GSMA

Mobile Big Data and Artificial Intelligence: Towards sustainable development in Southeast Asia

GSMA

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GSMA Central Insights Unit

The Central Insights Unit (CIU) sits at the core of GSMA Mobile for Development (M4D) and produces in-depth research on the role and impact of mobile and digital technologies in advancing sustainable and inclusive development. The CIU engages with public and private sector practitioners to generate unique insights and analysis on emerging innovations in technology for development. Through our insights, we support international donors to build expertise and capacity as they seek to implement digitisation initiatives in low-and middle-income countries through partnerships within the digital ecosystem.

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from the British people

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Executive summary

Introduction and objectives

In an increasingly connected world, Artificial Intelligence and Mobile Big Data (AI/MBD) are helping to address key socioeconomic challenges and have the potential to help achieve the Sustainable Development Goals (SDGs). Southeast Asia has seen unprecedented growth in connectivity in recent years. Mobile broadband networks are now covering around 96 per cent of the region and data traffic is expected to grow six-fold by 2027. Southeast Asia is set to benefit from increased digitalisation and the expansion of frontier technologies such as 5G, AI and IoT.

This report explores the potential for AI/MBD to support achieving the SDGs in Southeast Asia. It focuses on selected countries and use cases that have high potential for social, environmental and economic impact. It provides donor organisations, government agencies, MNOs and non-profit organisations, with insights into opportunities to unlock the potential of AI/MBD for sustainable development.

Country analysis: trends in Indonesia, Malaysia and Thailand

Our high-level assessment identifies Indonesia, Malaysia and Thailand as ready to exploit the potential of AI/MBD to achieve the SDGs. While they all face pressing social, environmental and economic development challenges, they also show potential for further growth and innovation.

The digital ecosystem is generally well-developed in the three countries that benefit from:

- Established AI champions, both from the private and public sector;
- Considerable interest and commitment from government, as demonstrated by recent development policies and AI strategies;
- Continuous investments in digital infrastructure and growing interest and investments in frontier technologies from the mobile industry.

The enabling environment is generally good and supported by key ecosystem players. All countries display:

- Good levels of connectivity, supported by enabling infrastructure, that allow for increased access and usage;
- Policies generally conducive to investments, business and entrepreneurship, fostering the innovation and growth of the ecosystem;
- Strong innovation linkages across sectors for research and development.

These key enablers generally compensate for existing barriers, including a lack of adequate regulatory frameworks for data use and difficulties in finding and retaining talents. Yet, addressing these gaps will be key to unlock the potential of AI/MBD.

Use cases: considerations for developing sustainable solutions

The use cases – proactive flood detection in Indonesia, transport and mobility in Malaysia, and forest monitoring systems in Thailand – show high potential for the SDGs but require broader ecosystem engagement and increased investments.

- Partnerships between MNOs and government agencies are vital for the success of AI/MBD solutions, while additional engagement from development agencies, other private sector organisations and academic and non-profit actors will amplify impact.

- The development, implementation and scaling of the solutions depend on a variety of shared as well as context-specific enabling factors, and on strong business models that are mutually beneficial for all actors involved.

Key lessons and recommendations

Critical success factors apply to all use cases, and to the broader ecosystem: global awareness; capability and skills; business models; models for collaboration; policy, regulation and data governance; and impact and expansion.

Scaling AI/MBD solutions in Southeast Asia will require the following actions:

1. Raising awareness of AI/MBD for sustainable development;
2. Supporting existing solutions and growing the ecosystem;
3. Implementing responsible data policies;
4. Building AI talent for the future;
5. Monitoring and evaluating impact.

1. Introduction

The role of Artificial Intelligence and Mobile Big Data for sustainable development

Artificial Intelligence and Mobile Big Data (AI/MBD) are used to address some of the biggest challenges facing the world today, in line with the United Nations Sustainable Development Goals (SDGs).

- These technologies have the potential to generate better knowledge about, and solutions to, both long-standing and emerging issues.
- They can help transform society and business through public-private partnerships that bring together diverse expertise.

Artificial Intelligence (AI)

Artificial Intelligence (AI) refers to the use of data to make decisions or perform tasks normally considered to require human knowledge, intelligence, learning and understanding. Such tasks include visual perception, speech recognition and decision-making.

Mobile Big Data (MBD)

MBD solutions refer to network traffic (from people, sensors and connected devices), combined with wider datasets, (such as public data from government agencies, private data from third parties, and traditional data from surveys) harnessed through big data analytics, artificial intelligence and machine learning.[1, 2]

$15.7 trillion

AI could contribute **$15.7 trillion** to the global economy by **2030**.[3]

17 SDGs

AI is being used to address all **17 SDGs**.[4]

5.3bn **53%**

With **5.3bn** unique mobile subscribers globally and **53 per cent** of people worldwide having used internet services on a mobile device, the mobile industry has **unprecedented global reach**.[5]

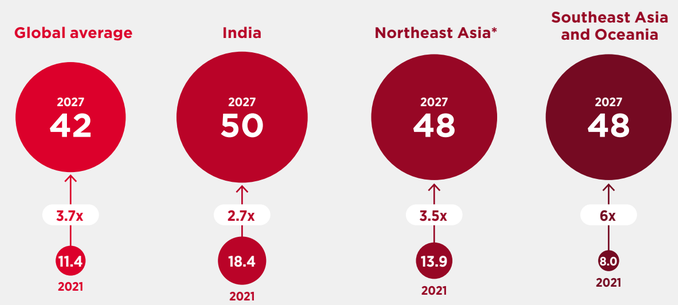
1. See GSMA Digital Toolkit.
2. GSMA. (2019). Mobile Big Data Solutions for a Better Future.
3. PwC. (2017). Sizing the prize – PwC's Global Artificial Intelligence Study: Exploiting the AI Revolution.
4. Cowls, J. Tsamados, A., Taddeo, M., Floridi, L. (2021). A definition, Benchmark and Database of AI for Social Good Initiatives.
5. GSMA. (2022). The Mobile Economy 2022.

The relevance of AI/MBD in Southeast Asia

Southeast Asia is benefiting from a vibrant mobile economy, and AI/MBD can drive further growth and innovation.

- Mobile connectivity is the main form of internet connectivity in Southeast Asia. Today, mobile broadband networks cover around 96 per cent of the region's population.[6]
- Globally, Southeast Asia is the region that has experienced the greatest growth in mobile internet.
- Several markets have started to deploy 5G networks and services. The ability of 5G to support the development of frontier technologies has the potential to drive further digital economic growth and innovation in the region.
- AI is expected to lead to a 10 to 18 per cent GDP uplift by 2030, equivalent to nearly $1 trillion.[7]
- However, the usage gap remains significant: 39 per cent of the population covered by mobile broadband does not yet subscribe to a mobile internet service.[8] Bridging this gap, and ensuring that AI/MBD solutions are responsive to the needs of all segments of society, will be essential to drive inclusive transformation.

Figure 1:
Current and projected data traffic on smartphones across Asia Pacific



Source: Ericsson
* Includes China

6. GSMA. (2022). The Mobile Economy Asia Pacific 2022.
7. Kearney. (2020). Racing towards the future: artificial intelligence in Southeast Asia.
8. GSMA. (2022). The Mobile Economy Asia Pacific 2022.

Objectives of the research

The purpose of this report is to explore the potential for AI/MBD to support achieving the SDGs in Southeast Asia. Specifically, the research aims to:

1. Identify the opportunities for AI/MBD to support the development needs and priorities of Southeast Asian countries, and explore the digital landscape in countries with significant opportunities for uplift.
2. Explore specific use cases with high potential for social, environmental and economic impact in selected countries, looking at key ecosystem players, enablers and barriers, and required funding mechanisms.
3. Inform future work to inspire greater innovation and adoption of AI/MBD for sustainable development by presenting success factors for deployment and recommendations on how to scale them.

Key audiences

Primary audience

This study aims to provide **donor organisations** and **government agencies** with insights into the potential of AI/MBD to address social, environmental and economic challenges in Southeast Asia. It offers examples of the specific role they can play to provide an enabling environment and tackle supply- and demand-side obstacles.

Supply-side actors will gain insights into how to build sustainable and impactful AI/MBD solutions. Specifically, the study highlights the requirements needed for **MNOs** to build sustainable business models.

Industry associations will gain a better understanding of the specific dynamics of Southeast Asian markets. They will also gain insights into how to bring multiple actors together to develop and scale solutions, and support the broader ecosystem.

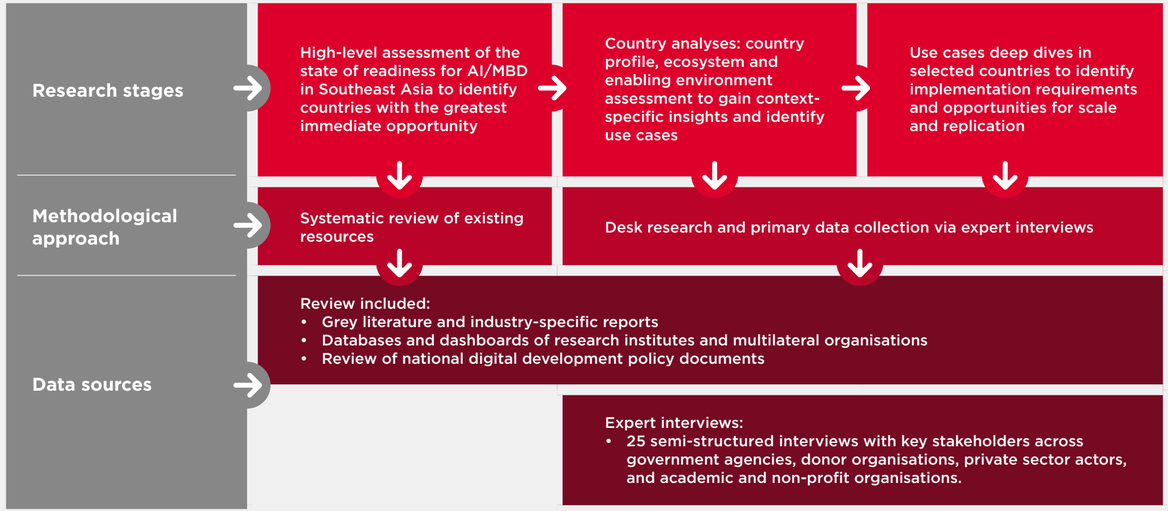
Secondary audience

Other private sector organisations, notably leading **tech companies**, will understand how they can bring their expertise in partnerships to amplify the sustainability and impact of AI/MBD solutions.

Non-profits organisations, such as **NGOs** and **Civil Society Organisations (CSOs)**, will find useful information on the existing gaps in Southeast Asia and can identify opportunities for advocacy. They will also gain insights into how they can contribute to the development of AI/MBD solutions.

