indonesia, refer to China experience It is accepted that villages in the 3T area will be difficult to cover
		Internet hospital quantity	400	2,561 functioning hospitals,
	Agricultural digitalization	Number of digitally connected agricultural machines used for crop cultivation and harvesting	2,100,000	About 42 million people are engaged in agricultural production. It is assumed that, on average, 20 people have one internet-connected agricultural machine
		Plant protection drone quantity	200,000	Refer to China's experience
	Digital logistics	Number of automated container freight terminals (ports)	20	Water transportation: Indonesia has about 2,439 ports of various types, including 33 major ports Refer to China experience Refer to China experience
		Number of automated dry bulk freight terminals (ports)	20	
		Railway 5G network coverage ratio	80%	Total of 6700 kilometers in Indonesia in 2023 Refer to China experience, 5G network accessibility rate in key places

Category	Scenario	Indicator	Goal (by 2029)	Remarks
Digital Application	**Digital logistics**	Highway 5G coverage ratio	80%	Total of 2800 kilometers in Indonesia in 2023 Refer to China experience, 5G network accessibility rate in key places
		Number of logistics distribution centers in Kabupaten and Kota	450	405 Kabupatens ,97 Kotas Refer to China experience (91%)
		Achieve express delivery service coverage in incorporated villages	90%	Total around 65,000 villages in Indonesia Refer to China's Case (95%)
	Industrial digitalization	Number of 'Lighthouse factories'	20	Refer to China's experience (63)
		Number of 5G factories	200	Refer to China's experience (300)
		Number of 5G mines	100	There are 207 mines currently in Indonesia
		Proportion of CNC equipment	60%	Refer to China experience (2025 64%)
	Digital tourism	5G coverage in scenic locations	80%	The focus needs to be on covering five super-priority national tourist attractions, namely Danau Toba in North Jiangsu Province; Borobudur Joglosemar in Central Java Province; Mandalika in Sinuang Province; and Rabbu in East Nuclear Province. Komodo Scenic Area in Labuan Bajo and Likupang Tourism Special Economic Zone in North Sioux Province. Refer to China's experience
		5G coverage in scenic location hotels & restaurants	80%	
		5G coverage in the CBD shopping center	80%	
		5G coverage in museums	80%	There are 300~400 state-owned museum in Indonesia Refer to China's Case

Category	Scenario	Indicator	Goal (by 2029)	Remarks
		5G coverage in mosques	80%	There are currently 554,152 Mosques in Indonesia
Digital Application	**Digital Culture**	Share of digitally stored/ enhanced cultural relics	50%	Refer to China's experience (48%-49%)
		Share of digitally stored/ enhanced ancient books	20%	Refer to China's experience (19%)
		Number of 4K/8K Ultra HD TV channels	8	Refer to China's experience (8)
		5G coverage in Oil, Mining & Energy Fields	80%	Global 5G growth for oil & gas, mining market CAGR 30% 2023-2030 (Arizton research)
		EV's & Charging Infra-structure	2-3 Bio USD	AC Ventures Report on Indonesia's EV Outlook 2023
	Digital Energy	Full Scale Smart power matering	90%	Forecast by Berg Insight, Smart Matering in Asia-Pasific, 6th Edition that 873 million smart electricity meters will be shipped in Asia Pasific during 2024-2029
		Renewable Energy Infrastructure	30%	IRENA Report for Indonesia Annual investment in renew-able energy capacity in the Reference Case is estimated at, on average, USD 9.4 billion in 2015-2030. With the REmap option this would increase to USD 16.2 billion.

4.2 National Digitalization Standards and Policy Development

A comprehensive strategy for digital infrastructure development in Indonesia, encompassing the following recommendations, is essential to ensure equitable access, optimize resources, and establish a thriving digital ecosystem for the future.

4.2.1 National Standards for Fiber Pre-deployment

Optical fibers support large-capacity, long-haul communications and are immune to electromagnetic interference, perfectly meeting the development requirements of today's diverse communication scenarios. In addition, fiber networks are cost-effective long-term assets. They provide the underlying connectivity for 5G wireless networks, computing power networks, cloud, and computing.

Indonesia urgently needs to increase fiber coverage, especially in residential, commercial, and industrial areas, as well as tourist hotspots and schools. The country also needs to put in place corresponding national standards for architectural design, construction, acceptance, and maintenance.

4.2.2 National Standards for Site Infrastructure Sharing (including towers, trenches, site cabinets and poles, etc.)

To accelerate digital infrastructure coverage, reduce network construction costs, and shorten the network construction period, the country urgently needs to promote the idea of "pole site sharing--and infrastructure sharing" and establish related national standards to avoid duplicated investment and accelerate network construction.

4.2.3 Rent-free Accommodation for Operator Base Stations in Key Public Areas such as CBD, Hotels, Restaurants, and Tourist Areas

In central business districts and other densely-populated locations, providing affordable connectivity services to meet the needs of residents and merchants relies on the sharing of public facilities. Therefore, we need to establish national communications construction standards for public facility sharing to provide carriers with access to public facilities at lower costs or even for free. This will truly benefit our people by making their lives and production activities easier.

4.2.4 Standards for Simultaneous Design, Construction, and Acceptance of Digital Infrastructure and Main Projects

To avoid repeated investment and disturbances to residents during construction, we urgently need to establish national communications construction standards for simultaneous design, construction, and acceptance. By “simultaneous”, we mean the design, construction, and acceptance of digital infrastructure (especially information network infrastructure) should be conducted simultaneously with the construction, expansion, and renovation of residential buildings, commercial premises, industrial plants, and municipal facilities such as subways, airports, hospitals, schools, and mosques

4.2.5 Spectrum Auction Price Strategy is More Pragmatic and Conducive to Efficient Deployment

5G spectrum needs reasonable pricing with incentive from regulators. Currently there are 452MHz bandwidth of spectrum to mobile operators for 4G service in Indonesia. Kominfo is planning to assign additional 600MHz bandwidth spectrum including prime 3.5GHz/2.6GHz and 700MHz in 2025. However, based on data from MNOs’ financial report, the spectrum regulatory cost to revenue burden of MNO is average of 14.62%.

MNOs cannot take double the spectrum for 4G+5G while the regulatory cost to revenue burden also double to 20%~30% respectively.

In global practice, the annualized cost spectrum is, on average 7% of revenue, while more than 10% may not be sustainable. It will benefit Digital Indonesia for consumers high quality while affordable service demands, and support ICT sector sustainable growth for industrial digital transformation.

4.2.6 Longer-term and Far-sighted Spectrum Reservation and Deployment Strategies

Given that one of the important reasons for my country's slow 5G deployment is the delay in spectrum clearance, we urgently need a more long-term and phased-in wireless spectrum management and development blueprint. These plans shall include, but are not limited to, spectrum scenario usage planning, frequency clearance--and refarming plans, allocation plans, coverage plans, security administration plans, auction strategies, life cycle management plans, etc. Only in this way can the future deployment of 5G/6G be ensured to be smoother and more efficient for Indonesia

Indicator	2025	2026	2027	2028	2029
Spectrum plans to release a proposal	• 700Mhz 90Mhz bandwidth • 2600Mhz190Mhz bandwidth • 3500Mhz/3300Mhz depend on clearance	-	• 1500Mhz TBD	• 6Ghz TBD	• 28Ghz TBD

4.2.7 National Digital Infrastructure Development Monitoring Platform (webpage)

It is recommended to establish a statistical and disclosure mechanism for communications development in Indonesia, as well as a related data platform to track the progress of Indonesia's digital infrastructure construction.

4.3 Development and Amendments to National Digitalization Laws and Regulations

It is proposed that relevant laws and regulations be amended or developed to expedite the advancement of the digital economy and digital infrastructure in Indonesia. This includes the enactment of:

- Indonesia Digital Economy Law
- Indonesia Digital Infrastructure Law
- Indonesia Communications and Digital Application Law
- Indonesia Artificial Intelligence Law

4.4 Enhancement of National Cybersecurity

The enhancement of national cybersecurity necessitates the establishment and refinement of a comprehensive network security governance framework, with particular emphasis on robust security legislation. A strategic objective of attaining cyber power status should guide the development of a multi-layered network security mechanism. This involves formulating and continually improving network security laws and regulations, ensuring that network management and operations adhere strictly to legal frameworks. Such adherence will foster a secure and legally compliant online environment, promoting the healthy functioning of the internet.

To ensure comprehensive network management and a positive network ecology, the enactment and enforcement of legislation, such as the Indonesian Cybersecurity Law, Indonesian Data Security Law, and Indonesian Critical Information Infrastructure Protection Act, are imperative. These laws will provide the legal foundation and guidance necessary for the growth and development of the network security industry. Furthermore, establishing a robust network security supervision mechanism, coupled with stringent enforcement against cybercrime, will serve as a powerful deterrent to illegal online activities and contribute to maintaining a secure and orderly cyberspace.

Stringent data protection policies must be developed and implemented to safeguard personal and organizational data, alongside a cross-border data flow supervision mechanism designed to strike a balance between data security and the free flow of information. Development of a Systematic Indonesian National Network Security Standard

The strategic plan entails the promulgation and implementation of comprehensive regulatory frameworks and standards across various domains, including but not limited to:

1. Network and data security management
2. Cross-border data security assessment and management
3. Export controls for personal and sensitive data
4. Security of critical national infrastructure (financial, energy, transportation)
5. Ethical governance and management of artificial intelligence, including generative AI
6. Cross-border data flow security for enterprises
7. Public data access and transparency
8. Risk management for digital assets
9. Safety standards for audio-visual content
10. Data property rights, transaction management, and Internet advertising regulation
11. Personal data usage management in apps and online services
12. Online auction oversight
13. Standards for blockchain and distributed ledger technologies
14. Classification and regulation of facial recognition technology
15. Security evaluation of open-source software
16. Public Key Infrastructure and online certificate management
17. Network data security risk assessment
18. Vehicle information security and data processing
19. Evaluation of SME digitalization levels
20. Commercial password management
21. IPv6 address allocation and encoding
22. Short-range wireless network management
23. Competition compliance for Internet platforms
24. Combating online violence and hate speech
25. Internet governance and child protection
26. Urban digital infrastructure development
27. Electronic document and records management for Government services
28. E-government electronic certification
29. Data recovery service security
30. Industrial Internet Security Classification and grading

Action Plans

5.

5. Action Plans

5.1 Expediting the Development of Dual-gigabit Cities

To accelerate the establishment of 100 gigabit cities, we will intensify the development of 5G mobile networks, gigabit fiber networks, and 400G transport networks within urban areas. Dual-gigabit city construction will be initiated in cities with high population density, advanced economic development, and substantial demand, particularly in Java and Sumatra.

Subsequently, this initiative will be progressively expanded to other cities. The advancement of dual-gigabit city construction will be subject to regular evaluation by national standards. By the conclusion of 2029, the number of gigabit cities in Indonesia is projected to reach 98. Leveraging dual-gigabit networks will facilitate the promotion of nascent services such as 4G/8K ultra-HD video and cloud VR/AR. Through the promotion of these applications, users will be incentivized to upgrade to broadband speeds of 500 Mbps or higher and adopt 5G technology.

Table 5.1 *Gigabit city construction standards*

Indicator	Description	Value
Gigabit fiber network coverage for urban households	Urban gigabit fiber network availability	80%
5G network access rate in key locations	5G network access in key urban locations	80%
Percentage of users with access to 500 Mbps or faster broadband	Proportion of broadband users with access to 500 Mbps or faster broadband as a percentage of all fixed broadband users in cities	25%
Percentage of 5G users	Proportion of 5G users as a percentage of all mobile broadband users in cities	25%

Reference : *Notice of the General Office of China's Ministry of Industry and Information Technology on Summarizing and Evaluating the Construction of Gigabit Cities in 2023*

Former Minister of PPN/Head of Bappenas Bambang Brodjonegoro, in March 2021 said that one of the things that is still hampering economic growth in Indonesia is infrastructure. The infrastructure that we hope will push the economy forward, first, infrastructure to fulfill basic services in the context of reducing poverty. Second, connectivity infrastructure, including sea, air, intermodal and land connectivity. Third, infrastructure for cities. If we can focus on these three things, it is hoped that we can accelerate economic growth.

Minister Bambang said that infrastructure and urban development play a role in increasing the competitiveness of economic growth and the quality of life of the community. In addition, urbanization plays an important role in increasing a country's GDP per capita and has a positive impact on the country's economy. From 1970-2012, every one percent increase in urban urbanization correlated with an average increase in GDP per capita. "Urbanization can make a country prosperous. For example, in India the ratio is 1:13, every one percent urbanization will increase GDP per capita by 13 percent. This means that the thrust in India can be up to thirteen times. Apart from India, Minister Bambang also mentioned the People's Republic of China which has a a growth rate of GDP per capita 1:10, meaning that for every one percent of urbanization there is a growth of 10 percent of GDP per capita. Then, Vietnam has an urbanization ratio of 1:8, Thailand is 1:7, but in Indonesia it is only 1:4, meaning that one percent of urbanization in Indonesia can only increase GDP per capita by 4 percent. This shows that urban infrastructure in Indonesia is still lacking.

Bappenas has a study on the development of 10 new metropolitan cities. Apart from determining the 10 areas that will be developed into cities, the government is also preparing themes. The list of 10 metropolitan cities includes the area: Mebesarro (Medan City, Binjai City, Deli Sedang Regency, and Karo Regency) with the theme of urban and rural linkage. Statutraya Agung (Palembang City, Banyuasing Regency, Ogan Ilir Regency, Ogan Komering Ilir Regency) with the theme production and distribution hub. Jabodetabekpunjur (DKI Jakarta, Bogor Regency, Bogor City, Depok City, Tangerang Regency, Tengerang City, South Tangerang City, Bekasi Regency, Bekasi City, Cianjur Regency) with the theme smart and resilient. Bandung Basin (Bandung City, Bandung Regency, West Bandung Regency, Cimahi City) with a digital creative theme. Kedungsepur (Kendal Regency, Demak Regency, Semarang City, Ungaran, Semarang Regency, Salatiga City, and Purwodadi, Grobogan Regency) with a cultural and compact theme. Pintukeratosusila (Gresik Regency, Surabaya City, Sidoarjo Regency, Mojokerto Regency, Mojokerto City, Lamongan Regency, Bangkalan Regency) with a green mixed theme used. Banjar Bakula (Banjarmasin City, Banjarbaru City, Banjar Regency, Barito Kuala Regency, Tanah Laut Regency) with the theme of urban agriculture. Sarbagita (Denpasar City, Badung Regency, Gianyar Regency, Tabanan Regency) with the theme of international tourism. Mamminasata (Makassar City, Maros Regency, Gowa Regency, Takalar Regency) with an urban seafront theme. Bimindo (Manado City, Bitung City, North Minahasa Regency) with a fisheries industry theme.

Continuously expanding the coverage of gigabit fiber networks: We will promote the large-scale deployment of 10G-PON in cities, improve the coverage of gigabit fiber networks in key locations such as industrial parks, commercial premises, mosques, large stadiums, museums, schools, and hospitals. We will also promote the user-end deployment of all-optical access networks and support the upgrades of home and enterprise gateways (optical modems) towards gigabit services on demand. We can promote re-cabling in homes, gigabit WLAN networking optimization, and user access device upgrades, so that broadband users can experience end-to-end gigabit services and be motivated to migrate to gigabit fiber broadband services. We will formulate and release national standards for FTTH, FTTO and FTTR pre-deployment in buildings to promote FTTH,FTTO and FTTR construction and improve network deployment efficiency.

Developing a dual gigabit city, which combines both 5G-Advanced and F5G-Advanced (Fifth Generation Fixed Network Advanced) technologies, requires several key prerequisites:

1. Robust Infrastructure: Establishing a solid foundation of fiber-optic networks and 5G base stations is crucial. This includes extensive deployment of 5G sites and ensuring ubiquitous coverage across urban and suburban areas

2. Advanced Technology Integration: Incorporating cutting-edge technologies such as cloud computing, edge computing, and extended reality (XR) to enhance network capabilities and support high-speed, low-latency applications

3. Collaborative Ecosystem: Building partnerships between telecommunication operators, technology providers, and local governments to facilitate infrastructure development and technological advancements

4. Regulatory Support: Implementing supportive policies and regulations that encourage investment in gigabit infrastructure and streamline the deployment process

5. Public and Private Investment: Securing funding from both public and private sectors to finance the extensive infrastructure required for dual gigabit networks

6. Digital Literacy and Inclusion: Promoting digital literacy and ensuring that all segments of the population can access and benefit from gigabit connectivity

These steps collectively help create a comprehensive and intelligent digital infrastructure, paving the way for future digital economy scenarios and smart city applications

Prioritize the construction of optical fiber communication infrastructure in urban development, share resources with municipal, transportation, and power facilities, and reduce the cost of installing optical fibers and building management infrastructure. Electrical power companies will be encouraged to use pole site resources to develop fiber broadband, accelerate coverage and share fiber resources.

Enhance cross-department communication and collaboration, reduce obstacles in obtaining construction permits and ROW for base station construction and optical fiber installation, shorten construction times and reduce enterprise costs. Set minimum broadband speeds and broadband package speeds.

Deploying 5G networks comprehensively: we will accelerate the expansion of 5G network coverage and optimize indoor 5G network coverage in urban areas, focusing on in-depth coverage in high-traffic urban locations such as mosques, large stadiums, and transportation hubs. We will also improve 5G network coverage in industrial parks, ports, and tourist attractions to facilitate digital transformation of traditional industries. Furthermore, we will promote 5G FWA deployment to quickly increase the penetration rate and download rate of fixed broadband networks and meet the fixed broadband service requirements of homes and SMEs.

Improve the bearer capability of the backbone transmission network. Promote basic telecom enterprises to continuously expand the capacity of backbone transmission networks, deploy 400 Gbit/s ultra-high-speed and ultra-large-capacity transmission systems on backbone networks on demand and improve the comprehensive bearing capacity of backbone transmission networks. Accelerate the development and application of technologies such as flexible all-optical cross-connections and intelligent management and control to improve network scheduling capabilities and service efficiency. Guide the deployment of 100 Gbit/s or higher-speed optical transmission systems on MANs.

Optimize data center interconnect (DCI) capabilities. Promote basic telecom enterprises to meet the requirements of high-speed interconnection of data centers, deploy and apply 400 Gbit/s optical transmission networks and Ethernet networks, and encourage the construction of data center direct interconnection networks and directional network direct interconnection. Continuously promote the application of core DCI technologies such as IPv6 segment routing (SRv6) and virtual extensible LAN (VXLAN) based on service development. Promote the application of software-defined networking (SDN) technology in data center interconnection to improve the cloud-network synergy capability.

Promote the construction of 5G transport networks. Promote basic telecom enterprises to carry out the construction of large-capacity, high-speed, and low-cost optical transmission systems in 5G fronthaul and midhaul networks, and improve the intelligent operation capabilities of integrated service access and network slicing resources. Promote the deployment of a 50 Gbit/s system at the metro access layer and a 100 or 200 Gbit/s and system at the metro aggregation layer and core layer (400G/800G system including OTN and IPv6 enhanced) of the 5G transport network. Gradually promote Layer 3 virtual private network (L3VPN) networking to the edge, which is compatible with the interconnection networking of edge cloud data centers.

Table 5.2 *Goals for building dual-gigabit cities*

Indicator	2025	2026	2027	2028	2029
Number of dual-gigabit cities	10	25	40	65	98

Box : 1

Dual-gigabit city project

Background

The urbanization process in Indonesia has encountered various challenges in developing digital infrastructure, including difficulties in securing rights of way, high construction costs, and protracted construction timelines. Establishing a conducive policy environment that facilitates the modernization of urban digital infrastructures is imperative to expedite urbanization.

Recommendations

Centralized Policy for Public Facility Access: Develop a centralized policy framework to enable access to public facilities such as Government buildings, schools, hospitals, and state-owned enterprises to construct digital infrastructure components like base stations, central offices, fiber optic cables, poles, and roadside boxes. This approach aims to reduce construction costs and expedite project timelines.

Synchronized Planning and Construction: Formulate policies to regulate the synchronized planning, design, construction, and acceptance of digital infrastructure alongside urban facilities and engineering projects, thereby emphasizing the significance of digital infrastructure within the broader urban development context.

Pre-deployment of In-Home and Area Optical Fiber Cables: Introduce a policy promoting the pre-deployment of in-home and area optical fiber cables in new residential construction and renovation projects to address the demand for fixed broadband services proactively.

Pilot Implementation

Prioritize ten cities, including agglomeration cities, potentially selected from the list of ten metropolitan cities or based on alternative criteria for pilot implementation. These cities should exhibit recent satisfactory or very good evaluation scores. Following the pilot phase, expand implementation to encompass all cities nationwide by 2029.

