ASEAN-JAPAN CENTRE

ASEAN-JAPAN YOUNG EXPERTS FELLOWSHIP PROGRAMME 2025

Discussion Paper Series
Volume 1 (2025)

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FOREWORD

Dr. Kunihiko Hirabayashi
Secretary General, ASEAN-Japan Centre

The ASEAN-Japan Centre is pleased to present the first volume of discussion papers produced under the inaugural ASEAN-Japan Young Experts Fellowship Program 2025. This initiative reflects the Centre's commitment to cultivating a new generation of scholars and practitioners whose work contributes to strengthening cooperation and dialogue between ASEAN Member States and Japan.

As the ASEAN-Japan partnership continues to deepen, the region faces a rapidly evolving landscape shaped by digital transformation, environmental challenges, and shifting economic dynamics. Addressing these issues requires evidence-based understanding, innovative thinking, and meaningful exchange from involved stakeholders across the region. The Fellowship was established to support young researchers from ASEAN and Japan through small-scale research grants and a platform to share timely insights on key regional issues.

The papers presented in this volume explore a diverse set of themes, including digital transformation, artificial intelligence governance, cybersecurity of critical infrastructure, and decarbonization and carbon credits in ASEAN and Japan region. By combining analytical research with on-the-ground empirical data, these contributions aim to start and inform discussions on ASEAN-Japan cooperation and provide insights relevant to academics, policymakers, private sector and other stakeholders across the region.

Equally important, this series presents the insights from four emerging experts whose work reflects the diversity, dynamism, and fresh perspectives within the ASEAN-Japan knowledge community. Their research demonstrates the importance of interdisciplinary approaches and cross-border collaboration in addressing shared regional challenges.

The Centre extends its sincere appreciation to the fellows for their dedication and intellectual contributions. It is our hope that this series will serve as a valuable resource for advancing dialogue, fostering new research collaborations, and supporting evidence-based policymaking within the ASEAN-Japan partnership.

Through initiatives such as the ASEAN-Japan Young Experts Fellowship Program, the Centre remains committed to strengthening knowledge exchange and empowering the next generation of researchers who will help shape a more resilient, innovative, and sustainable future for ASEAN and Japan.

ABOUT THE ASEAN-JAPAN YOUNG EXPERTS FELLOWSHIP PROGRAMME

The **ASEAN-Japan Young Experts Fellowship (AJYEF)** is an initiative designed to cultivate a new generation of emerging thought leaders and practitioners across key socio-economic domains. The programme fosters interdisciplinary collaboration, policy dialogue, and sustained institutional linkages between Japan and the ASEAN Member States (AMS), strengthening the foundation for long-term regional cooperation.

AJYEF reflects a shared commitment by the governments of Japan and ASEAN to advance a more strategic, forward-looking partnership grounded in "heart-to-heart" relations. As ASEAN and Japan navigate increasingly complex regional and global challenges – from digital transformation and climate change to economic resilience and social inclusion – the need for cross-sectoral and cross-generational collaboration has become more critical than ever.

Recognizing this evolving landscape, the ASEAN-Japan Centre established AJYEF as a platform to facilitate **two-way knowledge exchange** between emerging experts from diverse disciplines. The programme is designed not only to deepen mutual understanding, but also to bridge policy, research, and practice by connecting young scholars with policymakers, industry actors, and regional institutions.

Through initiatives such as **international joint research, policy dialogues, and collaborative knowledge production**, AJYEF aims to advance co-creation between ASEAN and Japan. By supporting the development of innovative, context-sensitive insights, the programme contributes to addressing shared socio-economic challenges and to the realization of a more inclusive, sustainable, and resilient regional future.

MEET THE FELLOWS

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Alfan Presekal is an Assistant Professor at the Computer Engineering, Department of Electrical Engineering, Universitas Indonesia. He is also member of Indonesia Cyber Awareness and Resilient Center (id CARE UI).

He earned his Bachelor of Engineering in Computer Engineering from Universitas Indonesia. During his bachelor years, he also participated in Young Scientist Exchange Program at Tokyo Institute of Technology. He pursued his Master's degree in Secure Software Systems at Imperial College London. He later completed his Ph.D. at Delft University of Technology, the Netherlands, within the Cyber Resilient Power Grids group. His research focused on advanced persistent threat detection and correlation for cyber-physical power systems.

During his PhD, he contributed to major Horizon Europe projects, including HVDC-WISE and COCOON. In 2025, one of his papers was recognized as outstanding publication in IEEE Transactions on Smart Grid. His research interests include cybersecurity, operational technology, artificial intelligence, and cyber-physical systems.

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Mr. Manantan's research has been published in the Australian Journal of International Affairs, Asian Politics and Policy, Issues and Studies, The Cyber Defense Review, and East Asia Forum.

ABSTRACT

This volume brings together four discussion papers produced under the ASEAN-Japan Young Experts Fellowship Program, an initiative of the ASEAN-Japan Centre aimed at fostering emerging scholarship on key issues shaping cooperation between ASEAN Member States and Japan. The papers examine critical dimensions of the ASEAN-Japan partnership – including climate cooperation, cybersecurity resilience, and artificial intelligence (AI) governance and collaboration – offering empirical evidence and analysis into how both sides can deepen engagement in addressing shared regional challenges.

The first paper focuses on cybersecurity threats to critical infrastructure across ASEAN and Japan. As cyber-physical systems in sectors such as energy, transportation, and healthcare become increasingly interconnected, they are also more vulnerable to sophisticated cyber-attacks and advanced persistent threats. Based on surveys and interviews with policymakers, infrastructure operators, and cybersecurity experts, the study assesses current levels of cybersecurity readiness in ASEAN Member States and Japan. It highlights the importance of strengthening technical capacity, institutional coordination, and cross-border information sharing. The paper also examines the growing role of artificial intelligence in improving threat detection, incident response, and overall cyber resilience, emphasizing the need for deeper ASEAN-Japan collaboration to address emerging cyber risks and protect critical infrastructure.

The second paper analyzes evolving cooperation between Indonesia and Japan in carbon markets through the Joint Crediting Mechanism (JCM). Japan's climate policy framework, guided by its updated Nationally Determined Contribution, aims to secure significant volumes of overseas carbon credits by 2030. Indonesia has emerged as a key partner under a Mutual Recognition Arrangement that integrates JCM projects with Indonesia's national carbon registry system. The study highlights growing demand for JCM credits, particularly as Japan prepares to implement its Green Transformation (GX) Emissions Trading System in fiscal year 2026. The research also identifies new opportunities for cooperation in Indonesia's forestry and land-use sectors, including mechanisms such as REDD+ and carbon capture initiatives. However, it also points to institutional coordination challenges between relevant ministries in both countries that must be addressed to effectively operationalize JCM projects in the Forest and Other Land Use (FOLU) sector.

The third paper examines the growing importance of AI governance in digital trade. As AI technologies become deeply embedded in digital economies, effective governance frameworks are needed to ensure transparency, trust, and interoperability across borders. The study reviews recent developments in Japan and Southeast Asia, including Japan's newly enacted AI legislation and ASEAN's regional guidelines on AI ethics and governance. The analysis highlights how these frameworks can support responsible AI development while facilitating digital trade integration. The paper recommends strengthening ASEAN-Japan cooperation to harmonize governance approaches, enhance regulatory interoperability, and support capacity building among ASEAN Member States in managing emerging AI technologies.

The fourth paper explores the broader landscape of ASEAN-Japan cooperation in artificial intelligence. Drawing on interviews with experts and analysis of policy initiatives, the study assesses opportunities and challenges shaping AI collaboration between Japan and Southeast Asia. It argues that Japan's long-standing economic engagement in the region – combined with its technological capabilities and reputation for institutional partnership – positions Japanese companies and start-ups to play a meaningful role in AI research, development, and talent training. At the same time, the paper notes that Southeast Asia has become an increasingly competitive

arena for technological influence amid global geopolitical dynamics. In this context, Japan and ASEAN can leverage their shared strengths in institutional cooperation and norm-setting to build an interoperable regional AI ecosystem that supports innovation while maintaining openness and trust.

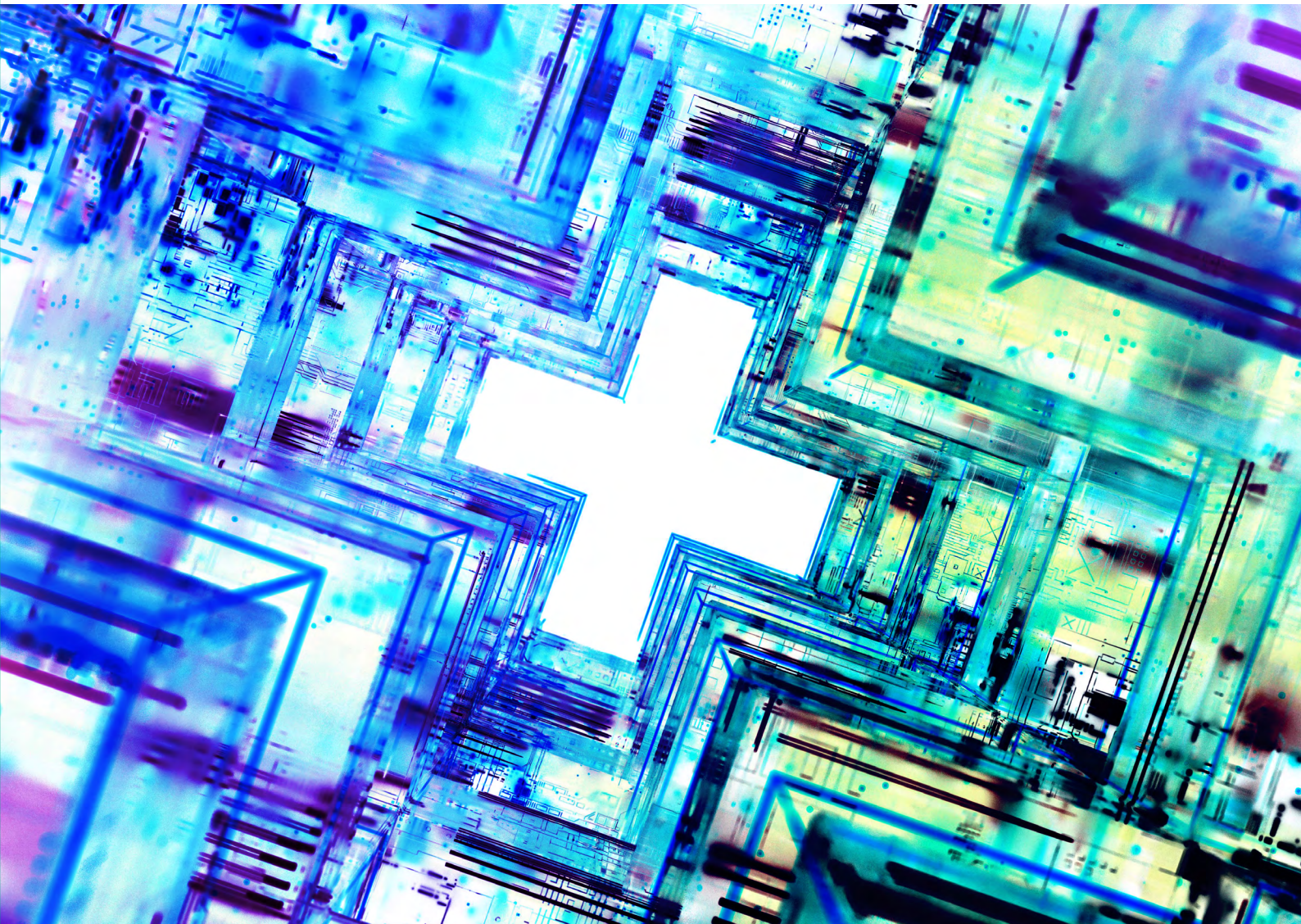
Taken together, the four papers illustrate the expanding scope of ASEAN-Japan cooperation across climate policy, digital governance, and emerging technologies. They highlight the importance of collaborative policy frameworks, regulatory alignment, and knowledge exchange in addressing complex transnational challenges. By bringing forward new perspectives from emerging researchers, this collection contributes to ongoing dialogue on how ASEAN and Japan can strengthen partnerships that support sustainable development, technological resilience, and inclusive regional growth.

CONTENTS

01

ASEAN and Japan Cybersecurity Readiness of Critical Infrastructure in the Age of Artificial Intelligence

Alfan Presekal, PhD



Section Outline

Abstract

Cybersecurity threats targeting critical infrastructure are becoming increasingly sophisticated and pose significant risks to national and regional security. Various incidents worldwide demonstrate how cyber attacks exploit vulnerabilities in cyber physical systems that underpin critical infrastructure sectors such as energy, transportation, and healthcare. These evolving threats underscore the growing exposure of interconnected operational technology and information technology environments to advanced persistent threats and state-sponsored hacktivism. Addressing these challenges requires countries to strengthen their cybersecurity readiness through coordinated strategies that integrate technological, organizational, and policy measures. This report investigates the cybersecurity readiness of critical infrastructure in ASEAN Member States and Japan, with particular attention to existing capabilities, gaps, and cross-border coordination mechanisms. In addition, the study examines the role of artificial intelligence as an enabling technology for enhancing threat detection, incident response, and resilience in critical infrastructure cybersecurity. The research is based on empirical evidence collected through surveys and semi structured interviews with stakeholders from ASEAN countries and Japan, representing government agencies, critical infrastructure operators, and cybersecurity experts. By synthesizing these findings, the report seeks to support and strengthen regional collaboration between ASEAN and Japan from the perspective of critical infrastructure cybersecurity. Finally, the study provides policy and technical recommendations to improve cybersecurity readiness and to reinforce regional cooperation frameworks for protecting critical infrastructure against emerging cyber threats.

Key Words: ASEAN, Artificial Intelligence, Critical Infrastructure, Cyber-Physical System, Cybersecurity, Japan, Operational Technology

1 Introduction

Cybersecurity of critical infrastructure (CI) has emerged as a major regional policy concern due to the essential role that CI plays in sustaining economic activity, public safety, and national security across interconnected economies. Cybersecurity threats targeting CI are increasing in scale and sophistication, driven by the growing integration of operational technology and information technology within cyber physical systems (CPS). Critical sectors such as energy, transportation, healthcare, and finance are now deeply interconnected, not only within national borders but also across regional supply chains and service networks, significantly expanding the attack surface available to malicious actors. Empirical evidence shows that many critical infrastructure operators have already experienced various cyber incidents, highlighting persistent gaps in preparedness and resilience [1]. Because disruptions in one

sector potentially can cascade across borders, particularly in economically integrated regions such as ASEAN and Japan, cybersecurity of CI increasingly exceeds the scope of purely national policy responses. These challenges are further exacerbated by uneven levels of cybersecurity maturity and resource availability across countries.

From a regional perspective, CI cybersecurity is shaped by transnational threat and shared systemic risk. The regional threat landscape is characterized by the rise of advanced persistent threats and state sponsored cyber operations that target assets essential to national security and economic stability. Within this context, ASEAN Member States face heightened risks due to cross border interdependency and varying national capabilities. Disruptions to energy systems, ports, digital connectivity, or financial infrastructure in one ASEAN country may propagate economic and operational impacts throughout the region. For instance, in the prospective vision of ASEAN power grid interconnection [2], a disruption in one nation may propagate throughout the region. To address the challenges, Japan has become an important partner driven by mutual security interests and strong economic ties with ASEAN. Existing ASEAN Japan cooperation has emphasized information sharing, coordinated incident response, and regional awareness initiatives as foundational elements of collective cybersecurity readiness [3].

The accelerated development of Artificial Intelligence (AI) substantially transforms the cyber threat landscape and the spectrum of defensive measures applicable for critical infrastructure. AI is increasingly recognized as a critical enabler for strengthening cybersecurity in critical infrastructure environments. Unlike traditional rule-based defenses, AI driven techniques can adapt to evolving threat patterns through continuous learning. Applications such as behavioral analytics and anomaly detection support early identification of malicious activity, which is particularly important in CPS environments where delayed detection can result in physical damage or service disruption [4]. At the same time, AI also empowers adversaries by enabling automated attack development, adaptive malware, and AI assisted reconnaissance, thereby increasing the speed, scale, and complexity of cyber threats. AI also enables predictive risk assessment by identifying vulnerabilities before they are exploited, thereby supporting proactive defense strategies [5].

These dual-use characteristics of AI introduce a complex policy challenge for regional cybersecurity governance. Despite these advantages, integrating AI into critical infrastructure cybersecurity presents significant technical, institutional, and policy challenges. Effective deployment requires high quality data, skilled personnel, transparent governance structures, and interoperable standards across national boundaries. Fragmented implementation without regional coordination risks creating uneven defensive capabilities that adversaries may exploit. Without coordinated regional policies, disparities in AI readiness among ASEAN Member States may further widen existing cybersecurity gaps. Harmonized policies and shared operational frameworks are therefore essential to maximize the benefits of AI while maintaining cross border interoperability.

Japan's relatively advanced cybersecurity ecosystem offers valuable policy and operational insights for addressing these shared challenges. Japan's experience in aligning policy, technology, and institutional coordination provides a practical reference for ASEAN countries seeking to enhance readiness. Ongoing initiatives, including ASEAN Japan policy dialogues and joint capacity building programs, have identified priority areas such as workforce development, alignment of national strategies, standardized information exchange, and joint exercises to test coordinated response capabilities [3]. ASEAN further plays a central role in facilitating multilateral engagement and addressing sensitive issues such as cross border incident management and data governance [6].