Research methodology

Figure 2: Research process



Source: GSMA Mobile for Development

Figure 3: The GSMA AI for Impact Use Case Framework

Themes	Cities and Public Infrastructure	Climate Change and Environment	Managing Disasters	Industry and Commerce	Social Inclusion
	Insights for cities and communities that enable better planning, service delivery, connection and mobility	Improved understanding and monitoring of environmental issues, supporting climate change impact reduction and more accurate forecasting	Providing better disaster alerts, supporting emergency response, informing potential for recovery and specific rehabilitation initiatives	Inclusive and efficient economic and industrial development through increased transparency, operational planning and financial access	Enhancing equity, social welfare, public access and health, and informing effective solutions to pressing social challenges
Sub Themes	Utilities	Air pollution	Early warning systems	Agritech	Access, equality and security
	Integrated transport systems	Natural resources management	Emergency response	Tourism, retail and manufacturing	Protecting vulnerable people
	Smart asset management	Safe water	Disaster displacement	Transport, logistics and supply chain	Inclusive education
	Infrastructure planning	Weather forecasting	Disaster rehabilitation	Mobile financial services	Health response planning

Source: GSMA AI for Impact (AI4I)

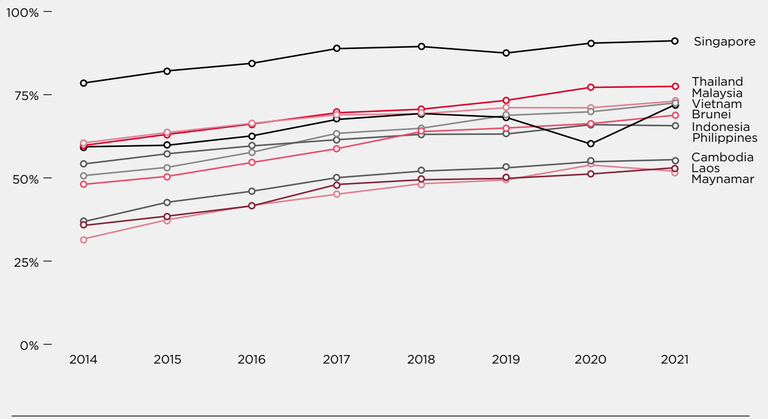
2. Regional landscaping

Mobile connectivity has steadily improved in Southeast Asia, but significant differences remain between countries

Looking at the key pillars of mobile connectivity,[9] Singapore and Thailand are leading the way in the region, closely followed by Malaysia, Brunei, Indonesia and the Philippines. Cambodia, Laos and Myanmar, however, still have room for improving their enabling environment.

These differences can be explained by varying levels of performance across the enablers of mobile connectivity, such as mobile internet network coverage, affordability of mobile devices and services, citizens' digital awareness and skills, and availability of secure online content that is relevant to the population.

Figure 4:
Evolution of mobile internet connectivity in Southeast Asia, 2014 - 2021



Source: GSMA Mobile for Development, Mobile Connectivity Index

9. See GSMA Mobile Connectivity Index.

Six Southeast Asian markets have launched 5G commercial services, with four more to follow by 2025

5G networks bring substantial improvements over 4G networks, including higher connection speeds, greater capacity and greater performance. They are a key enabler for frontier technologies such as cloud services, AI, IoT and edge computing.

5G is a natural progression from previous technology generations but it requires a certain degree of market readiness to maximise value from 5G services for consumers, operators and the wider society. Market readiness depends on underlying enablers such as the size of the population and level of urbanization, rate of economic growth, 4G availability, and affordability of 5G devices, among others.

5G adoption is set to accelerate in Southeast Asia as the technology's footprint expands across the region. Countries with large populations – such as Indonesia, the region's largest country, as well as Thailand, Vietnam and the Philippines – are expected to have the highest numbers of 5G connections in the coming years. But what will matter most will be the share of 5G connections. By 2030, 5G will make for more than 65% of total connections in several countries, including Malaysia and Thailand.

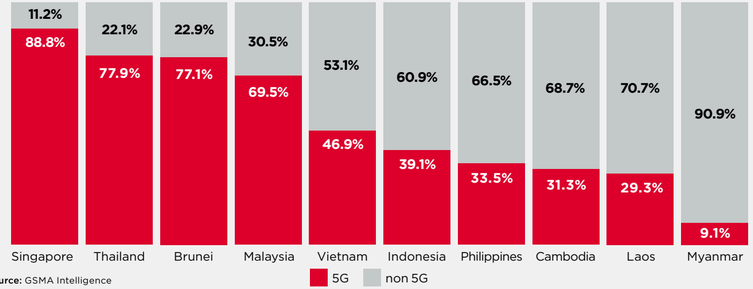
Momentum is growing in the region due to many factors, including the economic recovery from the pandemic, rising 5G handset sales and overall marketing efforts. As 5G network deployments continue, 5G's ability to support next-generation offerings will drive digital economic growth and innovation.

Figure 5:
Live and planned 5G networks in the Asia Pacific region, 2022

Source: GSMA Intelligence

Figure 6:
Projected share of 5G connections in Southeast Asia, 2030

5G connections as a percentage of total connections



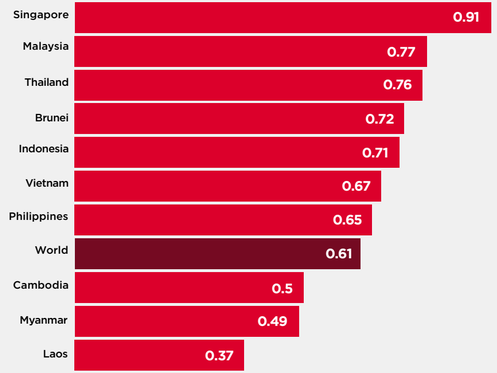
Source: GSMA Intelligence

Improved connectivity is fostering public sector digitalisation: some countries in the region are leveraging AI for public services

The public sector is a key area where digital transformation and emerging technologies can bring improved socioeconomic development, through more efficient internal government processes and quality public service delivery to citizens and businesses. Several Southeast Asian governments perform better than the world average – including Singapore, Malaysia, Thailand, Indonesia, Brunei and Vietnam – which suggests that they have the required laws and regulations, infrastructure and systems, and sufficient institutional backing to leverage innovation for public services.

Figure 7:
E-Government development scores in Southeast Asia, 2022

Scores range from 0 to 1

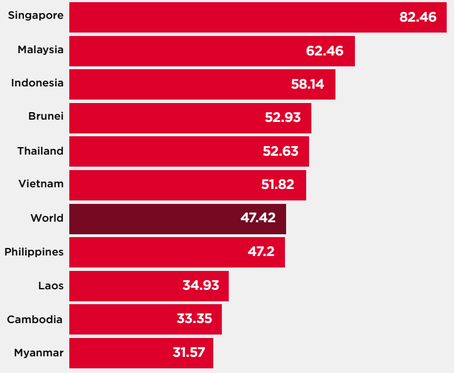


Source: United Nations

The E-Government Development Index assesses patterns of digital government of the 193 UN member states, looking at three key dimensions of e-government: (i) the scope and quality of online services; (ii) the status of telecommunication infrastructure; and (iii) existing human capacity.[10]

Figure 8:
Government AI readiness scores in Southeast Asia, 2021

Scores range from 0 to 100



Source: Oxford Insights

The Government AI Readiness Index ranks 160 countries by how prepared their governments are to use AI in public services. It is based on 42 indicators across three pillars: (i) government; (ii) technology sector; and (iii) data and infrastructure.[11]

10. United Nations. (2022). E-Government Survey 2022: The Future of Digital Government.
11. 11. Oxford Insights. (2022). Government AI Readiness Index 2021.

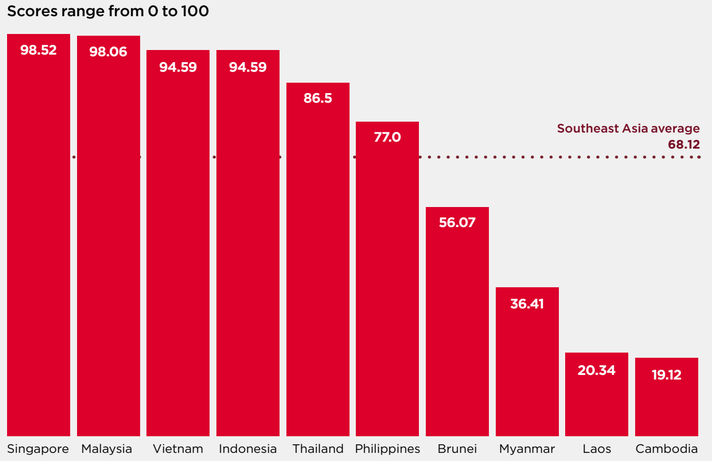
Online security concerns may hinder progress in digital adoption in some countries

Successful expansion of digital adoption is highly correlated with the existence of digital rights and the resulting level of safety and security experienced when getting online. Cybersecurity and data protection policies can help build trust in the digital economy and protect the openness of the digital space.

Southeast Asian countries have varying degrees of online security, with Singapore, Malaysia, Indonesia, Vietnam, Thailand and the Philippines seem to perform well.

However, ensuring that policies are adequately implemented is essential, as their existence does not necessarily guarantee online safety and security. In many countries globally, cybersecurity policies often come from a place of political motivation rather than a protection of privacy and digital rights.

Figure 9:
Online security scores in Southeast Asia, 2021



Source: International Telecommunications Union, Global Cybersecurity Index

Increasing digitalisation is raising awareness and interest in AI/MBD, but data regulation is still emerging

Mobile Big Data

1. Increasingly competitive mobile markets in Southeast Asia have driven down the costs of mobile internet use, boosting **access**.

2. **The e-economy continues to drive mobile internet use**, particularly in Singapore, Thailand, Malaysia, Indonesia, Myanmar and Vietnam.

3. Increasing data usage, coupled with adequate public sector engagement have led to the **growth of MBD infrastructure** in Indonesia, Malaysia, Singapore, Vietnam and Thailand.

4. The **outbreak of COVID-19 has increased interest** in big data to predict trends, driving **capability uplift**. Outside of Singapore upskilling opportunities are significant.

Artificial Intelligence

1. **Singapore is a leader** in broad AI capability; other nations are **driving AI uptake through national strategies**, including in Malaysia and Indonesia.

2. AI development and implementation in much of Southeast Asia has three broad opportunities for improvement: **addressing limited digital infrastructure; growing constrained talent pools**; and **operationalising digital technologies across government and industry**.

3. Increasing **financial incentives**, government investment and policy reforms are **generating interest in AI in the region**. Countries are formalising commitment to AI through national strategies and industry collaboration.

Data Regulation

Across Southeast Asia, consistent regulations for data protection and governance are needed to safeguard consumer rights and build trust. There are two main governance areas for development: **national level data regulation, and data governance at the regional level**.