There are 10 metropolitan cities that will be developed in Java and outside Java. The 10 metropolitan cities are not built from scratch. But, developing from what already exists. The 10 cities are 4 cities on Java, and 6 cities outside Java. The areas include Jabodetabek (Jakarta, Bogor, Depok, Tangerang, Bekasi), Bandung, Surabaya, Semarang, Mebidangro (Medan, Binjai, Deli Serdang, and Karo). In addition, Patungagung (Palembang, Betung, Indralaya, Kayuagung), Banjarbakula (Banjarmasin, Banjarbaru, Banjar, Barito Kuala), Sarbagita (Denpasar, Badung, Gianyar, Tabanan), Mamminasta (Makassar, Maros, Sungguminasa, Takalar), and Manado.

21 DESIGNATED GROWTH CENTER CITIES

	7 Industrial Centers		4 Commercial Centers		4 Educational Centers		6 Tourism Centers
1	Gresik	1	City of Manado	1	Jatinangor (Kab. Sumedang)	1	City of Mataram
2	Central Halmahera	2	Cities of Balikpapan & Samarinda (as part of the Tri-Cities with the New Capital Region)	2	Kota Malang	2	West Manggarai
3	Batang	3	City of Bandar Lampung	3	Kota Depok	3	Bintan
4	Cilegon	4	City of Sorong	4	Kota Salatiga	4	Toba
5	Morowali					5	Buleleng
6	Konawe					6	City of Tanjung Pinang
7	East Luwu						

4 SMALL CITIES WITH UNIQUE CHARACTERISTICS

	Selected 4 Small Cities with Distinct Characteristics
1	Toraja (Tana Toraja Regency)
2	Bandaneira (Maluku Tengah Regency)
3	Daruba (Pulau Morotai Regency)
4	Anggi (Pegunungan Arfak Regency)

Other than that 7 Industrial cities such as Gresik, Halmahera Tengah, Batang, Cilegon, Morowali, Konawe and Luwu timur also considered as central of growing toward gigabit cities.

4 trading cities also considered as gigabit cities development such as : Manado, Balikpapan, Samarinda, Bandar Lampung and Sorong.

4 Educational cities also potentially becoming gigabit cities are Jatinangor, Maklang, Depok and Salatiga.

6 Tourism destination also potential to becoming gigabit cities such as : Mataram, Manggarai Barat, Bintan, Toba, Buleleng and Tanjung Pinang.

4 Small Cities with local characteristic also potential to becoming gigabit cities development such as : Toraja, Bandaneira, Daruba and Anggi.

To effectively utilize this potential, one of the strategies carried out by the government is through the Movement Towards 1000 Smart Cities. Currently, as many as 25 cities and districts have become pioneers of Smart City Indonesia, namely: Jambi City, Pelalawan Regency, Siak Regency, Banyuasin Regency, Tangerang City, South Tangerang City, Purwakarta Regency, Bandung City, Bekasi City, Bogor City, Cirebon City, Sukabumi City, Sleman Regency, Semarang City, Banyuwangi Regency, Bojonegoro Regency, Gresik Regency, Sidoarjo Regency, Badung Regency, Singkawang City, Kutai Kartanegara Regency, Samarinda City, Makassar City, Tomohon City, and Mimika Regency.

25 SMART CITY PIONEER CITIES

SMART CITY CONCEPT

A city performs well by adopting intelligent perspectives on the economy, population, governance, mobility, and the environment.

25 CITIES AND REGENCIES BECOME SMART CITY PIONEERS IN INDONESIA

Figure 5.1 *25 Smart City Pioneer Cities*
Source: Bappenas Analysis (2019)

5.2 Accelerating the Modernization of Rural Areas

As the world's third largest agricultural producing country (refers to the proportion of agriculture in the national economy), Indonesia is accelerating agricultural modernization. Rural infrastructure is critical to the modernization of the rural areas. Communications is a type of public infrastructure that is as important as roads, electricity, and water supply, and constitutes an integral part of rural infrastructure. Improving the communications network infrastructure in rural areas: We will expand the coverage of 4G, 5G, and fiber broadband networks in rural and remote areas, and prioritize the 4G network coverage of densely populated areas, production and operation areas, and key transportation routes as well as key public facilities in rural areas such as mosques, schools, and hospitals to meet the communications service requirements of rural residents.

We will continue to promote universal broadband services, and increase subsidies for communications network development and O&M in rural and remote areas. In addition, we will drive the wide adoption of digital applications in rural areas, promote e-commerce platforms, online education, telemedicine, and other relevant services in rural areas, and focus on bridging the digital divide in order to achieve digital equality. We will also encourage rural mobile subscribers to migrate to 4G and 5G networks and increase mobile broadband speeds.to accelerate penetration and improve the quality of digital infrastructure especially in USO areas, a regulatory breakthrough is needed such as Incentives to Telcos that have built infrastructure in rural areas, in the form of reducing USO contribution. Another solution is to open the opportunity for local governments to build their rural infrastructure (Regional Owned Enterprises-BUMD, Koperasi), and/or Over The Top (OTT) Companies participation.

Accelerating the interconnection of approximate 1000 inhabited islands: we will drive the interconnection of key tourist islands and inhabited islands through OTN backbone and submarine optical cable to facilitate balanced development among different regions. By the end of 2029, 1,000 inhabited islands, including key tourist islands, will be interconnected through OTN backbone networks, which will support the development of services like 5G and gigabit optical network services on the islands. Accelerate the construction of submarine fiber from Indonesia to other Asia-Pacific countries to achieve interconnection. We will build 1-8-20 ms latency circles centered on Jakarta, Indonesia, and ASEAN countries to support cloud and computing power development.

Table 5.3 *Gigabit city construction standards*

Indicator	Description	Value
fiber network coverage for rurual households	Rural gigabit fiber network availability	50%
4G/5G network access rate, Wi-Fi 7 and beyond latest WiFi in key locations	4G/5G network access, WiFi 7 and beyond, in village	50%

Table 5.4 *Goals for building rural communications networks*

Indicator	2025	2026	2027	2028	2029
Total number of new villages with broadband network coverage	1,000	2,500	5,000	7,500	10,000
Total number of interconnected islands	100	250	350	500	654

Box : 2

Digital village project

Background

In Indonesia currently, mobile networks in rural and remote areas have not yet achieved full population coverage. Additionally, network quality is relatively poor. For example, FBB networks only covere a small amount of villages and is unable to meet the communication needs of rural residents. The major reasons for this are that the cost of network construction in 3T areas is relatively high, the return on investment is subsequently low and uncertain and the telecom operators do not have high incentives to build such networks. In order to enhance the digitalization and modernization of rural areas and promote their economic and social development, it is crucial that we introduce a number of measures to promote the development of digital facilities.

Recommendations

- Launch a policy on universal service to promote the construction of network facilities and water, electricity, roads, broadcasting and other infrastructure facilities in rural areas.
- Develop guidelines for network construction in 3T areas, divide rural areas into different types of districts and groups, and encourage telecom operators to build networks in 3T areas on a "one-operator-per-region" basis.
- Establish a national telecom universal service (USO) and village subsidy funds to subsidize the construction of networks in 3T areas so as to increase the incentive of telecom operators to build telecommunication networks and services in rural areas.

Pilot Implementation

Priority will be given to 1,000 cities in rural areas, such as the table above, to be implemented in 10,000 rural areas nationwide by 2029.

5.3 Accelerating the Development of 10-gigabit Intelligent Campuses

As a place where people work, play, and learn, campuses play an important role in city development, industry development, and people's lives. We will first build a batch of pilot 10-gigabit campuses in factories, business districts, tourist attractions, and schools to accelerate the implementation of digital campus applications.

Building 10-gigabit campuses:
We will accelerate the deployment of 5G, 10-gigabit optical networks, and Wi-Fi 7 on campuses, drive the evolution of campus networks from gigabit to 10 gigabit, and build higher-quality 10-gigabit campus networks.

We will bring 10-gigabit networks to rooms, desktops, and machines to enable high-speed transmission and management among machines, factory workshops, control rooms, and edge clouds, and provide 10-gigabit connections between campuses and external storage and computing resources. The goal is to provide cloud storage and computing capabilities to campuses and facilitate the digital transformation of production and management activities for enterprises in the campuses.

Table 5.5 *Standards for building 10-gigabit campuses*

Scope	Indicator	Value
Campuses	Average number of 5G base stations per 10,000 people on campus	50
	Percentage of 10G-PON ports on campus	90%
	Percentage of campuses with Wi-Fi 7	80%
Factories	Network transmission latency	< 10 ms
	Network transmission reliability	> 99.999%
	Number of TSN network in Factories	500

Reference : *Notice of the Jiangsu Provincial Telecommunications Administrative Bureau and Provincial Department of Industry and Information Technology on Building 10-Gigabit Campuses and related data of the Alliance of Industrial Internet*

5G+10-gigabit factories campus (Industry park): We will drive the in-depth coverage of 5G networks in industrial parks and industrial enterprises, adapt to the differentiated network requirements of campuses, factories, and workshops, and meet the management and production requirements of industrial parks and industrial enterprises. We will also encourage industrial enterprises to build fully-connected 5G factories, and expand the application of 5G from auxiliary activities to core production activities. By the end of 2029, 5G networks will provide in-depth coverage for 100 industrial parks, and the number of fully-connected 5G factories will reach 500.

Table 5.6 *Goals for building 5G+ industrial parks*

Indicator	2025	2026	2027	2028	2029
Number of 5G+ industrial parks	2	10	30	60	100
Number of fully-connected 5G factories	10	50	150	300	500

5G+ tourist resorts campus (tourism): We will expand the 5G coverage of key tourist scenarios, such as tourist attractions, resorts, large stadiums, conference centers, and exhibition centers, with a focus on key spots such as tourist service centers, ticket offices, cableway stops, and exhibition areas. We will first strengthen the development of 5G networks on the island of Bali, a key tourist attraction, and gradually expand 5G coverage in other key tourist attractions in the country. By the end of 2029, 5G networks will cover all key tourist attractions across Indonesia.

Table 5.7 *Goals for building 5G+ tourist attractions*

Indicator	2025	2026	2027	2028	2029
Number of 5G+ tourist attractions	10	50	100	300	500

Notes : *China's 5G Application "Set Sail" Action Plan has been used as a reference. In 2025, we will build 5G networks in 10 tourist attractions, including Riau Archipelago, Bali, Jakarta, Nusantara, Yogyakarta, Danau Toba, Borobudur Joglosemar, Mandalika, Labuan Bajo, and Komodo Likupang. As the number of tourist attractions and their ratings are unavailable, the tentative goal is set as 500. Advice from Bappenas and local think tank experts is greatly appreciated.*

5G+ school & university campuses (education): We will first build 5G networks for schools in urban areas, with a focus on key spots such as libraries, teaching buildings, canteens, dormitory buildings, and stadiums. In addition, we will gradually expand 5G coverage in different types of schools at all levels in rural and remote areas. By the end of 2029, 5G networks will cover all elementary schools, junior high schools, senior high schools, universities, and vocational schools nationwide.

Table 5.8 *Goals for building 5G+ campuses*

Indicator	2025	2026	2027	2028	2029
Number of 5G+ tourist attractions	50,000	100,000	200,000	300,000	400,000

Notes : *According to Statista, there are approximately 400,000 schools in Indonesia. All schools will be fully covered by 5G networks by the end of 2029. In accordance with this goal, it is estimated that the progress of 5G network rollout will be relatively slow at the early stage of the 2025–2029 period. As large-scale 5G rollout begins, the number of 5G+ campuses are expected to increase at a high speed at the middle and later stages of this period.*

5G+ public facility (business & living area): We will first provide 5G network coverage in urban areas, including large business districts, central business districts (CBDs), and star-rated hotels, hospital, mosque, museum to meet the requirements of online transactions, online office, entertainment, and comprehensive services. We will also accelerate the rollout of 5G networks in areas including large stadiums and large exhibition centers and conference centers to meet the requirements of live broadcast, video, and call services during large-scale sport events, conferences, exhibitions, and other activities. In addition, we will promote communications carriers' unconditional and free access to public facilities, accelerate 5G network deployment, and reduce carriers' construction and operation costs.

Data center campus network upgrading: We will strengthen the national planning of data centers, optimize the data center supply structure, promote the construction of tier-4 data centers, and guide the development of data center clusters, in order to lay a foundation for improving the country's competitiveness in computing power.

Based on AI development and business requirements, we will focus on establishing intelligent computing centers in areas with sound AI development and strong scientific research capabilities, so as to gradually increase the proportion of intelligent computing power. In addition, we will promote the collaborative development of data centers and networks, build high-speed bearer networks for data centers, and optimize cross-network and cross-region data exchange between data centers. We will also accelerate the construction of green data centers, advocate the control of power usage effectiveness (PUE) of data centers, and guide the use of green, energy-saving, and low-carbon technologies, products and solutions.

Take active action to verify and deploy 400G/800G OTN high-speed optical transmission networks and apply innovative technologies, including all-optical grooming (OXC), IPv6+ sliced network (FlexE), and flexible scheduling of computing power (E2E SRv6). We will promote bandwidth upgrade of metro backbone networks and national backbone networks to 400 GE, and consolidate the technical advantages of router clustering on backbone networks. We will also promote the deployment of 400 GE/800 GE hyper-converged data center networks in new computing power centers to centrally handle the heterogeneous computing power in the scenarios of general computing, intelligent computing, supercomputing, and more.

Box : 3

10-Gigabit Intelligent Campus Project

Background

Industrial parks and special economy zones are the most important carriers for Indonesia's manufacturing, innovation and other sectors. However, Indonesia's industrial parks face several challenges related to digital infrastructure. Many industrial parks struggle with inconsistent and slow internet connections, especially in remote areas, where industrial parks often lack basic connectivity. What`s more, the permission of digital infrastructure construction is time-consuming, and the cost is high. It is urgent and necessary to improve connectivity and streamline regulations in campus.

Recommendations

- Develop action plans to promote application of new-generation information technologies, such as 5G, fiber-optic broadband, industrial Internet, IPv6, etc., in industrial parks across Indonesia, and facilitating the digital transformation and high-quality development of industrial parks through the provision of support in terms of policies, technologies, facilities, standards and applications.
- Promote "10 Gigabit broadband to the Park and 1 Gigabit to the Enterprise" to support the digital innovation and applications in vertical industries in parks. Explore the construction and application of 5G networks in parks, and encourage to build 5G factories.

Pilot Implementation

Initiate pilot projects in selected industrial parks in Batam and Jakarta, subsequently expanding implementation to 100 parks nationwide by 2029.

5.4 Promoting Enterprise Cloudification and Related Digital Transformation

Accelerating the construction of OTN private lines:
As part of the efforts to meet the high-quality requirements of vertical industries such as finance, precision manufacturing, healthcare, and OTT, as well as the emerging computing power requirements, and the requirements of computing-to-computing interconnection of industry data centers, interconnection between enterprise headquarters and their branches, and enterprise cloudification, we will promote the construction of OTN private lines and provide ultra-high bandwidth, ultra-low latency, and highly-reliable network connectivity. This will support the informatization and digitalization of enterprises and industries.

Strengthening the construction of infrastructure for enterprise cloudification:
We will strengthen the construction of industrial Internet platforms and promote the interconnection of digital infrastructure. We will also accelerate the development of a number of enterprise-level, industry-level, and regional industrial Internet platforms. In addition, we will help leading enterprises in advantageous industries such as electronics, food & beverage, and automotives improve their internal and external networks, build enterprise-level industrial Internet platforms, and accelerate the cloudification of their equipment, platform systems, and services to realize end-to-end information sharing and business collaboration.

Furthermore, we will encourage Internet enterprises, industrial information engineering service providers, and software enterprises to take the lead in building industry-level platforms with proprietary technologies and competitive advantages in major and characteristic industries such as electronics, food & beverage, and automobiles. We will also encourage the construction of regional platforms in economic zones, industry clusters, and islands to provide enterprises with public services such as R&D and design, equipment networking, production control, energy management, inspection and testing, supply chain coordination and promote the optimal allocation of various resources.

Focusing on key steps and promoting the cloudification of production equipment, infrastructure, platform systems, and business applications:
First, we will promote the cloudification of production equipment. We will encourage enterprises to implement cloud-based data aggregation and online management of production equipment based on the industrial Internet platform, so as to improve equipment operation efficiency and reliability, resource utilization, production efficiency, and service capabilities. Second, we will promote infrastructure cloudification.

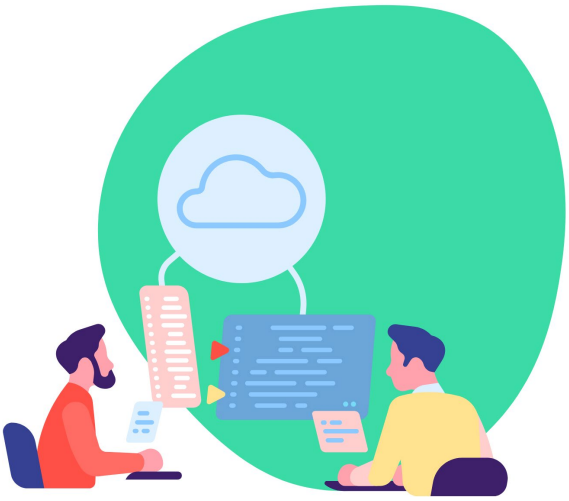
We will make full use of the professional and large-scale IT infrastructure services provided by cloud service providers to help enterprises construct computing, storage, networks, and other information infrastructure and solve problems such as large one-time investment in infrastructure, lack of assurance personnel, and weak security protection capabilities. Third, we will promote the cloudification of platform systems. We will also encourage enterprises to use the cloud-based big data platform to aggregate data resources, and perform data collection, storage, analysis, mining, and collaborative application.

Fourth, we will promote the cloudification of service applications. We will focus on promoting the cloudification of applications related to services including collaborative office, operations management, R&D and design, production control, and intelligent

applications, and promote mature, universal, and effective cloud-based information systems to meet enterprises' requirements for R&D and innovation, production control, operations management, and user services, so as to effectively accelerate the improvement of enterprises' comprehensive competitiveness.

Strengthening policy support and setting role models to provide guidance:
We will support the digital transformation of small- and medium-sized enterprises, especially those that adopt advanced technologies in key areas and have certain market impact. The support provided includes but is not limited to, subsidies for personnel training and purchase of digital equipment, and cloudification and digital transformation services.

We will also establish demonstration pilots for enterprise digital transformation, cultivate a number of benchmark enterprises for digital transformation, summarize replicable experiences, and share them with other



enterprises, industries, and regions. In addition, we will explore enterprise digital transformation strategies that meet the needs of different industries, fit regional development characteristics, and adapt to different development stages of large, medium, and small enterprises.

Table 5.9 *Cloudification Quantity Goals*

Indicator	2025	2026	2027	2028	2029
Number of enterprise	200,000	400,000	600,000	800,000	1000,000

Cummulative Value

Box : 4

Cloudification Project

Background

SMEs improved digital transformation in Indonesia is currently facing a number of challenges, such as high investment costs in digital infrastructure, shortages of suitable workers and especially, a shortage of digital talents. Cloudification could prove to be an effective means to meet SMEs' and startups' requirements for ICT infrastructure. For example, a fintech startup needs to enlarge its coverage in a short period of time which requires highly flexible IT infrastructure support.

Recommendations

- Formulate policies to guide financial enterprises especially fintech startups cloudification, and promote the expansion of the coverage of financial services, especially mobile payment, to realize financial inclusion.
- Develop policies to guide startups to adopt cloud infrastructure for rapid business deployment and development and provide subsidies for innovation startups cloudification.

Pilot Implementation

Prioritize implementing cloud subsidy policies among mobile payment and technology/innovation startups. This targeted approach aims to fosters the development of local digital talent and data centers, contributing to a robust digital ecosystem.

5.5 Promoting the Construction of Digital Governments

Countries around the world are accelerating the development of digital governments. Digitalization has become a major driver for innovation and transformation, and also an important indicator for measuring a country's comprehensive strength and international competitiveness. It has become an international consensus that governments should accelerate digital transformation. As a leader and pioneer of digitalization, the Indonesian government is continuously improving the effectiveness of its digital government, stimulating the vitality of the digital economy, optimizing the digital environment, and creating a sound digital ecosystem.