Given the region's high level of economic interdependence, cybersecurity incidents affecting CI constitute a collective action problem that demands coordinated regional policy responses. Given the strong economic interdependence within the region, cyber incidents affecting critical infrastructure in one country can propagate systemic impacts across supply chains and financial networks [3]. The central policy problem addressed in this study is

how ASEAN and Japan can strengthen collective cybersecurity readiness of critical infrastructure in an AI-driven threat environment while managing disparities in national capabilities. Accordingly, this study aims to assess the current state of CI cybersecurity readiness in ASEAN and Japan, examine how AI reshapes both cyber threats and defensive capacities, and identify policy relevant pathways for enhancing regional cooperation and coordinated response mechanisms.

2

Global and Regional Context of Cybersecurity in Critical Infrastructure

In the digital age, critical infrastructure is best understood as an integrated system of physical assets and embedded digital components. Historically defined as sector specific physical systems essential to public safety, economic stability, and national security, such as electricity grids, transportation networks, water systems, and emergency services, critical infrastructure has undergone a profound transformation with the convergence of Operational Technology (OT) and Information Technology (IT). Software, data flows, networked sensors, automated control systems, and algorithmic decision making are now embedded within core operations, improving efficiency and resilience while significantly expanding the attack surface. These changes introduce vulnerabilities related to software integrity, data availability, and control logic manipulation, prompting many governments to designate systemically important critical infrastructure (SICI) as assets whose disruption would cause severe societal, economic, or security impacts [7]. Across ASEAN Member States, however, definitions and protection levels remain uneven due to differences in regulatory capacity and institutional maturity.

The integration of artificial intelligence further complicates the cybersecurity landscape of critical infrastructure. AI driven functions such as anomaly detection, predictive maintenance, and automated control are increasingly embedded in operational environments [4], enabling more adaptive and proactive defense capabilities. At the same time, compromise or failure of these algorithmic components can generate cascading effects comparable to physical damage, as demonstrated by vulnerabilities in machine learning systems used for power grid management [8]. Globally, cybersecurity threats to critical infrastructure are intensifying amid rapid technological change and heightened geopolitical tension. State sponsored actors increasingly target energy, healthcare, manufacturing, and research sectors for espionage, coercion, and economic disruption [9]. No cyber attack targeted at critical infrastructure has been officially reported across Japan and ASEAN. However, real cyber attacks globally have been identified targeting critical infrastructure [10]. For example, the 2014 cyber attack on Ukrainian electricity grids lead to a massive blackout, impacting a quarter of a million individuals within six hours. Subsequently, the growing use of AI in offensive cyber operations, including automated exploitation, weaponized malware, and personalized phishing, further reduces the effectiveness of static defenses [11]. As digital transformation expands connectivity

between IT and OT environments, cyber intrusions increasingly pose risks of physical damage and service disruption rather than conventional data breach [12, 13].

Furthermore, digital interdependencies elevate the importance of data integrity and availability as telecommunications networks, cloud services, and data exchange platforms underpin essential services and function as core elements of critical infrastructure [14]. Policy frameworks are consequently transitioning to dependency-based classification models that encompass cross-sectoral and cross-border impacts [13]. These methodologies acknowledge that critical obstructions are increasingly situated within ICT-managed hubs rather than only in physical facilities, as exemplified by Japan's globally interconnected logistics and industrial networks [15]. Globally, definitions of critical infrastructure increasingly include cyber defense capabilities and organizational preparedness in addition to critical asset [16]. This comprehensive strategy facilitates more precise investment choices, enhanced supervision of AI governance, and the alleviation of risks linked to hostile exploitation of digital systems [8]. Therefore, for ASEAN and Japan, adopting dynamic, data-informed registries rather than static asset lists would improve alignment between national and regional resilience strategies [17, 18].

Regional digital transformation across ASEAN and Japan further underscores the need for coordinated cybersecurity governance, particularly as advanced digital technologies are integrated into critical infrastructure environments. Many ASEAN economies are rapidly deploying cloud-connected industrial systems, automation, and Internet of Things (IOT) technologies, yet cybersecurity readiness remains uneven due to skills shortages, cost constraints, and limited regulatory guidance [15]. These disparities create regional risk asymmetries, where weaker nodes may serve as entry points for wider disruptions. Japan offers a more mature governance model, combining infrastructure modernization with comprehensive cybersecurity and data protection frameworks [11] and sustained regional policy dialogue [19]. This contrast highlights that technological adoption alone does not translate into resilience without corresponding institutional capacity, regulatory coherence, and skilled human capital.

Within this context, artificial intelligence should be understood as a conditional accelerator rather than an inherent solution. Artificial intelligence increasingly underpins digital transformation in both regions, enabling scalable monitoring, predictive maintenance, and intrusion detection [14]. However, AI enhances detection, response, and system resilience only when supported by robust governance structures, sufficient human expertise, and interoperable regulatory frameworks across borders. Without these conditions, AI adoption may instead amplify risk by introducing vulnerabilities such as data poisoning and model manipulation [8, 11]. Addressing these risks requires interoperable governance, trusted data sharing mechanisms, and collaborative capacity building. Existing ASEAN-Japan cooperation frameworks therefore play a critical role in ensuring that AI enabled defenses are deployed responsibly and coherently, aligning innovation with coordinated regional strategies so that AI strengthens rather than undermines critical infrastructure resilience in an increasingly contested cyber environment [3, 15, 20].

3 ASEAN and Japan Cybersecurity Challenges and Readiness of Critical Infrastructure

Cybersecurity challenges affecting critical infrastructure in ASEAN and Japan arise from the interaction of persistent technical and organizational weaknesses, increasingly capable adversaries, and deepening interdependencies between operational technology (OT) and information technology (IT). Across the region, digital transformation has accelerated the

adoption of cloud connectivity, IOT systems, and automated control to improve operational efficiency and visibility. While these technologies deliver economic and operational benefits, they also significantly expand attack surfaces and increase exposure to cyber disruption [21]. For ASEAN in particular, shared supply chains, cross border service provision, and regional infrastructure interdependence mean that cyber incidents in sectors such as energy, water, transportation, and emergency services can propagate beyond national boundaries, amplifying systemic risk.

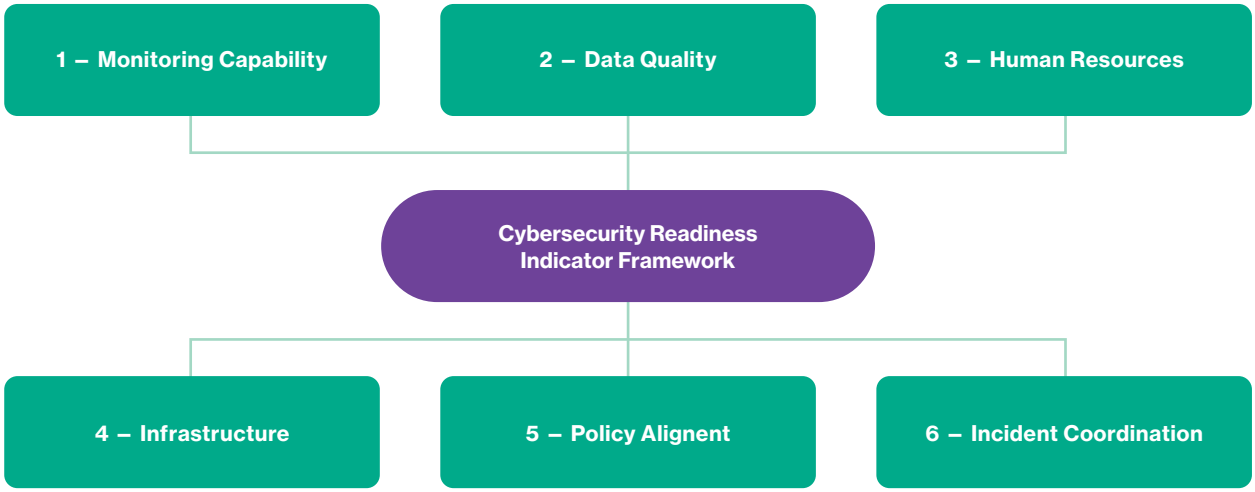
Many incidents across ASEAN and Japan continue to exploit well known vulnerabilities, including legacy systems, delayed patching, misconfigurations, and weak governance structures. These challenges are compounded by shortages of skilled cybersecurity professionals, particularly in safety critical environments where system downtime directly affects public welfare and economic stability. State-sponsored cyber activity represents a major source of risk, with campaigns increasingly targeting critical infrastructure supply chains and industrial control systems [13]. Such operations often emphasize long term persistence and prepositioning for disruption during periods of geopolitical tension, complicating attribution and response decisions for national authorities [22]. The presence of tightly coupled dependency chains further amplifies risk, as compromise in one service may affect multiple sectors operating integrated systems [21]. These dynamics underscore the need for regionally comparable readiness assessments that move beyond isolated asset protection toward systemic resilience.

Artificial intelligence plays a dual and increasingly prominent role in this regional threat environment. Adversaries leverage machine learning to enhance phishing, reconnaissance, and malware adaptability, reducing the effectiveness of static defenses [11]. At the same time, AI enabled defensive systems offer significant advantages for critical infrastructure operators by correlating large volumes of heterogeneous telemetry from industrial sensors, access controls, and network environments to improve anomaly detection and early identification of compromise [4]. AI also supports predictive resilience by enabling operators to anticipate periods of elevated operational stress and align security resources accordingly. However, reliance on AI introduces new risks, including data poisoning and adversarial manipulation that may degrade model performance or trigger unsafe automated responses [8]. These conditions reinforce the importance of readiness indicators that capture not only technological adoption, but also governance quality, human oversight, and institutional capacity to manage AI related risk.

In this study, cybersecurity readiness for critical infrastructure is defined as the combined capacity of institutions, technologies, and policies to prevent, detect, respond to, and recover from cyber incidents across interconnected OT and IT environments. Based on this definition, readiness is operationalized through six core dimensions: (1) monitoring capability, (2) data quality and governance, (3) human resource capacity, (4) infrastructure modernity, (5) policy alignment, and (6) incident coordination. Together, these dimensions form a structured set of indicators that can be used to assess policy strength, identify systemic gaps, and compare levels of preparedness across ASEAN Member States and Japan. Figure 1 summarizes the proposed cybersecurity readiness indicators and their illustrative metrics.

As shown in Table 1, monitoring capability serves as the primary operational indicator of readiness. This indicator includes Mean Time to Detect (MTTD) and Mean Time to Respond (MTTR) that capture how quickly operators can identify and contain cyber incidents before physical or service impacts occur. Lower MTTD and MTTR values indicate stronger operational readiness and more effective policy implementation, particularly in environments where AI-enabled analytics support near real-time decision-making. Empirical studies demonstrate that AI-enabled monitoring can significantly reduce both MTTD and MTTR by processing large telemetry streams and identifying deviations from operational baselines [4, 17]. In the ASEAN-Japan context, these metrics are especially relevant due to the risk of cross-border cascading effects.

Figure 1. Cybersecurity readiness indicators for critical infrastructure



Source: Professor Tagui Ichikawa, Hitotsubashi University

Data quality and governance constitute a second readiness dimension that reflects institutional discipline rather than technical sophistication alone. AI performance depends directly on reliable, normalized, and timely data, and robust data cleaning and validation have been shown to improve detection precision and reduce response latency [18]. Human resource capacity represents a third dimension, capturing the availability of skilled personnel capable of interpreting alerts, managing AI systems, and coordinating responses. Certification levels, simulation exercises, and participation in joint ASEAN-Japan training programs therefore function as measurable indicators of institutional readiness [17]. Japan's cybersecurity management certification frameworks provide reference models for workforce harmonization across the region [15].

Infrastructure modernity forms a fourth dimension of readiness. While legacy systems common across ASEAN often lack native security features, integration through middleware and application programming interfaces enables phased modernization and connectivity to advanced monitoring platforms, making such integration a positive transitional indicator [14]. Policy alignment constitutes a fifth, cross-cutting readiness dimension that reflects the coherence of national strategies, regulatory frameworks, and asset classification approaches. Harmonized definitions of critical infrastructure that account for digital and algorithmic dependencies reduce the risk of under protected transnational nodes [22]. Finally, incident coordination represents a sixth dimension, measured through participation in shared situational awareness networks, standardized threat intelligence exchange, and joint exercises [23]. Within ASEAN-Japan cooperation, interoperability standards, joint simulations, and certifications aligned with IEC 62443 strengthen collective readiness across diverse maturity levels [15].

Taken together, these readiness indicators provide a practical analytical tool for policymakers and regulators to assess cybersecurity preparedness, benchmark national progress, and identify priority areas for regional capacity building. Finally, readiness assessments must also address the security of defensive AI systems themselves. Indicators should capture adversarial robustness testing, secure model update pipelines, and controlled red teaming to evaluate susceptibility to poisoning and evasion attacks [8]. Advancing toward near real-time readiness dashboards shared across ASEAN and Japan would further enable evidence-based policy coordination and reduce the likelihood that localized weaknesses become exploitation points within interconnected critical infrastructure ecosystems [22].

4

Survey-based Assessment of ASEAN-Japan Cybersecurity Readiness for Critical Infrastructure

This section provides an empirical evaluation of cybersecurity readiness for key infrastructure in ASEAN Member States and Japan, utilizing survey data gathered from October to December 2025. The study aims to evaluate cybersecurity readiness across important cybersecurity entities and stakeholders, while identifying relative strengths, shortcomings, and coordination obstacles across national and sectoral contexts. The study assesses stakeholder-informed assessments of operational preparedness, institutional ability, and coordination effectiveness in securing critical infrastructure, rather than measuring official compliance benchmarks. A total of 128 responses were collected, of which 116 were full and appropriate for analysis. The respondents comprise a varied array of stakeholders, including operators of vital infrastructure, governmental and regulatory entities, commercial sector organizations, academic institutions, and cybersecurity experts. A purposive sampling method was employed to identify respondents with direct operational, policy, or strategic responsibility concerning critical infrastructure cybersecurity in Japan and specific ASEAN Member States. Survey invitations were distributed via professional networks and institutional collaborations to guarantee informed participation.

Cybersecurity readiness is operationalized through six aspects for systematic and comparable analysis: (1) monitoring capability, (2) data quality and governance, (3) human resource capacity, (4) infrastructure modernization, (5) policy alignment, and (6) incident coordination. These dimensions define readiness as a comprehensive socio-technical construct that includes technology, governance, and organizational capacity, rather than a limited assessment of compliance. Each dimension is implemented through a series of survey indicators evaluated using Likert-scale items. Monitoring capabilities is evaluated using indicators pertaining to real-time visibility, threat identification, and situational awareness, whereas incident coordination is assessed through the perceived efficacy of inter-agency and cross-border response mechanisms. Composite readiness assessments are derived from aggregated indicator scores across various stakeholder groups and nations. The complete survey instrument and indicator maps are included in Appendix A to improve transparency and replicability.

Table 1 summarizes the dominant descriptive findings from the survey and provides contextual grounding for the readiness analysis. Overall, the results indicate moderate levels of cybersecurity maturity, persistent human resource constraints, and limited but emerging use of artificial intelligence in cybersecurity operations. These findings reinforce the relevance of the six analytical readiness dimensions and motivate the deeper comparative analysis presented in subsequent sections.

Table 1. Summary of key survey findings on cybersecurity readiness

Indicator	Most dominant response
Most represented country	Japan (37.9%)
Most common cybersecurity knowledge level	Beginner (45.7%)
Most common AI knowledge level	Intermediate (54.3%)
Organizational cybersecurity maturity	Moderate (45.7%)
OT incident response planning	Exists but not regularly tested (49.1%)
Primary barriers	Skills shortage; limited resources (49.1%)
Current AI use in cybersecurity	Limited applications (31.0%)
Leading AI use case	Threat detection and anomaly monitoring (70.7%)

4.1

Monitoring Capability: Detection and Response Effectiveness

Monitoring capability denotes an organization's proficiency in identifying, analyzing, and promptly addressing cybersecurity events, especially in OT settings. Survey findings reveal that this dimension is still inadequately developed in both ASEAN and Japan. While 49.1% of respondents indicated the presence of an OT event response strategy, only 25% of the respondents actually implemented them in their respective organizations. Nine percent indicated that such plans undergo frequent testing, while 23.3 % confirmed the absence of a comprehensive OT incident response strategy.

These findings indicate increased MTTD and MTTR throughout the region. MTTD denotes the interval between the original breach and its identification, whereas MTTR quantifies the period necessary to contain and rectify an event post-detection. Extended MTTD and MTTR heighten the probability of physical damage, service interruptions, and cascade impacts across interlinked critical infrastructure sectors. Despite Japan's comparatively elevated organizational maturity, the ongoing presence of unverified response mechanisms indicates that enhancements in monitoring do not reliably result in expedited operational responses. In ASEAN situations, inadequate testing and insufficient response procedures further intensify delays in identification and containment.