Among the countries with significant immediate opportunities, Indonesia, Malaysia and Thailand look most ready to benefit from AI/MBD

Our high-level regional assessment of economic and digitalisation trends in the region presents three country-level clusters: countries with potential future impact, countries with significant opportunities for AI/MBD, and countries already benefiting from a developed AI/MBD space. Among the six countries with the greatest immediate opportunity, three appear to be particularly relevant: Indonesia, Malaysia and Thailand. They all benefit from comparatively high mobile connectivity, have well-performing e-government initiatives, established cybersecurity policies and have started to deploy 5G. At the same time, they all still face considerable challenges with respects to sustainable development, and have significant potential for further growth and innovation, as further explained in section 3.

3. Country analysis

3.1. Indonesia

Indonesia faces a variety of pressing development needs and challenges

Country profile

Indonesia

Population: 274.9m
Internet users: 147.6m
Internet penetration rate: 53.7%
Social media users: 130m
Mobile connections: 345.5m

National AI/MBD strategy: Indonesia established its national AI strategy in 2020. It signals the intention to integrate AI and digital technologies into more aspects of Indonesian society and looks to leverage cross-sector expertise.[12]

SDG assessment[13]

Sustainable Development Goal	Score	Dashboard	Trend
4. Quality education	92.1	Challenges remain	↑
12. Responsible consumption and production	92.1	Challenges remain	↑
13. Climate action	92.2	Challenges remain	↗
1. No poverty	80.3	Significant challenges remain	↗
8. Decent work and economic growth	72.6	Significant challenges remain	↑
7. Affordable and clean energy	72.1	Significant challenges remain	↗
11. Sustainable cities and communities	71.9	Major challenges remain	→
16. Peace, justice and strong institutions	71.3	Major challenges remain	↗
6. Clean water and sanitation	70.1	Significant challenges remain	↑
3. Good health and well-being	65.8	Major challenges remain	↗
2. Zero hunger	65.6	Major challenges remain	↗
14. Life below water	64	Major challenges remain	→
5. Gender equality	62.8	Significant challenges remain	↗
10. Reduced inequalities	57.8	Significant challenges remain	↗
15. Life on land	50.8	Major challenges remain	→
17. Partnerships for the goals	49.8	Major challenges remain	→
9. Industry, innovation and infrastructure	44.4	Significant challenges remain	↗
Country Score	**69.2**		

Dashboard:
- SDG achieved
- Challenges remain
- Significant challenges remain
- Major challenges remain

Trend:
- ↑ On track or maintaining SDG achievment
- ↗ Moderately improving
- → Stagnating
- ↓ Decreasing

12. The strategy is available on Indonesia's National Secretariat of Artificial Intelligence website.
13. Based on the SDG Index, an assessment of each country's overall performance on the SDGs, giving equal weight to each Goal. The score can be interpreted as a percentage of SDG achievement. The dashboard and trend arrows help identify priorities for further actions and indicate whether countries are on track or off-track. Sachs et al. (2022). From Crisis to Sustainable Development: the SDGs as Roadmap to 2030 and Beyond. Sustainable Development Report 2022.

Indonesia is well-positioned to benefit from ongoing digitalisation and increased application of AI

Assessment of AI/MBD ecosystem and stakeholders

Policies

Indonesia's national AI strategy supports five national priorities, where the government believes AI could have the biggest impact: health services, bureaucratic reform, education and research, food security, mobility and smart cities.[14] Further AI-related policy and data protection are expected to improve the regulatory environment. Greater adaptability of legal frameworks to support frontier technologies will benefit AI/MBD.

The country is part of GSMA's "Leading Nations" programme, which seeks to accelerate the growth of the digital economy and advance the mobile industry's sustainability by lobbying for regulatory modernisation with relevant stakeholders.

Champions

The Ministry of Communication and Information Technology (Kominfo) along with government agencies, such as the National Research and Innovation Agency (BRIN) and the Central Bureau of Statistics (BPS), are actively promoting investments in and adoption of frontier technologies.

Local initiatives, such as the Jakarta Smart City project, illustrate this appetite. The city of Jakarta partnered with AR technology company WIR Group to utilise metaverse platform to provide more convenient services and new experiences for the public.[15]

Private sector innovators have used and recognised the value of AI early on, and have driven broad investment in the ecosystem. These include: Tokopedia (e-commerce), Snapcart (cashback app), Nodeflux (software), Katai.ai (conversational AI), Bahasa.ai (AI chatbot).[16]

There is also a particular interest from donor organisations in climate technology, in a country vulnerable to natural disasters.

Mobile market

MNOs consolidation provides an opportunity to scale 5G. Authorities have approved a $6 billion merger between Ooredoo Indosat and CK Hutchison. 5G will represent 13 per cent of total mobile connections in 2025, and 39 per cent in 2030, up from less than one per cent today.[17]

Indonesia is the leading smartphone market in Southeast Asia and will benefit from 5G network expansion. 334 million smartphone connections are expected in 2025, representing 89 per cent of total connections, up from 80 per cent today.[18]

However, there is still scope to increase MNO investment in AI capabilities. MNO Telkomsel has shown awareness of and appetite for AI/MBD applications. It is partnering with BPS to delineate the boundaries of the metropolitan area of Cekungan Bandung by assessing commuting patterns.[19]

14. See Priorities and Challenges of Indonesia's Artificial Intelligence National Strategy.
15. GSMA. (2022). The Mobile Economy Asia Pacific 2022.
16. International Institute of Communications. (2022). Artificial Intelligence in the Asia-Pacific Region.
17. GSMA. (2022). The Mobile Economy Asia Pacific 2022.
18. Ibid.
19. UNESCAP. (2020). The Use of Mobile Positioning Data to Delineate Metropolitan Area in Indonesia: Case Study in Cekungan Bandung.

The enabling environment is generally good, but focusing on talent and data capabilities can enable greater impact

AI/MBD enablers and barriers

	Enabler	Barrier
Infrastructure	High level of ICT access and data usage, and high level of e-participation, supporting by enabling infrastructure.	Coverage is limited in peri-urban and rural areas where mobile infrastructure is still being rolled out, which limits the quality of connectivity and AI/MBD analytics.
Technology/ Innovation	The ecosystem is characterized by significant investment in and adoption of emerging technologies (e.g. computer software spending) and supported by a high level of AI scientific publications.	
Governance/ Institutions	There is a strong interest in using AI/MBD for decision-making across multiple verticals.	There is a lack of standardised regulatory frameworks across data and AI legislation.
Business/ Economy	Businesses have heavily invested in telecommunications services. There is a drive towards innovation linkages across sectors, with strong university-industry R&D collaboration.	Businesses are not digitally ready, with a lack of online presence, limited training opportunities and insufficient GERD[20] financing.
People/ Skills	**"To meet demand, AI expertise is coming from China and India, and is focused in financial services & eCommerce"** Digital Expert (SME), operating within Indonesia	The quality of education is low, in part due to a lack of public funding. Difficulties in attracting and retaining talents is hampering the growth of AI/MBD.

Global Innovation Index 2022

Selected dimensions

Indonesia has improved its ranking significantly over the last decade, moving up more than 20 ranks

Overall rank	Infrastructure	Institutions	Knowledge and technology outputs	Human capital and research	Business sophistication
75/132	46th	71st	78th	90th	92nd

Network Readiness Index 2022

Overall rank	Technology	Governance	People	Impact
59/131	48th	64th	66th	67th

45th
Future technologies

Indonesia is expected to have the fourth highest economic impact of AI within Southeast Asia by 2030[21]

$366bn Anticipated contribution of AI to GDP

12% Expected GDP uplift as a result of implementing AI

21. Gross domestic expenditure on research and experimental development (GERD) is the sum of financial resources used for the execution of research and experimental development works undertaken by the public sector and by the business enterprise sector.
20. Kearney. (2020). Racing towards the future: artificial intelligence in Southeast Asia.

There are multiple opportunities for impact in Indonesia across the AI4I Framework

Potential AI/MBD impact areas for use cases

	Opportunity[22]	Details	Relevant barriers and considerations
1	**Smart infrastructure for cities and mobility**	**Relevant Subthemes:** *Integrated Transport Systems* Using MBD to map mobility throughout major cities, to inform future infrastructure planning (e.g. Nusantara)	
2	**Sensors and monitoring systems for city assets**	**Relevant Subthemes:** *Smart Asset Management* Using MBD from mobile devices and purpose built sensors to monitor public assets	Requires adoption of mobile sensors by participants
3	**Network energy consumption saving**	**Relevant Subthemes:** *Utilities, Climate Resiliance* Incorporating clean energy supply into grids and optimising utilization and performance	
3	**Proactive flood detection**	**Relevant Subthemes:** *Emergency Response, Early Warning Systems, Climate Resilience* Using AI, sensors, data logging, real-time connectivity and smart cameras to anticipate flooding	
4	**Food stock prediction and digitization of agricultural land**	**Relevant Subthemes:** *Agritech* Lerveraging aggregate data from sensors and mobile devices to better plan future food production quantities	Requires adoption of mobile sensors by paticipants
5	**Intelligent maritime resource planning and mobile data integration**	**Relevant Subthemes:** *Transport, Logistics and Supply Chain* Leveraging aggregate data from sensors and mobile devices to better inform planning for maritime assets	Requires adoption of mobile sensors by paticipants
6	**Artificial intelligence for smart credit scoring**	**Relevant Subthemes:** *Mobile Financial Services* Leveraging MBD and AI to build credit scores for populations where more traditional methods of credit scoring are not possible	
7	**Interactive learning systems and personalized learning**	**Relevant Subthemes:** *Education and Access* Using MBD to assess, quantify and map populations so as to better inform regional needs and inform more effective education platforms/services	Domestic infrastructure may not enable continuous connectivity in non-urban areas
8	**Virtual & remote health monitoring and delivery**	**Relevant Subthemes:** *Health Responsse Planning* Using AI / MBD to track the spread of disease, deliver rapid vitual care (including via chatbots) and patient monitoring e.g. for COVID-19	Domestic infrastructure may not enable continuous connectivity in non-urban areas

- Cities and public infrastructure
- Climate change & environment
- Managing disasters
- Industry and commerce
- Social inclusion

22. Opportunities identified through desk research and interviews.

Reducing the population's vulnerability to natural disasters is a pressing need for Indonesia, where AI/MBD can contribute

Why is AI-enabled proactive flood detection important for Indonesia?

- 76 million Indonesians live in areas at high-risk of flooding[23]
- The 2007 floods in Jakarta killed 79 people and caused ~USD 600m damage[24]
- The average annual cost of flooding is estimated to rise 400% by 2050[25]
- Impact will be in anticipating events, informing emergency response efforts, and minimising losses in real-time

Opportunity	Main stakeholder/ owner	Impact area(s)	Description	Rationale for selection
Proactive flood detection	XL axiata	**Climate Change and Environment** **Managing Disasters**	The proactive flood detection use case leverages mobile sensor networks to monitor and evaluate water levels in dams, sewers and water ways, and groundwater levels, and leverages AI to predict flooding events. There is an opportunity for MNO XL to build flood sensing APIs, either under a commercial license or for public-access funded by government investment in flood-detecting sensor networks.	✓ Potential social and environmental impact on human lives and economies of high flood-risk areas ✓ Strong value proposition for government and owners of susceptible large infrastructure gives a path to commercial sustainability ✓ Existence of use case champion ✓ Proof of concept delivered for Jakarta district ✓ Considerable scaling opportunities in other flood-prone municipalities in Indonesia and across Southeast Asia.