- Promoting digital services that benefit both enterprises and people: We will promote the construction of a unified digital government service platform, upgrade and improve the INA Digital initiative, provide unified digital ID services, and create a single portal to provide government services externally. We will also provide higher levels of digital and intelligent government services to meet the diversified service requirements of enterprises and people at different levels. In addition, we will build a ubiquitous service system, integrate government service data resources, streamline information systems of different government departments, and promote the online processing of different kinds of government service requests from end to end. We will also improve the capabilities of providing smart and convenient services, promote integrated handling of government service requests, and build a new model of online government service handling, so as to provide more proactive, precise, collaborative, and smart services. Furthermore, we will provide high-quality and convenient enterprise-related services and promote the application of e-contracts, e-seals, and e-invoices. We will also promote the end-to-end online approval of enterprise-related service requests, shorten the overall approval process and period, and reduce the materials required and related expenses, with a focus on strengthening enterprise-related services throughout the lifecycle. We will promote digital applications of basic public services, develop digital health services, smart communities, and digital social security services, build a digital life network with diversified participants and complete functions, and improve the supply and coverage of digital social services.

- Promoting the development of an integrated e-Government cloud platform: We will build a national integrated government big data center system; coordinate the use of existing resources such as equipment rooms, computing and storage facilities, and networks; and accelerate the development of a national integrated e-Government cloud platform. This aims to provide government departments with a full range of services,

including infrastructure, supporting software, application services, information resources, operational support, and information security. Each department's e-Government cloud will be centrally managed by the national integrated e-Government cloud platform. At the local level, provinces will coordinate e-Government cloud development efforts to deliver e-Government cloud services more efficiently. A unified scheduling mechanism for e-Government cloud resources will be established to improve resource management and scheduling across the integrated e-Government cloud platform.

- Building a secure and robust national sovereignty cloud: We will store, manage, and utilize key business data, core research data, and national core endowment data (population, geography, economy, and national defense) using a distributed cloud architecture with a higher security level to address the challenges of a complex international cyber environment.

- Improving e-Government networks: We will accelerate the construction of a unified national e-Government network to provide secure and stable network infrastructure for the e-Government cloud, support information and cyber security for government departments, and streamline channels for service collaboration and data sharing. We will develop the capabilities required for the rapid deployment, flexible scheduling, and intelligent O&M of high-bandwidth, low-latency, and highly-reliable e-Government networks; promote the application of the fifth-generation fixed network (F5G) centered on technologies such as 10G PON, Wi-Fi 7, 200G/400G, OXC, and OSU-OTN; and speed up the deployment of dual-gigabit access to provide the high bandwidth needed for government office work, videoconferencing, and more.

We will enhance the mobile access capabilities and service functions of the e-Government extranet to meet the requirements of mobile application scenarios such as mobile office, government service, emergency management, social management, and major event support. We will improve the supporting capabilities of the national e-Government intranet, innovate common office applications on the intranet, and strengthen cross-department service collaboration and application integration. We will expand network coverage by extending e-Government networks to lower-level government agencies, and enhance the integration of e-Government networks with new technologies like 5G and big data.

Table 5.10 *e-Gov Quantity Goals*

Indicator	2025	2026	2027	2028	2029
E Gov Index (UN EGDI)	0,75	0,78	0,81	0,85	0,9

Cummulative Value

Box : 5

Digital Government Project

Background

When dealing with public services currently, enterprises and the public often encounter challenges such as cumbersome procedures, submission of multiple materials, and a multitude of separate tasks. . In order to improve this interaction of government services and further streamline processes, it is necessary to establish new standards and norms and promote the establishment of a new barrier-free, one-stop government service super app.

Recommendations

- Set basic requirements for a national integrated government service platform superapp to standardize affairs management, process optimization, online and offline integration, supervision and inspection, etc.
- Develop policies to unify the construction of a national medical insurance information platform and support cross-regional, cross-level, cross-business, cross-department, and cross-system information sharing and business collaboration in medical insurance.

Pilot Implementation

Public service applications such as those covering public security, civil, and business matters will be given a high priority in being ,connected first to INA. We will actively promote their take-up in key cities such as Jakarta and Surabaya.

Target

Achieve comprehensive connectivity of all public service ministry affairs to INA Digital with nationwide promotion and utilization.

5.6 Encouraging and Promoting Digital Applications

5G+ industrial Internet:
We will promote the in-depth integration of 5G modules with industrial terminals such as AR/VR devices, remotely-controlled devices, machine vision devices, and AGVs; accelerate industrial intranet transformation with 5G; build benchmarks for fully-connected 5G factories; develop a network deployment model that integrates IT networks and production control networks; and apply "5G+ industrial Internet" to key production processes. We will develop typical application scenarios of "5G+ industrial Internet" and constantly develop related pilots and showcases with a focus on R&D and design, manufacturing, operations management, products, services, and other key aspects across key industries. We will support the in-depth application of 5G to smart manufacturing, such as in quality inspection, remote O&M, multi-machine collaboration, and human-computer interaction; build more showcases; and promote the replication of mature models in more industries and fields.

5G+ smart oceans:
We will drive the application of the fifth-generation mobile/fixed communications (5G/F5G) technologies to the remote control of heavy cargo-handling equipment, the end-to-end operation of intelligent horizontal transport equipment, and personnel safety assurance at ports, as well as multi-functional navigation marks and video surveillance systems. We will accelerate the construction of digital and automated port terminals, container yards, and warehouse yards; promote the digitalization of port construction and maintenance throughout the entire process and lifecycle; and drive the application of 5G in scenarios such as unmanned inspection, self-driving container trucks, and intelligent tally. We will push for the application of 5G to offshore oil and gas development and offshore wind power facilities, in order to support intelligent exploration, mining monitoring, remote control, intelligent pipeline transportation, automatic inspection and O&M, geofences, and machine inspection. We will expand the application of 5G to marine fisheries to facilitate smart aquaculture and fishing, fishing boat monitoring, environment monitoring, and accurate aquaculture decision making.

5G+ tourism:
We will increase the application of immersive AR/VR content and 4K/8K video that rely on the large uplink rates of 5G to provide tourists with immersive and multi-view tour experience at home, making them feel more engaged as if they were visiting onsite. We will encourage scenic spots and museums to launch online digital experience products; develop new services such as cloud tourism, cloud performance, cloud live streaming, and cloud exhibitions; develop new tourist consumption models such as customized, experience-based, intelligent, and interactive tourism; and create new scenarios of immersive traveling experience.

Box : 6

Digital Applications Project

Background

Enterprises are encountering challenges such as low levels of digitalization, a lack of urgent demand for digital transformation, and high application costs. To address these issues and stimulate digital adoption across various industries, coupled with promoting deep convergence between 5G technology and diverse sectors, the government needs to assume a leadership role in driving industrial digitalization.

Recommendations

Case Compilation:
Gather 5G application cases from different industries to create a comprehensive national 5G industry application case list.

Competition Promotion:
Organize diversified competitions, such as regional and industry-specific 5G industry convergence application competitions. Select exemplary 5G application cases, develop detailed case studies, and disseminate these best practices for replication and broader adoption.

Guidance Development: Prepare guidelines for constructing 5G fully connected factories, providing comprehensive guidance on infrastructure development, factory area construction, key link establishment, network security, key development industries, and construction pathways.

Pilot Implementation

Initiate 5G industry application competitions in Java's industrial and marine sectors. Identify and promote outstanding 5G industry application cases across various economic sectors.

Target

Expand the application fields of the 5G industry, broaden the scope of regional competitions, and conduct 5G application competitions and national competitions in Java, Sumatra, Sulawesi, and Kalimantan regions. This aims to generate a collection of exemplary cases for nationwide promotion, fostering widespread adoption and innovation in 5G applications.

5.7 Accelerating the Adoption of Digital and 5G Devices for a Digital Society

We will further open up the device market, introduce more 5G devices, encourage the boom of related applications, and in particular, facilitate the production, import, and sales of 5G devices and wearables in home, business, and industrial scenarios.

We will use 5G to accelerate the intelligent upgrade of traditional media activities, such as production, interviews, editing, and broadcast. We will promote high-tech, new-form video services; drive the application of 5G new radio (NR) broadcast TV; and provide broadcast TV and emergency broadcast services. We will deliver 5G-based 4K/8K live broadcast and panoramic, interactive audio and video services to offer 360° sport-event watching experience and facilitate the use of 5G in large-scale sports events.

Dual-gigabit + Education: We will accelerate the application of dual-gigabit teaching devices and AR/VR teaching content, and use AR/VR and holographic projection technologies to create scenario-based, interactive, and immersive classes. We will enhance the application of dual-gigabit technology in scenarios such as smart classes, holographic teaching, campus security protection, education management, and comprehensive student assessment, in order to digitalize teaching, management, research, and service activities.

Box : 7

Digital and 5G Devices Project

Background

The widespread adoption of 5G digital terminals face obstacles such as high application costs and inadequate promotion. To facilitate the penetration of 5G technology into various sectors and expedite industrial digital transformation, governmental intervention is required to stimulate the adoption of new terminals

Recommendations

Subsidies and Tariff Incentives:
Introduce subsidies to encourage the purchase of 5G terminals, including handheld devices, wearables, and IoT modules. Implement preferential and exemption policies for import tariffs on 5G digital terminals, fostering large-scale application.

Pilot Implementation

Implement preferential import tariffs and purchase subsidies for 5G devices and wearables across home, business, and industrial scenarios within key economic regions like Java. This pilot aims to gauge the effectiveness of these incentives and pave the way for broader implementation.

5.8 Accelerating the Cultivation and Introduction of Digital Talent

We will increase the number of students enrolled in digital-related majors and education majors, cultivate teachers with digital skills, provide training devices, and establish base standards.We will link talent cultivation with employment by encouraging university-enterprise collaboration and establishing modern apprenticeships.

While attaching importance to the development of basic research subjects, we will also work to enhance vocational education, such as developing talent for live streaming, e-Sports gaming, and animation. The country will introduce preferential policies in terms of taxation, subsidies, and approval procedures in this regard.

We will strengthen international cooperation, and introduce preferential policies for talent cultivation, introduction, and mobility. In particular, we will offer strong policies to retain excellent talent.

5.9 Accelerate the Construction and Use of Data Centers and Realize the Potential of Data Optimisation

Data centres, often overlooked, form the backbone of the digital economy, powering essential activities like e-commerce and facilitating trends such as industrial data curation and optimization. Currently, more than 80 data centers have been built in Indonesia. It is forecast that the local data center market will have a compound annual growth rate of 14% between 2023 and 2028. Nevertheless, in order to develop optimally many larger and more advanced data centers with better energy efficiency (PUE<1.4) will be required.

Digital data are becoming an essential input in decision-making, production processes, transactions and relationship management. These data include, but are not limited to, geospatial, population, economic, and enterprise information. They also include personal and institutional data, lifestyle and entertainment, as well as for scientific research and study. But processing these data requires increasingly powerful computing power. The storage of these data also requires high security and massive backup disk arrays. Lastly the transmission of these data requires high-speed, stable networks.

How to safely maximize the value of these data to serve the development of Indonesia is another equally important issue that needs to be considered. We recommend the establishment of a compliant, efficient, safe and orderly data element valuing system. The data process flow needs to start with data rights registration, data compliance reviews, data supplier and demander qualification reviews, data product commercialization, data product retention and data product transactions. We will also need to continually improve the data property rights system, explore and practice data pricing rules, and establish a multi-level integrated and smooth data transaction system that enables safe and efficient data circulation.

Table 5.11 *Large Data Center Quantity Goal*

Indicator	2025	2026	2027	2028	2029
Large Date Center quantity	90	100	120	150	188

Cummulative Value

Box : 8

Data Centers Project

Background

Construction of massive data centers will tie-up land unnecessarily and could waste other resources. Multiple small data centers for example lack the flexibility and scalability or much larger ones. To overcome these issues the government needs to introduce policies to regulate the development of data centers. In addition, loosely regulated data may exacerbate energy consumption efficiency initiatives. The government should introduce more policies to better guide more energy efficient and sustainable data center development.

Recommendations

Construction Guidelines:
Implement guidelines for constructing new data centers, ensuring rational site selection, alignment with long-term application objectives, and adherence to national needs and standards.

Energy-Saving Policies:
Introduce data center energy-saving policies, targeting a Power Usage Effectiveness (PUE) of less than1.4 to promote efficiency and sustainability

Pilot Implementation

Prioritize constructing green and highly energy-efficient extensive data centers in vital economic areas such as Java Island. It is suggested that 90 large data centers be established by 2025.

Target

By 2029, 188 large data centers will be constructed with a capacity of 5MW per million population. Ensure new data centers achieve a PUE of less than 1.4, underscoring a commitment to energy efficiency and sustainability.

5.10 Accelerating High-Tech Research, Industry Development, and Innovation with Enterprise and Market Leadership

Targeted Scientific Research and Innovation:

1. Prioritize key areas and address weak links in the construction of a modern industrial system.
2. Focus on bottlenecks like integrated circuits, industrial motherboards, basic software, advanced materials, scientific research instruments, and core sources.
3. Increase technology research and development efforts to ensure the independence and security of critical industrial chains and supply chains, thereby providing controllable scientific and technological support.
4. Aim for future technological and industrial development leadership, accelerating scientific and technological innovation in new-generation information technology, artificial intelligence, quantum technology, biotechnology, new energy, and new materials.
5. Cultivate emerging industries and future industries while actively utilizing new technologies.
6. Leverage technological transformation to enhance traditional industries and promote high- end, intelligent, and green industries.

Enterprise and Market-Led Innovation:

Empower leading scientific and technological enterprises to play a pivotal role. Encourage scientific and technological innovation among small and medium-sized enterprises and private enterprises. Support enterprises in leading or participating in major national scientific and technological projects. Foster collaboration between enterprises, universities, colleges, and scientific research institutions to jointly address scientific and technological issues, conduct research, and cultivate talent.

Implement mechanisms to solidify enterprises' central position in scientific and technological innovation, granting them autonomy in decision-making, R&D investment, research organization, and achievement transformation. Harness the advantages of market demand, integrated innovation, and organizational platforms to pave the way from scientific and technological strength to robust enterprises and industries.

Promoting the Transformation of Scientific and Technological Achievements:

Innovation value and innovation-driven development can only be realized when scientific and technological achievements are aligned with Indonesia's national needs, the needs of its people, and market demands, completing the transition from research to experimental development and, ultimately, promotion and application.

Scientific and technological achievements should manifest as real productivity, spawning new industries and driving industrial transformation and upgrading. To achieve deep integration of scientific and technological innovation with industrial innovation, promptly apply research outcomes to specific industries and industrial chains, enhancing the modern industrial system. Capitalize on Indonesia's vast market and economies of scale to strengthen the national technology transfer system, improve policy support and market services, and promote the application and iterative upgrade of independently developed products.

Key Project Reference

Table 5.12 *Large Data Center Quantity Goal*

No	Project	Project Benefits	Funding Indications	Implementing Agencies
1	National ICT construction project (including 5G, Fiber, Backbone, Datacenter promotion project)	National ICT construction project (including 5G, Fiber, Backbone, Data center promotion project) Keep up with the pace of infrastructure construction in ASEAN and the world's digital economy powers. Make up for the shortcomings in the development of Indonesia's digital economy. Accelerate the construction of new infrastructure such as 5G networks and data centers, seize the opportunity to lay out strategic emerging industries and future industries such as those in the broad digital economy, vigorously promote technological innovation and strive to expand new growth points and form new development momentum.	17.22B USD	
2	Digital Education phase1	Improve the quality of education coverage in remote areas, balance the distribution of educational resources, popularize multime- dia teaching configurations in schools and enrich the content of online education.	620M USD	
3	National Grid digitalization project phase 1	Focus on improving the digitalization level of the national power grid to ensure the security of Indonesia's national energy supply while making good use of the power grid network to expand more efficient and economical new network services, including but not limited to high-speed broadband services and data center services.	3B USD	
4	Digital logistic promotion project phase1	Upgrade the digital capabilities of Indonesia's national transportation system, including roads, railways, waterways, and logistics distribution centers and service online platforms at all levels. Enhance national logistics delivery capabilities and effectively accelerate the endogenous cargo turnover capacity of economic development.	743M USD	
5	Digital Industry Park promotion project phase1	Comprehensively improve the coverage of information infrastructure and services in industrial parks and create a hardware environment for the implementation and subsequent evolution of the Making Indonesia 4.0 strategy	329M USD	

Notes :

- References for "dual-gigabit city construction": Dual Gigabit Network Coordinated Development Action Plan (2021–2023) and Notice of the General Office of the Ministry of Industry and Information Technology on Summarizing and Evaluating Gigabit City Construction in 2022.

- Reference for "5G+ industrial areas": Guidelines for the Construction of Converged 5G and Industrial Internet Application Pilot Zones.

- Reference for "5G+ tourism": Notice of the Ministry of Industry and Information Technology and the Ministry of Culture and Tourism on Strengthening the Coordinated and Innovative Development of 5G+ Smart Tourism and Notice of the Ministry of Industry and Information Technology and 10 Other Departments on Launching the "Signal Upgrade" Special Action.

- Reference for "5G+ campuses": "Set Sail" Action Plan for 5G Applications (2021–2023) and Notice of the General Office of the Ministry of Industry and Information Technology and the General Office of the Ministry of Education on Organizing Application for "5G+ Smart Education" Pilot Projects.

- Reference for "Optical-network adoption": 14th Five-Year Plan for Information and Communications Industry Development and Dual Gigabit Network Coordinated Development Action Plan (2021–2023).

Projected Economic Impact

6.

6. Projected Economic Impact

6.1 Gross Domestic Product (GDP)

The National Digitalization Plan is projected to boost Indonesia's GDP significantly. Increasing broadband penetration in Indonesia is expected to significantly impact GDP growth from 2025 to 2030.

Studies by Worldbank and ITU (The economic contribution of broadband, digitization and ICT regulation Econometric modeling for the Asia-Pacific region, 2019) have shown that a 10% increase in broadband penetration can lead to a 1% to 1.5% increase in GDP per capita. This impact can be even more pronounced for developing economies like Indonesia, with potential GDP growth increases of up to 1.38% for every 10% rise in broadband penetration.

Research on the economic impact of broadband in the Asia-Pacific region often relies on econometric analysis, either cross-sectional or country-specific. Within the cross-sectional group, a study by McKinsey & Co (2009), based on a comparison of broadband policies and penetration across selected countries in the Asia-Pacific region, concluded that an increase of 10 percent in broadband penetration would lead to approximately 0.6 to 0.7 percent increase in GDP growth.

The study concluded that the collective gross domestic product (GDP) could generate an additional USD 150 billion to USD 180 billion and could generate more than 6.5 million jobs. Similarly, in a study of the contribution of mobile technology to economic growth in a selection of countries in the Asia-Pacific region, analysts of Oxford Economics (2016) measured the impact of mobile Internet on labor productivity as well as the increase in the labor participation rate. The first relationship was specified through a Dynamic Generalized Method of Moments, according to which an additional subscription of mobile broadband per 100 inhabitants is associated with a 0.03 percent increase in labor productivity.