4.2
Data Quality and Governance

Effective monitoring and AI-enabled cybersecurity depend fundamentally on the quality, availability, and governance of data. While 70.7% of respondents identified threat detection and anomaly monitoring as the most promising AI application, inconsistent adoption of formal cybersecurity standards indicates fragmented data governance and normalization practices.

Internal cybersecurity policies were the most reported framework (71.3%), whereas internationally recognized standards such as ISO/IEC 27001 (36.2%), NIST CSF (14.9%), and IEC 62443 (13.8%) showed substantially lower adoption. This pattern is more pronounced among ASEAN respondents, suggesting weaker institutionalized data governance compared to Japan. As a result, AI systems are often deployed in environments where telemetry is incomplete or poorly validated, limiting detection accuracy and increasing false positives. Data governance thus emerges as a key readiness constraint rather than a purely technical issue.

4.3
Human Resource Capacity

The survey identified human resource capacity as the major constraint. 49.1% of respondents identified a shortage of skilled cybersecurity specialists as a principal obstacle, which corresponds to the percentage citing insufficient financial or organizational resources. This difficulty becomes particularly apparent in OT instances, where specialized knowledge is essential for interpreting warnings, managing AI systems, and coordinating actions without interrupting physical processes.

Demographic study indicates that 43.1% of respondents hold less than five years of professional experience, while merely 5.2% self-identify as having advanced cybersecurity expertise. Conversely, AI expertise is more uniformly disseminated, with a predominant number indicating intermediate proficiency. This disparity indicates that AI tools may be implemented more swiftly than the organizational capabilities necessary for their secure governance and operationalization.

4.4
Infrastructure Modernity

Infrastructure modernity captures the extent to which existing systems can support contemporary cybersecurity controls and AI-enabled monitoring. Survey results indicate that 34.5% of respondents view legacy system complexity as a major barrier to strengthening cybersecurity, particularly in ASEAN manufacturing, energy, and transportation sectors.

While Japan demonstrates more advanced modernization trajectories, integration challenges persist when connecting legacy

OT assets to centralized monitoring and analytics platforms. The findings suggest that readiness in this dimension is transitional rather than binary: organizations adopting middleware, application programming interfaces, or phased modernization approaches are better positioned to integrate AI-enabled security controls.

Table 2. ASEAN and Japan Composite Cybersecurity Readiness Index (scale 0-5)

Readiness parameters	ASEAN Average	Japan
Monitoring Capability	2.4	3.1
Data Quality and Governance	2.2	3.3
Human Resource Capability	2.1	2.8
Infrastructure Modernity	2.3	3.2
Policy Alignment	2.0	3.5
Incident Coordination	2.1	3.0
Overall Readiness Index	2.18	3.15

5

Conclusion and Recommendations

This study examined the cybersecurity readiness of critical infrastructure in ASEAN Member States and Japan in the context of increasing cyber-physical interdependence and the growing role of artificial intelligence (AI) in both cyber threats and defensive capabilities. The survey-based findings provide empirical evidence that, although respondents across ASEAN and Japan demonstrate relatively high awareness of cybersecurity risks, this risk perception does not consistently translate into corresponding levels of operational readiness. The findings indicate that while awareness of cybersecurity risks is relatively high across the region, overall readiness remains uneven, with persistent gaps in human resource capacity, policy alignment, and incident coordination, particularly among ASEAN countries. Japan demonstrates comparatively stronger governance frameworks and institutional maturity; however, readiness across all dimensions remains below optimal levels, underscoring the need for sustained regional cooperation.

Survey results reveal moderate organizational cybersecurity maturity and limited but emerging adoption of AI-enabled security solutions. Notably, respondents frequently acknowledge the criticality of cyber threats to operational technology environments, yet objective readiness indicators, such as the existence and testing of incident response plans or adoption of inter-national standards, remain weak. Monitoring capability and incident response planning are constrained by the lack of regularly tested response mechanisms, contributing

to elevated mean time-to-detect and mean time-to-respond. Data quality and governance also emerge as critical bottlenecks, as fragmented adoption of international standards limits the effectiveness of AI-driven detection and analytics. Human resource capacity is identified as the most significant constraint, with skills shortages and limited operational experience inhibiting the secure deployment and governance of advanced technologies. These findings confirm that cybersecurity readiness must be understood as a socio-technical construct integrating technology, governance, and institutional capacity rather than as a purely technical function.

5.1 Implications for ASEAN-Japan Cybersecurity Cooperation

The empirical results have important implications for ASEAN-Japan cybersecurity cooperation. Areas of coordination are strongest where structured policy dialogue, capacity-building initiatives, and information exchange mechanisms already exist, particularly in Japan-led training programs and regional forums. However, fragmentation persists in operational practices, standards adoption, and incident coordination across ASEAN Member States. Uneven readiness constitutes a regional vulnerability because interconnected critical infrastructure systems allow localized weaknesses to propagate across borders, amplifying systemic risk. The disparity between Japan's relatively mature governance environment and the heterogeneous readiness levels within ASEAN underscores the limits of bilateral cooperation if not complemented by region-wide alignment mechanisms. Without harmonized approaches to readiness assessment, incident reporting, and AI governance, advanced capabilities in one jurisdiction may be undermined by weaker nodes elsewhere in the regional ecosystem.

5.2 Strategic Directions for Strengthening Regional Cybersecurity

To address these challenges, the study identifies several strategic directions that ASEAN and Japan should prioritize to strengthen cybersecurity coordination and collective resilience. Regional mechanisms add value in areas where individual national efforts are insufficient, especially in managing cross-border dependencies, shared threat intelligence, and AI governance frameworks.

Based on these findings, the following policy-relevant recommendations are proposed:

1. Establish a unified ASEAN-Japan framework for critical infrastructure classification and prioritization that explicitly incorporates digital dependencies and AI-managed operational components. Harmonized definitions would enable coordinated risk assessment, targeted investment, and more effective cross-border incident response.

2. Strengthen policy alignment through standardized incident reporting and information-sharing protocols, including minimum notification timelines, common data formats, and interoperable threat intelligence mechanisms. Such alignment would reduce coordination delays during large-scale or transnational incidents.

3. Embed AI governance requirements into cybersecurity policy and certification frameworks, mandating explainable AI, regular adversarial robustness testing, and secure model lifecycle management for AI-enabled systems deployed in safety-critical environments. Alignment with standards such as IEC 62443 would enhance interoperability and trust.

4. Prioritize regional capacity building and human capital development through joint ASEAN-Japan training programs focused on operational technology security, AI-assisted threat analysis, and incident coordination. Mutual recognition of certifications and expanded joint exercises would help reduce capability asymmetries.

5. Promote privacy-preserving AI collaboration mechanisms, such as federated learning and encrypted analytics pipelines, to enable effective cross-border threat detection while respecting national data protection and sovereignty requirements.

6. Operationalize these measures through a phased ASEAN-Japan cybersecurity roadmap supported by a dedicated coordination mechanism. A joint body could oversee implementation, monitor performance metrics such as mean time-to-detect and mean time-to-respond, and ensure continuous adaptation to evolving threat landscapes.

In conclusion, enhancing cybersecurity readiness for critical infrastructure in ASEAN and Japan requires an integrated approach that aligns technological innovation with governance reform and institutional collaboration. Artificial intelligence offers significant potential to strengthen detection, response, and resilience, but its benefits can only be realized when supported by harmonized policies, skilled personnel, and trusted cross-border cooperation mechanisms. By addressing gaps between perceived risk and actual readiness, strengthening regional coordination where fragmentation persists, and pursuing strategic, capacity-oriented cooperation, ASEAN and Japan can reduce systemic vulnerabilities and build a more resilient regional cybersecurity ecosystem capable of mitigating complex and evolving cyber threats.

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Appendix

Survey Form

A1. Select your current country of residence or place of work:

- ○ Brunei Darussalam (1)
- ○ Cambodia (2)
- ○ Indonesia (3)
- ○ Japan (4)
- ○ Lao PDR (5)
- ○ Malaysia (6)
- ○ Myanmar (7)
- ○ Philippines (8)
- ○ Singapore (9)
- ○ Thailand (10)
- ○ Timor-Leste (11)
- ○ Viet Nam (12)

A2. Select your company or organization sector:

- ○ Energy – Oil & Gas (1))
- ○ Energy – Electricity (2)
- ○ IWater & Waste Management (3)
- ○ Transportation & Logistics (4)
- ○ Financial Services (5)
- ○ Healthcare (6)
- ○ Manufacturing (7)
- ○ ICT / Telecommunications (8)
- ○ Government / Regulatory Body (9)
- ○ Academia / Research (10)
- ○ Others (please specify) (11)

A3. Describe your role or position in your company or organization:

A4. Total of years of your professional working experiences:

A5. How would you rate your current knowledge of cybersecurity?

A6. How would you rate your current knowledge of Artificial Intelligence?

B1. How would you rate the overall cybersecurity maturity of your company or organization?

B2. What are the main barriers to strengthening cybersecurity in your company or organization?

- ○ Limited budget / resources (1)
- ○ Shortage of skilled professionals (2)
- ○ Lack of policy or regulatory clarity (3)
- ○ Complexity of legacy systems (4)
- ○ Low executive / management awareness (5)
- ○ Others (please specify) (6)

B3. Do you agree that some sectors considered critical infrastructure may face higher risks and consequences from cyberattacks?

B4. How well prepared is your company or organization to respond to a cybersecurity incident affecting critical infrastructure Operational Technology?

B5. Which cybersecurity standards or frameworks are currently adopted in your company or organization for securing critical infrastructure Operational Technology systems? (Select all that apply)

- ○ ISO/IEC 27001 (Information Security Management) (1)
- ○ NIST Cybersecurity Framework (CSF) (2)
- ○ IEC 62443 (Industrial / Opertational Technology security standards) (3)
- ○ National or sector-specific cybersecurity regulations (4)
- ○ Internal company cybersecurity policies (5)
- ○ Others (please specify) (6)

B6. To what extent is Artificial Intelligence currently used in cybersecurity operations in your company or organization?

B7. In your opinion, which Artificial Intelligence applications have the greatest potential for securing critical infrastructure and Operational Technology?

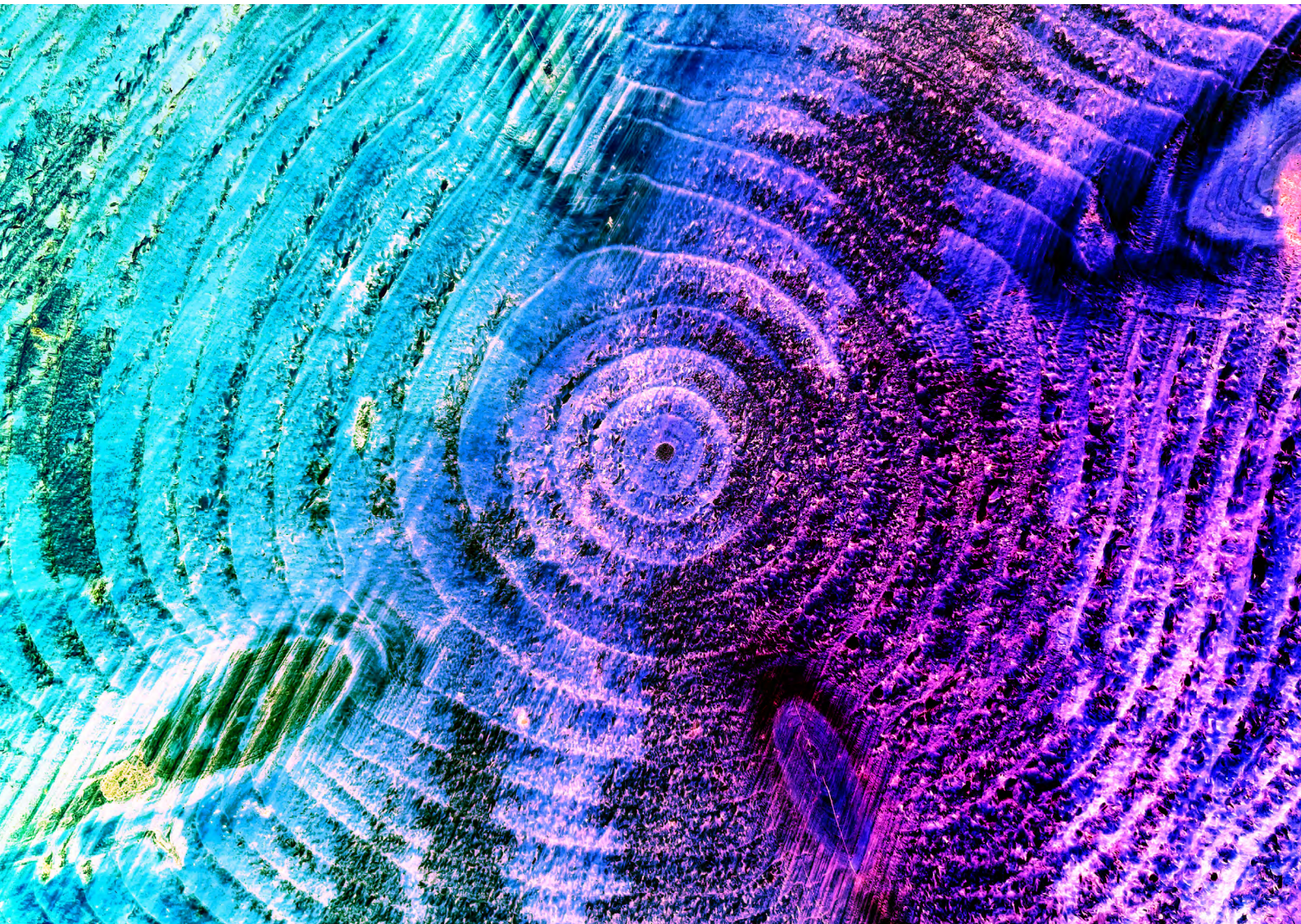
- ○ Threat detection and anomaly monitoring (1)
- ○ Predictive analytics for risk management (2)
- ○ Automated incident response and containment (3)
- ○ Enhancing resilience and system recovery (4)
- ○ Others (please specify) (5)

B8. Provide your suggestion (if any), what do you see as the most urgent priority for strengthening cybersecurity of critical infrastructure in your company or organization?

02

Unlocking Nature-based Solution Carbon Trade Between Japan and Indonesia through the Forestry Sector

Hangga Prihatmaja



Section Outline

Abstract

Japan's domestic policies are designed to connect Japanese stakeholders interested in procuring carbon credits from outside Japan, including Indonesia. These policies are guided by Japan's Updated Nationally Determined Contribution (JNDC), which directs the Joint Crediting Mechanism (JCM) platform to acquire overseas credits totaling up to 100 million tCO2eq by 2030. Credits are generated through the implementation of JCM projects in partner countries. In Indonesia, such a project can be executed under the Mutual Recognition Arrangement on the Joint Crediting Mechanism (MRA-JCM) between the Government of Japan (GOJ) and the Government of Indonesia (GOI). Projects registered in Indonesia's National Registry System (Sistem Registri Nasional [SRN]) are fully recognized as JCM projects, as the SRN is treated as equivalent to the JCM Registry. The resulting credits are referred to as JCM credits and are treated as compliance credits for Japanese companies (J-Comps). JCM governance is also aligned with Article 6 of the Paris Agreement, which governs Internationally Transferred Mitigation Outcomes (ITMOs) and the corresponding adjustments (CAs) to prevent double counting.

The GOJ is also establishing the Green Transformation (GX) Policy and its emissions trading system (GX ETS) through the GX League, with implementation scheduled for fiscal year 2026. Under the GX Policy, JCM credits are treated as compliance credits that can be converted into J-Credits and used for domestic trading in Japan among J-Comps through the JCM Registry and/or the Japan Exchange Group of the Tokyo Stock Exchange (JPX-TSE). The GX League comprises approximately 300–400 J-Comps, accounting for more than 60% of Japan's total emissions. Given the compliance status of JCM credits, the volume of credits expected to be acquired over the next decade, and the GX Policy's planned full implementation in fiscal year 2026, demand for JCM credits is likely to grow significantly.

These policy developments, particularly the updated JNDC designating the land use, land-use change, and forestry (LULUCF) sector as a scope of work, align with the MRA-JCM. This enables the forestry and other land use (FOLU) sector to become a prospective registered JCM project and may encourage J-Comps to enter the carbon market from the Indonesian FOLU sector. Potential project types include the Reducing Emissions from Deforestation and Forest Degradation (REDD+) Mechanism and carbon capture and storage/carbon capture, utilization and storage (CCS/CCUS), applicable across forest types and selected ecological biomes.

In line with the GOJ's intention to acquire JCM credits, Japan is mobilizing financial support for projects as part of its contribution. Credit acquisition is expected to be based on a share agreed by members of the Joint Committee, supporting the achievement of the NDCs in both countries. In the Indonesian context, this study shows that the GOJ will acquire a share of the credits generated by JCM

projects in Indonesia, following a Joint Committee decision under which a significant portion will be retired in the host countries in accordance with the ITMO mechanism through the appropriate CA methodology.