23. Rentschler, J., Klaiber, C., Vun, J. (2021). Floods in the neighborhood: Mapping poverty and flood risk in Indonesian cities, World Bank blog.
24. Water Science Policy. (2021). Is Jakarta flood-resilient or are the citizens? Prevention Web Blog.
25. Januriyadi, N. (2020). Indonesia: Jakarta's flood costs will increase by 400% by 2050, research shows. Prevention Web Blog.

3.2. Malaysia

Malaysia's conducive policy environment can facilitate the application of AI/MBD to address development challenges

Country profile

Malaysia

Population: 32.5m
Internet users: 27.4m
Internet penetration rate: 84.2%
Social media users: 28m
Mobile connections: 39.9m

National AI/MBD strategy: Malaysia recently established several policies: the National 4IR Policy (2021) which is the overarching framework for frontier technologies, the Digital Economy Blueprint (2021) which outlines key digital priorities, and the Digital Investments Future5 Strategy (2021) that focuses on investments.

SDG assessment[26]

Sustainable Development Goal	Score	Dashboard	Trend
1. No poverty	100	SDG achieved	On track or maintaining SDG achievment
4. Quality education	92.9	Challenges remain	Moderately improving
11. Sustainable cities and communities	86.1	Challenges remain	Moderately improving
12. Responsible consumption and production	82.1	Significant challenges remain	Moderately improving
3. Good health and well-being	80.5	Major challenges remain	Moderately improving
6. Clean water and sanitation	78.7	Significant challenges remain	Stagnating
9. Industry, innovation and infrastructure	77.4	Challenges remain	Moderately improving
8. Decent work and economic growth	74.9	Significant challenges remain	On track or maintaining SDG achievment
13. Climate action	73.7	Significant challenges remain	Stagnating
16. Peace, justice and strong institutions	70.5	Significant challenges remain	Moderately improving
7. Affordable and clean energy	67.7	Major challenges remain	Moderately improving
14. Life below water	63.9	Major challenges remain	Stagnating
5. Gender equality	57.5	Major challenges remain	Moderately improving
17. Partnerships for the goals	56.8	Significant challenges remain	Stagnating
2. Zero hunger	48.4	Major challenges remain	Stagnating
10. Reduced inequalities	47.4	Major challenges remain	Trend information unavailable
15. Life on land	37.9	Major challenges remain	Stagnating
Country Score	**70.4**		

Dashboard:
- SDG achieved
- Challenges remain
- Significant challenges remain
- Major challenges remain

Trend:
- On track or maintaining SDG achievment
- Moderately improving
- Stagnating
- Decreasing
- Trend information unavailable

26. Sachs et al. (2022). From Crisis to Sustainable Development: the SDGs as Roadmap to 2030 and Beyond. Sustainable Development Report 2022.

The AI/MBD ecosystem is thriving and benefits from strong governmental interest

Assessment of AI/MBD ecosystem and stakeholders

Policies

Malaysia's national policies are providing an enabling environment for increased investment in and adoption of frontier technologies:

- The National 4IR Policy is the overarching framework for frontier technologies, including AI and Big Data, and aligns with the SDGs;[27]
- The Digital Investments Future5 Strategy aims to attract investments and build digital capabilities across AgTech, HealthTech, Digital Economy and FinTech, CleanTech, and EduTech;[28]
- The Digital Economy Blueprint outlines key digital priorities including digitising the public sector, economic competitiveness, digital infrastructure, digital talent, inclusive digital society, and trusted and ethical digital environment. [29]

These policies are supporting innovation and growth, which enables high engagement from the private sector.

Champions

MyDIGITAL Corporation is responsible for implementing the key policies of the government, the National 4IR Policy and Malaysia's Digital Economy Blueprint, and for coordinating efforts between public, private and civil society organisations. MDEC is another lead agency in driving the digital economy agenda and in charge of the Digital Investments Future5 Strategy. It focuses on driving investments, building local tech champions, catalysing digital innovation ecosystems and promoting digital inclusivity.

There are sector-specific champions, such as the Malaysia Smart Cities Alliance, which has a vision for a number of AI/MBD-driven initiatives. i-City, an ICT-based urban development, announced a $2.3 million digital transformation plan to enhance its theme park with a metaverse experience.[30]

The private sector is highly engaged as well. For example, Malaysia announced a $1 billion project to build its first AI park, a partnership between a local company, G3 Global, and China's SenseTime and China Harbour Engineering.[31] The banking and financial services sector has been a leader in innovation and adoption of AI/MBD technologies. Tech entrepreneurship is also flourishing.

Mobile market

The government has reiterated its intention to deploy 5G via a single wholesale network – an approach that will make the country stand out from other markets that will adopt the commercialisation of multiple competing next generation mobile networks.

MNOs consolidation provides an opportunity to scale 5G. Celcom Axiata and Digi.Com expect to complete a $12.1 billion deal to combine their operations by the second half of 2022, subject to regulatory approval. The combined unit will have a market share of 45%. 5G is expected to represent 19 per cent of total mobile connections in 2025, and 69 per cent in 2030, up from less than one per cent today.[32]

27. Economic Planning Unit. (2022). National Fourth Industrial Revolution (4IR) Policy.
28. See MDEC portal: MDEC moves forward with 'Digital Investments. Future5' Strategy.
29. MyDigital (2021). Malaysia Digital Economy Blueprint.
30. GSMA. (2022). The Mobile Economy Asia Pacific 2022.
31. Ibid
32. Ibid

Malaysia's enabling environment is well-performing and can be further enhanced by regulatory reform and talent upskilling

AI/MBD enablers and barriers

	Enabler	Barrier
Infrastructure	Malaysia exhibits positive performance scores in international internet bandwidth, which benefits access to ICT. Usage is also relatively good (e.g. e-participation).	
Technology/ Innovation	The ecosystem is thriving and benefits from high investments in frontier technologies. Malaysia is already a regional leader in AI research publications.	**"Strict compliance guidelines around data-sharing between MNOs limit AI/MBD applications"** Head of Data at Malaysian MNO
Governance/ Institutions	There is operational stability, government effectiveness and good rule of law, which is conducive to business and entrepreneurship.	There is a need to introduce data privacy laws and a regulatory framework related to the use and operationalisation of AI. Strategies and priority areas for AI development lack clarity.
Business/ Economy	There is a drive for innovation linkages across sectors, with strong university-industry R&D collaboration. Startups have access to credit and financing, making it easier to scale. Malaysia's economy is one of the strongest in the region, with high-tech manufacturing and exports, and e-commerce growth.	Businesses are not digitally ready, with a lack of online presence and insufficient training opportunities. Cost-effective AI/MBD offerings and business models are needed.
People/ Skills	**"The government has made significant investments in big data capabilities"** Digital policy SME	Difficulties in attracting and retaining talent, both domestic and international, is hampering the growth of AI/MBD.

Global Innovation Index 2022

Selected dimensions

Malaysia ranks 3rd among the 36 upper-middle-income group economies

Overall rank	Market sophistication	Institutions	Human capital and research	Knowledge and technology outputs	Infrastructure
36/132	26th	34st	38th	39th	41st

Network Readiness Index 2022

Overall rank	People	Technology	Impact	Governance
36/131	35th	36th	39th	40th

28th Future technologies

Malaysia is expected to have the second highest economic impact of AI within Southeast Asia by 2030.[33]

$115bn Anticipated contribution of AI to GDP

14% Expected GDP uplift as a result of implementing AI

33. Kearney. (2020). Racing towards the future: artificial intelligence in Southeast Asia.

Malaysia displays several scalable AI opportunities, from smart city initiatives and improved food security to health planning

Potential AI/MBD impact areas for use cases

	Opportunity[34]	Details	Relevant barriers and considerations
1	**Smart infrastructure for cities and mobility**	**Relevant Subthemes:** *Integrated Transport Systems* Using MBD to map mobility throughout major cities, to inform future infrastructure planning	
2	**Mobility mapping for transportation planning**	**Relevant Subthemes:** *Integrated Transport Systems and Smart Asset Management, Air Pollution* Using MBD to to map travel patterns and volumes to inform transportation planning, air quality considerations and asset management	Requires adoption of mobile sensors by participants
3	**Proactive flood detection**	**Relevant Subthemes:** *Early Warning Systems, Emergency Response, Climate Resilience* Using AI, sensors, data logging, real-time connectivity and smart cameras to anticipate flooding	
4	**Food stock prediction and digitization of agricultural land**	**Relevant Subthemes:** *Agritech* Leveraging aggregate data from sensors and mobile devices to better plan future food production quantities	Requires adoption of mobile sensors by participants
5	**Health facility planning**	**Relevant Subthemes:** *Access, Equality & Security, Health Response Planning* Using MBD and AI to identify populations under-serviced by current health facility placement	
6	**Health response planning for infectious disease**	**Relevant Subthemes:** *Health Response Planning* Using AI / MBD to track the spread of disease, deliver rapid virtual care and patient monitoring e.g. for COVID-19	

- Cities and public infrastructure
- Climate change & environment
- Managing disasters
- Industry and commerce
- Social inclusion

34. Opportunities identified through desktop research and source interviews.

The government has prioritised transport and mobility as areas of interest

Why is AI-enabled transport and mobility important for Malaysia?

- 78 per cent of Malaysia's population live in cities; this rapid urbanisation is putting a strain on the country's urban mobility system[35]
- Transport is the second-leading cause of greenhouse gas emissions in the country, due to by high reliance on private cars[36]
- The existing smart cities agenda, in partnership with the UK government, can be leveraged
- Solutions would be scalable within country through other smart cities initiatives and other transport use cases, and replicable in other countries and other sectors
- Opportunity for MNOs to contribute their data within appropriate business models, with benefits in a range of areas, including air quality and health

Opportunity	Main stakeholder/ owner	Impact area(s)	Description	Rationale for selection
Smart infrastructure for cities and mobility **Mobility mapping for transportation planning**	MyDIGITAL	**Cities and Public Infrastructure** **Climate Change and Environment**	The Government through MyDIGITAL, and aligned with the Smart Cities Alliance, has identified transport and mobility as a priority area for AI and MBD solutions. MBD is ideal for identifying population movement patterns and can provide insights for logistics.	✓ Multitude of potential use cases within the broader impact areas, all with clear social, economic and environmental benefit ✓ Use cases in transport and mobility would have scope to scale across the country, region and beyond, and for methods to be applied in other sectors ✓ Existence of use case champions within MyDIGITAL and the Economic Planning Unit

35. GSMA. (2022). Harnessing technology and data for sustainable urban mobility in Malaysia.
36. Susskind L., Chun J., Goldberg S., Gordon JA., Smith G. and Zaerpoor Y. (2020). Breaking Out of Carbon Lock-In: Malaysia's Path to Decarbonization.