On the other hand, a similar increase in one subscription of mobile broadband per 100 population is associated with a 0.006 percentage point increase in the labor participation rate. With these two relationships, the study quantified the future impact of mobile Internet technology on GDP growth and job creation. In a similar vein, GSMA analysts (2017) studied the impact of the mobile economy in selected countries in the Asia-Pacific region by assessing the direct, indirect, and productivity contribution to the GDP,

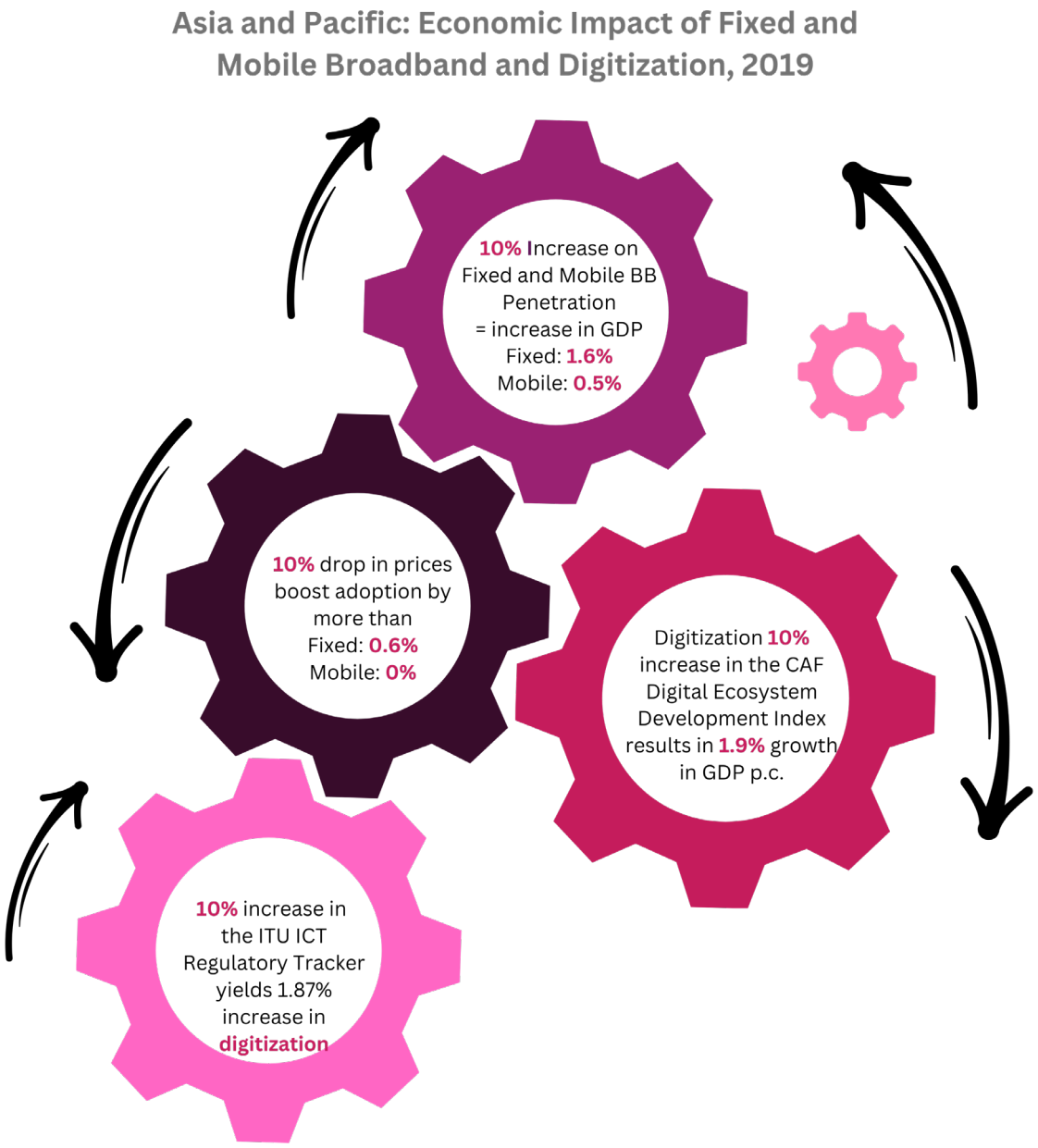


Figure 6.1 *Asia and Pacific: Economic Impact of Fixed and Mobile Broadband and Digitization, 2019*
Source: ITU

-and measuring the generation of direct and indirect employment. The direct contribution in 2016, estimated at 1.6 percent of GDP, was calculated with the value added by infrastructure providers, mobile operators, device manufacturers, distributors, and content and applications developers. The indirect contribution was estimated at 0.6 percent of GDP, while the productivity impact reached 3 percent of output. On the other hand, direct employment amounted to 6.4 million jobs, while indirect jobs reached 9.7 million.

Given Indonesia's ongoing investments in expanding its broadband infrastructure, including the rollout of 5G and fiber-optic networks, the country is well-positioned to leverage these benefits. The telecommunications sector is expected to continue its rapid growth, contributing significantly to the national GDP.

A study by the Telkom University, ITB and University of Indonesia examined the impact of every increased of 10% broadband speed on Indonesia's GDP will positively impacting around 1%. Business actors who have internet speeds above 30 Mbps have net revenues up to 93% higher or reach 15 times higher than respondents with internet speeds of less than 1.5 Mbps. The research found that improvements in broadband infrastructure and internet usage have a positive effect on economic growth.

Key findings include:

Positive GDP Impact : The study used time series data from 2001 to 2016 and found that increases in broadband subscriptions and internet users positively impacted GDP.

Economic Performance: Enhanced internet access supports new business models like e-commerce and e-business, creating new jobs and expanding market networks. This contributes to higher income and economic growth.

Technological Adoption: The adoption of advanced technologies facilitated by better broadband speeds can lead to significant productivity gains and economic benefits.

These findings highlight the importance of investing in broadband infrastructure to drive economic growth in Indonesia. Increasing broadband penetration and speed can have a significant impact on Indonesia's GDP.

Here are some specific figures:

GDP Growth Contribution: According to McKinsey, every 10% increase in broadband penetration can drive a 1% to 1.5% increase in GDP per capita.

Economic Boost: The Ministry of Finance predicts that technology adoption, including broadband improvements, could add up to $2.8 trillion to Indonesia's economy by 2040, contributing an additional 0.55 percentage points to annual GDP growth between 2020 and 2040.

Productivity Gains: Enhanced broadband infrastructure could boost productivity by $9.5 billion (IDR 131 trillion) over a 10-year period.

These figures highlight the substantial economic benefits that can be achieved through strategic investments in broadband infrastructure.

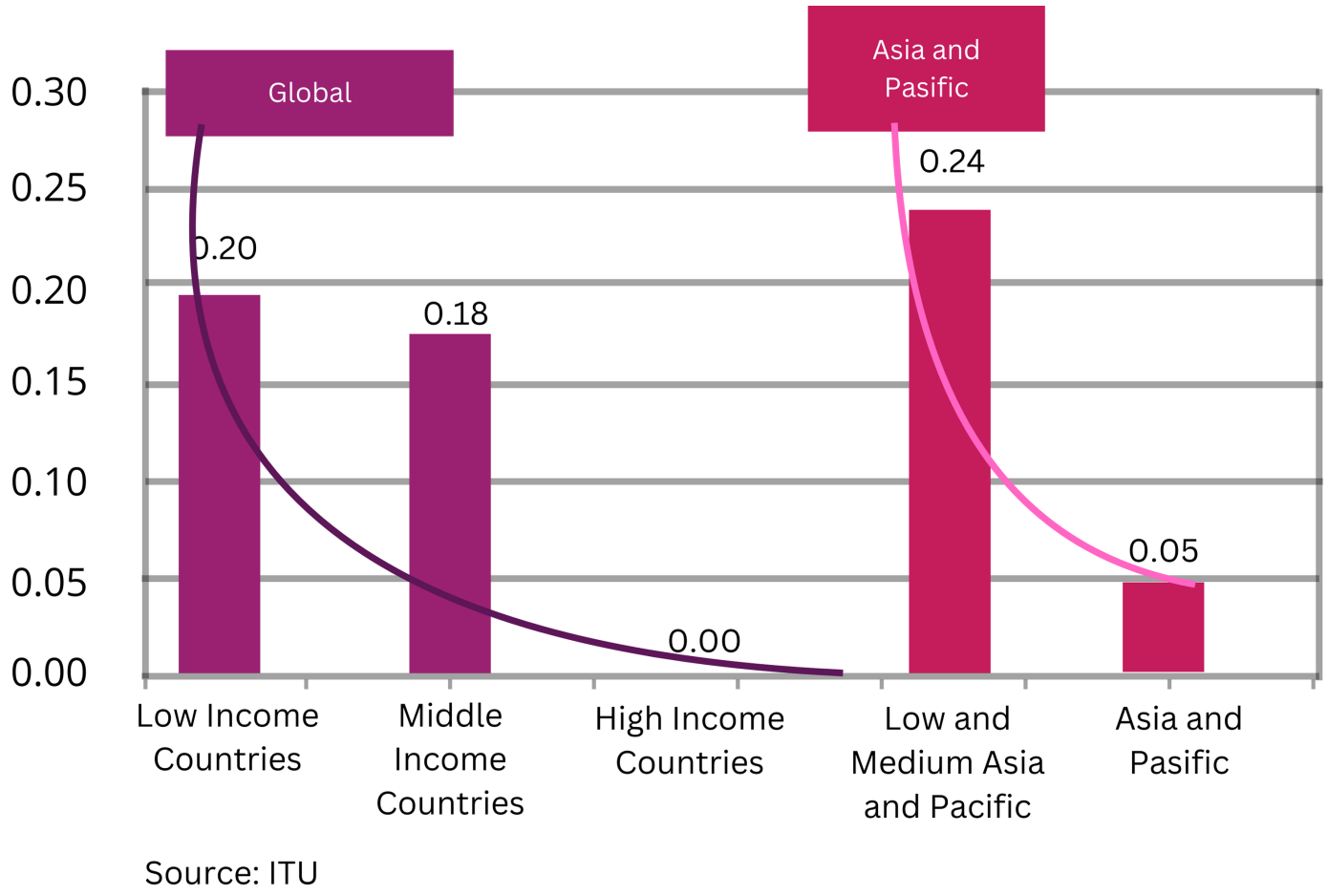


Figure 6.2 *Economic Impact of Mobile Broadband (Global Sample vs Asia Pasific Region 2017)*
Source: ITU

Refer to World Bank Report 2024 in order to achieve more sophisticated economies, middle-income countries need two successive transitions, not one. In the first, investment is complemented with infusion, so that countries (primarily lower-middle-income countries such as Indonesia) focus on imitating and diffusing modern technologies. In the second, innovation is added to the investment and infusion mix, so that countries (primarily upper-middle-income countries) focus on building domestic capabilities to add value to global technologies, ultimately becoming innovators themselves. In general, middle-income countries need to recalibrate the mix of the three drivers of economic growth—investment, infusion, and innovation—as they move through middle income status (table 6.1).

To intentionally import state-of-the-art technology, knowledge of market potential, and business practices from abroad, as well as expedite their diffusion at home (figure 6.3), newly minted middle-income economies have to change tack. Policy makers must support firms that are ready and able to incorporate global technologies into production. For firms to make the most of new technologies, they need technically skilled workers in large numbers and a sufficient supply of engineers, scientists, managers, and other highly skilled professionals. Countries that are relatively open to economic ideas from abroad and have instituted strong secondary education and vocational training programs at home tend to perform better than those that have not.

The experiences of three economies that have grown quickly from the lower-middle-income to high-income levels in recent decades. Korea's success may be the best support for the argument that sustaining high growth requires adding infusion to accelerations of investment, and then again augmenting the 2i mix with innovation policies. Korea was among the least developed countries globally in the early 1960s, with income per capita of less than US$1,200 in 1960. By 2023, after an unparalleled five-decade run of high output growth, Korea's income per capita had risen to about US$33,000.

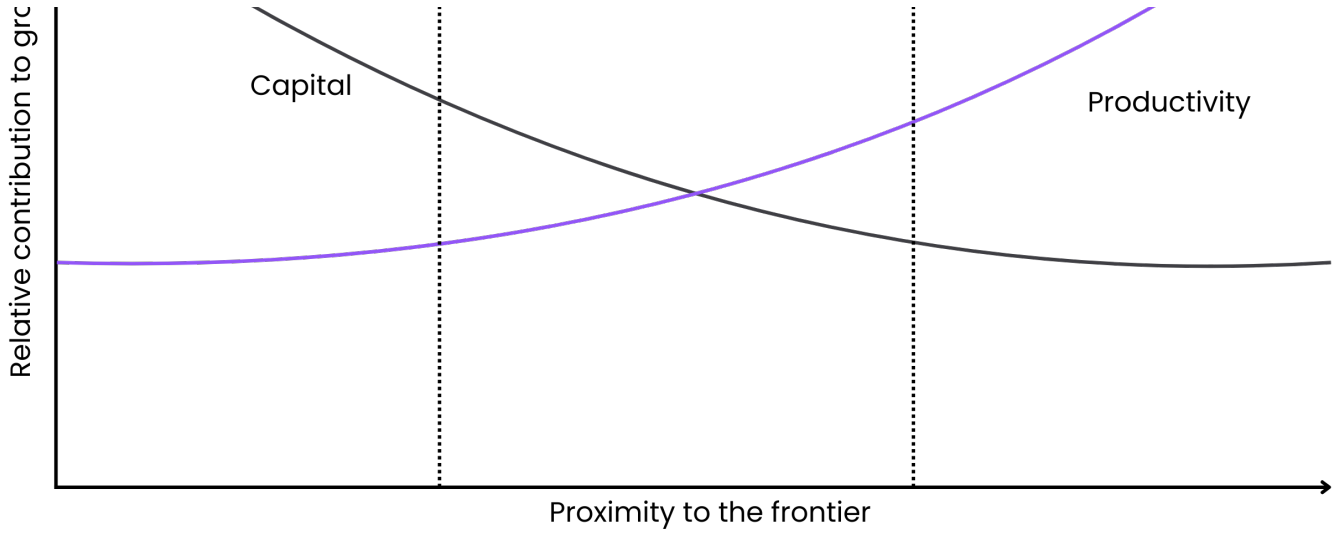
Table 6.1 *To achieve high-income status, countries will need to recalibrate their mix of investment, infusion, and innovation*
Source: WDR 2024 team.

Income Classification	Investment	Infusion	Innovation
Low-income	Higher priority	Lower priority	Lower priority
Low-middle income	Higher priority	Higher priority	Lower priority
Upper-middle-income	Higher priority	Higher priority	Higher priority

Note: The purple dials indicate a strategy that is a priority for that particular income group. The grey dials indicate a strategy that is less of a priority for that

Notes: *The orange dials indicate a trategy that is a priority for that particular income group. The blue dials indicate a strategy that is less of a priority for that particular income group until the priority strategy is successfully achieved*

Figure 6.3 *Middle-income countries must engineer two successive transition to move to high-income status*
Source: WDR 2024 team.



Notes: *Note: The curves illustrate the relative contributions of capital and productivity to economic growth (y-axis), according to countries' proximity to the frontier (represented by the leading economies). Countries farther out on the x-axis are closer to the frontier*

To estimate the expected values for each variable, we can look at historical data, current trends, and expert forecasts. Here some general guidelines and hypothetical values for each variable from 2024 to 2030:		
1. Broadband Speed Increase (BSI)	**INDEX**	
	1	Low
Expected Value: Annual increase of 10-15% in average broadband speed.	2	Mid
Example: If the average speed is 50 Mbps in 2024, it might increase to 57.5 Mbps in 2025 (assuming a 15% increase).	3	High
2. Broadband Penetration Rate Increase (BPRI)	**INDEX**	
	0,75	Low
Expected Value: Annual increase of 5-10% in broadband penetration.	1,50	Mid
Example: If the penetration rate is 70% in 2024, it might increase to 77% in 2025 (assuming a 10% increase).	2,25	High
3. Digital Infrastructure Investment Rate (DIIR)	**INDEX**	
	0,60	Low
Expected Value: Annual increase of 8-12% in investment.	1,20	Mid
Example: If the investment is $10 billion in 2024, it might increase to $11 billion in 2025 (assuming a 10% increase).	1,80	High
4. Digital E-Commerce Growth Rate (DEGR)	**INDEX**	
	0,90	Low
Expected Value: annual growth rate of 7-10%.	1,80z	Mid
Example: If the digital economy contributes $100 billion to GDP in 2024, it might grow to $110 billion in 2025 (assuming an 10% growth).	2,70	High

5.	Digital Ocean Development Rate (DODR)	INDEX	
		0,55	Low
Expected Value: Annual growth rate of 5-8%.		1,10	Mid
Example: If the digital ocean sector contributes $20 billion to GDP in 2024, it might grow to $21.6 billion in 2025 (assuming an 8% growth).		1,65	High
6.	**Digital Mining Development**	**INDEX**	
		0,65	Low
Expected Value: Annual growth rate of 4-7%.		1,30	Mid
Example: If the digital mining sector contributes $15 billion to GDP in 2024, it might grow to $16.05 billion in 2025 (assuming a 7% growth).		1,95	High
7.	**Digital Manufacturing Development Rate (DMfDR)**	**INDEX**	
		0,70	Low
Expected Value: Annual growth rate of 6-9%.		1,40	Mid
Example: If the digital manufacturing sector contributes $50 billion to GDP in 2024, it might grow to $54.5 billion in 2025 (assuming a 9% growth).		2,10	High
8.	**Digital Agriculture Development Rate (DADR)**	**INDEX**	
		0,80	Low
Expected Value: Annual growth rate of 5-8%.		1,60	Mid
Example: If the digital agriculture sector contributes $30 billion to GDP in 2024, it might grow to $32.4 billion in 2025 (assuming an 8% growth).		2,40	High
9.	**Digital Logistics Development Rate (DLDR)**	**INDEX**	
		0,85	Low
Expected Value: Annual growth rate of 7-10%.		1,70	Mid
Example: If the digital tourism sector contributes $25 billion to GDP in 2024, it might grow to $27.5 billion in 2025 (assuming a 10% growth).		2,55	High
10.	**Digital Tourism Development Rate (DTDR)**	**INDEX**	
		0,95	Low
Expected Value: annual growth rate of 7-10%.		1,90	Mid
Example: If the digital economy contributes $100 billion to GDP in 2024, it might grow to $110 billion in 2025 (assuming an 10% growth).		2,85	High

11. Digital Healthcare Development Rate (DHDR)	INDEX	
	0,75	Low
Expected Value: Annual growth rate of 8-12%.	1,50	Mid
Example: If the digital healthcare sector contributes $35 billion to GDP in 2024, it might grow to $39.2 billion in 2025 (assuming a 12% growth).	2,25	High

12. State-Owned Enterprise Digital Transformation Rate (SOEDTR)	INDEX	
	0,60	Low
Expected Value: Annual growth rate of 5-8%.	1,20	Mid
Example: If the digital transformation of SOEs contributes $45 billion to GDP in 2024, it might grow to $48.6 billion in 2025 (assuming an 8% growth).	1,80	High

13. Digital Culture Development Rate (DCDR)	INDEX	
	0,65	Low
Expected Value: Annual growth rate of 4-7%.	1,30	Mid
Example: If the digital culture sector contributes $10 billion to GDP in 2024, it might grow to $10.7 billion in 2025 (assuming a 7% growth).	1,95	High

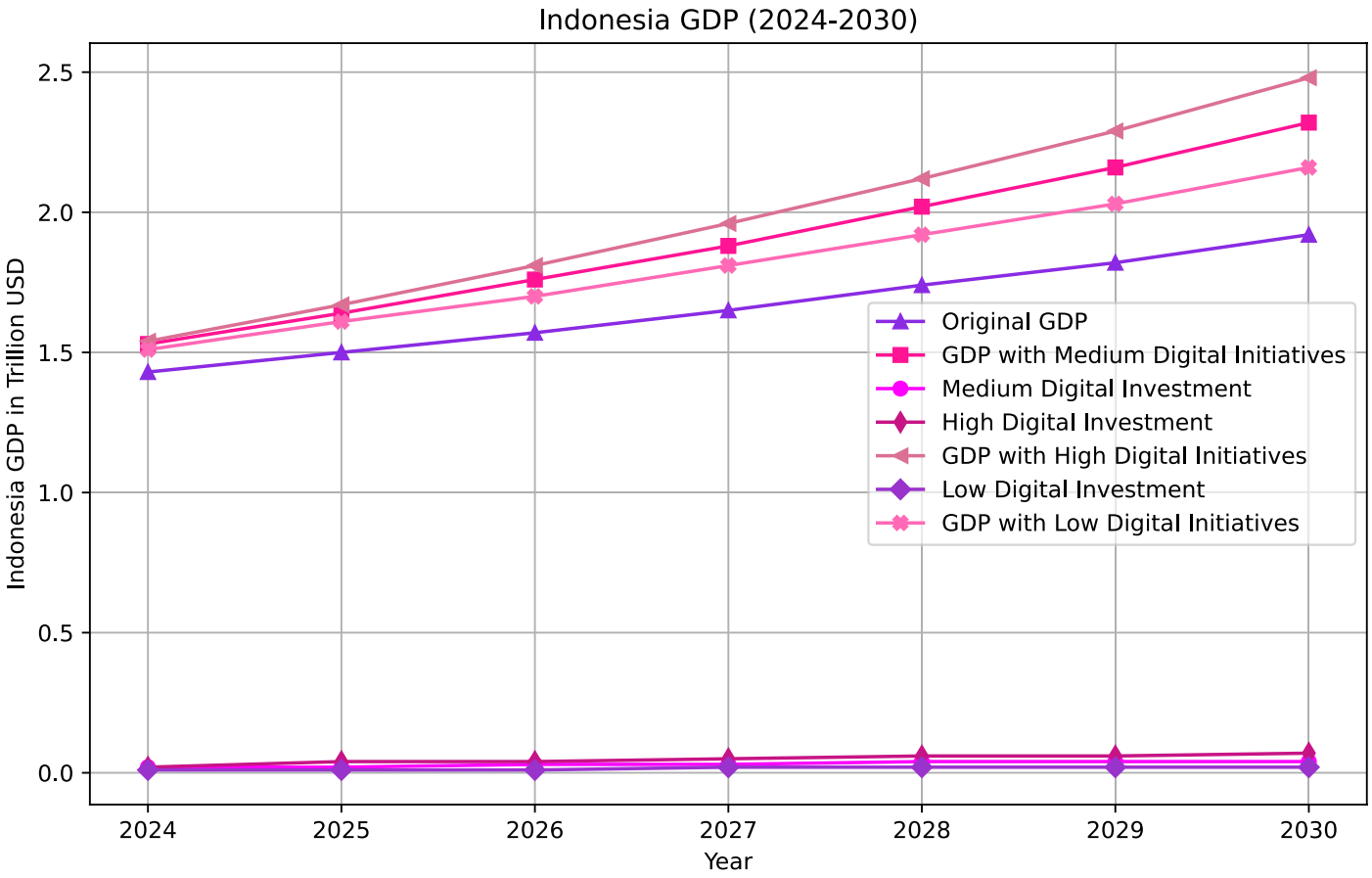
14. Digital Energy Developoment Rate (DenDR)	INDEX	
	0,95	Low
Expected Value: Annual growth rate of 4-7%.	1,90	Mid
Example: If the digital energy sector contributes $200 billion to GDP in 2024, it might grow to $215 billion in 2025 (assuming a 7% growth).	2,85	High