The GOI issued its Second INDC (2031–2035) in 2025 as a cornerstone policy to enable international carbon trading from Indonesia. This policy intensifies efforts to reduce emissions relative to an absolute baseline, with the FOLU sector as the most significant contributor. The GOI also issued Presidential Regulation No. 110 of 2025 (Perpres 110/2025) on the implementation of carbon pricing instruments and national greenhouse gas emissions control, providing frameworks to support the Second INDC and to serve as a new basis for stakeholders to advance carbon trading between Indonesia and the international community, including Japan. The regulation serves as a legal framework, enabling the mobilization of Article 5 on result-based payments and Article 6 on voluntary cooperation under the Paris Agreement to support the achievement of INDC targets.

Following the 2024 Indonesian presidential election, forest carbon governance is being updated. Governance of forest carbon is now handled by the Ministry of Forestry of the Republic of Indonesia (MoForI). As a consequence of the JCM arrangement, the JCM governance for FOLU projects should be managed by MoForI, as mandated by Perpres 110/2025. However, the Ministry of Environment of Indonesia (MOEI) still plays a coordinating role, as prospective credits generated from the JCM FOLU Project should be registered and issued through the SRN. On the other hand, the JCM FOLU Project for the Japanese side is handled by the Ministry of Agriculture, Forestry, and Fisheries (MAFF) of the GOJ.

Because the MRA-JCM was signed in October 2024 by the Ministry of Environment and Forestry of Indonesia (MOEFI) and the Ministry of Environment of Japan (MOEJ), the cooperation arrangement between MoForI and MAFF, as the mandated sectoral ministries for the prospective JCM FOLU Project, has not yet been initiated. On the Japanese side, the role of the MAFF in managing the JCM FOLU Project remains unclear. Thus, in practice, MoForI and MAFF should actively communicate to implement the JCM FOLU Project.

1

Background

In October 2024, the Government of Japan (GOJ) and the Government of Indonesia (GOI) signed a Mutual Recognition Arrangement on the Joint Crediting Mechanism (MRA-JCM). Through the MRA, Indonesia's carbon credit system is recognized by the GOJ, supporting achievement of the greenhouse gas (GHG) emission-reduction targets mandated by the Paris Agreement. The MRA also extends coverage to the waste, forestry, and other land use (FOLU) sectors and addresses aspects of the registration system, measurement, reporting, and verification (MRV), and carbon reduction certification between the two countries. The JCM between Indonesia and Japan dates to 2013, when the two countries signed a bilateral JCM agreement under the Low Carbon Growth Partnership. Since then, 60 projects have been registered in Indonesia to implement decarbonization technologies and renewable energy initiatives, with funding from Japan. These projects contribute to the GOJ's ambitious target of achieving a 73% reduction in carbon emissions by 2045, compared with 2013 levels, as outlined in Japan's Nationally Determined Contribution (JNDC).

Japanese stakeholders can claim carbon emission reductions or removals generated in JCM partner countries by transferring carbon credits to help achieve the JNDC target. In line with these targets, the GOJ has directed domestic stakeholders, including its business chamber, to support their achievement by disseminating leading decarbonization technologies, products, systems, services, and infrastructure; implementing mitigation actions; and contributing to the sustainable development of partner countries. The JNDC has therefore provided an opportunity for international carbon trade between Japan and other countries, including Indonesia. However, none of those projects to date have focused on the FOLU sector, as the GOJ has prioritized technology-based solutions (TbS) over nature-based solutions (NbS). As a result, progress in implementing the MRA, especially in engaging the Indonesian FOLU sector, has been limited, despite the need to do so to execute the FOLU Project under the MRA-JCM. This necessity is fully understandable, as the Forestry Attaché of Japan for the GOI has explained that the JCM has no experience in the FOLU Sector.

The GOJ prefers implementing TbS through decarbonization technologies and renewable energy, as stated in the JCM policy documents. JCM projects implemented by Japanese stakeholders in Indonesia, as partner countries, can mobilize significant capital expenditure and more easily share the capital burden among partners. Furthermore, the carbon credits can be distributed in closer alignment with partners' contributions. By contrast, NbS, through the implementation of the JCM FOLU projects, is perceived as unique and requires a different approach. According to an interview with the Forestry Attaché of Japan for the GOI, NbS may create a new complication for the JCM due to the evaluation of contributions, including efforts that cannot be practically assigned a monetary value, within a social- and environmental-based approach to implementing prospective NbS JCM FOLU projects.

Despite these complications, all stakeholders in Indonesia and Japan should pay attention to the FOLU sector. The updated JNDC 2030-2045, issued in 2021, indicates that one of the scopes of work for Japanese stakeholders is the land use, land-use change, and forestry (LULUCF) sector.

This aligns with the MRA-JCM signed in October 2024, which could serve as a platform for Japanese stakeholders to collaborate on carbon credits from Indonesia's FOLU sector. The GOJ's intention regarding the LULUCF sector is also aligned with Indonesia's enhanced NDC (INDC) in 2022, which identifies five sectors to mitigate carbon emissions: energy, waste, industrial processes and product use (IPPU), agriculture, and forest and land use (FOLU). Under the enhanced INDC, the GOI has committed to achieving an unconditional target of 31.89% and a conditional target of 43.20% by 2030. The FOLU sector accounts for 60% of Indonesia's carbon reduction, compared with other sectors. This share makes the Indonesian FOLU sector a crucial player in mitigation efforts and gives it strong potential for intervention by Japanese stakeholders, given its significant calculated total carbon stock of 36 GtCO2eq in forest areas in 2024.

Indonesia's FOLU carbon stock has attracted attention from various stakeholders, including the international community, which has long recognized the importance of tropical forests for maintaining the world's climate and preventing biodiversity loss. In addition, there is potential, under effective international cooperation, to create credit for hard-to-abate industries. The FOLU sector can generate high-integrity credit by avoiding double-counting, requires relatively small capital expenditure, demonstrates tremendous credit creation, and delivers better business returns. These advantages are more favourable than those of other sectors covered by the JNDC and INDC. This potential is becoming increasingly attractive, as the updated JNDC has stated its intention to acquire 100 million tCO2eq of credit by 2030 and 200 million tCO2eq by 2040.

To enable such international carbon trade from Japan, the GOI has supportive policies on carbon pricing and trading in the FOLU sector. Presidential Regulation Number 98/2021 (Perpres 98/2021) on the Carbon Pricing Mechanism, enacted during the presidency of Joko Widodo, provides a framework for achieving the INDC and controlling national GHG emissions in development planning. "Carbon

pricing" (Nilai Ekonomi Karbon) is defined as the value assigned to each unit of GHG emissions from human and economic activities. Another specific strategy to reduce carbon emissions from the FOLU sector and create opportunities for carbon trading is the FOLU Net Sink 2030 framework. Given the potential for future collaboration and carbon credit trading between Indonesia and Japan, a win-win situation could be achieved, allowing Japan to meet its JNDC commitment while supporting Indonesia's FOLU sector. However, there are potential issues between countries that are allegedly hindering the implementation of the MRA.

The first issue, from the GOJ's perspective, is the agreed-upon system to avoid double-counting. This is linked to the GOI's concern about the risk of an overlap claim arising from the seemingly substantial credit-creation potential in the Indonesian FOLU Sector. The issue of avoiding double-counting intentionally slows progress in carbon trading initiatives aimed at protecting the credit claim for fulfilling the INDC's commitment. The second issue concerns the agreed-upon methodology for implementing a prospective JCM FOLU project that facilitates the implementation of TbS and/or NbS to evaluate stakeholder contributions. The third issue, vis-à-vis the political developments in Indonesia and Japan, has significantly influenced the governance of the MRA-JCM. These issues lead to the following questions:

1. Are there any policy barriers between the two countries?
2. Are there any alternative mutual platforms that facilitate trading between Indonesia and Japan, and what business models do they use?
3. Are there any market preconditions and other identified variables that enable carbon trading between the GOI and the GOJ, or business-to-business trading between the countries?
4. Are there any approaches to ensure the integrity of the credit claimed and the distribution of contributions toward the intended JNDC and INDC?

To address the issues and questions above, research on Japan's Market Development for Carbon Trade in the Indonesian Forestry Sector was conducted between July 2025 and January 2026. Interviews were conducted with key stakeholders in Indonesia and Japan regarding the development of the MRA-JCM. The research also included attendance at various symposia and seminars on the progress of the JCM, the Article 6 Implementation Plan (A6IP), the J-Credit Scheme, Japan's Green Transformation (GX) Policy, blue carbon, potential corporate action on carbon credits for Indonesia–Japan, the Indonesian Emission Reduction Certificate system vis-à-vis the National Registry System (Sertifikat Penurunan Emisi Indonesia-Sistem Registri Nasional [SPEI-SRN]), and the influence on other Southeast Asian (SEA) countries. Nonetheless, various documents were used as analytical material and data sources to support the information gathered during the interview, symposium, and seminar processes.

2

Politics in the Joint Crediting Mechanism (JCM)

A. Evolution of the JCM: From Technology Transfer to Carbon Market Instrument

The JCM serves as a policy platform for the GOJ to build partnerships with other countries. It also supports partner countries in their technological transition by transferring Japan's decarbonization and renewable energy technologies. Under the JCM, Japanese stakeholders can mobilize capital to implement JCM projects in partner countries, thereby enhancing their business returns and ultimately advancing their own emissions-reduction efforts. In the context of Indonesia–Japan bilateral cooperation, JCM cooperation

has been developed since 2013 as part of the Low Carbon Growth Partnership, which is governed by the Ministry of Environment and Forestry of Indonesia (MOEFI) and the Ministry of Environment of Japan (MOEJ). To date, 60 projects have been implemented using various TbS for decarbonization technologies, and credits from 13 of these projects have been distributed among partners.

Nevertheless, the GOJ has been guiding the JCM's direction in the LULUCF sector since the updated JNDC was issued in 2021, which includes LULUCF as one of its scopes of work to fulfil its commitment. This situation has been acknowledged by the GOI, leading the two countries to sign the MRA-JCM in October 2024, opening a new horizon for the Indonesian Forestry and Land Use (FOLU) sector to become a prospective registered JCM project. In particular, following the 10th JCM Joint Committee meeting in December 2024, the JCM is also defined as a carbon market tool through which Japanese companies (J-Comps) and the GOJ collaborate on mitigation activities in partner countries and, in return, acquire reliable credits generated by the JCM FOLU Project. From this perspective, the role of the MRA-JCM also extends to recognizing the Indonesian Emission Reduction Certificate system vis-à-vis the National Registry System (Sertifikat Penurunan Emisi Indonesia-Sistem Registri Nasional [SPEI-SRN]). Therefore, under the MRA-JCM, it reconciles the registry systems of both countries and makes the SPEI-SRN equivalent to the JCM Registry, with pressure points in project registration through the JCM-SRN, third-party MRV, and credit integrity through corresponding adjustments (CAs). All of this is progressively managed and authorized by the JCM Joint Committee of Indonesia and Japan.

According to the MRA, the Joint Committee is a functional body that guides the implementation of JCM projects. Based on interviews with the Joint Committee's members, it has several responsibilities, including: 1) formal documentation; 2) project record; 3) developing the MRV system; and 4) determining the CAs as a method to avoid double-counting and to calculate stakeholders' contributions. In the context of the JCM FOLU Project, these responsibilities have been supplemented by defining the appropriate methodology for the Project and authorizing the calculation of the carbon emissions outcome for each project. Given the Joint Committee's important role, it should comprise representatives from the technical ministries of both countries, as mandated by the MRA.

B. Japan's Green Transformation (GX) Policy as a Demand Driver for JCM Credits

This progressive update to the MRA-JCM between Indonesia and Japan is attractive to Japanese stakeholders because Japan's contributions to GHG emissions reductions or removals in partner countries can be quantified as mitigation outcomes to fulfill its JNDC commitment to the United Nations Framework Convention on Climate Change (UNFCCC) goal. Hence, the JCM is used to facilitate global action in transferring mitigation outcomes between Indonesia and Japan, with outcomes expressed as emission-reduction values, conservatively calculated and authorized by both governments through the Joint Committee. The mitigation outcome can then be shared as JCM credits among the countries and companies in proportion to their contributions. For each registered JCM project to be implemented by Japanese stakeholders, the GOJ offers various incentives, including financial assistance. In addition to private capital allocation, it provides assistance with initial capital expenditures to advance both nations' commitments, as depicted in their respective JNDCs and INDCs to the UNFCCC, as well as to support sustainable development.

In line with the notion of sharing JCM credits among partners, the JNDC's LULUCF sector scope of work is expected to be translated into a JCM FOLU project in Indonesia. This expectation is shared by all MRA stakeholders and is driven by the JNDC's commitment to acquire up to 100 million tCO2eq in carbon credits by 2030. Toward this ambitious target, the GOJ drives the JCM office, directing all domestic stakeholders, including business chambers, to implement the JCM project in Indonesia to contribute to mitigation actions and further credit creation. This expectation is intensifying because the JCM credits generated from the prospective JCM FOLU are considered to have high integrity due

to their embedded social and biodiversity values, require relatively small capital expenditure, and generate substantial credit.

The expectations above are based on the compelling case of the JCM Forestry Project in Cambodia. In this project, the J-Comp fully funded the Cambodian JCM Forestry Project to reduce forest loss through effective law enforcement and improve the livelihoods of communities in and around wildlife sanctuary areas, thereby qualifying it as a JCM REDD+ Project. Data from the JCM Office show that this project generated 612,617 tCO2eq and was fully claimed by the J-Comp under the Joint Committee Decision on Credit Distribution Notification dated 23 December 2023. Furthermore, during various workshops and meetings, the JCM Office consistently informed stakeholders that JCM credits can be traded in-house in Japan, enabled by Japan's GX Policy. This in-house policy, submitted during the 211th session of the Diet held on 23 January 2023, states that the GX is designed to achieve three goals: decarbonization, a stable energy supply, and economic growth by mobilizing the full strength of the public and private sectors. Key factors in the GX Policy are: 1) creating new markets and demand by and for Japanese stakeholders, and 2) strengthening Japan's industrial competitiveness, which can be an entry point for any interested stakeholders. Moreover, the GX Policy strongly promotes further use of the JCM by expanding the number of JCM partner countries, enhancing its implementation structure, and envisioning large-scale projects. It creates a tendency for JCM credits to be treated as compliance credits.

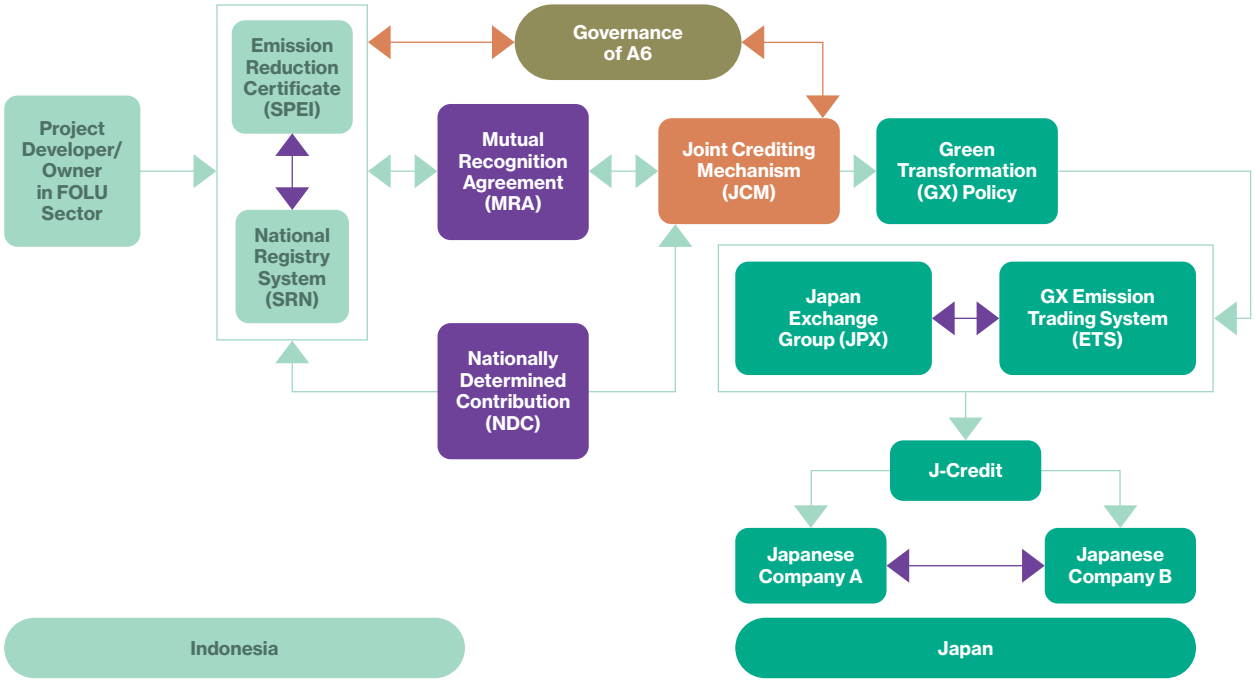
To implement the GX Policy, the GOJ has established a guideline for the GX League, comprising 300–400 J-Comps that account for more than 60% of Japan's total emissions. Given the status of JCM credits as compliance credits, the substantial volume of credits to be acquired over the next decade, and the GX Policy's full implementation in fiscal year 2026, demand for JCM credits will grow significantly. Moreover, the GX Policy also provides leverage for J-Comps' globally acclaimed decarbonization technologies to achieve net-zero GHG emissions, thereby strengthening Japan's industrial competitiveness, putting the country's economy back on track for further growth, and driving future economic development and job and income growth. In addition, J-Comps have considered that, through the GX Policy, they can transform their businesses into greener, more sustainable ones and achieve better returns from higher avoided emissions than companies under the business-as-usual (BAU) case. They are projected to grow their revenues at an annual rate of 7%, approximately 20% higher than the average J-Comp.