3.3. Thailand

Thailand still faces multiple socioeconomic development challenges, despite relatively good performance towards achieving the SDGs

Country profile

Thailand

Population: 69.9m
Internet users: 48.6m
Internet penetration rate: 69.5%
Social media users: 55m
Mobile connections: 90.7m

National AI/MBD strategy: Thailand's 12th National Economic and Social Development Plan (2017) and its 20-year National Master Plan for Digital Development (2018-2037) describe opportunities for frontier technologies to strengthen the economy and improve quality of life.

SDG assessment[37]

Sustainable Development Goal	Score	Dashboard	Trend
1. No poverty	100	SDG achieved	On track or maintaining SDG achievment
4. Quality education	93.6	Challenges remain	On track or maintaining SDG achievment
13. Climate action	85.7	Significant challenges remain	Stagnating
12. Responsible consumption and production	83.7	Significant challenges remain	On track or maintaining SDG achievment
3. Good health and well-being	79	Major challenges remain	Moderately improving
11. Sustainable cities and communities	77.2	Significant challenges remain	Moderately improving
6. Clean water and sanitation	76.4	Significant challenges remain	On track or maintaining SDG achievment
7. Affordable and clean energy	72.7	Significant challenges remain	Moderately improving
8. Decent work and economic growth	72.5	Significant challenges remain	Moderately improving
16. Peace, justice and strong institutions	70.3	Major challenges remain	Stagnating
10. Reduced inequalities	69.7	Significant challenges remain	Moderately improving
14. Life below water	69.5	Major challenges remain	Stagnating
5. Gender equality	69.4	Significant challenges remain	Moderately improving
15. Life on land	65.4	Major challenges remain	Stagnating
17. Partnerships for the goals	59.2	Significant challenges remain	Decreasing
9. Industry, innovation and infrastructure	58.7	Significant challenges remain	On track or maintaining SDG achievment
2. Zero hunger	57.3	Major challenges remain	Stagnating
Country Score	**74.1**		

Dashboard:
- SDG achieved
- Challenges remain
- Significant challenges remain
- Major challenges remain

Trend:
- On track or maintaining SDG achievment
- Moderately improving
- Stagnating
- Decreasing

37. Sachs et al. (2022). From Crisis to Sustainable Development: the SDGs as Roadmap to 2030 and Beyond. Sustainable Development Report 2022.

The AI/MBD ecosystem is gaining momentum, government commitment is key to future growth

Assessment of AI/MBD ecosystem and stakeholders

Policies

There is an emerging body of digital policies that are signalling government's interest in AI/MBD, including:

- The 12th National Economic and Social Development Plan describes opportunities for frontier technologies and specifically AI/MBD to enhance the nation's economy and quality of life for its people, in line with the SDGs;[38]
- The 20-year National Master Plan for Digital Development aims to enhance Thailand's economic and social development capacity through digital technology. It focuses on six priority areas: building trust in digital technology, building country-wide high-capacity digital infrastructure, boosting the economy with digital technology, creating a knowledge-driven digital society, developing a digital government, and upskilling the workforce.[39]

Other laws were introduced in the past few years to facilitate, protect and create a secure digital ecosystem for both consumers and digital providers.

Champions

There are government champions such as the Ministry of Digital Economy and Society, the Digital Government Development Agency, the Digital Economy Promotion Agency, and the Data Innovation and Governance Institute.

Recently, the Tourism Authority of Thailand, together with the provinces of Chanthaburi, Rayong, and Si Sa Ket, has launched the 'Amazing Thailand Metaverse: Amazing Durian project'. The virtual travel experience was specially created to attract a new sector of tourists using the metaverse platform.[40]

The private sector is driving investments in frontier technologies – Thailand enterprises rank first in Southeast Asia with respects to R&D expenditure. Private sector champions include OxygenAI (software development), Jitta (financial services) K Plus (mobile banking services), SCB Abacus (financial services).[41]

Mobile market[42]

Thailand's mobile market is highly concentrated with three operators holding more than 96% share. AIS is the industry leader; the two other major MNOs – TrueMove and DTAC – are in the process of merging, which will allow the new entity to have a market share of 53 per cent and to scale 5G.

MNOs drive 5G enterprise opportunities. AIS has announced a collaboration with Tata Consultancy Services (TCS), which combines AIS's expertise in connectivity with TCS's background in IT consulting to develop 5G-enabled IoT offerings for enterprises in Thailand. Solutions will be jointly marketed to customers in sectors such as manufacturing, logistics, smart cities and transportation.

In March 2022, Dtac launched a new solution for SMEs in Thailand to protect business information and personal data from cyber threats.

38. Office of the National Economic and Social Development Board. (2017). 12th National Economic and Social Development Plan.
39. See Thailand Digital Economy and Society Development Plan. ITU Presentation.
40. GSMA. (2022). The Mobile Economy Asia Pacific 2022.
41. International Institute of Communications. (2022). Artificial Intelligence in the Asia-Pacific Region.
42. GSMA. (2022). The Mobile Economy Asia Pacific 2022.

Thailand is benefiting from good digital infrastructure, a thriving innovation ecosystem and investment from the private sector

AI/MBD enablers and barriers

	Enabler	Barrier
Infrastructure	Thailand exhibits positive performance scores in international internet bandwidth, which benefits access to ICT, and usage is good. Mobile infrastructure to enable scalable AI/MBD initiatives is developing.	
Technology/ Innovation	An increasing level of awareness of emerging technologies is driving large scale operationalisation of AI tools across industry sectors, with application to some public sector functions. Industry growth hubs are emerging as focal points for adoption of frontier technologies.	**"What is missing in Thailand, and throughout the region, is a consistent approach to data sharing. This would require standardisation and regulation of data policy"** Senior Analytics Executive at a Thai MNO
Governance/ Institutions		The regulatory environment is relatively weak in Thailand, characterised by a lack of standardised set of AI strategies, regulations and guidelines.
Business/ Economy	Businesses have heavily invested in telecommunications services and been involved in GERD. There is a drive for innovation linkages across sectors, with strong university-industry R&D collaboration. Startups have access to credit and financing, making it easier to scale. Thailand's economy also benefits from strong high-tech manufacturing and exports, and e-commerce growth.	The economy is still characterised by low levels of ICT services imports and exports, limited FDI net inflows and a lack of knowledge-intensive employment. More sustainable and cost effective business models for AI/MBD offerings in market are needed.
People/ Skills		Lack of digital skills and difficulties in attracting and retaining talent is hampering the growth of AI/MBD. The education system is low-performing, due to lack of public funding and an inadequate pupil-teacher ratio.

Global Innovation Index 2022
Selected dimensions

Thailand ranks 5th among the 36 upper-middle-income group economies

43/132	27th	43rd	54th	71st	78th
Overall rank	Market sophistication	Knowledge and technology outputs/Business sophistication	Infrastructure	Human capital and research	Institutions

Network Readiness Index 2022

46/131	45th	46th	47th	48th
Overall rank	People	Impact	Technology	Governance

52nd
Future technologies

Thailand is expected to have the fourth highest economic impact of AI within Southeast Asia by 2030.[43]

$117bn Anticipated contribution of AI to GDP

13% Expected GDP uplift as a result of implementing AI

43. Kearney. (2020). Racing towards the future: artificial intelligence in Southeast Asia.

There is an opportunity to exploit AI/MBD solutions across several sectors of the economy and society

Potential AI/MBD impact areas for use cases

	Opportunity[34]	Details	Relevant barriers and considerations
1	**Smart Grids**	**Relevant Subthemes:** *Smart Asset Management* Using MBD to inform smart grids to facilitate greater electricity and utility access	
2	**Predictive maintenance and public asset planning**	**Relevant Subthemes:** *Smart Asset Management, Integrated Transport Systems* Leverage MBD and AI to anticipate maintenance and to inform integrated transport planning	Requires adoption of mobile sensors by participants
3	**Flood monitoring and modelling**	**Relevant Subthemes:** *Early Warning Systems, Emergency Response, Climate Resilience* Hydro-meteorological monitoring of flood related data and information to inform flood planning and comms	Inconsistent connectivity in non-urban areas
4	**Smart energy management systems**	**Relevant Subthemes:** *Air Pollution* Data analysis and artificial intelligence for improving energy efficiency in Building Energy Management	
5	**Forest monitoring systems**	**Relevant Subthemes:** *Climate Resilience* Automating carbon capture & carbon credit process leveraging satellite imagery, AI & sensor networks	Requires adoption of mobile sensors by participants
6	**Food Stock Prediction and Digitization of agricultural land**	**Relevant Subthemes:** *Agritech* Leveraging aggregate data from sensors and mobile devices to better plan future food production quantities	Requires adoption of mobile sensors by participants
7	**Automated tourism**	**Relevant Subthemes:** *Tourism, Retail & Manufacturing* Analysis and automation of tourism promotion and engagement using mobile data	Shortage of AI/MBD skills may limit degree of implementation
8	**Smart financial inclusion**	**Relevant Subthemes:** *Mobile Financial Services, Access, Equality & Security* Artificial intelligence to identify opportunities for innovation funding and financial inclusion	
9	**Interactive learning systems**	**Relevant Subthemes:** *Inclusive Education* Using AI/MBD to build interactive and personalised learning systems to upskill and train in priority areas (ICT)	

- Cities and public infrastructure
- Climate change & environment
- Managing disasters
- Industry and commerce
- Social inclusion

44. Opportunities identified through desktop research and source interviews.

Forest monitoring systems emerged as a promising AI/MBD use case

Why is AI-enabled forest monitoring important for Thailand?

- Thailand is heavily reliant on emission-generating fossil fuels to meet its energy needs[45]
- Since the heavy deforestation up to the 1980s, Thailand's forest clearance has stabilised though some contention about management practices remains
- Thailand's Government leads in Southeast Asia in technical readiness for a domestic carbon market, for which this solution could play an important role
- TrueDigital's analytics workforce can be leveraged to building a scalable business model

Opportunity	Main stakeholder/ owner	Impact area(s)	Description	Rationale for selection
Forest monitoring systems	truedigital	**Climate Change and Environment** **Industry & Commerce**	The forest monitoring systems solution uses satellite images, other sensor data and AI to quantify the amount of carbon in a forest or other natural environment. The introduction of such a model would dramatically increase the ability of government and other organisations to value the carbon capture potential of a particular area of forest and track any change over time, such that its carbon value could be traded.	✓ Novel approach through the integration of AI/MBD into monitoring carbon sequestration in forests ✓ Clear environmental and social benefit and economic impact ✓ Clear path to commercial sustainability, and considerable scaling opportunities within Thailand, Southeast Asia and beyond ✓ Existence of use case champion

45. IEA. (2021). The Potential Role of Carbon Pricing in Thailand's Power Sector.

4. Use cases deep dives

4.1. Proactive flood detection in Indonesia

An AI-based proactive flood detection solution may materially benefit 76 million Indonesians living in high-risk flood zones

Use case summary

Proactive flood detection

Solution: Mobile sensor networks to monitor and evaluate water levels in dams, sewers and water ways, and groundwater levels, and leverages AI to predict flooding events. There is an opportunity for MNOs to build flood sensing APIs, either under a commercial license or for public-access funded by government investment in flood-detecting sensor networks.