LOW SCENARIO

Year	Baseline GDP Growth Rate	Adjusted GDP Growth Rate	Incremental GDP
	%	%	%
2024	5,04	6,11	1,07
2025	5,11	6,18	1,07
2026	4,98	6,05	1,07
2027	5,01	6,08	1,07
2028	5,03	6,10	1,07
2029	5,05	6,12	1,07
2030	5,06	6,13	1,07

MEDIUM SCENARIO			
Year	Baseline GDP Growth Rate	Adjusted GDP Growth Rate	Incremental GDP
	%	%	%
2024	5,04	7,18	2,14
2025	5,11	7,25	2,14
2026	4,98	7,12	2,14
2027	5,01	7,15	2,14
2028	5,03	7,17	2,14
2029	5,05	7,19	2,14
2030	5,06	7,20	2,14

HIGH SCENARIO			
Year	Baseline GDP Growth Rate	Adjusted GDP Growth Rate	Incremental GDP
	%	%	%
2024	5,04	8,25	3,21
2025	5,11	8,32	3,21
2026	4,98	8,19	3,21
2027	5,01	8,22	3,21
2028	5,03	8,24	3,21
2029	5,05	8,26	3,21
2030	5,06	8,27	3,21



	2024	2025	2026	2027	2028	2029	2030
Original GDP	1,43	1,50	1,57	1,65	1,74	1,82	1,92
GDP with Medium Digital Initiatives	1,53	1,64	1,76	1,88	2,02	2,16	2,32
Medium Digital Initiatives	0,02	0,02	0,03	0,03	0,04	0,04	0,04
High Digital Initiatives	0,03	0,04	0,04	0,05	0,06	0,06	0,07
GDP with High Digital Initiatives	1,54	1,67	1,81	1,96	2,12	2,29	2,48
Low Digital Initiatives	0,01	0,01	0,01	0,02	0,02	0,02	0,02
GDP with Low Digital Initiatives	1,51	1,61	1,70	1,81	1,92	2,03	2,16

Figure 6.4
Indonesia GDP Growth (2024 - 2030)

Indicator	Source
GDP per capita (PPP)	IMF
Fixed broadband subscriber penetration	ITU-OVUM
Capital-Gross capital formation (percentage of GDP)	World Bank
Education-School enrolment, tertiary (percent gross)	World Bank
Fixed telephone subscribers	ITU
Rural population (percent of total population)	World Bank
Fixed broadband price	ITU
HH fixed broadband	OVUM
Fixed broadband revenue	ITU-OVUM
Mobile broadband unique subscriber penetration	GSMA
Mobile unique subscriber penetration	GSMA
Mobile broadband price/ARPU	ITU-GSMA
HHI mobile broadband	GSMA
Mobile broadband revenue	GSMA

Pillar	Sub-pillar	Indicator	Source
Infrastructure	Investment	Telecommunications investment per capita in current prices – five year average (USD PPP)	World Bank; ITU
	Quality of service	Average fixed broadband download speed (Mbit/s)	Akamai
	Quality of service	Average mobile broadband download speed (Average Mbit/s)	Akamai
	Quality of service	Fixed broadband connections with download speed higher than 4 Mbit/s (percentage)	Akamai
	Quality of service	Fixed broadband connections with download speed higher than 10 Mbit/s (percentage)	Akamai
	Quality of service	Fixed broadband connections with download speed higher than 15 Mbit/s (percentage)	Akamai
	Quality of service	Fiber optic broadband connections as a percentage of total fixed broadband connections	ITU; FTTH; OECD
	Quality of service	International broadband bandwidth per Internet user (bit/s)	ITU
	Coverage	Fixed broadband coverage (% of households)	Eurostat, CAF Ideal; OECD
	Coverage	2G coverage	ITU
	Coverage	3G coverage	ITU
	Coverage	4G coverage	ITU
	Service Infrastructure	IXPs per 1 000 000 population	Packet Clearing House; UNCTAD
	Service Infrastructure	Number of secure servers (per 1 000 000 population)	World Bank
	Service Infrastructure	Number of satellites (per 1 000 000 population)	N2yo.com
Factors of digital production	Human capital	Education years expectancy (years)	World Bank; UNESCO
	Human capital	Tertiary school enrolment (per cent population)	World Bank; UNESCO
	Schools	Per cent educational establishments with Internet access	UNESCO; CEPAL
	Schools	Computers per students ratio	UNESCO; CEPAL
	Innovation	USPTO patents per country (per 1 000 000 population)	USPTO
	Innovation	Intellectual property revenues (USD per capita PPA in current prices)	World Bank
	Investment in innovation	R&D spending (per cent of GDP)	World Bank; UNESCO
	Economic development	GDP per capita (USD current prices)	IMF
	Economic development	Electric energy consumption (kWh per capita)	World Bank

Pillar	Sub-pillar	Indicator	Source
Institutional and Regulatory	Cyber-security and piracy	Percent of non-licensed installed software	BSA, The software alliance
	Cyber-security and piracy	Commercial value of non-licensed software (as percent of GDP)	BSA, The software alliance
	Goverment role	Percent of regulatory agency attributions based on ITU regulatory tracker	ITU; TAS
	Goverment role	Percent of regulatory agency functions based on ITU regulatory tracker	ITU; TAS
	-	Population	World Bank
	-	Exchange rate PPP	IMF
	-	Number of households	ITU
	-	GDP per capita for first quintile (USD in current prices)	IMF; World Mundial

6.2 Job Creation

The digital transformation is anticipated to create substantial employment opportunities. Indonesia will need approximately nine million digital sector workers over the next 15 years, digitalization initiative impact in 2030 will push our workers number from original plan of 150.9 million towards 152.5 million (low scenario) up to 160 million (high scenario). This surge in demand for digital skills will not only reduce unemployment but also enhance the overall quality of the workforce.

Sector	Current Workers	2023	Regular Growth	Digital Annual Growth
Digital Infrastructure	ICT Infrastructure workers majority 30-40 yes highly concentrated in major cities (Jkt, Btm, Mdn)	800.000	7%	5%
Digital E-commerce	ECommerce workers majority 25-35 yrs spreading in major cities (Jkt, Sby, Bdg)	1.500.000	18 %	5 %
Digital Ocean	Maritime (30-50 yrs) major port cities (tg priok, tg perak, belawan), fishery (24-45 yrs) major in north sumetera, east java, south sulawesi), oceanary (30-40 yrs) major in conservatory areas (bali, lombok, raja ampat)	7.000.000	4%	8%
Digital Mining	Coal, Nickel & Bauxite, Gold & Copper mining (25-45 yrs) majority in Kalimantan, Sulawesi & Papua	1.500.000	4%	7%
Digital Manufacturing	F&B, Textile & Apparel, Automotive, Electronics (25-45 yrs) majority in Java, Sumatera, Kalimantan & Sulewasi	18.830.000	5%	9%
Digital Agriculture	Crop production, livestock, fisheries, forestry (25-50 yrs) majority in Java, Sumatra, Kalimantan, Sulawesi & Eastern Indonesia	40.690.000	2%	8%

Sector	Current Workers	2023	Regular Growth	Digital Annual Growth
Digital Logistics	Freight transport, warehousing & storage, courier-express & parcel (CEP), supply chain mgnt (24-45 yrs) majority in Java, Sumatera, Kalimantan & Sulawesi	3.500.000	4%	9%
Digital Tourism	Hospitality, Travel Services, Food & Beverage, Entertaintment & Recreation, Transportation (20-40 yrs) majority in Bali, Jakarta, Yogyakarta, Central Java & Eastern Indonesia	23.000.000	6%	10%
Digital Healthcare	Hospital & Clinics, Primary Healthcare centers, Pharmacies & Laboratories, Public Health Services (25-50 yrs) Majority in Java, Sumatera & Eastern Indonesia	2.500.000	5%	12%
Digital SOEs	Energy, transportation, telecommunication & finance sectors (25-50 yrs) majority in Java, Sumatera, Kalimantan & Sulawesi	1.200.000	3%	8%
Digital Culture	Culinary arts, fashion, crafts, film-animation & video, music & gaming (20-40 yrs) majority in Java, Bali & Yogyakarta	23.980.000	5%	10%
Digital Energy	Oil & Gas, Coal Mining, Renewable Energy, Electricity generation & distribution (25-50 yrs) majority in Java, Sumatera, Kalimantan & Eastern Indonesia	1.500.000	3%	7%

LOW SCENARIO									
Sector	**Job Creation (2024-2030)**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTAL**
Digital Infrastructure	Approximately 600,000 digitally-capable talents annually	480.000	504.000	529.200	555.660	583.443	612.615	643.246	3.908.164
Digital E-commerce	Significant growth with the digital economy reaching USD 110 billion by 2025 (Incl in. Digi Infra)	-	-	-	-	-	-	-	-
Digital Ocean	Part of the broader digital economy growth, contributing to 9 million digital sector jobs	21.600	23.328	25.194	27.210	29.387	31.737	34.276	192.733
Digital Mining	Enhanced productivity and safety, creating new roles in predictive maintenance and AI	13.600	14.552	15.571	16.661	17.827	19.075	20.410	117.695
Digital Manufacturing	Expected to create over 10 million new jobs by 2030	44.000	47.960	52.276	56.981	62.110	67.699	73.792	404.819
Digital Agriculture	Increased efficiency and productivity, leading to new job opportunities	287.200	310.176	334.990	361.789	390.732	421.991	455.750	2.562.629
Digital Logistics	Growth driven by e-commerce and digital transformation, creating numerous jobs	40.000	43.600	47.524	51.801	56.463	61.545	67.084	368.017
Digital Tourism	Expansion of digital services and platforms, boosting employment in the sector	181.664	199.830	219.813	241.795	265.974	292.572	321.829	1.723.477
Digital Health-care	Growth in telemedicine and digital health services, creating new healthcare roles	10.160	11.379	12.745	14.274	15.987	17.905	20.054	102.504
Digital SOEs	Digital transformation of state-owned enterprises, leading to job creation	12.800	13.824	14.930	16.124	17.414	18.807	20.312	114.212
Digital Culture	Growth in digital content creation and cultural industries, creating new opportunities (incl in Digi Tour)	-	-	-	-	-	-	-	-

LOW SCENARIO									
Sector	**Job Creation (2024-2030)**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTAL**
Digital Energy	Expansion of renewable energy and smart grid technologies, creating numerous jobs	104.000	111.280	119.070	127.404	136.323	145.865	156.076	900.018
		1.195.024	**1.279.930**	**1.371.313**	**1.469.700**	**1.575.660**	**1.689.813**	**1.812.830**	**10.394.269**

Workers	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Improvement**
Regular Growth	142.180.000	143.601.800	145.037.818	146.488.196	147.953.078	149.432.609	150.926.935	
With Low Digital Initiative	**143.375.024**	**144.654.954**	**146.026.267**	**147.495.966**	**149.071.626**	**150.761.439**	**152.574.269**	**1.647.334**
Churn	**5.687.200**	**5.744.072**	**5.801.513**	**5.859.528**	**5.918.123**	**5.977.304**	**6.037.077**	**41.024.817**
	4%	**4%**	**4%**	**4%**	**4%**	**4%**	**4%**	
Add	**6.882.224**	**6.797.226**	**6.789.961**	**6.867.298**	**7.036.671**	**7.306.134**	**7.684.411**	**49.363.926**

MEDIUM SCENARIO									
Sector	**Job Creation 2024-2030)**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTAL**
Digital Infrastructure	Approximately 600,000 digitally-capable talents annually	600.000	630.000	661.500	694.575	729.304	765.769	804.057	4.885.205
Digital E-commerce	Significant growth with the digital economy reaching USD 110 billion by 2025 (Incl in. Digi Infra)	-	-	-	-	-	-	-	-
Digital Ocean	Part of the broader digital economy growth, contributing to 9 million digital sector jobs	27.000	29.160	31.493	34.012	36.733	39.672	42.846	240.916
Digital Mining	Enhanced productivity and safety, creating new roles in predictive maintenance and AI	17.000	18.190	19.463	20.826	22.284	23.843	25.512	147.118
Digital Manufacturing	Expected to create over 10 million new jobs by 2030	55.000	59.950	65.346	71.227	77.637	84.624	92.241	506.024
Digital Agriculture	Increased efficiency and productivity, leading to new job opportunities	359.000	387.720	418.738	452.237	488.416	527.489	569.688	3.203.286
Digital Logistics	Growth driven by e-commerce and digital transformation, creating numerous jobs	50.000	54.500	59.405	64.751	70.579	76.931	83.855	460.022

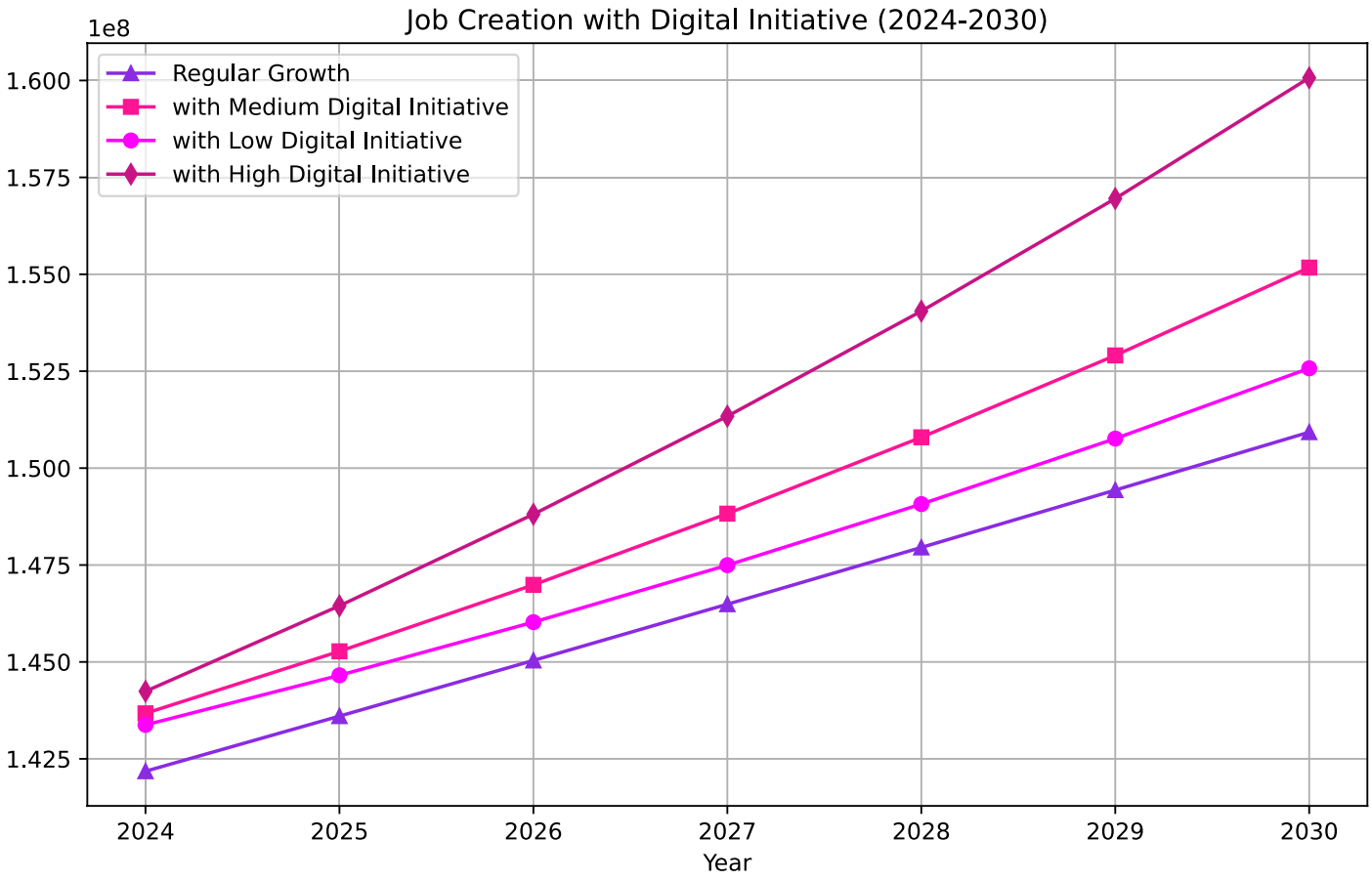
MEDIUM SCENARIO									
Sector	**Job Creation 2024-2030)**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTAL**
Digital Tourism	Expansion of digital services and platforms, boosting employment in the sector	227.080	249.788	274.767	302.243	332.468	365.715	402.286	2.154.347
Digital Healthcare	Growth in telemedicine and digital health services, creating new healthcare roles	12.700	14.224	15.931	17.843	19.984	22.382	25.068	128.130
Digital SOEs	Digital transformation of state-owned enterprises, leading to job creation	16.000	17.280	18.662	20.155	21.768	23.509	25.390	142.765
Digital Culture	Growth in digital content creation and cultural industries, creating new opportunities (incl in Digi Tour)	-	-	-	-	-	-	-	-
Digital Energy	Expansion of renewable energy and smart grid technologies, creating numerous jobs	130.000	139.100	148.837	159.256	170.403	182.332	195.095	1.125.023
		1.493.780	1.599.912	1.714.141	1.837.125	1.969.575	2.112.266	2.266.037	12.992.836

Workers	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Improvement**
Regular Growth	142.180.000	143.601.800	145.037.818	146.488.196	147.953.078	149.432.609	150.926.935	
With Mid Digital Initiative	**143.673.780**	**145.273.692**	**146.987.833**	**148.824.958**	**150.794.533**	**152.906.799**	**155.172.836**	**4.245.901**
Churn	**5.077.857**	**5.128.636**	**5.179.922**	**5.231.721**	**5.284.039**	**5.336.879**	**5.390.248**	**36.629.301**
	3,57%	**3,57%**	**3,57%**	**3,57%**	**3,57%**	**3,57%**	**3,57%**	
Add	**6.571.637**	**6.800.528**	**7.129.937**	**7.568.483**	**8.125.493**	**8.811.069**	**9.636.149**	**54.643.296**

HIGH SCENARIO									
Sector	**Job Creation 2024-2030)**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**TOTAL**
Digital Infrastructure	Approximately 600,000 digitally-capable talents annually	900.000	945.000	992.250	1.041.863	1.093.956	1.148.653	1.206.086	7.327.808
Digital E-commerce	Significant growth with the digital economy reaching USD 110 billion by 2025 (Incl in. Digi Infra)	-	-	-	-	-	-	-	-
Digital Ocean	Part of the broader digital economy growth, contributing to 9 million digital sector jobs	40.500	43.740	47.239	51.018	55.100	59.508	64.268	361.374
Digital Mining	Enhanced productivity and safety, creating new roles in predictive maintenance and AI	25.500	27.285	29.195	31.239	33.425	35.765	38.269	220.678
Digital Manufacturing	Expected to create over 10 million new jobs by 2030	55.000	59.950	65.346	71.227	77.637	84.624	92.241	506.024
Digital Agriculture	Increased efficiency and productivity, leading to new job opportunities	82.500	89.925	98.018	106.840	116.455	126.936	138.361	759.036
Digital Logistics	Growth driven by e-commerce and digital transformation, creating numerous jobs	75.000	81.750	89.108	97.127	105.869	115.397	125.783	690.033
Digital Tourism	Expansion of digital services and platforms, boosting employment in the sector	340.620	374.682	412.150	453.365	498.702	548.572	603.429	3.231.520
Digital Healthcare	Growth in telemedicine and digital health services, creating new healthcare roles	19.050	21.336	23.896	26.764	29.976	33.573	37.601	192.196
Digital SOEs	Digital transformation of state-owned enterprises, leading to job creation	24.000	25.920	27.994	30.233	32.652	35.264	38.085	214.147
Digital Culture	Growth in digital content creation and cultural industries, creating new opportunities (incl in Digi Tour)	-	-	-	-	-	-	-	-

Digital Energy	Expansion of renewable energy and smart grid technologies, creating numerous jobs	195.000	208.650	223.256	238.883	255.605	273.498	292.642	1.687.534
		2.061.170	2.206.008	2.361.843	2.529.569	2.710.155	2.904.654	3.114.212	17.887.611

Workers	2024	2025	2026	2027	2028	2029	2030	Improvement
Regular Growth	142.180.000	143.601.800	145.037.818	146.488.196	147.953.078	149.432.609	150.926.935	
With High Digital Initiative	**144.241.170**	**146.447.178**	**148.809.021**	**151.338.590**	**154.048.744**	**156.953.399**	**160.067.611**	**9.140.676**
Churn	**4.671.629**	**4.718.345**	**4.765.528**	**4.813.184**	**4.861.315**	**4.909.929**	**4.959.028**	**33.698.957**
	3%	**3%**	**3%**	**3%**	**3%**	**3%**	**3%**	
Add	**6.732.799**	**7.563.723**	**8.536.731**	**9.663.577**	**10.956.982**	**12.430.718**	**14.099.704**	**69.984.234**



	2024	2025	2026	2027	2028	2029	2030
Regular Growth	142.180.000	143.601.800	145.037.818	146.488.196	147.953.078	149.432.609	150.926.935
With Medium Digital Initiative	143.673.780	145.273.692	146.987.833	148.824.958	150.794.533	152.906.799	155.172.836
With Low Digital Initiative	143.375.024	144.654.954	147.495.966	147.495.966	149.071.626	150.761.439	152.574.269
With High Digital Initiative	144.241.170	146.447.178	151.338.590	151.338.590	154.048.744	156.953.399	160.067.611

Figure 6.5 *Job Creation with Digital Initiative (2024-2030)*

6.3 Digital Investment

The plan aims to attract significant investments, particularly in the mobile 5G sectors. From 2024 and 2030, the digital investment initiative is expected to unlock around USD $10.4 – USD $22.4 billion (low case) up to USD $31,2 – USD $67.2 billion (high case) yearly in investments. These investments will be crucial in developing the necessary infrastructure and fostering innovation, ultimately contributing an estimated USD $560 billion to the GDP over the next six years. These investment is total investment coming from government as well as private sectors. Normally central government invest 37%, regional government & SOE ministry 21% and the rest coming from private, FDI, and PPP.