The key features of the GX Policy can be achieved by the league through the development of its GX strategy to identify climate-related opportunities. This can be done through corporate climate-related disclosure, according to the GX Guideline. This is the main document for J-Comps to identify investment opportunities, including the number of patents resulting from corporate actions towards decarbonization technologies, the percentage of recycled materials, potential green revenue, and avoided emissions (AE). In particular, AE is a quantified contribution to mitigation actions (as a positive project impact), equal to the difference between the GHG emissions of conventional goods and services (the BAU baseline) and those of the new baseline. Therefore, AE is a metric for assessing climate-related opportunities and their foundational elements, based on defined concepts and methodologies. In principle, the AE's identification and calculation in the disclosure document represent J-Comps' efforts to secure project credits, quantified as a contribution to the JNDC. However, since reducing emissions from industry alone is insufficient, overseas JCM projects become more important. Achieving the AE through overseas JCM projects is expected to reduce emissions in partner countries, thereby creating intangible value (e.g., societal value). Therefore, the AE not only indicates the total emissions (in CO2eq) that will be (and already) avoided by J-Comps, but also the total carbon credits planned to be (and already) acquired through best efforts in investing in domestic and overseas JCM projects to reduce emissions, which can be converted into in-house credits.

Once the AE is calculated and evaluated, J-Comps can determine the credit emission balance and whether to implement either an owned domestic project or a prospective JCM overseas project.

Notably, the prospective emission-reduction project could expand green markets and increase the supply of goods and services from Japanese technology. The emission reductions reported in the GHG inventories section of the Corporate Climate-Related Disclosure document reflect their best efforts to implement the GX Policy and the potential business returns associated with it. The document indirectly indicates a new demand for carbon credits to be traded among J-Comps. Therefore, all domestic stakeholders are consulted to explore specific purposes, such as forecasting potential business collaborations. The GX Emissions Trading System (GX ETS), prepared by the league under the GX Policy, also exists. Through the GX ETS, carbon trading among J-Comps can be ensured, driven by their own caps or emission thresholds. Using a cap-and-trade system, each J-Comp may trade its credits when its emission performance is below its cap with those that exceed it. The structure of the JCM is shown in Figure 1.

Figure 1. The Political Structure of the Joint Crediting Mechanism (JCM)



Source: Created by the Author, 2025

3

JCM as Japan's Operational Interpretation of Article 6 (A6) of the Paris Agreement

A. The Equivalence of the JCM and A6 of the Paris Agreement

As a platform for bilateral cooperation that pursues a voluntary scheme, the JCM is consistent with Article 6 of the Paris Agreement (A6) by facilitating global action to implement NDCs and enabling higher ambition in mitigation and adaptation. A bilateral cooperation voluntary scheme is at odds with the Result-based Payment (RBP) scheme mandated in Article 5 (A5), since it requires host countries to first implement various mitigation activities, achieve mitigation performance, and report that performance to partner countries or international institutions/programmes that have committed to compensating the mitigation performance after it has been verified and validated by a third party agreed upon by both parties. The

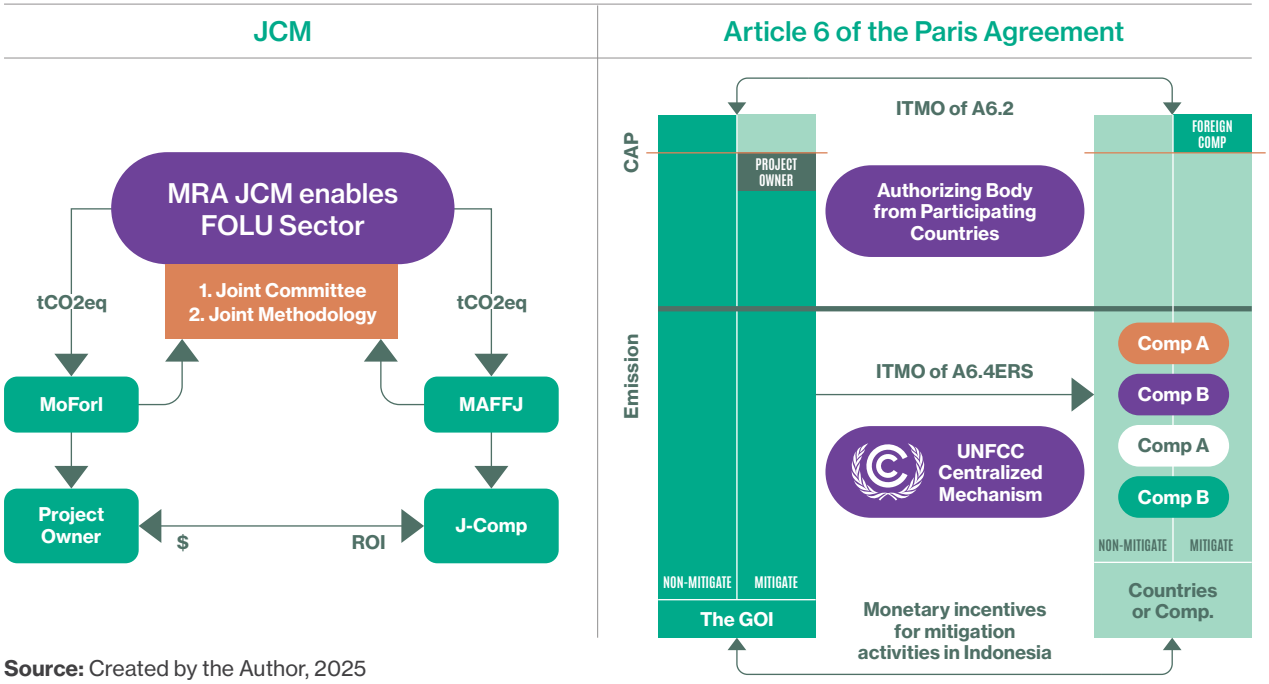
compensation amount is subject to negotiation before the bilateral agreement.

Under A6.2 of paragraph 2, countries (e.g., the GOJ and the GOI) that are party to a legal and legitimate agreement may use Internationally Transferred Mitigation Outcomes (ITMOs) toward the JNDC and INDC once the emission-outcome-reduction value is authorized by both governments. Moreover, A6.4 of paragraph 4 establishes a centralized framework and methodology for implementing mitigation activities through the UNFCCC-established Supervisory Body, under which centralized mechanisms govern the validation, verification, and registration of projects implemented in host countries. Therefore, under A6.4, host parties may issue emission reductions that can be used for ITMOs or for domestic-to-other-international-mitigation purposes.

Returning to the ITMOs in A6.2 and A6.4, host countries can receive monetary incentives for their mitigation efforts. Under A6.2, these incentives are negotiated between the project owners and their prospective international partner. Under A6.4, the mechanism is implemented by completing the Host Party Participation Requirements Form before any communication between the host countries' designated national agencies and the UNFCCC A6.4 Supervisory Body. Once the mitigation outcome is verified and validated under the A6.4 Mechanism Emission Reductions (A6.4ERs), the units can be acquired by foreign governments or international companies, provided that emission reductions resulting from the A6.4ERs shall not be used to demonstrate achievement of the INDC if another party uses them to demonstrate theirs.

Several key components of the JCM and A6 have been identified due to their similarities to ensure accountability for high-integrity mitigation outcomes, promote sustainable development, and maintain environmental integrity. The key components are to: 1) establish a legal and legitimate bilateral agreement; 2) develop a joint office comprising representative authorities from each party to ensure transparency; and 3) develop an accounting methodology to avoid double-counting, agreed upon by the stakeholders and consistent with any applicable guidance on the corresponding adjustment (CA) (Figure 2). These components are supported by a well-governed system across host countries, from the national level down to the local level, to ensure reliable mitigation efforts, authorization, reporting, and tracking.

Figure 2. The Equivalence of the Joint Crediting Mechanism (JCM) and Article 6 of the Paris Agreement (A6)



Source: Created by the Author, 2025

In particular, ITMOs that are once "first transferred" to be counted as part of the partner country's NDC are discounted from the host country's NDC to prevent double counting of the mitigation outcome through the appropriate CA. Even if the acquiring partner country later transfers those ITMOs to a third country, this does not affect the host country, whose NDC achievement has already been adjusted. Therefore, each participating party shall apply CA in a manner that ensures transparency, accuracy, completeness, comparability, and consistency. It shall also be representative and consistent with the participating parties' NDC implementation and achievement. With the key components above in mind, the equivalence mechanism between the JCM and A6 is identified, enabling both government-based institutions and private stakeholders to enter the international carbon market. Nonetheless, A6 can be treated as a meta-policy due to its capacity to govern vis-à-vis the country's regulation on carbon trading in a particular sector, such as the MoForI's forestry regulation on carbon trading from forest areas, by first considering the higher law applicable to the FOLU sector.

B. ASEAN's Opportunities for the JCM

Given this progressive development in international carbon trading, the Indonesian FOLU sector could join the movement by providing credits from forest areas, since these credits offer distinct advantages, as elaborated in the previous section. In addition, the GOJ's defined acquired emission reductions in the JNDC have raised awareness in other ASEAN partner countries, such as the Philippines, Thailand, Myanmar, Cambodia, the Lao PDR, and Viet Nam. This is because SEA countries have also set emission-reduction targets within specified timelines (Table 2), and the Japanese market has emerged as a potential source of international support.

Table 2. ASEAN and Japan Composite Cybersecurity Readiness Index (scale 0-5)

Country	Nationally Determined Contributions	Net-Zero Pledge
Malaysia	Emissions intensity of 45% (unconditional) by 2030 from the 2005 levels	2021 net-zero GHGs by 2050
Philippines	2.71% (unconditional) and 72.29% (conditional) from the BAU by 2030	None, due to its commitment to 75%
Singapore	60 MtCO2eq	2020 and 2022 netzero GHGs by 2050
Thailand	30% (unconditional) and 40% (conditional) by 2030 from the BAU	2021 net-zero GHGs by 2050
Viet Nam	15.8% (unconditional) and 43.5% (conditional) reduction below the BAU in 2030	2021 net-zero GHGs by 2050
Brunei Darussalam	20% from the BAU by 2030 (unconditional)	2021 net-zero GHGs by 2050
Cambodia	An emissions reduction target of 41.7% (unconditional) by 2030 compared to the BAU	2022 net-zero GHGs by 2050
Lao PDR	60% (unconditional) by 2030 from the baseline (or 62,000 ktCO2eq in absolute terms)	2020 and 2021 netzero GHGs by 2050
Myanmar	244.52 MtCO2eq (unconditional) and 414.75 MtCO2eq as subject to conditions of international finance and technical support by 2030	None

Source: A6IP (2025)

However, the credits generated and distributed from SEA's JCM-registered projects through 2025 remain well below the GOJ's intended target of 100 million tCO2eq. This figure is based on the emission mitigation value from ASEAN JCM projects between 2016 and 2025, for which the total generated credits amount to 751,418 tCO2eq. Of these total credits, 92.03% is claimed by the GOJ, and the remaining 7.97% is allocated to the host countries, of which 71.97% is claimed by the GOI. This credit acquisition target is limited to JCM partner countries; therefore, there is ample room for SEA countries to act. Furthermore, based on the ongoing JCM projects that have already agreed on the credit allocation by the Joint Committee, the average 20% credit allocation would be close to the GOJ's intended acquisition, so the remaining credit allocation will be retired domestically in the host country.

Given that the credit allocation recognizes the parties' respective contributions to the JCM projects in a fair and equitable manner, the fair sharing of contributions, including the authorization and tracking of mitigation outcomes, and the involvement of the CA, allows carbon credits resulting from such projects, reported by both governments and consistent with the relevant guidance, to be transferred to meet NDC targets. When carbon credits are transferred internationally, the emission reductions are not accounted for solely by the host country's NDC but are jointly counted toward the acquiring country's NDC.

4

Fundamental Considerations for Japanese Stakeholders in Enabling International Credit Mitigation Transfer from the Indonesian FOLU Sector

A. Socio-Economic Opportunities among Stakeholders

Social factors refer to shared beliefs and attitudes within a population. In the study context, these factors include Japan's understanding of and attitude towards procuring credits from the FOLU sector, as well as the driving factors behind this. Additionally, JCM projects' know-how can broaden the public's understanding of which types of FOLU projects can be executed in line with market interest, including producing reliable credit, distributing claims, and communicating with the Japanese market, thereby improving business returns.

In this regard, carbon trading is expected among J-Comps, given their interest in participating in such projects, as the implementation of the JCM could yield stronger social-psychological effects in the market. J-Comps are interested in JCM projects because the GOJ offers access to specific subsidies to fund technology investments in installing updated technologies in other countries, while the GOJ remains willing to provide logistical and policy support. Once J-Comps implement the projects, the JCM credits generated and utilized can be retired internally to offset the J-Comp's emissions in Japan, or they can be traded with another J-Comp to offset the purchasing corporation's emissions domestically. The latter credit-trading scenario among J-Comps falls under the GX ETS currently being prepared by the league under the GX Policy, using a cap-and-trade mechanism, as elaborated in Section 2, and is subject to the J-Credit Scheme. The link between JCM credits and J-Credits is essential to understand, as domestic J-Credits and JCM credits are currently primarily accepted as Qualified Carbon Credits towards the JNDC commitment. Both credits are key tools in the emerging

Japanese carbon credit ecosystem, despite a direct public trading platform not yet emerging. Instead, JCM credits issued to each J-Comp are registered in the JCM registry and channelled to the JPX Carbon Market.

Table 3. Comparison of Carbon Credit Quantities Region

Region	Quantity of Carbon Credits (MtCO2eq)	Year
Worldwide	215	2018
	282	2019
	336	2020
Domestic J-Credit Scheme	4.7	2018
	5.9	2019
	7.0	2020
	7.1	2021

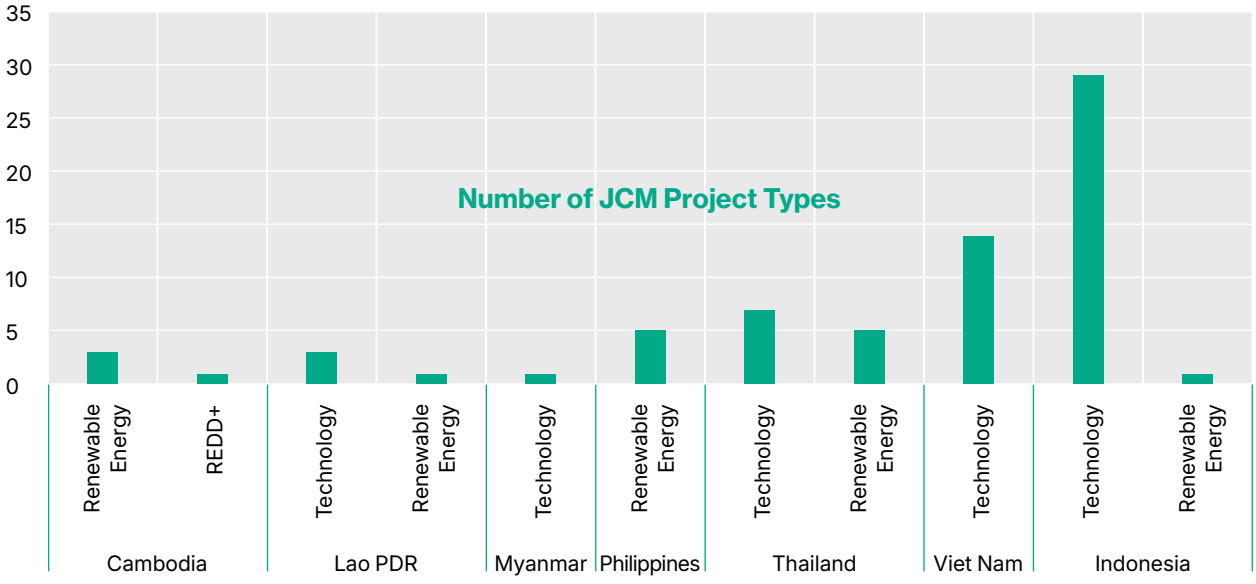
Source: MITSUI Corp., compiled by author (2025)

The number of carbon credits issued worldwide is growing rapidly (Table 3). Thus, credit trading is attracting greater attention, including in Japan. As a result, more J-Comps are investing in large-scale overseas JCM projects, such as the JCM FOLU Project, to earn substantial credits. Under the upcoming GX Policy, JCM Credits can be traded for J-Credits, sold, and the proceeds used for various purposes, such as business expansion and the recovery of investment costs, as additional value beyond GOJ financial support. They can also be reinvested in activities such as facility improvements or further initiatives to reduce GHG emissions or increase absorption.