Impact: The capacity to better anticipate floods and alert citizens will mean more effective emergency response, less injury and loss of life and property. Given the average annual cost of flooding across Indonesia is expected to increase by 400% by 2050, increased flood resilience will have considerable human and financial benefits in the long term. Beyond Indonesia, an estimated 956 million people throughout Southeast Asia live in high-risk flood zones, suggesting scale and replication opportunities.[46]

Relevant themes

- Climate Change and Environment
- Managing Disasters

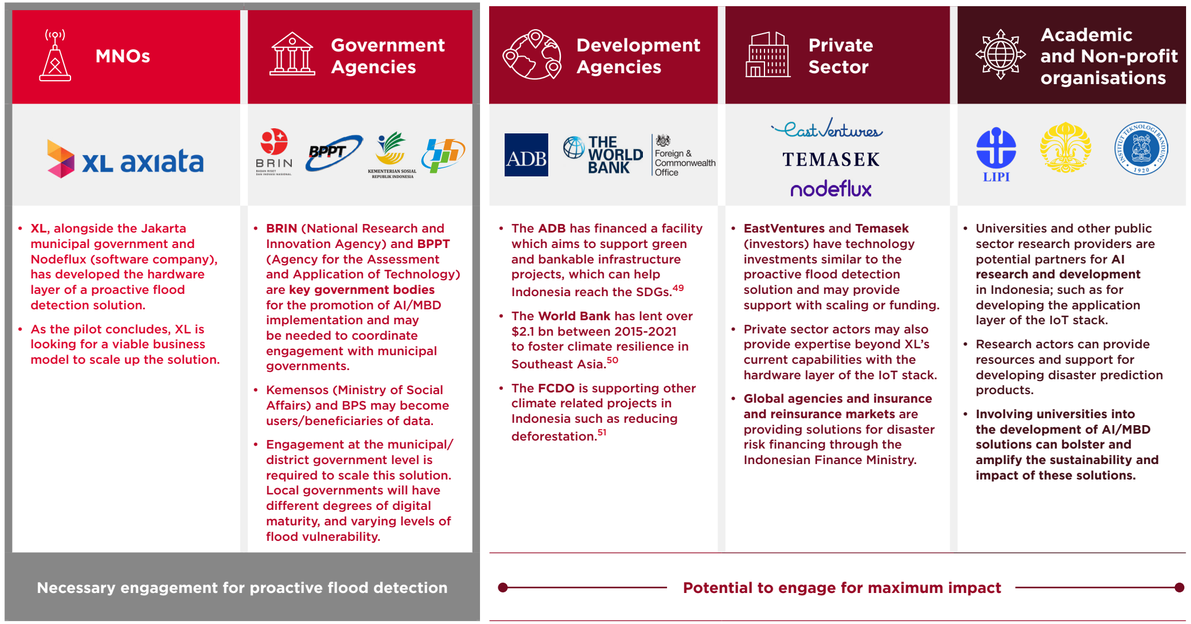
Ecosystem participants and roles[47]

	The need	From data... to actionable insight			From insight... to impact
	Demand side	Supply side[48]			Demand side
High level AI4I use case	**Problem Statement** Flooding is a regular problem across many parts of Indonesia, causing damage to public, private, and commercial infrastructure. Proactive measures are necessary to mitigate flood risks and alert citizens.	**Processing** Real-time data from a sensor network (including smart cameras) captures water levels in dams, sewers and waterways, and groundwater levels.	**Analytics** Data is continually processed and monitored by machine learning algorithms. Increases in water levels are identified.	**Packaging** Updated quantitative analytics outputs are packaged into a format suitable to be fed into city-level data centres.	**Apply/integrate/ implement** Data centres integrate data into an application layer, which is used to anticipate flooding and generate proactive flood warnings. The approach may be applied to other areas (such as landslides).
Stakeholders	Government Agencies Development Agencies	Government Agencies MNOs			Development Agencies
		Academic and Non-profit organisations Private Sector			

It may take 1-2 years to generate sufficient data to properly train an AI model. But depending on the most suitable business model, XL could create a solution which covers the entirety of the IoT stack, or limit its activity to select components (such as the hardware layers).

46. Rentschler, J., Klaiber, C., Vun, J. (2021). Floods in the neighborhood: Mapping poverty and flood risk in Indonesian cities, World Bank blog.
47. See GSMA Digital Toolkit.
48. See GSMA. (2019). Big Data for Social Good: Technical Considerations.

Government engagement is vital for flood detection solutions, broader ecosystem engagement will drive greater impact



49. ADB. (2022). $150 Million ADB Loan to Support Green Recovery, Catalyze Financing Toward SDGs in Indonesia. ABD News Release.
50. World Bank. (2021). South Asia Builds Climate Resilience, With Steadfast Support from IDA. World Bank Blog.
51. See FCDO Development Tracker.

The government is taking a lead in promoting innovation and can champion specific AI/MBD projects

Enabler	Implications
Proof of concept delivered	The proactive flood detection concept has been proven in a project with AI firm Nodeflux[52] and the municipal government of Jakarta.
Partnership opportunities	Partnerships may be leveraged to build complementary capabilities where gaps exist (e.g. in application layer IoT stack development). This was demonstrated by the partnership with Nodeflux.
Alignment with existing programmes	The proactive flood detection use case is strongly aligned to the "smart infrastructure pillar" of Indonesia's Smart Cities programme, which may generate interest from government stakeholders.
Clear social environmental, and economic impact	There is strong evidence of the negative impact of floods in Indonesia, which shows the relevance of developing solutions to prevent them and mitigate risks.

Barrier	Implications
Capability and skills for product development	XL's current primary expertise is within the hardware and big data layer of the IoT development stack. To create tailored IoT applications, XL still need to explore options for partnering or building internal capability through recruitment and/or development.
Lack of sustainable business model	A sustainable business model is still being determined and there is a need to clarify how the solution can be scaled. It will also take time to build the data with which to train any model. The value proposition relates to averting the potential impact of flooding on human life and/or on public and private infrastructure. Revenues would need to cover the cost of installing sensor networks or for accessing network data which could be made available through a public API; or XL could manage the API themselves. Privacy considerations will also need to be understood and managed appropriately.
Limited stakeholder engagement	Disaster management largely falls within the remit of municipal and district governments. There is a need to raise awareness of this use case opportunity across these government levels data centres in order to scale the solution.

52. International Institute of Communications. (2022). Artificial Intelligence in the Asia-Pacific Region.

Effective partnerships and financing are needed for the sustainability of the proactive flood detection solution

Business model analysis

	Current state	Required to progress
Value proposition	The solution monitors real-time data from sensor networks to capture water levels and anticipate when a flooding event will occur. It can help inform disaster preparedness and response efforts and mitigate against damage to human life and to public and private infrastructure. For instance, XL can send real-time SMS alerts to affected communities.	There is an opportunity to partner with government departments to create flood monitoring APIs, which may be accessed by other actors (e.g. startups) and turned into applications. Alternatively, partnerships with AI companies may allow for the development of full stack solutions. The value proposition can be leveraged across other disasters areas, such as landslides, and in other countries and sectors.
Users	The solution is currently only used by the municipal government of Jakarta.	To scale the solution, prospective users need to be identified in other municipal/district governments (data analytics teams for example, or those responsible for emergency response), or large private enterprises with infrastructure prone to flood risk.
Investment	The sensor network has only been funded by the municipal government of Jakarta. Scaling the solution requires further investments into sensor hardware.	Depending on the business model chosen, XL may seek to secure investment from government partners, or consider other potential funding streams, such as impact investors and development partners.
Costs	XL is incurring project costs for the purchasing, installation and maintenance of hardware. It is also developing the analytics and associated IT operating costs (e.g. for data centres).	Contingent on the business model, additional costs may be incurred in the upper layers of the IoT stack, such as data analytics and application layers.
Revenue streams	XL's current project operating costs are not being covered. Some of the costs for installation and maintenance of hardware have been covered by the government.	Revenue may be generated through government and/or private sector subscription to the network and insights and alerts generated by it, as well as monetised APIs. Further development of the business model will help identify additional revenue streams in the market.

4.2. Transport and mobility in Malaysia

In Malaysia, AI/MBD solutions can play a key role for sustainable transport planning and reduction of emissions

Use case summary

Government-led prioritisation

Solution: The Government through MyDIGITAL, and aligned with the Smart Cities Alliance, has identified transport and mobility as a priority area for AI/MBD solutions. MBD is ideal for identifying population movement patterns and can provide insights for logistics.

Impact: Integration of AI/MBD into transport planning stands to inform more effective infrastructure and reduce emissions from traffic congestion, which also benefits air quality. There is potential for scale, by widely promoting the solutions and encouraging behaviour change.

Relevant themes

- **Cities and Public Infrastructure**
- **Climate Change and Environment**

Ecosystem participants and roles

High level AI4I use case	The need	From data... to actionable insight		From insight... to impact
	Demand side	**Supply side**		**Demand side**
	Problem Statement Traffic congestion impacts the economy and environment. Partnerships, data integration and the skills that could deliver solutions are under-realised.	**Processing** The solution relies on multi-modal mobility data from people and vehicles, smart image data, and environmental data (air quality, temperature, and rainfall data).	**Analytics** Data from these multiple real-time data streams can be integrated and used to provide a system view of transport and mobility.	**Packaging** Integrated data can generate outputs that give real-time (and potentially predictive) insights into traffic flow, public transport demand, safety and air quality.	**Apply/integrate/ implement** There is scope to integrate (automated) public transport and mobility solutions for buses and rail, ride-sharing, smart parking, electric vehicles, dynamic toll pricing, safety and air quality monitoring solutions.
Stakeholders	**Government Agencies** **Development Agencies**	**Government Agencies** **MNOs**		**Government Agencies** **Academic and Non-profit organisations** **Private Sector** **Development Agencies**	

Opportunities abound for collaboration and partnerships between government, MNOs and others from the private sector. They can all provide data and benefit from integration and insights to solving a range of specific problems.