Some examples of investment percentages between government and private sector in several Asia Pacific countries are as follows:

1. China:

Investment in infrastructure development and other sectors is dominated by state-owned enterprises (SOEs) and the private sector. Here is an estimate of the comparison of investment percentages between government and private sector:

- Government: State-Owned Enterprises (SOEs): Around 60-70% of total infrastructure investment comes from SOEs. The Chinese government uses SOEs to drive major projects, including road, railway, and energy construction.
- Private: Private Enterprises: Around 30-40% of total infrastructure investment comes from the private sector. Private companies, including foreign direct investment (FDI), play an important role in the technology, manufacturing, and renewable energy sectors. This investment reflects China's strategy to combine the strengths of government and private sector in driving rapid and sustainable economic and infrastructure development.

2. Vietnam:

- Government: The government contributes about 35% of total infrastructure investment.
- Private: The private sector, including FDI, contributes about 65% of total infrastructure investment.

3. Malaysia:

- Government: About 45% of total infrastructure investment comes from the government.
- Private: About 55% of total infrastructure investment comes from the private sector

4. Thailand:

- Government: The government contributes about 50% of total infrastructure investment.
- Private: The private sector contributes about 50% of total infrastructure investment.

This comparison shows that the private sector plays a significant role in infrastructure investment in Asia Pacific countries, often greater than the government's contribution. This reflects the importance of public-private partnerships in supporting economic and infrastructure development in the region.

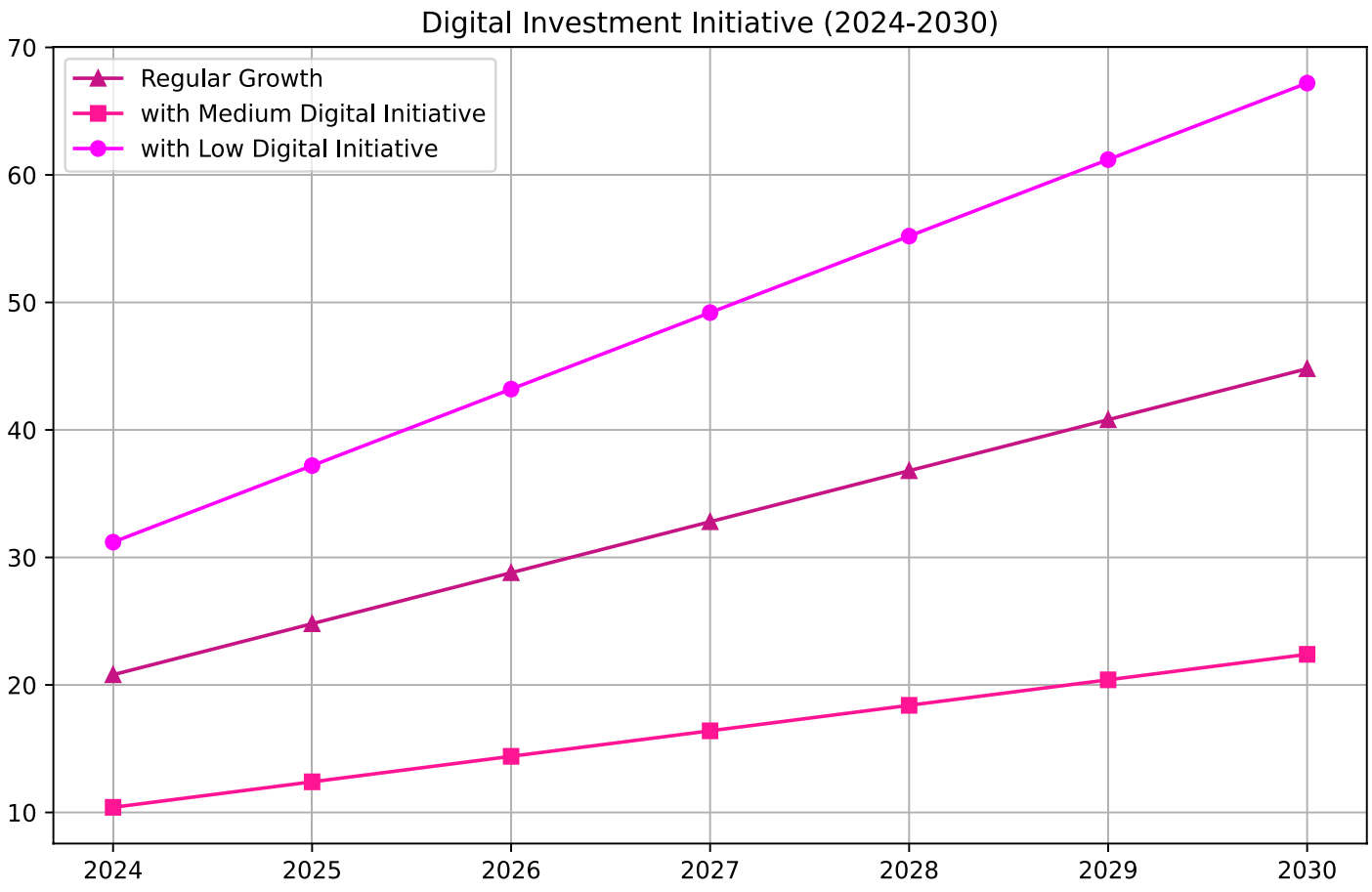
Indonesia is expecting to have allocation investment as follows:

- Government is expected to invest about 20-30% of total infrastructure investment.
- Private sector is expected to invest about 70-80% of total infrastructure investment including foreign direct investment (FDI) and public-private partnerships (PPP).

LOW SCENARIO DIGITAL INITIATIVE INVESTMENT														
Sector (in Billion USD)	**2024**		**2025**		**2026**		**2027**		**2028**		**2029**		**2030**	**Total**
Digital Infra-structure	1,5	17%	1,8	14%	2,0	13%	2,3	11%	2,5	10%	2,7	9%	3,0	**15,7**
Digital E-com-merce	1,25	20%	1,5	17%	1,75	14%	2	13%	2	11%	3	10%	3	**14,0**
Digital Ocean	0,5	20%	0,59	17%	0,70	14%	1	13%	1	11%	1	10%	1	**5,6**
Digital Mining	0,75	20%	0,89	17%	1,04	14%	1	13%	1	11%	1	10%	2	**8,4**
Digital Manufac-turing	1	20%	1,2	17%	1,4	14%	2	13%	2	11%	2	10%	2	**11,2**
Digital Agricul-ture	0,6	17%	0,7	14%	0,8	13%	1	11%	1	10%	1	9%	1	**6,3**
Digital Logistics	0,9	17%	1,05	14%	1,2	13%	1	11%	2	10%	2	9%	2	**9,5**
Digital Tourism	0,5	20%	0,6	17%	0,7	14%	1	13%	1	11%	1	10%	1	**5,6**
Digital Health-care	1,25	20%	1,5	17%	1,75	14%	2	13%	2	11%	3	10%	3	**14,0**
Digital SOEs	0,75	20%	0,9	17%	1,05	14%	1	13%	1	11%	2	10%	2	**8,4**
Digital Culture	0,4	25%	0,5	20%	0,6	17%	1	14%	1	13%	1	11%	1	**4,9**
Digital Energy Develop-ment	1	20%	1,2	17%	1,4	14%	2	13%	2	11%	2	10%	2	**11,2**
Total Low Scenario	**1,5**	**17%**	**12,40**	**16%**	**14,4**	**14%**	**16,39**	**12%**	**18,39**	**11%**	**20,39**	**10%**	**22,40**	**114,8**

MEDIUM SCENARIO DIGITAL INITIATIVE INVESTMENT														
Sector (in Billion USD)	**2024**		**2025**		**2026**		**2027**		**2028**		**2029**		**2030**	**Total**
Digital Infrastructure	3,0	17%	3,5	14%	4,0	13%	4,5	11%	5,0	10%	5,5	9%	6,0	**31,5**
Digital E-commerce	2,5	20%	3,0	17%	3,5	14%	4,0	13%	4,5	11%	5,0	10%	5,5	**28,0**
Digital Ocean	1,0	20%	1,2	17%	1,4	14%	1,6	13%	1,8	11%	2,0	10%	2,2	**11,2**
Digital Mining	1,5	20%	1,8	17%	2,1	14%	2,4	13%	2,7	11%	3,0	10%	3,3	**16,8**
Digital Manufacturing	2	20%	2,4	17%	2,8	14%	3,2	13%	3,6	11%	4	10%	4,4	**22,4**
Digital Agriculture	1,2	17%	1,4	14%	1,6	13%	1,8	11%	2	10%	2,2	9%	2,4	**12,6**
Digital Logistics	1,8	17%	2,1	14%	2,4	13%	2,7	11%	3	10%	3,3	9%	3,6	**18,9**
Digital Tourism	1	20%	1,2	17%	1,4	14%	1,6	13%	1,8	11%	2	10%	2,2	**11,2**
Digital Healthcare	2,5	20%	3	17%	3,5	14%	4	13%	4,5	11%	5	10%	5,5	**28,0**
Digital SOEs	1,5	20%	1,8	17%	2,1	14%	2,4	13%	2,7	11%	3	10%	3,3	**16,8**
Digital Culture	0,8	25%	1	20%	1,2	17%	1,4	14%	1,6	13%	1,8	11%	2	**9,8**
Digital Energy Development	2	20%	2,4	17%	2,8	14%	3,2	13%	3,6	11%	4	10%	4,4	**22,4**
Total Mid Scenario	**20,8**	**19%**	**24,8**	**16%**	**28,8**	**14%**	**32,8**	**12%**	**36,8**	**11%**	**40,8**	**10%**	**44,8**	**229,6**

HIGH SCENARIO DIGITAL INITIATIVE INVESTMENT														
Sector (in Billion USD)	**2024**		**2025**		**2026**		**2027**		**2028**		**2029**		**2030**	**Total**
Digital Infrastructure	4,5	17%	5,25	14%	5,99	13%	7	11%	7	10%	8	9%	9	**47,2**
Digital E-commerce	3,75	20%	4,5	17%	5,25	14%	6	13%	7	11%	8	10%	8	**42,0**
Digital Ocean	1,5	20%	1,79	17%	2,10	14%	2	13%	3	11%	3	10%	3	**16,8**
Digital Mining	2,25	20%	2,69	17%	3,14	14%	4	13%	4	11%	4	10%	5	**25,2**
Digital Manufacturing	3	20%	3,6	17%	4,2	14%	5	13%	5	11%	6	10%	7	**33,6**
Digital Agriculture	1,8	17%	2,1	14%	2,4	13%	3	11%	3	10%	3	9%	4	**18,9**
Digital Logistics	2,7	17%	3,15	14%	3,6	13%	4	11%	5	10%	5	9%	5	**28,4**
Digital Tourism	1,5	20%	1,8	17%	2,1	14%	2	13%	3	11%	3	10%	3	**16,8**
Digital Healthcare	3,75	20%	4,5	17%	5,25	14%	6	13%	7	11%	8	10%	8	**42,0**
Digital SOEs	2,25	20%	2,7	17%	3,15	14%	4	13%	4	11%	5	10%	5	**25,2**
Digital Culture	1,2	25%	1,5	20%	1,8	17%	2	14%	2	13%	3	11%	3	**14,7**
Digital Energy Development	3	20%	3,6	17%	4,2	14%	5	13%	5	11%	6	10%	7	**33,6**
Total High Scenario	**31,2**	**19%**	**37,2**	**16%**	**43,20**	**14%**	**49,2**	**12%**	**55,19**	**11%**	**61,19**	**10%**	**67,20**	**354,4**



	2024	2025	2026	2027	2028	2029	2030
Total Medium Scenario	20,8	24,8	28,8	32,8	36,8	40,8	44,8
Total Low Scenario	10,4	12,4	14,4	16,4	18,4	20,4	22,4
Total High Scenario	31,2	37,2	43,2	49,2	55,2	61,2	67,2

Figure 6.6 *Digital Investment Initiative (2024-2030)*

This strategic focus on digitalization is set to transform Indonesia's economy, making it more resilient, inclusive, and competitive on the global stage.

Details of each investment in every sector are as follows:

Digital Infrastructure

DIGITAL INFRASTRUCTURE									
LOW INVEST-MENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Fixed Broadband (FTTX, FWA)	5,8	6,5	7,0	7,3	7,6	7,8	8,0	50,0	3,2
Mobile Broadband (5G, 5,5G, Pre 6G)	12,1	13,6	14,6	15,4	15,8	16,2	16,6	104,3	6,7
Gigabit City	2,5	3,1	3,9	4,7	5,6	6,2	6,9	33,0	2,1
Gigabit Campus	0,5	0,8	1,1	1,4	1,8	2,1	2,3	10,0	0,6
FO Rural Villages	0,1	0,2	0,3	0,4	0,6	0,9	1,2	3,8	0,2
FO Between Island	0,1	0,2	0,3	0,4	0,6	0,9	1,1	3,4	0,2
Data Center	0,6	0,8	1,2	1,9	2,2	2,7	3,0	12,4	0,8
Cloud	0,1	0,1	0,1	0,2	0,2	0,3	0,3	1,2	0,1
Security	1,5	1,9	2,5	3,2	4,2	5,5	7,1	25,9	1,7
Total	**23,3**	**27,2**	**31,0**	**34,9**	**38,7**	**42,6**	**46,5**	**244,1**	**15,7**

DIGITAL INFRASTRUCTURE									
MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Fixed Broadband (FTTX, FWA)	11,6	13,0	13,9	14,7	15,3	15,6	16,0	100,1	6,5
Mobile Broadband (5G, 5,5G, Pre 6G)	24,3	27,2	29,2	30,8	31,7	32,5	33,1	208,6	13,5
Gigabit City	5,0	6,3	7,8	9,4	11,3	12,5	13,7	65,9	4,3
Gigabit Campus	1	1,5	2,3	2,8	3,5	4,2	4,6	19,9	1,3
FO Rural Villages	0,3	0,4	0,6	0,8	1,3	1,9	2,5	7,7	0,5
FO Between Island	0,2	0,3	0,5	0,8	1,1	1,7	2,2	6,9	0,4
Data Center	1,1	1,7	2,5	3,7	4,5	5,3	6,0	24,7	1,6
Cloud	0,1	0,2	0,2	0,4	0,4	0,5	0,6	2,5	0,2
Security	3,0	3,8	5,0	6,5	8,4	11,0	14,2	51,9	3,3
Total	**46,5**	**54,3**	**62,0**	**69,8**	**77,4**	**85,3**	**93,0**	**488,2**	**31,5**

HIGH INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Fixed Broadband (FTTX, FWA)	17,4	19,5	20,9	22,0	22,9	23,5	23,9	150,1	9,7
Mobile Broadband (5G, 5,5G, Pre 6G)	36,4	40,8	43,8	46,1	47,5	48,7	49,7	313,0	20,2
Gigabit City	7,5	9,4	11,7	14,1	16,9	18,7	20,6	98,9	6,4
Gigabit Campus	1,5	2,3	3,4	4,2	5,3	6,3	7,0	29,9	1,9
FO Rural Villages	0,4	0,6	0,8	1,3	1,9	2,8	3,7	11,5	0,7
FO Between Island	0,3	0,5	0,8	1,1	1,7	2,6	3,3	10,3	0,7
Data Center	1,7	2,5	3,7	5,6	6,7	8,0	9,0	37,1	2,4
Cloud	0,2	0,2	0,4	0,6	0,7	0,8	0,9	3,7	0,2
Security	4,4	5,8	7,5	9,7	12,6	16,4	21,4	77,8	5,0
Total	**69,8**	**81,5**	**93,0**	**104,7**	**116,1**	**127,9**	**139,4**	**732,3**	**47,2**

Digital E-Commerce

DIGITAL E-COMMERCE									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Infrastructure (Cloud & Data Center)	3	4	5	6	7	7	8	40	3
Logistic, Warehouse, Delivery & Transportation	5	5	6	7	8	9	9	49	3
Digital Payment System (QRIS, MFA, Biometric, Fintech)	3	3	4	4	5	5	6	30	2
Cybersecurity (Data Protection, Compliance)	2	2	2	3	3	3	3	18	1
Customer Experience (UI, UX, Al Chatbot, Cust Support)	1	1	2	2	2	2	3	13	1
Digital Marketing, Advertising & Personalization	2	3	3	4	4	5	5	27	2
Technology Innovation (Al, AR/VR, Blockchain)	2	2	2	2	3	3	3	17	1
Regulatory Compliance (e-Contract, Customer Protection)	1	1	1	1	2	2	2	10	1
Sustainability (Green Logistic, Sustainable Packaging)	1	1	1	2	2	2	2	12	1
Total	**19**	**23**	**27**	**31**	**35**	**39**	**43**	**217**	**14**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Infrastructure (Cloud & Data Center)	7	8	10	12	13	15	16	81	5
Logistic, Warehouse, Delivery & Transportation	9	11	12	14	16	17	19	98	6
Digital Payment System (QRIS, MFA, Biometric, Fintech)	6	7	8	9	10	11	12	61	4
Cybersecurity (Data Protection, Compliance)	4	4	5	5	6	6	7	37	2
Customer Experience (UI, UX, Al Chatbot, Cust Support)	2	3	3	4	4	5	5	27	2
Digital Marketing, Advertising & Personalization	5	6	7	8	9	10	11	54	3
Technology Innovation (Al, AR/VR, Blockchain)	3	4	4	5	5	6	6	34	2
Regulatory Compliance (e-Contract, Customer Protection)	1	2	2	3	3	4	4	20	1
Sustainability (Green Logistic, Sustainable Packaging)	2	2	3	3	4	4	5	24	2
Total	**39**	**47**	**54**	**62**	**70**	**78**	**85**	**434**	**28**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Infrastructure (Cloud & Data Center)	10	13	15	17	20	22	24	121	8
Logistic, Warehouse, Delivery & Transportation	14	16	19	21	23	26	28	147	9
Digital Payment System (QRIS, MFA, Biometric, Fintech)	8	10	11	13	15	16	18	91	6
Cybersecurity (Data Protection, Compliance)	6	6	7	8	9	9	10	55	4
Customer Experience (UI, UX, Al Chatbot, Cust Support)	3	4	5	6	7	7	8	40	3
Digital Marketing, Advertising & Personalization	7	8	10	12	13	15	16	81	5
Technology Innovation (Al, AR/VR, Blockchain)	5	6	6	7	8	9	10	51	3
Regulatory Compliance (e-Contract, Customer Protection)	2	3	4	4	5	6	7	30	2
Sustainability (Green Logistic, Sustainable Packaging)	3	4	4	5	6	7	7	35	2
Total	**58**	**70**	**82**	**93**	**115**	**116**	**128**	**651**	**42**