B. Technological Factors of the Carbon Trading Mechanism

There are four main types of credit projects: 1) renewable energy (power generation); 2) renewable energy (heat); 3) energy-saving facilities; and 4) forest absorption. However, among the JCM SEA projects, most methodologies approved by the respective Joint Committees are TbS for renewable energy and energy-saving facility types (Figure 3). The common ground is that implementing these project types can simplify the allocation of credit contributions based on the percentage of investment in the facility. Meanwhile, among the 34 TbS JCM SEA projects, the total is 78,911 tCO2eq, whereas the JCM REDD+ project from Cambodia accounts for 612,525 tCO2eq, or more than 80% of the total JCM credit generated. It can be seen that the forest absorption project, through the NbS FOLU sector, is promising for a win–win outcome of the JCM partnership.

Figure 3. JCM Projects by Type in SEA



Source: JCM, compiled by Author, 2025

NbS draw on actions to protect, sustainably manage, and restore natural or modified ecosystems to address anthropogenic drivers of climate change that lead to high GHG emissions. NbS methodologies that expand to include more "removed emissions" can be seen in the Philippine agriculture sector's experience with alternate wetting and drying (AWD), which reduced GHG emissions from rice fields by about 30%. Given its significance, the JCM has already adopted AWD as an official methodology that can be replicated for other JCM rice projects. As the Philippine's AWD is not a part of the FOLU Sector, it is necessary to strengthen other NbS methods: REDD+; afforestation, reforestation, and revegetation (ARR); agricultural land management; wetland restoration and conservation; improved forest management (IFM); and others that are inspired by a natural approach and provide benefits for both people and the environment. In this regard, Indonesia has extensive experience in implementing the REDD+ programme funded by foreign governments, as well as ARR and IFM under the carbon voluntary scheme. In addition to Cambodia's experiences, the extensive REDD+ opportunities in the SEA region are generating substantial carbon credits. Therefore, it is necessary to invite J-Comps to invest in these applicable FOLU methods.

Nevertheless, several factors underlie the heavy focus on TbS in most JCM projects in ASEAN, despite progress in JCM's feasibility study toward NbS FOLU projects. These factors include: 1) the absence of a FOLU-based project registered under the JCM elsewhere, resulting in a lack of experience in developing the appropriate FOLU methods; 2) the appropriateness of using TbS in FOLU projects; and 3) credit allocation accounting for stakeholders, which applies only if NbS methods are applicable to JCM FOLU projects. However, given the uniqueness of the FOLU sector, it is emphasized that FOLU projects can integrate both approaches.

The uniqueness of the FOLU sector lies in the forest's role as a centre of sustainability, encompassing biodiversity conservation, and in its value to customary communities. Therefore, the FOLU sector requires a specific methodology that incorporates factors such as the agreed Forest Reference Emission Level, which is essential for determining baseline and final mitigation outcomes. Another factor to consider is the characteristics of the FOLU project to be implemented in either lowland or highland terrestrial forests, peatlands, or mangroves. Each forest type has its own climate, soil conditions, and biodiversity, which together define an ecological biome. Moreover, consideration of the local social context is essential, as villages and their residents live within and adjacent to forest areas and derive their livelihoods from forest resources. This consideration is based on co-creating benefits for the local and indigenous communities.

5

Strategic Pathways Forward: NbS Carbon Trade Between Japan and Indonesia through the Forestry Sector

A. Indonesia's Update to Presidential Regulation 110/2025

In 2025, the GOI issued the Second INDC (2031–2035), which has become a cornerstone of policy. In this Second INDC, the GOI updated its commitment to an absolute emission-reduction target of 1491 GtCO2eq by 2030 under the Low Carbon Compatible with Paris Agreement (LCCP) High scenario. The term "conditional" as a baseline for international assistance and the percentage value in the emission mitigation standard have been revoked. This enables investment from the international community and increases public interest in contributing to the country's mitigation efforts in line with the designated absolute baseline. In this setting, the Indonesian FOLU sector accounts for the majority (50%) of the total mitigation target across the five sectors, despite its contribution being

slightly lower than in the Enhanced INDC 2022. The target areas for the FOLU sector cover 2 million hectares for peatland restoration and 8.3 million hectares for degraded land rehabilitation by 2030. The FOLU targets will be met through the REDD+ programme, technology to reduce emissions from harvested wood products, and other potential projects.

Along a different but convergent path, the FOLU Net Sink 2030 has been established since 2023 through the following actions: (1) reducing emissions from deforestation and forest degradation; (2) increasing the carbon sequestration capacity of natural forests; (3) increasing carbon sequestration in land systems; (4) reducing emissions from fires and peat decomposition; (4) law enforcement; and (6) the provision of economic incentives and financial mechanisms. This is a clear political signal recognizing REDD+ as an essential component of the NDC target for the FOLU sector. The GOI has also placed the ocean's blue carbon on the radar for mitigation action in mangroves, seagrass meadows, and seaweed. Mangroves, in particular, have been included in the national GHG inventory under the wetland category, in the estimation of REDD+ results, and in the establishment of its Forest Reference Emission Level.

The GOI has also issued Presidential Regulation No. 110/2025 (Perpres 110/2025) on the Second INDC, covering the implementation of carbon pricing instruments and national GHG emissions control. It replaces Perpres 98/2021 on the Carbon Pricing Mechanism, thereby creating a new pathway for international stakeholders to advance carbon trading from Indonesia, including with Japan. Perpres 110/2025 serves as a legal framework that enables the use of Article 5 on the RBP and Article 6 on voluntary cooperation to mobilize capital flows from both domestic and international sources to support mitigation efforts. The presidential regulation also prescribes carbon pricing measures, including technical arrangements, levies, and the expansion of the RBP scheme. It further strengthens the role of the SRN to better align with Article 13 of the Paris Agreement by implementing the One GHGs Data Policy, setting the carbon price, and supporting the transparency framework. In the context of the JCM, the SRN is an important tool, comparable to the JCM registry, for registering JCM projects and channelling reliable credits with full integrity. Perpres 110/2025 also designates the MOEI as a technical coordination appointee and a member of the national GHG management and carbon pricing steering committee, alongside the Ministry of Finance of Indonesia and the Indonesian Financial Services Authority (Otoritas Jasa Keuangan [OJK]). Therefore, the MOEI will lead the integration of the JCM project into the SRN, while the technical ministries, such as MoForI, will be responsible for technical regulations to support Perpres 110/2025. Specifically, the forestry technical regulation will specify the arrangement of derivative regulations for the FOLU sector to operationalize the Joint Committee, develop a panel methodology, and develop the MRV system to evaluate the integrity of credit creation and the CA, thereby supporting high-quality carbon stocks and potentially increasing market prices.

Finally, to attract international stakeholders, including those from Japan, the GOI also implements policies on tax holidays, tax allowances, and import duty exemptions for investments related to emission mitigation and sustainable development. The establishment of Indonesia's Taxonomy for Sustainable Finance is also underway, and the GOI, through the OJK, has clearly identified investment opportunities for CCS in both production and protected forests.

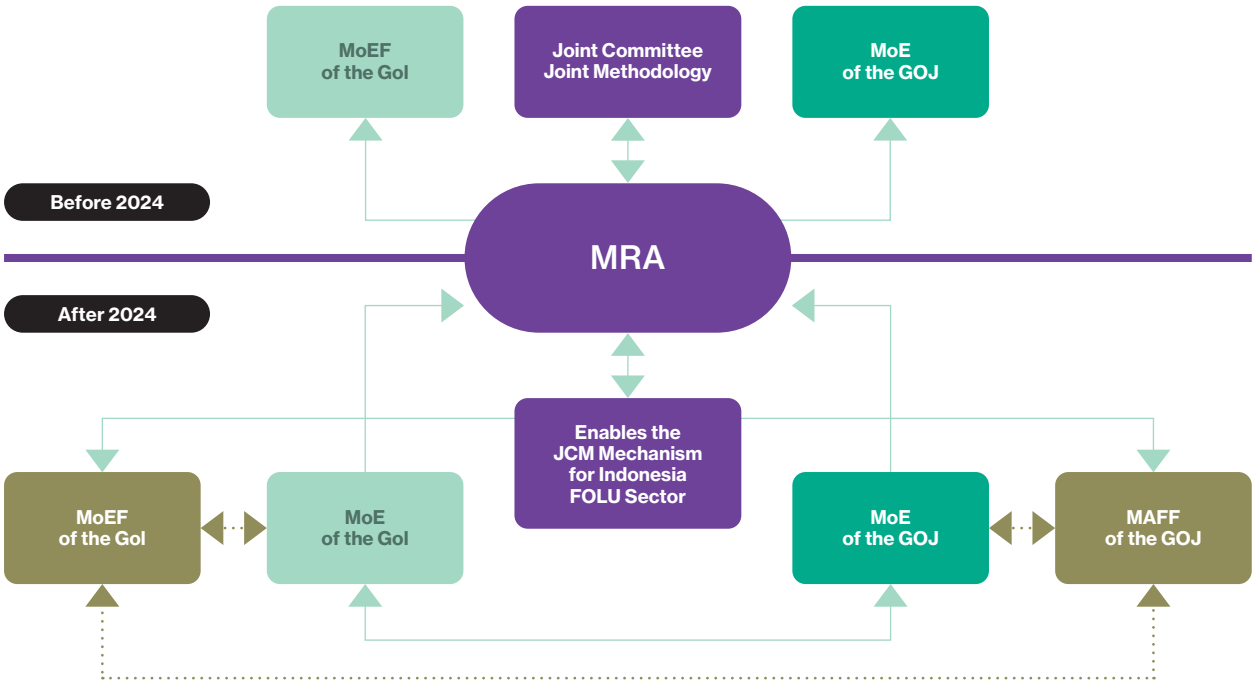
B. Strategic Action for Enabling Carbon Trade from the Indonesian FOLU Sector

The governance of the JCM is also being updated following the 2024 Indonesian presidential election. This follows the separation of MOEFI into two ministries: MOEI and MoForI. As a logical consequence of the JCM arrangement, the JCM FOLU Project should be managed by the MoForI, in addition to the MOEI's role as the technical coordination appointee mandated by Perpres 110/2025. Meanwhile, the governance of the JCM within the GOJ is also being updated through the establishment of the JCM Agency (JCMA) as the designated Global Environment Centre to oversee all JCM operations, effective April 2025, in accordance with Article 57-19 of

the revised Act on Promotion of Global Warming Countermeasures. Under the revised Act, the Ministry of Agriculture, Forestry, and Fisheries (MAFF), together with the MOEJ and the Ministry of Economy, Trade and Industry (METI), is an important stakeholder in managing the JCM FOLU Project on the Japanese side.

The signed MRA-JCM in October 2024 states that the JCM is managed by the MOEFI and the MOEJ. Nevertheless, the updated political situation has designated MoForI and MAFFJ as the actual holders of the prospective JCM FOLU Project. Yet this appears unrealized by all stakeholders, as the GOI's point of view, through the MOEI, continues to hold that the entire JCM sector remains under its authority, whereas the MAFFJ's role in managing the JCM FOLU Project remains in the shadow of the MOEI and METI. Thus, the MoForI and the MAFF, in light of the updated political situation above, should actively communicate to implement the JCM FOLU Project (Figure 4).

Figure 4. Governance of the MRA JCM after the 2024 presidential election



Source: Created by the author, 2025)

Points of communication include: stakeholder awareness of the re-arrangement of the JCM FOLU into the MOEI and MoForI, including the clear relationship between MoForI and MAFFJ. Furthermore, this re-arrangement should be communicated in accordance with Article J.19 of the MRA-JCM, which governs modifications to the MRA with the mutual consent of both parties. The modification provides an opportunity for a new agreement between MoForI and MAFFJ, serving as an upgrade to the MRA-JCM. Another point of communication concerns the current Joint Committee, as no single appointed individual from the MoForI has sat on it. Therefore, the appointment of an authorized expert from the MoForI to the Joint Committee is necessary. All of this is supposed to be carried out within the framework of the diplomatic relationship between Indonesia and Japan through the Embassy of Indonesia in Tokyo.

C. NbS Carbon Trade Between Japan and Indonesia in the FOLU Sector

It has already been established that the reasons underlying the JCM projects to date have focused on building facilities with specific TbS to achieve carbon savings through the AE. Nonetheless, these TbS projects are often perceived as limited

because of their lower overall carbon-saving capacity. Meeting the JCM's acquisition target of 100 million tCO2eq by 2030 and ensuring sufficient returns on investment for private JCM projects are perceived as challenging. Meanwhile, the NbS of the FOLU sector could contribute much more, given its advantages, as described in the previous section.

Despite the advantages of the FOLU sector, arguments from the Economic Research Institute for ASEAN and East Asia (ERIA) indicate that addressing emissions in this sector relies more on regulations, law enforcement, and planning than on technology alone. Therefore, the FOLU sector has been excluded from the scope of the Technology List and Perspectives for Transition Finance in Asia. This further underscores the limitations of the ASEAN-Japan Zero Emission Community (AZEC) in providing financial transition opportunities for the FOLU sector. This is because the scope of the sectors considered is hard-to-abate sectors related to hydrogen and ammonia, CCS, CCUS for CO2 capture and transport, renewable energy, biofuel, biomass, and electricity, for which the JCM methodology is in place.

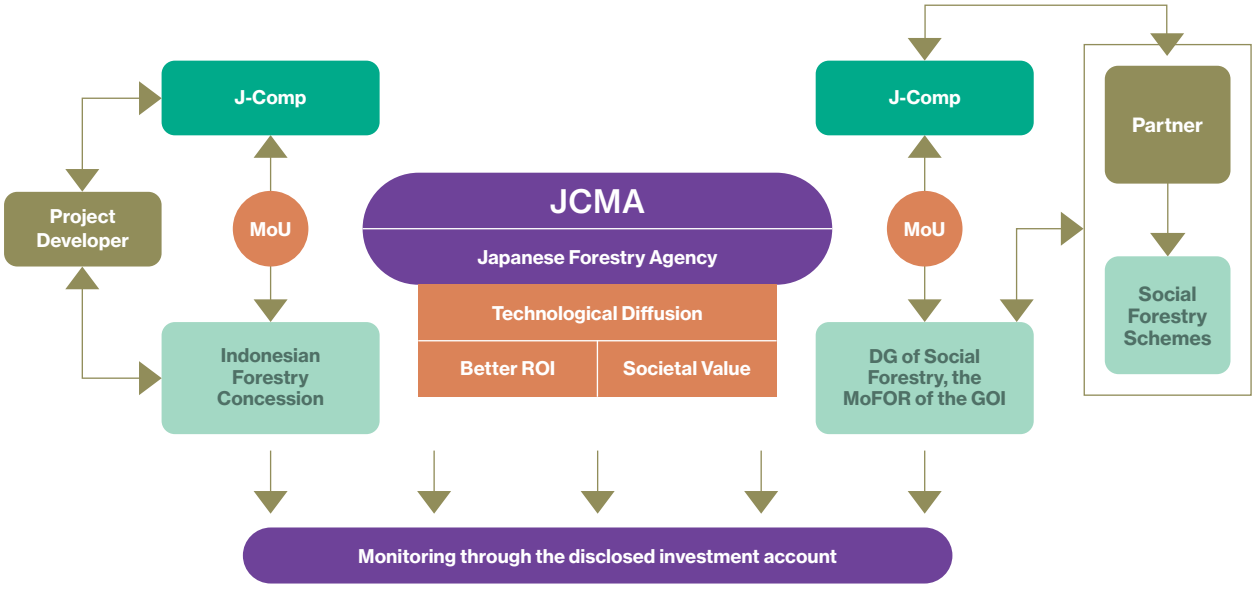
Nonetheless, the case of the REDD+ Cambodian JCM project and Indonesia's successful experiences in managing the RBP REDD+ projects raise significant concerns regarding the potential of the JCM FOLU sector. In particular, Indonesia's REDD+ reforestation scheme was one of the largest suppliers of carbon credits to the international market. Another study on the REDD+ programme in West Kalimantan, Indonesia, shows that, within the project timeline (2012–2022), mitigation performance exceeded 200,000 tons CO2eq, with additional co-benefits for communities.

Also, a growing social forestry initiative in Indonesia is underway, in which communities are obligated to avoid deforestation and forest degradation, promote reforestation and afforestation, and improve their livelihoods within their knowledge and familiarity. These activities may increase the forest's capacity to sequester carbon without sacrificing the need to sustain communities' livelihoods from forest resources. Several social forestry initiatives in West Java, East Java, and East Nusa Tenggara show potential for implementing the mixed TbS and NbS concept, such as a prospective biomass project. The TbS is implemented through the construction of small-scale on-site biomass plants, while the NbS is evident in the use of timber as a plant material. The other potential project can utilize the momentum in the GX international development strategy, as the GOJ has already stated that the GX Policy will be a key driver of the AZEC agenda. It will provide direct assistance for decarbonization technologies, such as CCS/CCUS, through capacity building and policy coordination in partner countries.

Another opportunity can be created through collaboration with Indonesian Forestry Concession Holders in natural and plantation forests (Perizinan Berusaha Pemanfaatan Hutan [PBPH]). Because this collaboration is part of corporate actions, proactive communication should be established and facilitated through workshops and business matchmaking among stakeholders interested in implementing Indonesia's JCM FOLU Project. During these activities, it should be clarified that the government's role is to develop the platform through policy to help private entities align their intentions with the principles of the JCM FOLU Project. Once matched, the private entities of both countries should form a consortium to implement the project in the host countries, with access to funding from the GOJ and the capital burden divided among the partners.