Sustainable and impactful solutions for transport and mobility require cross-sector collaboration

	MNOs	Government Agencies	Development Agencies	Private Sector	Academic and Non-profit organisations
Key Entities	TM ONE, U mobile, digi, maxis, celcom	MyDIGITAL, MTDC, MDEC, Kementerian Pengangkutan Malaysia	ADB, The World Bank, JICA, giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Foreign & Commonwealth Office	eMcoVit, SMART PARKING, fn founders NETWORK	Universiti Teknologi Malaysia, MMU Multimedia University, The National University of Malaysia
Details	• MBD gives real-time information from individuals for traffic management and planning (prediction and detection models forecasting traffic issues) and optimisation of public transport systems for better efficiency and sustainability. It can also be used for managing the logistics of transporting goods and freights. • MNOs drive innovation and experimentation, develop data infrastructure and data governance (with government).	• MyDIGITAL plays a leading role in AI-solutions for transport and mobility, together with Malaysia Digital Economy Corporation and other government agencies, such as The Ministry of Transport or the Malaysian Technology Development Corporation, to continue building the ecosystem: — Develop the AI agenda. — Allocate resources. — Promote long term changes in education and build future workforce. — Establish testbeds and an innovation mindset; help make them pervasive across business and other sectors.	• Several international development organisations are already providing funding for transport and mobility projects in Malaysia (e.g. improving infrastructure and logistics), to make transport systems more efficient and mitigate the effects of climate change. • Investments can unlock value through different use cases, and in sectors and geographies. • Donors/other international investors, can leverage expertise from other markets.	• As well as industry-specific companies such as eMoovit (autonomous vehicle software solution) and Smart Parking (car parking technology business), there is a growing range of AI companies providing products and services across machine learning, NLP, big data, data science, software engineering. • There is a growing ecosystem of entrepreneurs and startups being supported by organisations such as the Founders Network. • Opportunity to engage in impactful innovation can deliver an enhanced employee value proposition for data scientists.	• A number of universities are developing programmes in AI and data science, such as: — University of Technology. — University of Science. — Multimedia University. — The National University of Malaysia. • Programmes can better align with the needs of the industry and society, both in research to ensure real problems are being addressed, and in education to ensure trainings are well-tailored and targeted. • In line with its mandate, the Intelligent Transport System Association of Malaysia can also provide significant support for this use case.

Necessary engagement for transport and mobility

Potential to engage for maximum impact

The government is taking a lead in promoting innovation and can champion specific AI/MBD projects

Enabler	Implications
Malaysia's smart city initiative and AI-related policies	There is growing momentum around AI and data-driven projects, with the smart cities programme providing an opportunity to leverage a growing AI/MBD ecosystem.
Champions in government and the private sector	Across the key agencies such as MyDIGITAL and MDEC, and throughout the private sector, there are a number of champions who are supporting and promoting digital and technological advances.
Collaboration between government and the private sector	There are an increasing number of examples of cross-sector collaborations and partnerships in Malaysia. The smart cities programme is fostering collaborations between the public and private sectors and with partners in the UK and elsewhere.
Platforms for collaboration and experimentation	Government is supporting the establishment of testbeds and innovation hubs in cities, for collaborative experimentation and innovation.

Barrier	Implications
Need to specify a use case and potential impact	There is still a need to specify a precise solution and prove its value to develop a stronger understanding of the potential impact - social, environmental or economic – and to build an adequate business model.
Need to develop solutions based on context-specific priorities	The government will get the best outcome by focusing on specific needs rather than bringing an existing solution that may not be adequately tailored to the specific context. Diverse transport experts should be engaged in identifying and prioritising the use case, before the government can select the appropriate lead.
Need funding to initiate and develop a new project	Once a specific solution is identified, a funding mechanism needs to be established, including for a specific pilot. A proof of concept needs to be developed, and should include models for engagement and potential partnership between the government and other key stakeholders.
Lack of models and regulations for using and sharing data	There is an opportunity to be more consistent with policy and regulation of data use over time. A more stable and transparent data environment will increase trust with MNOs, the public and other organisations, and support the realisation of greater value from data analytics.
Narrow pool of AI talents	There are still challenges in the ecosystem around developing, retaining and attracting talent in AI and related areas.

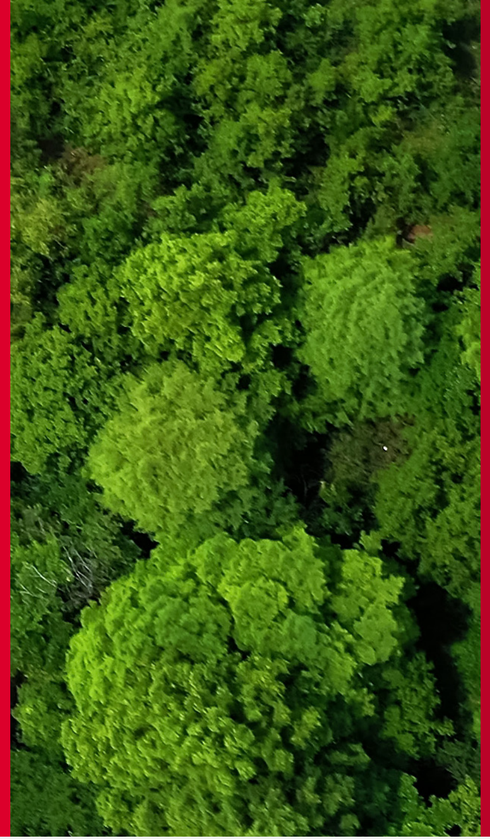
To succeed, the government and MNOs must identify a specific solution and build its value proposition

Business model analysis

	Current state →	Required to progress
Value proposition	Any specific AI/MBD use case in transport and mobility is likely to have a significant value proposition, because the negative impacts of poor urban mobility are clear. Traffic congestion, congestion, whether caused by over-dependence on private vehicles or poor infrastructure planning, has a major effects on the economy and the environment.[53]	Identifying a specific use case with a focused and tailored value proprosition for citizens, the private sector and the government is the next key step.
Users	Potential users are those living in urban areas and regularly using transport and mobility infrastructure and services.	Determining the needs of users will be part of the development of the use case. The solution should be responsive to the specific needs arising from different segments of society.
Investment	Time has been invested in the process, although it has not yet led to any tangible investment. However, the government has separately invested in a range of AI and data-driven initiatives and strategy development.	A staged investment can be made over time, starting with the initial process of identifying a use case and raising awareness to attract partners. Further investment would need to be sourced to pilot or implement the specific solution, and to scale it. Investment could come from the government, industry or any other third party.
Costs	Specific AI/MBD use case and business case are still being determined.	Likely costs will include those for running the process to identify a use case and formalising the collaborative arrangements, as well as those costs for access to data, data processing, analytics, integration, product development, training and implementation of a solution.
Revenue streams	The existing smart cities activities indicate potential revenue streams, whether for the government or for private sector players.	An objective in choosing a use case would be to ensure there is a sustained business model. Revenues would flow to either public or private entities depending on the use case.

53. GSMA. (2022). Harnessing technology and data for sustainable urban mobility in Malaysia.

4.3. Forest monitoring systems in Thailand



Effective forest monitoring systems for Thailand will expedite and automate labour intensive carbon sequestration assessments

Use case summary

Forest monitoring systems

Solution: The forest monitoring systems solution relies on satellite images, other sensor data and AI to determine the amount of carbon in a forest or other natural environment. The introduction of such a model would dramatically increase the ability of governments and other organisations to value the carbon capture potential of a particular area of forest and track any change over time, such that its carbon value could be traded.

Impact: Thailand's ongoing forest rehabilitation work would benefit from automated, cost-effective monitoring. Deforestation has a significant impact on greenhouse gas (GHG) emissions. The emergence of carbon offset initiatives and carbon trading markets domestically would allow for further positive environmental, economic and industrial impacts in Southeast Asia and beyond.

Relevant themes

- Climate Change and Environment
- Industry & Commerce

Ecosystem participants and roles

High level AI4I use case

The need	From data... to actionable insight			From insight... to impact
Demand side	**Supply side**			**Demand side**
Problem Statement The current process of carbon capture assessment is heavily manual; people need to be on the ground to physically collect data. To date, AI methods have also faced limitations and challenges.	**Processing** Satellite images from forests can be used to estimate the size and age of vegetation in forest. Data from sensors can be used capture the amount of carbon in a forest.	**Analytics** Data from processed satellite images are compared, and used to approximate total carbon sequestration of area over a specific time period.	**Packaging** Carbon sequestration approximation data is packaged as a continually updated, static quantitative data product.	**Apply/integrate/ implement** Carbon sequestration data can show the change in carbon levels in forests over time, which can be used to support the issuance and trading of carbon credits.

Stakeholders

- Government Agencies
- Development Agencies
- Private Sector
- MNOs
- Academic and Non-profit organisations
- Government Agencies
- Development Agencies
- Private Sector

Public sector and academic stakeholders will be vital in leveraging forestry data sets, conducting proof of concept research, informing processing and analytical methods (especially given it is such a challenging AI problem space), and legitimising the use case.

The ongoing deployment of forest monitoring systems requires close collaboration with government agencies

54. World Bank (2021). Supporting Thailand's Climate Goals through the World Bank Partnership for Market Readiness.
55. See ADB's Work in Thailand.
56. See FCDO Development Tracker.
57. Bloomberg. (2021). Thai Companies Plan Exchange for Carbon Credits, Emulating China.

Mobile Network Operator True has an opportunity to benefit from CP Group's position in the emerging carbon credits market

Enabler	Implications
Emerging market for carbon credits within Thailand	The emergence of organisations such as the Carbon Markets Club have encouraged voluntary emissions-offset programmes, which will continue to drive carbon credit markets.
Strong connection of CP Group within Carbon Markets club; potential to access funding	CP Group's commitment to voluntary emissions-offset incentivises carbon credit cost reduction. This use case will allow for cheaper sequestration measurement and potentially reduce credit cost.
Potential emergence of international/ regional carbon markets	Following COP26, a number of countries agreed to rules that include important requirements and safeguards for the emergence of international carbon markets[58] to encourage continuing investment in sequestration methods. Regional Dialogues on Carbon pricing (redicap) have already emerged within Southeast Asia.[59]
Lower cost of implementation/ speed to scale	Although some manual data still needs to inform the AI model, once trained, implementation costs for using it at greater scale and in areas where physical access is difficult, will be reduced.

Barrier	Implications
Need to train new model on local Thai data	There are differences in the types of vegetation data used to train AI in different countries, making it difficult to leverage pre-existing forest monitoring AI.
Limited access to forestry data	Legislation currently restricts access to government data if used for commercial purposes, which restricts access to forestry data and hinders the AI training process.
Need to develop business model	There is a need to develop a business model that captures the challenges and risks of accessing robust forestry data to train and test AI, whether that data comes from the government or other sources.
Need for specific expertise and increased government involvement	Developing carbon sequestration approximations requires forestry-related subject matter expertise. It is likely that the solution will require engagement with and/or support from the Ministry of Natural Resources and Environment and constituent departments. In addition, government awareness of opportunities should be further strengthened.
MNO AI capacity constraints	Given that TrueDigital primarily handles analytics for TrueMove, there is the potential that technical and capacity constraints persist as work progresses.