Digital Ocean

DIGITAL OCEAN									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
IOT&AI for predictive maintenance, real time monitoring & automation	1,8	1,9	2,1	2,4	2,4	2,6	2,7	15,9	1,0
Blockchain for secure & tranparant supply chain management	1,1	1,3	1,5	1,6	1,8	2,0	2,1	11,4	0,7
Big Data Analysis for optimizing routes, fuel & operational efficiencies	1,6	1,7	1,9	2,0	2,2	2,4	2,5	14,3	0,9
Sustainable fishery practices	0,7	0,9	1,0	1,2	1,4	1,6	1,7	8,5	0,5
Traceability & certification for fishery sourcing	0,5	0,6	0,8	1,0	1,2	1,4	1,6	7,1	0,5
Automation fish processing & logistic to improve efficiency & quality	0,7	0,9	1,0	1,2	1,4	1,6	1,7	8,5	0,5
Marine biodiversity Monitoring	0,5	0,6	0,8	1,0	1,2	1,4	1,6	7,1	0,5
R&D for digitalizing marine conservation	0,7	0,9	1,0	1,2	1,4	1,6	1,7	8,5	0,5
Digital Platform for public awareness and upskilling	0,2	0,4	0,6	0,8	1,0	1,2	1,4	5,6	0,4
Total	**7,8**	**9,3**	**10,9**	**12,4**	**14,0**	**15,5**	**17,1**	**86,8**	**5,6**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
IOT&AI for predictive maintenance, real time monitoring & automation	3,6	3,9	4,2	4,8	4,8	5,1	5,4	31,8	2,1
Blockchain for secure & tranparant supply chain management	2,3	2,6	2,9	3,2	3,6	3,9	4,3	22,8	1,5
Big Data Analysis for optimizing routes, fuel & operational efficiencies	3,2	3,5	3,8	4,0	4,4	4,7	5,0	28,5	1,8
Sustainable fishery practices	1,4	1,7	2,1	2,4	2,8	3,1	3,5	17,0	1,1
Traceability & certification for fishery sourcing	0,9	1,3	1,7	2,0	2,4	2,7	3,1	14,1	0,9
Automation fish processing & logistic to improve efficiency & quality	1,4	1,7	2,1	2,4	2,8	3,1	3,5	17,0	1,1
Marine biodiversity Monitoring	0,9	1,3	1,7	2,0	2,4	2,7	3,1	14,1	0,9
R&D for digitalizing marine conservation	1,4	1,7	2,1	2,4	2,8	3,1	3,5	17,0	1,1
Digital Platform for public awareness and upskilling	0,5	0,9	1,3	1,6	2,0	2,4	2,7	11,2	0,7
Total	**15,50**	**18,60**	**21,70**	**24,80**	**27,90**	**31,00**	**34,10**	**173,6**	**11,2**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
IOT&AI for predictive maintenance, real time monitoring & automation	5,5	5,8	6,3	7,2	7,2	7,7	8,1	47,8	3,1
Blockchain for secure & tranparant supply chain management	3,4	3,9	4,4	4,8	5,4	5,9	6,4	34,2	2,2
Big Data Analysis for optimizing routes, fuel & operational efficiencies	4,8	5,2	5,6	6,0	6,6	7,1	7,6	42,8	2,8
Sustainable fishery practices	2,1	2,6	3,1	3,6	4,2	4,7	5,2	25,5	1,6
Traceability & certification for fishery sourcing	1,4	1,9	2,5	3,0	3,6	4,1	4,7	21,2	1,4
Automation fish processing & logistic to improve efficiency & quality	2,1	2,6	3,1	3,6	4,2	4,7	5,2	25,5	1,6
Marine biodiversity Monitoring	1,4	1,9	2,5	3,0	3,6	4,1	4,7	21,2	1,4
R&D for digitalizing marine conservation	2,1	2,6	3,1	3,6	4,2	4,7	5,2	25,5	1,6
Digital Platform for public awareness and upskilling	0,7	1,3	1,9	2,4	3,0	3,5	4,1	16,8	1,1
Total	**23,3**	**27,9**	**32,6**	**37,2**	**41,9**	**46,5**	**51,2**	**260,4**	**16,8**

Digital Mining

DIGITAL MINING									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Infrastructure 5G private network, pilot project & training programs	0,5	0,7	0,9	1,2	1,6	2,0	2,4	9,4	0,6
Expansion of IOT & automation technologies, Data analytic implementation	1,2	1,4	1,6	1,8	2,0	2,1	2,3	12,5	0,8
Advance robotic , AI Integration & Cybersecurity enhancement	1,5	1,7	1,9	2,1	2,4	2,7	2,9	15,3	1,0
Full scale deployment of digital mining solution, workforce upscaling	1,6	2,0	2,4	2,7	3,0	3,3	3,6	18,7	1,2
Optimization of digital mining operation & real-time monitoring system	2,0	2,4	2,8	3,2	3,5	3,8	4,1	21,9	1,4
Integration of blockchain for supply chain transparance & AI enhancement	2,3	2,7	3,1	3,5	3,8	4,3	4,7	24,5	1,6
Further innovation for sustainability & global competitivenes enhancement	2,4	3,1	3,5	4,0	4,5	5,0	5,4	27,9	1,8
Total	**11,6**	**14,0**	**16,3**	**18,6**	**20,9**	**23,2**	**25,6**	**130,2**	**8,4**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Infrastructure 5G private network, pilot project & training programs	1,1	1,4	1,8	2,4	3,2	4,0	4,8	18,8	1,2
Expansion of IOT & automation technologies, Data analytic implementation	2,4	2,8	3,3	3,7	4,0	4,3	4,6	25,0	1,6
Advance robotic , AI Integration & Cybersecurity enhancement	3,0	3,4	3,8	4,3	4,8	5,3	5,9	30,5	2,0
Full scale deployment of digital mining solution, workforce upscaling	3,2	3,9	4,7	5,5	6,1	6,7	7,3	37,5	2,4
Optimization of digital mining operation & real-time monitoring system	4,1	4,8	5,6	6,4	7,1	7,6	8,3	43,8	2,8
Integration of blockchain for supply chain transparance & AI enhancement	4,6	5,4	6,2	7,0	7,7	8,6	9,5	49,0	3,2
Further innovation for sustainability & global competitivenes enhancement	4,9	6,2	7,1	7,9	9,0	9,9	10,8	55,8	3,6
Total	**23,25**	**27,90**	**32,55**	**37,20**	**41,85**	**46,50**	**51,15**	**260,40**	**16,8**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Infrastructure 5G private network, pilot project & training programs	1,6	2,1	2,7	3,7	4,8	6,0	7,3	28,2	1,8
Expansion of IOT & automation technologies, Data analytic implementation	3,7	4,2	4,9	5,5	6,0	6,4	6,9	37,5	2,4
Advance robotic , AI Integration & Cybersecurity enhancement	4,5	5,1	5,8	6,4	7,2	8,0	8,8	45,8	3,0
Full scale deployment of digital mining solution, workforce upscaling	4,9	5,9	7,1	8,2	9,1	10,0	10,9	56,2	3,6
Optimization of digital mining operation & real-time monitoring system	6,1	7,2	8,4	9,6	10,6	11,4	12,4	65,8	4,2
Integration of blockchain for supply chain transparance & AI enhancement	6,9	8,0	9,3	10,5	11,5	12,9	14,2	73,5	4,7
Further innovation for sustainability & global competitivenes enhancement	7,3	9,3	10,6	11,9	13,5	14,9	16,2	83,7	5,4
Total	**34,9**	**41,9**	**48,8**	**55,8**	**62,8**	**69,7**	**76,7**	**390,6**	**25,2**

Digital Manufacturing

DIGITAL MANUFACTURING									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructure, Automation, IoT integration	1,4	1,6	1,9	2,2	2,4	2,7	3,0	15,2	1,0
Advance Robotic, AI & Workforce Training	1,6	2,0	2,3	2,6	2,9	3,3	3,6	18,3	1,2
Smart Factory, Cybersecurity & cloud computing	2,0	2,4	2,9	3,3	3,7	4,1	4,5	22,8	1,5
5G connectivity , digital twins, predicxtive maintenance	2,2	2,6	3,0	3,5	3,9	4,4	4,8	24,4	1,6
Blockchain for supply chain, AR/ VR for Operation Maintenance & Training	2,4	2,9	3,4	3,9	4,4	4,9	5,4	27,4	1,8
Sustainable Manufacturing & Green Technology Integration	2,7	3,3	3,8	4,4	4,9	5,4	6,0	30,5	2,0
Full-Scale Industry 4.0 Adoption, Innovation Hubs	3,1	3,8	4,4	5,0	5,6	6,3	6,9	35,0	2,3
Total	**15,5**	**18,6**	**21,7**	**24,8**	**27,9**	**31,0**	**34,1**	**173,6**	**11,2**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructure, Automation, IoT integration	2,7	3,3	3,8	4,4	4,9	5,4	6,0	30,5	2,0
Advance Robotic, AI & Workforce Training	3,3	3,9	4,6	5,2	5,9	6,5	7,2	36,5	2,4
Smart Factory, Cybersecurity & cloud computing	4,1	4,9	5,7	6,5	7,3	8,2	9,0	45,7	2,9
5G connectivity , digital twins, predicxtive maintenance	4,4	5,2	6,1	7,0	7,8	8,7	9,6	48,7	3,1
Blockchain for supply chain, AR/ VR for Operation Maintenance & Training	4,9	5,9	6,9	7,8	8,8	9,8	10,8	54,8	3,5
Sustainable Manufacturing & Green Technology Integration	5,4	6,5	7,6	8,7	9,8	10,9	12,0	60,9	3,9
Full-Scale Industry 4.0 Adoption, Innovation Hubs	6,3	7,5	8,8	10,0	11,3	12,5	13,8	70,0	4,5
Total	**31,00**	**37,20**	**43,40**	**49,59**	**55,80**	**61,99**	**68,20**	**347,18**	**22,4**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Digital Infrastructure, Automation, IoT integration	4,1	4,9	5,7	6,5	7,3	8,2	9,0	45,7	2,9
Advance Robotic, AI & Workforce Training	4,9	5,9	6,9	7,8	8,8	9,8	10,8	54,8	3,5
Smart Factory, Cybersecurity & cloud computing	6,1	7,3	8,6	9,8	11,0	12,2	13,5	68,5	4,4
5G connectivity , digital twins, predicxtive maintenance	6,5	7,8	9,1	10,4	11,7	13,1	14,4	73,1	4,7
Blockchain for supply chain, AR/ VR for Operation Maintenance & Training	7,3	8,8	10,3	11,7	13,2	14,7	16,2	82,2	5,3
Sustainable Manufacturing & Green Technology Integration	8,2	9,8	11,4	13,1	14,7	16,3	17,9	91,4	5,9
Full-Scale Industry 4.0 Adoption, Innovation Hubs	9,4	11,3	13,1	15,0	16,9	18,8	20,6	105,1	6,8
Total	**46,5**	**55,8**	**65,1**	**74,4**	**83,7**	**93,0**	**102,3**	**520,8**	**33,6**

Digital Agriculture

DIGITAL AGRICULTURE									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructure (5G, WiFi, Lora), Smart Farming (IoT based), Training & upskilling for farmers	1,4	1,6	1,9	2,2	2,4	2,7	3,0	15,2	1,0
Precision Agriculture, AI Integration	1,6	2,0	2,3	2,6	2,9	3,3	3,6	18,3	1,2
Sustainable Practices, Blockchain for supply chain, Digital Market Place	2,0	2,4	2,9	3,3	3,7	4,1	4,5	22,8	1,5
Advance Analytic, Robotics Planting & Harvesting, Cyber Security for Agri Data	2,2	2,6	3,0	3,5	3,9	4,4	4,8	24,4	1,6
Climate resilience, IOT Expansion for real-time data collection & Research AgriTech	2,4	2,9	3,4	3,9	4,4	4,9	5,4	27,4	1,8
Smart Irrigation, AR-VR for training & remote assistance, Enhancing Logistic Distribution	2,7	3,3	3,8	4,4	4,9	5,4	6,0	30,5	2,0
Full Scale Digital Transformation, Innovation Hubs & Promoting Collaboration Global Ecosystem	3,1	3,8	4,4	5,0	5,6	6,3	6,9	35,0	2,3
Total	**15,5**	**18,6**	**21,7**	**24,8**	**27,9**	**31,0**	**34,1**	**173,6**	**11,2**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructure (5G, WiFi, Lora), Smart Farming (IoT based), Training & upskilling for farmers	1,7	1,9	2,2	2,5	2,8	3,0	3,3	17,4	1,1
Precision Agriculture, AI Integration	2,0	2,3	2,7	3,0	3,3	3,7	4,0	20,9	1,3
Sustainable Practices, Blockchain for supply chain, Digital Market Place	2,3	2,7	3,1	3,5	3,9	4,3	4,7	24,4	1,6
Advance Analytic, Robotics Planting & Harvesting, Cyber Security for Agri Data	2,7	3,1	3,5	4,0	4,4	4,9	5,3	27,9	1,8
Climate resilience, IOT Expansion for real-time data collection & Research AgriTech	3,0	3,5	4,0	4,5	5,0	5,5	6,0	31,4	2,0
Smart Irrigation, AR-VR for training & remote assistance, Enhancing Logistic Distribution	3,3	3,9	4,4	5,0	5,5	6,1	6,6	34,9	2,2
Full Scale Digital Transformation, Innovation Hubs & Promoting Collaboration Global Ecosystem	3,7	4,3	4,9	5,5	6,1	6,7	7,3	38,4	2,5
Total	**18,60**	**21,70**	**24,80**	**27,90**	**31,00**	**34,10**	**37,20**	**195,30**	**12,6**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Digital Infrastructure (5G, WiFi, Lora), Smart Farming (IoT based), Training & upskilling for farmers	2,5	2,9	3,3	3,7	4,2	4,6	5,0	26,2	1,7
Precision Agriculture, AI Integration	3,0	3,5	4,0	4,5	5,0	5,5	6,0	31,4	2,0
Sustainable Practices, Blockchain for supply chain, Digital Market Place	3,5	4,1	4,6	5,2	5,8	6,4	7,0	36,6	2,4
Advance Analytic, Robotics Planting & Harvesting, Cyber Security for Agri Data	4,0	4,6	5,3	6,0	6,6	7,3	8,0	41,8	2,7
Climate resilience, IOT Expansion for real-time data collection & Research AgriTech	4,5	5,2	6,0	6,7	7,5	8,2	9,0	47,1	3,0
Smart Irrigation, AR-VR for training & remote assistance, Enhancing Logistic Distribution	5,0	5,8	6,6	7,5	8,3	9,1	10,0	52,3	3,4
Full Scale Digital Transformation, Innovation Hubs & Promoting Collaboration Global Ecosystem	5,5	6,4	7,3	8,2	9,1	10,0	11,0	57,5	3,7
Total	**27,9**	**32,5**	**37,2**	**41,8**	**46,5**	**51,2**	**55,8**	**292,9**	**18,9**

Digital Logistic

DIGITAL LOGISTIC									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Logistic Platform & Solution (Asset, Warehouse, Data, Security & Network management)	3,9	4,6	5,3	5,9	6,6	7,2	7,9	41,4	2,7
Transportation Management (Route Optimization & Real-time tracking)	2,3	2,7	3,0	3,4	3,8	4,2	4,6	23,9	1,5
Automation & Robotics (Automated Warehouse, Drones & Autonomous Vehicle for lastmile)	1,7	1,9	2,2	2,5	2,8	3,1	3,3	17,5	1,1
Infrastructure Development (Modern Warehousing, storage, Transportation system & operation)	2,9	3,4	3,8	4,3	4,8	5,3	5,8	30,3	2,0
Support & Maintenance services (Planning, Consulting, Deployment, Operation & Integration)	1,1	1,2	1,4	1,6	1,8	1,9	2,1	11,1	0,7
National Logistic Ecosystem (connectivity, transportation system, energy system & ICT infa)	1,4	1,6	1,8	2,0	2,3	2,5	2,7	14,3	0,9
Full Scale Digital Transformation, Innovation Hubs & Promoting Upskilling Workers	0,8	0,9	1,0	1,1	1,3	1,4	1,5	7,9	0,5
Total	**13,9**	**16,3**	**18,6**	**20,9**	**23,3**	**25,6**	**27,9**	**146,5**	**9,5**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Logistic Platform & Solution (Asset, Warehouse, Data, Security & Network management)	7,9	9,2	10,5	11,8	13,1	14,5	15,8	82,8	5,3
Transportation Management (Route Optimization & Real-time tracking)	4,6	5,3	6,1	6,8	7,6	8,3	9,1	47,8	3,1
Automation & Robotics (Automated Warehouse, Drones & Autonomous Vehicle for lastmile)	3,3	3,9	4,4	5,0	5,6	6,1	6,7	35,0	2,3
Infrastructure Development (Modern Warehousing, storage, Transportation system & operation)	5,8	6,7	7,7	8,6	9,6	10,6	11,5	60,5	3,9
Support & Maintenance services (Planning, Consulting, Deployment, Operation & Integration)	2,1	2,5	2,8	3,2	3,5	3,9	4,2	22,3	1,4
National Logistic Ecosystem (connectivity, transportation system, energy system & ICT infa)	2,7	3,2	3,6	4,1	4,6	5,0	5,5	28,7	1,8
Full Scale Digital Transformation, Innovation Hubs & Promoting Upskilling Workers	1,5	1,8	2,0	2,3	2,5	2,8	3,0	15,8	1,0
Total	**27,90**	**32,55**	**37,20**	**41,85**	**46,50**	**51,15**	**55,80**	**292,95**	**18,9**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Digital Logistic Platform & Solution (Asset, Warehouse, Data, Security & Network management)	11,8	13,8	15,8	17,7	19,7	21,7	23,7	124,2	8,0
Transportation Management (Route Optimization & Real-time tracking)	6,8	8,0	9,1	10,2	11,4	12,5	13,7	71,7	4,6
Automation & Robotics (Automated Warehouse, Drones & Autonomous Vehicle for lastmile)	5,0	5,8	6,7	7,5	8,3	9,2	10,0	52,6	3,4
Infrastructure Development (Modern Warehousing, storage, Transportation system & operation)	8,6	10,1	11,5	13,0	14,4	15,9	17,3	90,8	5,9
Support & Maintenance services (Planning, Consulting, Deployment, Operation & Integration)	3,2	3,7	4,2	4,8	5,3	5,8	6,4	33,4	2,2
National Logistic Ecosystem (connectivity, transportation system, energy system & ICT infa)	4,1	4,8	5,5	6,1	6,8	7,5	8,2	43,0	2,8
Full Scale Digital Transformation, Innovation Hubs & Promoting Upskilling Workers	2,3	2,6	3,0	3,4	3,8	4,1	4,5	23,7	1,5
Total	**41,8**	**48,8**	**55,8**	**62,8**	**69,8**	**76,7**	**83,7**	**439,4**	**28,4**