Lastly, engagement with the PBPH and Social Forestry schemes is subject to legally binding regulations (Figure 5). By engaging with either, the J-Comp can be assured of the arrangement's legal certainty. Notably, because future cooperation will generate credits from the JCM FOLU Project, which relies on technological diffusion, societal value, and improved business returns, it is necessary to disclose the investment account for monitoring purposes.

Figure 5. Corporate Action Towards Cooperation with the Indonesian Forestry Concession (PBPH) and Social Forestry



Source: Created by the author, 2025)

6 Conclusion

A thorough analysis has been conducted of the current state of potential carbon trading in Indonesia and Japan. From the Japanese perspective, the JCM is the only global platform, with the JNDC as the cornerstone policy. Through the JCM, the GOJ intends to secure significant credits from partner countries by 2030 through overseas JCM projects implemented by Japanese stakeholders, including government institutions and J-Comps. The generated JCM credits are subject to domestic trading under the J-Credit scheme, enabled by the implementation of the GX Policy in fiscal year 2026. The JCM credits are treated as compliance credits, creating significant demand from J-Comps.

Given the GOJ's current intention to secure significant credit volume from JCM partner countries in the coming decades, implementing the JCM FOLU sector could advance this goal. In particular, the Updated JNDC has expressed concern about whether the LULUCF sector falls within the scope of work. Regarding the JNDC's scope of work on LULUCF, the MRA-JCM signed in October 2024 between the GOJ and the GOI, enabling the FOLU sector to become a prospective JCM project for credit creation. This is because FOLU projects generate high-integrity credits by avoiding double-counting, require relatively small capital expenditure, demonstrate tremendous credit creation, and deliver better business returns.

From an Indonesian perspective, the Second INDC 2031–2035 and Presidential Regulation No. 110/2025 are cornerstones of Indonesia's carbon trading policy. They authorize the MoEI as the technical coordination appointee for these initiatives, with the technical ministries responsible for technical regulation as mandated by the presidential regulation. The Forestry Technical Regulation should be developed and operationalised, with reliance on the CA to ensure credit integrity and the applicable JCM joint methodology. Moreover, concerns on the Joint Committee, chaired by the appointed person from the MoForI, should be addressed.

The MoEI's appointment to coordinate the Indonesian side's arrangements for the international carbon market could pose an obstacle. Also, concerns about the presidential regulation center on carbon trade governance across other technical ministries, since there is a presumptuous seizure of mandates over carbon trade among them. Because the INDC has identified 5 sectors to be governed, each under different technical ministries, there is sectoral sentiment about who is most entitled to be appointed. Nonetheless, the relationship between the technical ministries and the Indonesian Coordinating Ministry, which houses Indonesia's JCM Office. Therefore, by elevating the technical appointee to direct management within the presidential office, where the new office is established, with specific authorities and an independent budget allocation, management is expected to be effective and efficient, aligned with the enormous economic potential.

Also, the update on the governance of carbon trading in the Indonesian FOLU sector should be of concern, given the 2024 Indonesian presidential election and the MRA-JCM signed between the MOEFI and the MOEJ. Due to the election, the MOEFI has been split into the MOEI and the MoForI. Meanwhile, following the development of the JCMA in 2025, the JCM management has designated MAFF as one of the key agencies alongside the MOEJ and METI, and made the MAFF a main stakeholder for the prospective JCM FOLU Project. Stakeholders are unaware of this update, which has slowed progress on MRA-JCM in the FOLU sector. Therefore, diplomatic communications should be initiated between MoForI and MAFFJ.

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03

The Role of AI Governance in Digital Trade: Lessons from ASEAN and Japan

Catherine Setiawan

Section Outline

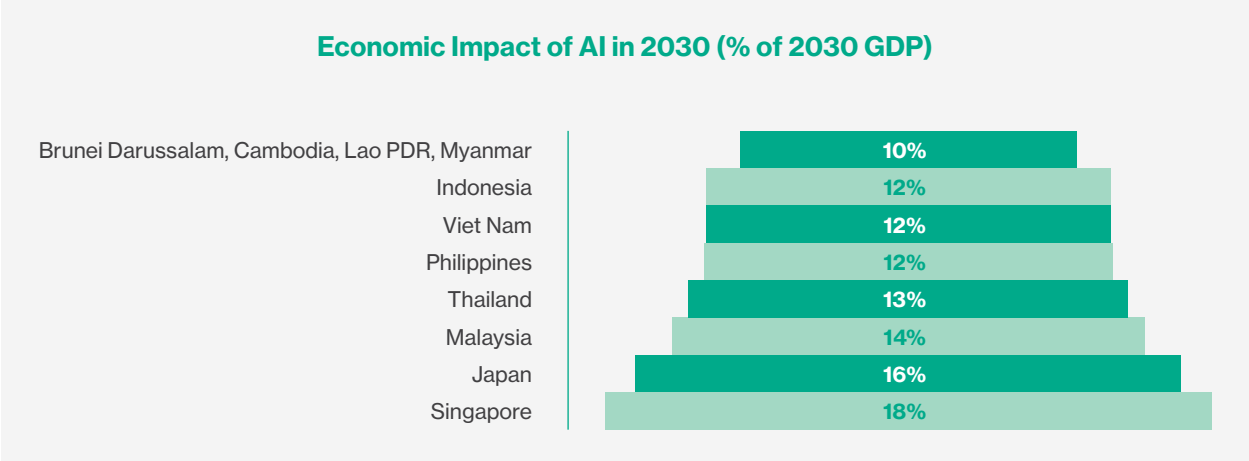
Abstract

Artificial intelligence (AI) is being increasingly embedded in digital trade systems, making it important to have a robust governance mechanism, especially to ensure trust, transparency, and cross-border interoperability. Japan, as a global leader in digital policy and a key advocate for the Data Free Flow with Trust concept, recently passed its AI Act in May 2025, with implementation set in September. In line with this, countries in Southeast Asia, as well as the Association of Southeast Asian Nations (ASEAN) as a whole, have made significant efforts to formulate guardrails around AI through the release of the ASEAN Guide on AI Ethics and Governance in 2024, followed by a supplementary guide specifically for generative AI in 2025. With this timely information, this paper examines the role of AI governance in digital trade, with an overview and progress from Japan and Southeast Asia. The study also offers recommendations for ASEAN Member States to strengthen AI governance through ASEAN-Japan collaboration.

1 Background

Artificial intelligence (AI) is expected to provide a 10%–18% uplift in gross domestic product (GDP) across Southeast Asia (SEA) and Japan by 2030 (Chua and Dobberstein, 2020), amounting to nearly $1 trillion in SEA and $331 billion in Japan (see Figure 1). AI is also rapidly transforming global trade, where cross-border transactions, e-commerce, and data-driven services are becoming central to economic activity (World Trade Organization, 2025). AI technologies, including machine learning, automation, and data analytics, enable more efficient trade processes by optimizing supply chains, predicting market trends, and facilitating digital payment and logistics systems (Global Partner Solutions Inc., 2026).

Figure 1. Economic Impact of AI in 2030 in Southeast Asia and Japan



Lao PDR = Lao People's Democratic Republic
Source: East Ventures and OpenAI (2025)

We can see from Figure 1 the economic potential of AI in both Japan and Southeast Asia. However, this economic potential does not stand independently without some policy concerns, such as data privacy protection, algorithmic bias, and ethical decision-making. These challenges signal a need for robust and coherent governance frameworks, ensuring trustworthy and transparent AI development that is in line with societal values. This paper is written in a timely manner with the adoption of Japan's AI Promotion Act, alongside the release of the ASEAN Guide on AI Governance and Ethics (2024) and the expanded ASEAN Guide on AI Governance and Ethics - Generative AI (2025). These regulations mark important regional turning point for AI Governance progress in the region. These initiatives also signal a move toward more structured and harmonized AI governance, while supporting the implementation of the Data Free Flow with Trust (DFFT) principles in the evolving digital trade landscape. This study specifically examines: (i) how AI could transform digital trade dynamics in the region; (ii) the current landscape of AI governance in Southeast Asian countries and Japan, with particular attention to its implications for digital trade; (iii) challenges and opportunities arising from AI adoption; and (iv) how ASEAN-Japan cooperation can help address existing gaps while maximizing shared opportunities.

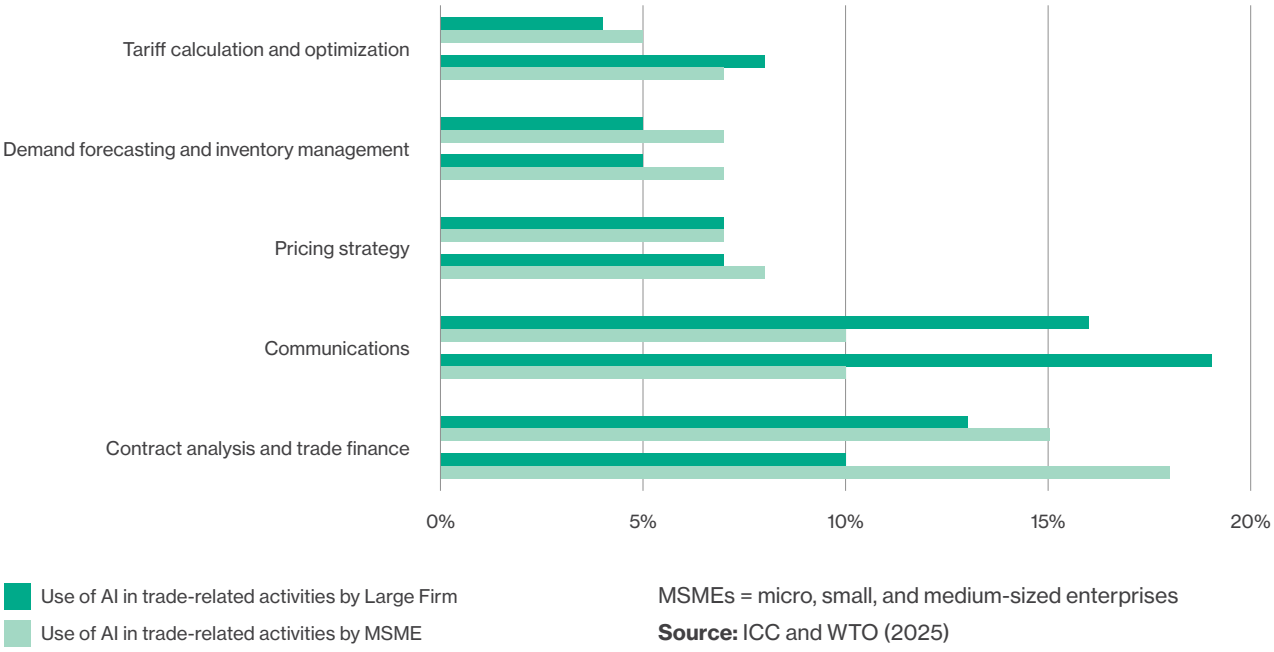
2

Linkages between AI and Digital Trade

A World Trade Organization (WTO, 2024) report on AI and trade describes how AI differs from other digital technologies in several important ways and has the potential to greatly impact international trade. As a general-purpose technology, it can adapt to a broad spectrum of fields and tasks with exceptional flexibility and efficiency. By leveraging large datasets, AI continuously learns and enhances its accuracy and performance. AI may reduce trade costs by enhancing trade logistics, increasing productivity, overcoming language barriers, and minimizing search costs, as well as boosting productivity in certain services sectors. As a result, AI can reshape comparative advantages by boosting productivity, and the emergence of AI will increase demand and trade in AI-related products.

A joint survey by the International Chamber of Commerce (ICC) and the WTO (2025) examines how companies around the world are adopting AI to support trade-related activities. They primarily use AI to help with language-processing activities, trade compliance, and market intelligence in trade-related activities (Figure 2). As a result, companies that are using AI have perceived improved efficiency in trade and are expecting cost reductions (Figure 3).

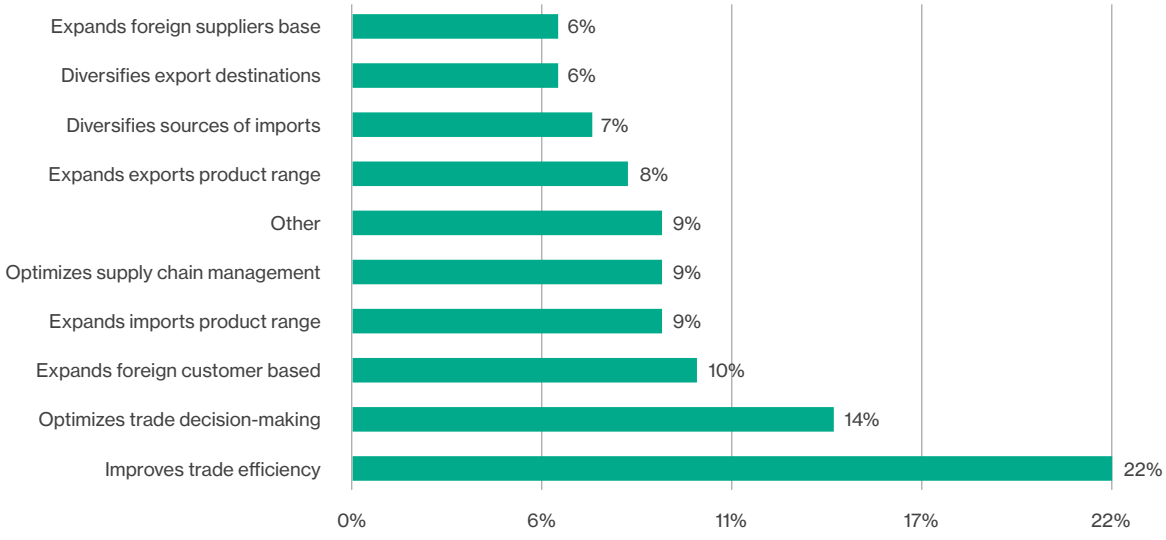
Figure 2. Use of AI in trade-related activities by firm size



MSMEs = micro, small, and medium-sized enterprises

Source: ICC and WTO (2025)

Figure 3. Benefits of AI in trade-related activities



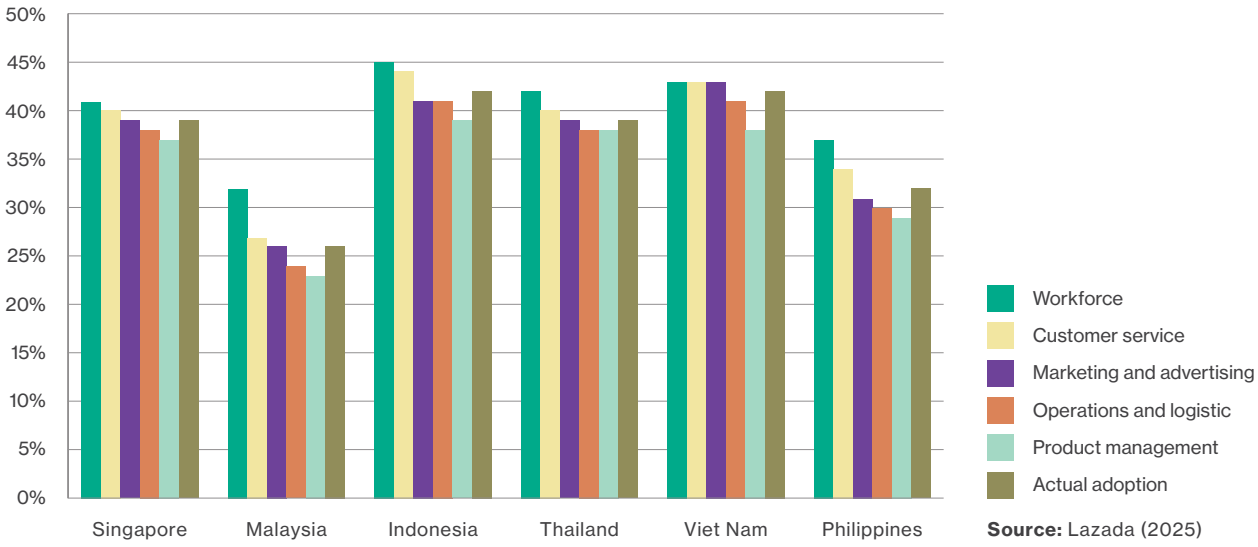
Source: ICC and WTO (2025)

Despite this potential, the study from the ICC and the WTO also mentions concerns about regulatory fragmentation, skills shortages, lack of trust, and security risks. One key challenge for companies is related to regulatory uncertainty and fragmentation, as different data protection regimes might increase compliance costs.

2.1
Case Study of Lazada

The case study of Lazada illustrates how AI can be beneficial for digital trade in Southeast Asia. As one of Southeast Asia's leading e-commerce platforms, Lazada operates in several Southeast Asian countries, including Indonesia, Malaysia, Singapore, Thailand, Viet Nam, and the Philippines (Lazada, n.d.). The platform is part of the Alibaba Group and was founded in 2012. It plays a significant role in accelerating digital trade and supporting small and medium-sized enterprises (SMEs) in Southeast Asia by connecting millions of sellers and consumers across the region through its digital marketplace, logistics network, and digital payment solutions. Lazada integrates AI into its systems with the intention to improve its seller performance and customer experience through demand forecasting, personalized product recommendations, fraud detection, smart logistics routing, and targeted marketing campaigns (Lazada, 2025) (see Figure 4).