58. Leeds, C. (2021). How Asean economies can capitalise on carbon markets to reduce emissions and turbocharge growth.
59. See UNFCCC

Access to data and investments are needed to build an effective and sustainable solution and expand to the carbon trading market

Business model analysis

	Current state	Required to progress
Value proposition	The solution is currently in early stages of development, and requires a Thailand forestry specific dataset to effectively train the AI prior to commercial application.	Integrating one or more forestry datasets is required to build effective and robust forest monitoring AI, and further consultation with forestry SMEs will be needed to inform the analytics and determine the packaging components of the solution.
Users	CP Group is currently the primary user.	There would be a range of users, from the government to any public or private organisations with large emissions footprints, both for the tool itself and for the subsequent carbon credits and other forestry-related opportunities.
Investment	The solution currently requires limited investment. TrueDigital is attempting to leverage data from the government and Mae Fah Luang Foundation.	Investment may be required to collect additional satellite imagery and supplementary data to inform more effective AI.
Costs	Current costs are allocated to human resources, data access and storage (of satellite images), analytics (including computing) and model building, training and validation. There are also costs associated with working with partners to access forestry data.	Additional costs will be incurred to access or build datasets required to train AI, along with all the current data storage and analytics costs. If further data is integrated into the solution, investment into sensors and data fusion processes will also be required.
Revenue streams	The solution does not currently generate any revenue.	There is an opportunity to develop a compelling business model to engage and attract private enterprise and government clients.

5. Conclusion and recommendations

There is a significant opportunity to achieve impact and unlock the potential of AI/MBD across sectors and countries

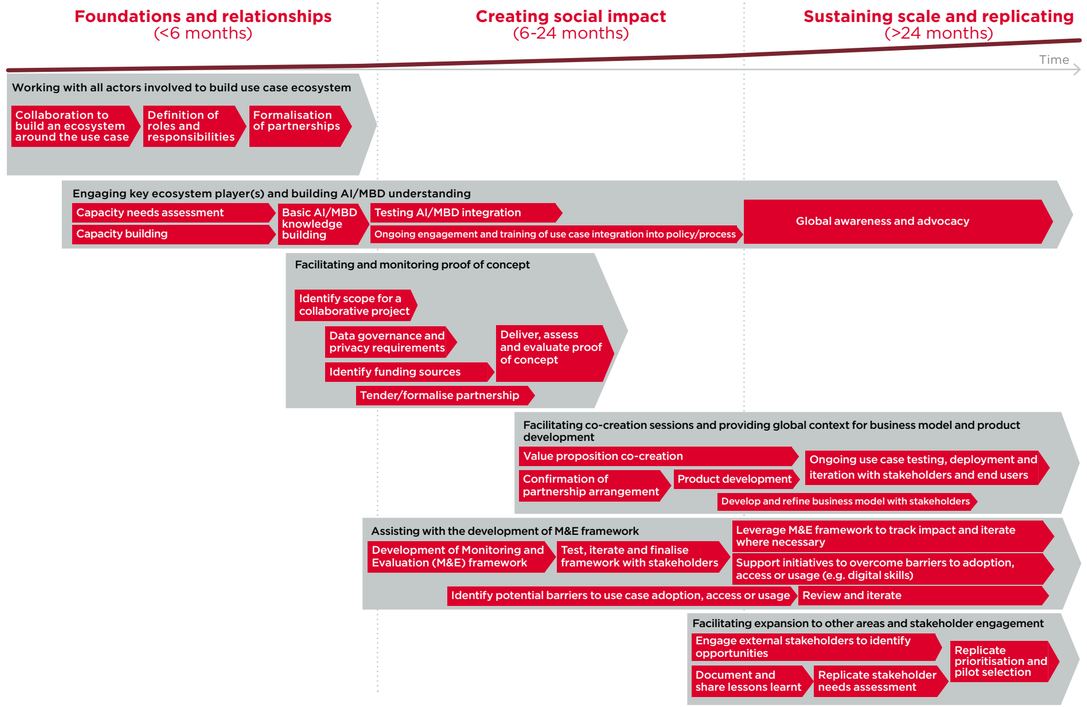
The overall opportunity

This report has identified promising use cases for AI/MBD in Southeast Asia that positively impact the UN SDGs – proactive flood detection in Indonesia, transport and mobility in Malaysia and forest monitoring systems in Thailand – with potential for expansion into other countries. The necessary elements to drive adoption of AI/MBD are present in the broader regional ecosystem, although at early and differing stages of development. Mobile infrastructure is good as is the uptake of basic digital technologies. National strategies for AI are being developed, and across the three countries there are experts and champions in AI/MBD. There is also a growing culture of supporting innovation and entrepreneurship.

Delivering impact

The use cases discussed in this report illustrate the innovative capacity of the mobile industry and the tremendous opportunity for collaborative partnerships across sectors. In the short term, it will be essential to focus on those areas with the greatest opportunities to accelerate progress and expand the use of AI/MBD for sustainable development. Each of the use cases has the potential to deliver significant economic, social and environmental impact across the region. In the long term, greater impact will be realised as the solutions are replicated into different sectors and markets.

Driving execution: from building the foundations to achieving impact through scale and expansion into new areas



A series of shared, critical success factors apply to all use cases

Global awareness

Awareness is key to open the opportunity space and consider the multiple possibilities to apply AI/MBD to solving development challenges.

All actors involved in AI/MBD initiatives, especially national actors, need to be fully aware of the potential for impact of AI/MBD solutions and application opportunities.

Capability and skills

A skilled workforce is one of the building blocks of a thriving AI/MBD ecosystem.

There is a need to develop, retain and attract AI-related talent spanning the full data value chain (software engineering, data analytics, etc), particularly in the public sector.

Business models

Co-developing business models is vital to moving identified opportunities to viable solutions that can be scaled, which builds economic, social and environmental impact.

Supply-side actors and government do not necessarily have experience developing shared value propositions and business models as they lack familiarity with each other's incentives (commercial drivers vs. non-financial value).

Models for collaboration

The development of solutions requires collaboration between government, the private sector and society.

Collaboration must be actively pursued. Leaders across sectors need to be aligned in understanding opportunities and have common incentives.

Policy, regulation and data governance

Policies governing the use of data need to be enhanced and standardised, which will help innovation and scaling.

Supply-side actors and governments could be more aware of regional and global regulatory issues spanning different sectors and focus on improving the enabling environment.

Impact and expansion

Long-term measures of economic, social and environmental impact, and frameworks to monitor and evaluate solutions, are essential to identify gaps and best practices.

Expansion of impactful and sustainable solutions to other sectors can amplify impact.

Key recommendations for scaling AI/MBD in Southeast Asia

Recommendations	Actions	Actors
Raise awareness of AI/MBD	Donor organisations, in collaboration with NGOs and CSOs working in the digital space, have a role to play in raising awareness on how AI/MBD can help achieve the SDGs. Donor organisations should outline the role governments and MNOs can play in driving initiatives and how other ecosystem players can support them to maximise impact. They can also showcase best practices from successful global AI/MBD implementations that are relevant to emerging markets, focusing on models for cross-sector collaboration, product development processes and human centric design for AI/MBD solutions.	Donor organisations, Industry associations, Non-profit organisations
Support the development of use cases and grow the ecosystem	Donor organisations have a key role to play in supporting government and MNOs in developing AI/MBD solutions and accelerate uptake of frontier tech for the SDGs. Key areas for support include conducting needs assessments, initiating partnerships, working with ecosystem partners to identify sustainable business models, and developing and testing new solutions.	Donor organisations, Industry associations
	At the ecosystem level, donor organisations can help establish new ways of working that encourage collaboration and innovation, for instance by creating AI/MBD multistakeholder taskforces and by establishing facilities that deliver in-country support to ecosystem players (e.g. AI Centre of Excellence).	
Implement responsible data policies	Donor organisations should raise awareness on data protection standards and support governments in implementing adequate data policies by providing technical assistance and consulting on regulatory guidelines and frameworks relating to the ethical use and privacy of data. They should also encourage initiatives to align practices at the regional level, to facilitate interoperability and data sharing.	Governments, Donor organisations, Industry associations
	MNOs need to ensure they follow data protection standards. For instance, they should always ensure that data shared for big data analytics is deidentified, randomised and anonymised.	MNOs
Build AI talent for the future	Governments should invest in upskilling people to build a pipeline of talents in AI, data science, engineering and other relevant fields. They should tailor the education curriculum to include digital skills from introductory to advanced levels, and create targeted training programmes for professionals in relevant fields. They could leverage the experience of private sector leaders, such as tech companies as well as non-profit organisations working in the digital space. In addition, governments should promote AI and data science career pathways and create a supporting strategy to attract and retain talents.	Governments
	Donor organisations can support government initiatives and facilitate skills and capacity development programmes to raise the level of AI/MBD literacy, understanding, expertise and practice.	Donor organisations, Industry associations
Monitor and evaluate impact	All actors can work together to co-design frameworks for monitoring and evaluating the success of AI/MBD solutions, including outcome measures that capture economic, environmental and social benefits, and lessons learned, in order to raise awareness, secure investments, and inform policy making.	Donor organisations, Governments, Industry associations MNOs, Non-profit organisations

6. Appendix

Glossary of terms

Application programming interface (API)	Refers to tools that enable a programme to communicate with another programme or operating system, and that help software developers create their own applications.
Artifical intelligence (AI)	AI refers to the use of data to make decisions or perform tasks normally considered to require human knowledge, intelligence, learning and understanding. Such tasks include visual perception, speech recognition and decision-making.
Connectivity	Refers to connection to the internet, either through fixed broadband or mobile broadband, and other communication networks.
Digital economy	Incorporates all economic activity reliant on or significantly enhanced by using digital means including technologies, infrastructure, services and data.
Digitalisation	Enabling or improving processes by leveraging digital technologies and digitised data.
Digital transformation	Refers to the economic and societal effects of digitalisation.
Frontier technology	Frontier technologies (also referred to as emerging technologies) are defined as potentially disruptive technologies that can address large-scale challenges and opportunities. Frontier technologies include AI, big data, blockchain, the Internet of Things (IoT), augmented reality, virtual reality, drones and robotics.
Interoperability	Enables unrestricted data sharing and use between different systems. In an interoperable system, two or more systems can share and exchange data so that it is understood by all systems involved.
Mobile big data (MBD)	Refers to network traffic (from people, sensors and connected devices), combined with wider datasets (such as public data from government agencies, private data from third parties, and traditional data from surveys) harnessed through big data analytics, AI, and machine learning.
Mobile broadband	3G, 4G or 5G technologies.
Usage gap	Populations that live within the footprint of a mobile broadband network but do not use mobile internet.

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