Digital Tourism

DIGITAL TOURISM									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Smart Tourism Platform & Digital Infrastructure in Tourism Destination (5G, Fiber Optic, WiFi)	2,1	2,5	2,9	3,4	3,8	4,2	4,6	23,6	1,5
Digital Services & Application (Mobile Apps, Travel Planning, Local Guide, Real-time Updates, AR/VR, Online Payment)	1,7	2,0	2,3	2,7	3,0	3,3	3,7	18,6	1,2
Data Management & Analytics (Tourist Data Platform, Personalized Experience, AI & ML Prediction & Suggestion, Optimizing Resources)	1,2	1,5	1,7	1,9	2,2	2,4	2,7	13,6	0,9
Digital Literacy & Workshop (Training & Development, Upskilling, Certification digital competencies in Tourism industry)	0,8	0,9	1,1	1,2	1,4	1,5	1,7	8,7	0,6
Eco-Friendly Technology Introduction, Green Certification for Digitalization & sustainable practices	1,0	1,2	1,4	1,6	1,8	2,0	2,2	11,2	0,7
Full Scale Digital Transformation, Innovation Hubs & Promoting Upskilling SME	1,0	1,2	1,4	1,6	1,8	2,0	2,2	11,2	0,7
Total	**7,8**	**9,3**	**10,8**	**12,4**	**13,9**	**15,5**	**17,1**	**86,8**	**5,6**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Smart Tourism Platform & Digital Infrastructure in Tourism Destination (5G, Fiber Optic, WiFi)	4,2	5,0	5,9	6,7	7,6	8,4	9,3	47,1	3,0
Digital Services & Application (Mobile Apps, Travel Planning, Local Guide, Real-time Updates, AR/VR, Online Payment)	3,3	4,0	4,6	5,3	6,0	6,6	7,3	37,2	2,4
Data Management & Analytics (Tourist Data Platform, Personalized Experience, AI & ML Prediction & Suggestion, Optimizing Resources)	2,4	2,9	3,4	3,9	4,4	4,9	5,4	27,3	1,8
Digital Literacy & Workshop (Training & Development, Upskilling, Certification digital competencies in Tourism industry)	1,6	1,9	2,2	2,5	2,8	3,1	3,4	17,4	1,1
Eco-Friendly Technology Introduction, Green Certification for Digitalization & sustainable practices	2,0	2,4	2,8	3,2	3,6	4,0	4,4	22,3	1,4
Full Scale Digital Transformation, Innovation Hubs & Promoting Upskilling SME	2,0	2,4	2,8	3,2	3,6	4,0	4,4	22,3	1,4
Total	**15,50**	**18,60**	**21,70**	**24,80**	**27,90**	**31,00**	**34,10**	**173,60**	**11,2**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Smart Tourism Platform & Digital Infrastructure in Tourism Destination (5G, Fiber Optic, WiFi)	6,3	7,6	8,8	10,1	11,4	12,6	13,9	70,7	4,6
Digital Services & Application (Mobile Apps, Travel Planning, Local Guide, Real-time Updates, AR/VR, Online Payment)	5,0	6,0	7,0	8,0	9,0	10,0	11,0	55,8	3,6
Data Management & Analytics (Tourist Data Platform, Personalized Experience, AI & ML Prediction & Suggestion, Optimizing Resources)	3,7	4,4	5,1	5,8	6,6	7,3	8,0	40,9	2,6
Digital Literacy & Workshop (Training & Development, Upskilling, Certification digital competencies in Tourism industry)	2,3	2,8	3,3	3,7	4,2	4,6	5,1	26,0	1,7
Eco-Friendly Technology Introduction, Green Certification for Digitalization & sustainable practices	3,0	3,6	4,2	4,8	5,4	6,0	6,6	33,5	2,2
Full Scale Digital Transformation, Innovation Hubs & Promoting Upskilling SME	3,0	3,6	4,2	4,8	5,4	6,0	6,6	33,5	2,2
Total	**23,3**	**27,9**	**32,5**	**37,2**	**41,8**	**46,5**	**51,2**	**260,4**	**16,8**

Digital Healthcare

DIGITAL HEALTHCARE									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Telemedicine & Remote Care & Preventive System (Platform, Telehealthcare, Remote Monitoring Device (IOT & Wearable)	3,9	4,7	5,4	6,2	7,0	7,8	8,5	43,4	2,8
Electronic Healthcare Records (System, Data Integration & Interoperability, Security)	2,8	3,4	4,0	4,5	5,1	5,7	6,3	31,8	2,1
Artificial Intelligence & Big Data (Diagnostic, Predictive, Improve Outcomes & Operational Efficiency)	3,4	4,0	4,7	5,4	6,0	6,7	7,4	37,6	2,4
Health Information System (Integration for all Health Facilities, Ensuring Cyber Security & Data Privacy compliances)	2,3	2,8	3,3	3,7	4,2	4,6	5,1	26,0	1,7
Digital Health Infrastructure (5G, Broadband Internet, FTTx, Cloud Computing & Storage system)	2,8	3,4	4,0	4,5	5,1	5,7	6,3	31,8	2,1
Training & Workforce Development (Digital Literacy & Certification Programs)	1,8	2,2	2,5	2,9	3,3	3,6	4,0	20,2	1,3
Full Scale Digital Transformation, Innovation Hubs & Promoting Digital Healthcare Ecosystem	2,3	2,8	3,3	3,7	4,2	4,6	5,1	26,0	1,7
Total	**19,4**	**23,2**	**27,1**	**31,0**	**34,9**	**38,7**	**42,6**	**217,0**	**14,0**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Telemedicine & Remote Care & Preventive System (Platform, Telehealthcare, Remote Monitoring Device (IOT & Wearable)	7,8	9,3	10,9	12,4	14,0	15,5	17,1	86,8	5,6
Electronic Healthcare Records (System, Data Integration & Interoperability, Security)	5,7	6,8	8,0	9,1	10,2	11,4	12,5	63,7	4,1
Artificial Intelligence & Big Data (Diagnostic, Predictive, Improve Outcomes & Operational Efficiency)	6,7	8,1	9,4	10,7	12,1	13,4	14,8	75,2	4,9
Health Information System (Integration for all Health Facilities, Ensuring Cyber Security & Data Privacy compliances)	4,6	5,6	6,5	7,4	8,4	9,3	10,2	52,1	3,4
Digital Health Infrastructure (5G, Broadband Internet, FTTx, Cloud Computing & Storage system)	5,7	6,8	8,0	9,1	10,2	11,4	12,5	63,6	4,1
Training & Workforce Development (Digital Literacy & Certification Programs)	3,6	4,3	5,1	5,8	6,5	7,2	8,0	40,5	2,6
Full Scale Digital Transformation, Innovation Hubs & Promoting Digital Healthcare Ecosystem	4,6	5,6	6,5	7,4	8,4	9,3	10,2	52,1	3,4
Total	**38,75**	**46,50**	**54,25**	**62,00**	**69,75**	**77,50**	**85,25**	**434,00**	**28,0**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Telemedicine & Remote Care & Preventive System (Platform, Telehealthcare, Remote Monitoring Device (IOT & Wearable)	11,6	14,0	16,3	18,6	20,9	23,3	25,6	130,2	8,4
Electronic Healthcare Records (System, Data Integration & Interoperability, Security)	8,5	10,2	11,9	13,6	15,3	17,1	18,8	95,5	6,2
Artificial Intelligence & Big Data (Diagnostic, Predictive, Improve Outcomes & Operational Efficiency)	10,1	12,1	14,1	16,1	18,1	20,2	22,2	112,9	7,3
Health Information System (Integration for all Health Facilities, Ensuring Cyber Security & Data Privacy compliances)	7,0	8,4	9,8	11,2	12,6	13,9	15,3	78,1	5,0
Digital Health Infrastructure (5G, Broadband Internet, FTTx, Cloud Computing & Storage system)	8,5	10,2	11,9	13,6	15,3	17,0	18,8	95,5	6,2
Training & Workforce Development (Digital Literacy & Certification Programs)	5,4	6,5	7,6	8,7	9,8	10,8	11,9	60,7	3,9
Full Scale Digital Transformation, Innovation Hubs & Promoting Digital Healthcare Ecosystem	7,0	8,4	9,8	11,2	12,6	13,9	15,3	78,1	5,0
Total	**58,1**	**69,7**	**81,4**	**93,0**	**104,6**	**116,2**	**127,9**	**651,0**	**42,0**

Digital State Own Enterprise

DIGITAL STATE OWNED ENTERPRISE									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructures (5G e-Gov Network, Private & Hybrid , Disaster Recovery Data Centers)	3,3	4,0	4,6	5,3	5,9	6,6	7,3	36,9	2,4
Cybersecurity (People, Process & Technology enhancement)	1,4	1,7	1,9	2,2	2,5	2,8	3,1	15,5	1,0
Artificial Intelligence & Big Data (predictive maintenance, customer service & Operational Efficiency)	1,9	2,3	2,7	3,0	3,4	3,8	4,2	21,2	1,4
Digital Services & Platform (E-Gov public services & transaction, CRM to enhancing customer interaction	1,6	2,0	2,3	2,6	3,0	3,3	3,6	18,4	1,2
Cloud Computing (Cloud Infrastructure & Hybrid Cloud for optimizing resources)	1,4	1,7	1,9	2,2	2,5	2,8	3,1	15,5	1,0
Smart Technologies (IOT for realtime monitoring & automation, Smart Grids for energy management)	1,1	1,4	1,6	1,8	2,0	2,3	2,5	12,7	0,8
Digital Literacy & Workforce development (Training & Certification)	0,9	1,1	1,2	1,4	1,6	1,8	1,9	9,9	0,6
Total	**11,6**	**13,9**	**16,3**	**18,6**	**20,9**	**23,3**	**25,6**	**130,2**	**8,4**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructures (5G e-Gov Network, Private & Hybrid , Disaster Recovery Data Centers)	6,6	7,9	9,2	10,5	11,9	13,2	14,5	73,8	4,8
Cybersecurity (People, Process & Technology enhancement)	2,8	3,3	3,9	4,4	5,0	5,6	6,1	31,1	2,0
Artificial Intelligence & Big Data (predictive maintenance, customer service & Operational Efficiency)	3,8	4,5	5,3	6,1	6,8	7,6	8,3	42,4	2,7
Digital Services & Platform (E-Gov public services & transaction, CRM to enhancing customer interaction	3,3	3,9	4,6	5,3	5,9	6,6	7,2	36,8	2,4
Cloud Computing (Cloud Infrastructure & Hybrid Cloud for optimizing resources)	2,8	3,3	3,9	4,4	5,0	5,6	6,1	31,1	2,0
Smart Technologies (IOT for realtime monitoring & automation, Smart Grids for energy management)	2,3	2,7	3,2	3,6	4,1	4,5	5,0	25,4	1,6
Digital Literacy & Workforce development (Training & Certification)	1,8	2,1	2,5	2,8	3,2	3,5	3,9	19,8	1,3
Total	**23,25**	**27,90**	**32,55**	**37,20**	**41,85**	**46,50**	**51,15**	**260,40**	**16,8**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Digital Infrastructures (5G e-Gov Network, Private & Hybrid , Disaster Recovery Data Centers)	9,9	11,9	13,8	15,8	17,8	19,8	21,8	110,7	7,1
Cybersecurity (People, Process & Technology enhancement)	4,2	5,0	5,8	6,7	7,5	8,3	9,2	46,6	3,0
Artificial Intelligence & Big Data (predictive maintenance, customer service & Operational Efficiency)	5,7	6,8	8,0	9,1	10,2	11,4	12,5	63,6	4,1
Digital Services & Platform (E-Gov public services & transaction, CRM to enhancing customer interaction	4,9	5,9	6,9	7,9	8,9	9,8	10,8	55,1	3,6
Cloud Computing (Cloud Infrastructure & Hybrid Cloud for optimizing resources)	4,2	5,0	5,8	6,7	7,5	8,3	9,2	46,6	3,0
Smart Technologies (IOT for realtime monitoring & automation, Smart Grids for energy management)	3,4	4,1	4,8	5,5	6,1	6,8	7,5	38,2	2,5
Digital Literacy & Workforce development (Training & Certification)	2,7	3,2	3,7	4,2	4,8	5,3	5,8	29,7	1,9
Total	**34,9**	**41,8**	**48,8**	**55,8**	**62,8**	**69,8**	**76,7**	**390,6**	**25,2**

Digital Culture

DIGITAL CULTURE									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructures (5G , FTTx , WiFi for cultural sites and remote areas) and Digital Archives (cultural & heritage, historical records)	1,4	1,7	2,0	2,4	2,7	3,1	3,4	16,7	1,1
Digital Content Creation (VR, AR for museums, historical place and cultural event)	1,1	1,4	1,7	2,0	2,2	2,5	2,8	13,7	0,9
Digital Literacy & Skills Development (Training, Workshop, Seminar in Digital Tools and Technology for Publics as well as SME)	0,9	1,1	1,3	1,5	1,7	2,0	2,2	10,6	0,7
Digital Platforms and Applications (Cultural Apps, Online Portals for virtual exhibition and cultural event, Transactional Commerce)	1,1	1,4	1,7	2,0	2,2	2,5	2,8	13,7	0,9
Preservation & Conservation (Digital Preservation to preserve and restore using digital tech, 3D scanning & Printing for replicating & restoration)	0,9	1,1	1,3	1,5	1,7	2,0	2,2	10,6	0,7
Smart Technologies (IOT for realtime monitoring & automation, Digital Cultures initiative)	0,9	1,1	1,3	1,5	1,7	2,0	2,2	10,6	0,7
Total	**6,2**	**7,7**	**9,3**	**10,9**	**12,4**	**14,0**	**15,5**	**76,0**	**4,9**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Digital Infrastructures (5G , FTTx , WiFi for cultural sites and remote areas) and Digital Archives (cultural & heritage, historical records)	2,7	3,4	4,1	4,8	5,5	6,1	6,8	33,4	2,2
Digital Content Creation (VR, AR for museums, historical place and cultural event)	2,2	2,8	3,3	3,9	4,5	5,0	5,6	27,3	1,8
Digital Literacy & Skills Development (Training, Workshop, Seminar in Digital Tools and Technology for Publics as well as SME)	1,7	2,2	2,6	3,0	3,5	3,9	4,3	21,3	1,4
Digital Platforms and Applications (Cultural Apps, Online Portals for virtual exhibition and cultural event, Transactional Commerce)	2,2	2,8	3,3	3,9	4,5	5,0	5,6	27,3	1,8
Preservation & Conservation (Digital Preservation to preserve and restore using digital tech, 3D scanning & Printing for replicating & restoration)	1,7	2,2	2,6	3,0	3,5	3,9	4,3	21,3	1,4
Smart Technologies (IOT for realtime monitoring & automation, Digital Cultures initiative)	1,7	2,2	2,6	3,0	3,5	3,9	4,3	21,3	1,4
Total	**12,40**	**15,50**	**18,60**	**21,70**	**24,80**	**27,90**	**31,00**	**151,90**	**9,8**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Digital Infrastructures (5G , FTTx , WiFi for cultural sites and remote areas) and Digital Archives (cultural & heritage, historical records)	4,1	5,1	6,1	7,2	8,2	9,2	10,2	50,1	3,2
Digital Content Creation (VR, AR for museums, historical place and cultural event)	3,3	4,2	5,0	5,9	6,7	7,5	8,4	41,0	2,6
Digital Literacy & Skills Development (Training, Workshop, Seminar in Digital Tools and Technology for Publics as well as SME)	2,6	3,3	3,9	4,6	5,2	5,9	6,5	31,9	2,1
Digital Platforms and Applications (Cultural Apps, Online Portals for virtual exhibition and cultural event, Transactional Commerce)	3,3	4,2	5,0	5,9	6,7	7,5	8,4	41,0	2,6
Preservation & Conservation (Digital Preservation to preserve and restore using digital tech, 3D scanning & Printing for replicating & restoration)	2,6	3,3	3,9	4,6	5,2	5,9	6,5	31,9	2,1
Smart Technologies (IOT for realtime monitoring & automation, Digital Cultures initiative)	2,6	3,3	3,9	4,6	5,2	5,9	6,5	31,9	2,1
Total	**18,6**	**23,2**	**27,9**	**32,6**	**37,2**	**41,9**	**46,5**	**227,9**	**14,7**

Digital Energy

DIGITAL ENERGY									
LOW INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Renewable Energy Infrastructures (Solar, Wind, Geothermal & Hydro Power)	8,1	9,7	11,3	12,9	14,5	16,1	17,7	90,3	5,8
Smart Grid Technology (Modernization, Energy Storage for rural, villages, sub urban & cities)	2,3	2,8	3,3	3,7	4,2	4,7	5,1	26,1	1,7
Digital Platform & Analytic (Energy Management System, Big Data & AI for predictive maintenance, optimization energy system)	1,3	1,6	1,9	2,1	2,4	2,7	3,0	15,0	1,0
EV's & Charging Infrastructures (EV Production, Charging Station expansion Nationwide)	2,0	2,4	2,8	3,2	3,5	3,9	4,3	22,1	1,4
Cybersecurity (Security System for energy infrastructure & training for employee and workers)	1,0	1,2	1,4	1,6	1,8	2,0	2,2	11,0	0,7
Full Scale Digital Transformation for Electricity (Migrating to AIOT Based Smart Meter & SCADA)	0,8	1,0	1,1	1,3	1,5	1,6	1,8	9,0	0,6
Total	**15,5**	**18,6**	**21,7**	**24,8**	**27,9**	**31,0**	**34,1**	**173,6**	**11,2**

MID INVESTMENT (Trillion Rph)	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**Sub Total**	**In USD**
Renewable Energy Infrastructures (Solar, Wind, Geothermal & Hydro Power)	16,1	19,4	22,6	25,8	29,0	32,3	35,5	180,7	11,7
Smart Grid Technology (Modernization, Energy Storage for rural, villages, sub urban & cities)	4,7	5,6	6,5	7,5	8,4	9,3	10,2	52,2	3,4
Digital Platform & Analytic (Energy Management System, Big Data & AI for predictive maintenance, optimization energy system)	2,7	3,2	3,8	4,3	4,8	5,4	5,9	30,1	1,9
EV's & Charging Infrastructures (EV Production, Charging Station expansion Nationwide)	3,9	4,7	5,5	6,3	7,1	7,9	8,7	44,1	2,8
Cybersecurity (Security System for energy infrastructure & training for employee and workers)	2,0	2,4	2,8	3,2	3,5	3,9	4,3	22,1	1,4
Full Scale Digital Transformation for Electricity (Migrating to AIOT Based Smart Meter & SCADA)	1,6	1,9	2,3	2,6	2,9	3,2	3,5	18,1	1,2
Total	**31,00**	**37,20**	**43,40**	**49,60**	**55,80**	**62,00**	**68,20**	**347,19**	**22,4**

HIGH INVESTMENT (Trillion Rph)	2024	2025	2026	2027	2028	2029	2030	Sub Total	In USD
Renewable Energy Infrastructures (Solar, Wind, Geothermal & Hydro Power)	24,2	29,0	33,9	38,7	43,6	48,4	53,2	271,0	17,5
Smart Grid Technology (Modernization, Energy Storage for rural, villages, sub urban & cities)	7,0	8,4	9,8	11,2	12,6	14,0	15,4	78,2	5,0
Digital Platform & Analytic (Energy Management System, Big Data & AI for predictive maintenance, optimization energy system)	4,0	4,8	5,6	6,4	7,3	8,1	8,9	45,1	2,9
EV's & Charging Infrastructures (EV Production, Charging Station expansion Nationwide)	5,9	7,1	8,3	9,5	10,6	11,8	13,0	66,2	4,3
Cybersecurity (Security System for energy infrastructure & training for employee and workers)	3,0	3,5	4,1	4,7	5,3	5,9	6,5	33,1	2,1
Full Scale Digital Transformation for Electricity (Migrating to AIOT Based Smart Meter & SCADA)	2,4	2,9	3,4	3,9	4,4	4,8	5,3	27,1	1,7
Total	**46,5**	**55,8**	**65,1**	**74,4**	**83,7**	**93,0**	**102,3**	**520,8**	**33,6**

Notes :

- *References for "dual-gigabit city construction": Dual Gigabit Network Coordinated Development Action Plan (2021–2023) and Notice of the General Office of the Ministry of Industry and Information Technology on Summarizing and Evaluating Gigabit City Construction in 2022*
- *Reference for "5G+ industrial areas": Guidelines for the Construction of Converged 5G and Industrial Internet Application Pilot Zones*
- *Reference for "5G+ tourism": Notice of the Ministry of Industry and Information Technology and the Ministry of Culture and Tourism on Strengthening the Coordinated and Innovative Development of 5G+ Smart Tourism and Notice of the Ministry of Industry and Information Technology and 10 Other Departments on Launching the "Signal Upgrade" Special Action*
- *Reference for "5G+ campuses": "Set Sail" Action Plan for 5G Applications (2021–2023) and Notice of the General Office of the Ministry of Industry and Information Technology and the General Office of the Ministry of Education on Organizing Application for "5G+ Smart Education" Pilot Projects*
- *Reference for "Optical-network adoption": 14th Five-Year Plan for Information and Communications Industry Development and Dual Gigabit Network Coordinated Development Action Plan (2021–2023)*

Conclusion

As we set the goal on this acceleration journey towards digital transformation, we must recognize the collective effort required from all stakeholders—government, private sector, academia, and civil society. The strategies outlined in this document are designed to not only propel Indonesia into a leading digital economy but also to ensure that the benefits of digitalization are inclusive and far-reaching.

By fostering innovation, enhancing digital infrastructure, and promoting digital literacy, we can create a resilient and competitive economy that meets the demands of the future. The projected increase in GDP and the creation of millions of new jobs through digitalization initiatives underscore the transformative potential of this strategy. Significant investments in digital infrastructure and services will further accelerate this growth, positioning Indonesia as a key player in the global digital economy.

Collaborative work together is necessary to build a digitally empowered Indonesia, where technology serves as a catalyst for sustainable growth, improved quality of life, and equitable opportunities for all.

Together, we can achieve a brighter, more connected future.

Indonesia Digital 2025-2029 Transformation Strategy

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