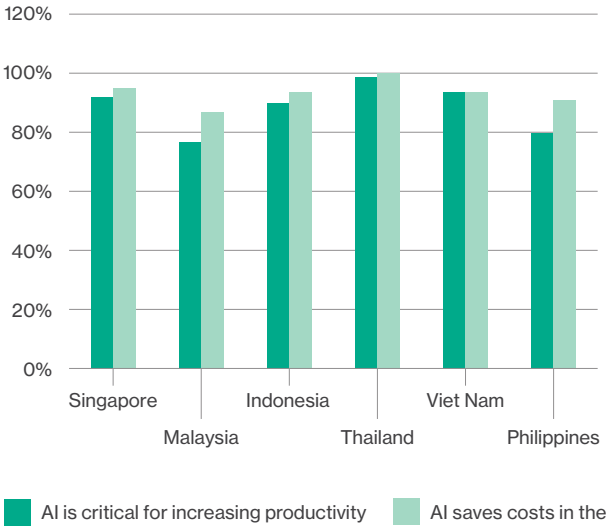
Figure 4. Adoption of AI by Lazada in Southeast Asia



Source: Lazada (2025)

The survey conducted by Lazada shows that Indonesia and Viet Nam have some of the highest levels of AI usage on the Lazada platform, with marketing and customer service functions leading adoption ahead of workforce and infrastructure-related functions. Lazada sellers in Singapore and Thailand fall within the moderate range. While sellers on Lazada Singapore boast high AI adoption due to its strong infrastructure, they lag behind in knowledge of the latest AI tools and features. Sellers on Lazada Thailand are generally in a good position in the AI adoption journey, with above-average knowledge and actual AI adoption compared to other SEA markets. Sellers in Malaysia and the Philippines lag behind other Southeast Asian markets in actual AI adoption because infrastructure development trails behind customer service and marketing and advertising.

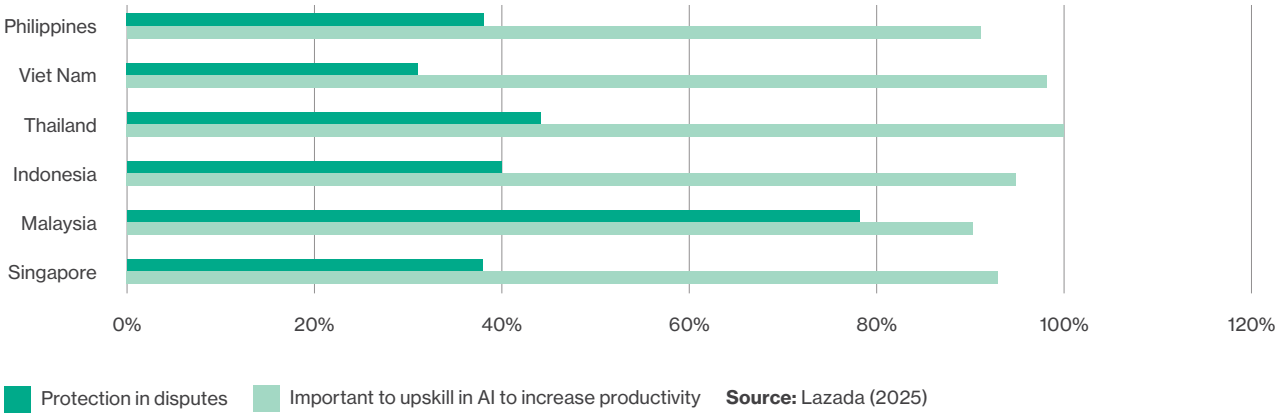
Figure 5. Perception of AI among Lazada sellers in Southeast Asia



Source: Lazada (2025)

By embedding AI throughout its marketplace infrastructure, Lazada improves operational efficiency, enhances customer satisfaction, and enables data-driven decision-making for sellers. Figure 5 shows opinions from sellers on how AI can be leveraged to drive growth and efficiency in the evolving e-commerce landscape of SEA. Lazada sellers mostly have good perceptions that AI is important in increasing productivity and saving costs in the long run.

Figure 6. Challenges faced by Lazada sellers in AI adoption



Source: Lazada (2025)

The use of AI among Lazada sellers does present challenges, as shown in Figure 6, particularly in: (i) upskilling, and (ii) dispute protection. There is strong consensus across markets on the need to upskill employees to use AI effectively, as employees often prefer familiar, traditional tools. Thailand leads in AI awareness and adoption, while Singapore, Viet Nam, and Indonesia require targeted training programmes. Moreover, sellers in most countries (generally above 30%) expect enhanced protection mechanisms, particularly in dispute resolution. Clear guidelines and regulations are also needed to ensure trust in AI-driven processes, as well as compliance with security standards to build confidence among users.

3

AI Governance Frameworks in Japan and Southeast Asia

3.1

Japan

Rather than imposing rigid rules, Japan is taking a distinctive regulatory approach that is layered, flexible, and non-binding (Nagano, 2025). As AI transforms economies and societies, Japan is relying on three complementary pillars (Inoue and Kamata, 2025):

1. The AI Promotion Act (2025), which provides a comprehensive and systematic formulation and implementation of policies to advance the research, development, and utilization of AI-related technologies (Government of Japan, 2025).

2. The AI Guidelines for Business (2024), which translate these strategic principles into practical guidance for operators (Ministry of Internal Affairs and Communications and Ministry of Economy, Trade and Industry, 2024).

3. Interpretive guidance on existing laws, including the Copyright Act (Government of Japan, 1970) and the Act on the Protection of Personal Information (APPI) (Government of Japan, 2003), to address challenges posed by generative AI.

These are not trade regulations and do not specifically address trade or digital trade. These pillars are primarily intended to balance innovation, accountability, and international alignment. Japan's AI development is aligned with discussions on internationally accepted AI ethics, standards, and interoperability, which are key for cross-border digital commerce and make Japanese AI solutions more acceptable in foreign markets (Kiantara, 2025).

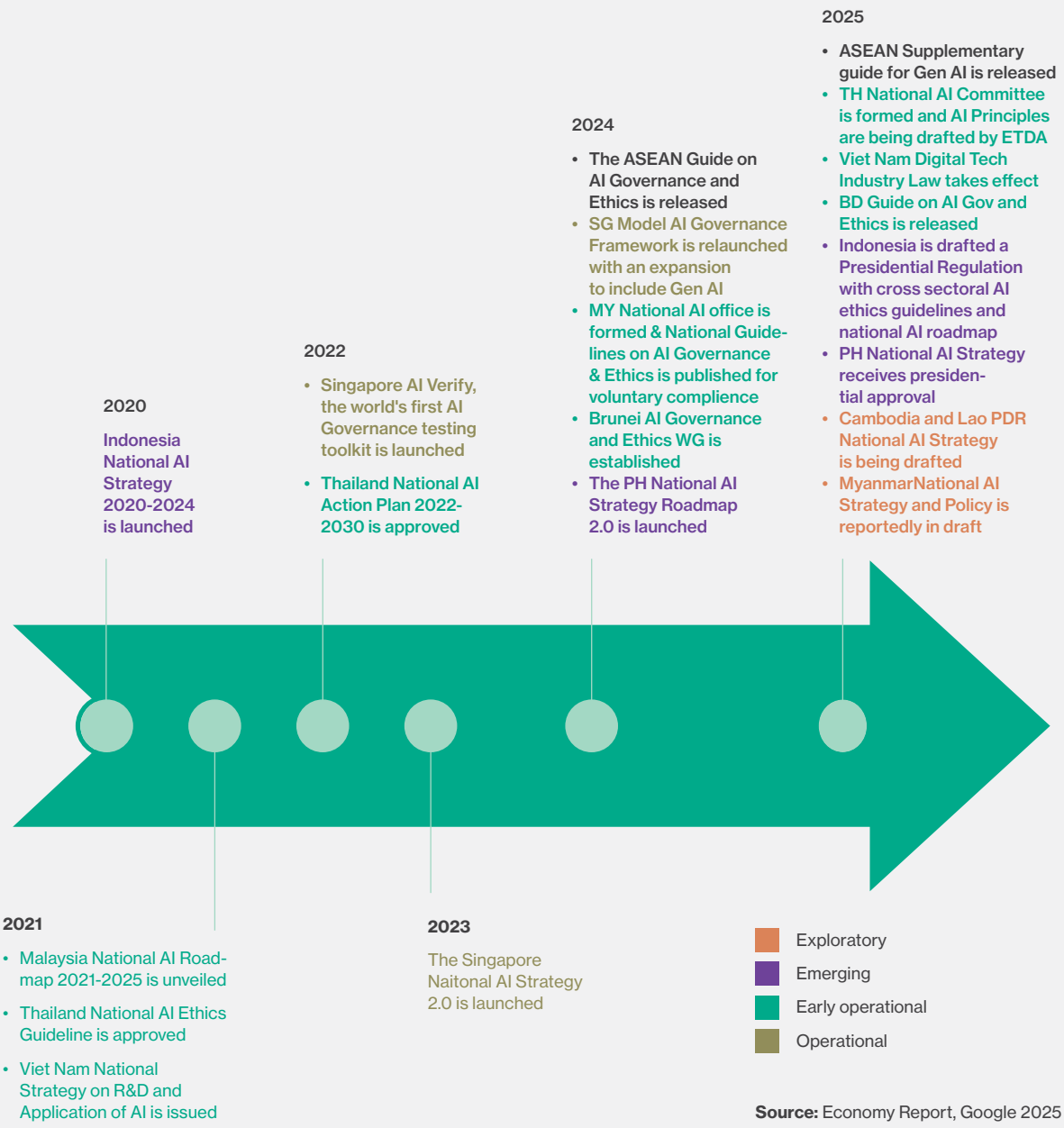
3.2

Southeast Asia

We can see from Figure 7, that governance in Southeast Asia includes: (i) the ASEAN Guide on AI Governance and Ethics (ASEAN, 2024), (ii) the Expanded ASEAN Guide on AI Governance and Ethics – Generative AI (ASEAN, 2025a), and (iii) the ASEAN Responsible AI Roadmap (2025-2030) (ASEAN, 2025b). These guides provide a flexible, risk-based approach tailored to the diverse levels of digital readiness and governance capacity among ASEAN Member States (AMS), addressing the unique risks and opportunities of generative AI technologies, such as mistakes and anthropomorphism, inaccu-

rate responses and disinformation, deepfakes, impersonation, fraudulent and malicious activities, infringement of intellectual property rights, privacy and confidentiality, and the propagation of embedded biases (details can be seen in Appendix). The roadmap was developed to provide actionable steps for ASEAN policymakers and stakeholders to create the ideal conditions for responsible AI to flourish in the region, and for AMS to leverage and enable responsible AI in a meaningful, impactful, and sustainable manner by 2030 (details can be seen in the Appendix).

Figure 7. AI Governance Progress in Southeast Asia



Source: Economy Report, Google 2025

As of 2025, Southeast Asian countries are at different stages of developing AI governance frameworks, with a strong emphasis on ethical use, data protection, and alignment with international standards. Singapore is leading progress in enforceable AI governance, applying a principles-based approach through its Model AI Governance Framework, emphasizing interoperability, accountability, and support for cross-border digital trade (Personal Data Protection Commission, Singapore, 2020). Brunei Darussalam comprehensive framework, set out in the Guide on AI

Governance and Ethics (Authority for Info-Communications Technology Industry, 2024) is supported by multi-stakeholder collaboration and the Personal Data Protection Order 2025 (Law Gratis, 2025).

Malaysia (National AI Office, Malaysia, 2025) is promoting responsible AI across key sectors through ethical principles (Malaysian Administrative Standards Technology & Innovation Council, 2025) and the National Artificial Intelligence Office (MyDIGITAL Corporation, 2024), while Indonesia has non-binding ethical guidelines from the Financial Services Authority (Financial Services Authority, 2023) and the Ministry of Communication and Digital Affairs (Ministry of Communication and Informatics, 2023), complemented by the EIT Law[1] and the Personal Data Protection Law,[2] with a draft AI roadmap (Kementerian Komunikasi dan Digital) still under consultation. Moreover, the Philippines is shaping AI policy through its National AI Strategy Roadmap and broader digital governance laws to encourage responsible AI adoption and future participation in regional digital markets (Enriquez, 2025). Viet Nam has enacted its first comprehensive AI Law, effective from March 2026 (Government of Viet Nam, 2025), establishing risk-based regulatory requirements that balance innovation, data protection, and cross-border digital trade readiness. Cambodia (Royal Government of Cambodia, 2025; Ministry of Posts and Telecommunications, Cambodia, 2024), the Lao PDR[3] and Myanmar lack standalone AI laws but are advancing national strategies and leveraging existing information and communications technology, data protection, and cyber laws to guide AI adoption. While no specific AI law exists in Lao PDR, its government has adopted a 20-year vision for 2021–2040 (Ministry of Technology and Communications, 2021), augmented by short-term plans (Lao People's Democratic Republic, 2021) to guide digital policy, including AI, to ensure transparency, accountability, data privacy, and protection of the public interest, while reflecting the ASEAN Way. Myanmar (Fourrage, 2025) is still developing its AI strategy alongside cybersecurity and e-governance plans. Across the region, these initiatives reflect a growing commitment to transparency, accountability, human-centric AI, and harmonization to enable AI-enabled digital trade and regional integration.

3.3

AI Relies on Strong Data Governance in International Trade

AI governance may include data governance as a critical component, especially in the context of international trade (OECD, 2024). Data governance is even more influential and reliable given that both Japan and Southeast Asia have soft-law AI governance frameworks that are non-binding. In terms of data accuracy and security, data governance in the regions also helps ensure compliance with international regulations, such as data privacy laws and trade agreements (Leblond, 2024). Reliance on data governance for AI-enabled trade systems reduces the risks of data misuse and bias, and ensures that AI supports fair and lawful international commerce (Atlan, 2024). This, in turn, increases trust across countries.

[1] Law No. 11 of 2008, which was last amended through Law No. 1 Year 2024 regarding Electronic Information and Transactions (EIT Law).
[2] Law No. 27 of 2022 on Personal Data Protection.
[3] Some existing legal frameworks can intersect with AI applications including: the Law on Electronic Data Protection (2017), Law on Electronic Transactions (2022), and Law on Cyber Crime (2015). In addition, some related government initiatives and strategies include the Digital Economy Strategy (2021–2030) and National Digital Economy Development Plan (2021–2025).

3.4 Integration of AI Provisions in International Trade Agreements

To date, AI is generally not addressed explicitly in existing trade agreements involving Japan and Southeast Asia, as shown in Table 1. There are some limited and general mentions in more recent agreements, such as the Digital Economy Framework Agreement (DEFA) and various Digital Economy Agreements (DEAs), which refer to "emerging areas", including AI. Unfortunately, these references remain broad and aspirational in nature. As a result, a regulatory gap remains between the rapid advancement of AI technologies and the current structure of regional trade agreements (Setiawan, 2025).

Table 1. Comparative overview of AI provisions in ASEAN and Japan's free trade agreements

Agreement	Scope and Purpose	AI Provisions	Digital Trade Provision
Regional Comprehensive Economic Partnership (RCEP	Regional trade agreement including ASEAN Member States, Japan, and other partner countries, aimed at strengthening economic integration and trade liberalization.	Does not explicitly address AI governance in a dedicated provision or chapter. However, it broadly facilitates the development of technologies such as AI through its e-commerce chapter and general digital economy integration provisions.	E-commerce chapter (Chapter 12) promotes regulatory and policy environments for digital trade, including paperless trading, wider use of e-signatures, reduced regulatory burdens, consumer protection in online transactions, cybersecurity cooperation, and support for SMEs to participate in e-commerce
Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)	Multilateral trade agreement involving Japan and several Asia-Pacific economies, including some ASEAN members, focusing on trade liberalization and digital economy cooperation.	Does not contain explicit AI provisions or a dedicated chapter on artificial intelligence.	The e-commerce and intellectual property chapters establish high-standard digital trade rules that are highly relevant to the development and deployment of AI technologies.
ASEAN-Japan Comprehensive Economic Partnership (AJCEP)	Regional economic partnership between ASEAN Member States and Japan designed to strengthen trade in goods and services, investment, and economic cooperation.	Does not explicitly contain AI provisions or a dedicated AI governance chapter.	Although negotiated before modern digital trade rules emerged, the agreement promotes trade facilitation, investment cooperation, and technology exchange. Subsequent ASEAN-Japan cooperation initiatives support digital innovation and e-commerce capacity building.
Digital Economy Agreement (DEA)	A digital economy cooperation agreement led by Singapore with partner economies to establish international digital trade rules and connectivity standards.	Encourages cooperation in emerging technologies, such as digital identities, artificial intelligence, financial technology, and data innovation.	Promotes alignment of digital rules and standards across jurisdictions, interoperability between digital systems, cross-border data flows, and protection of personal data and consumer rights.
ASEAN Digital Economy Framework Agreement (DEFA) (currently under study)	Regional ASEAN framework agreement for digital economy cooperation expected to be concluded around 2026.	AI cooperation is expected to be one of the core emerging technology elements within the framework.	Core elements include digital trade, cross-border e-commerce, digital payments, cross-border data flows, and data protection frameworks.

Source: Setiawan (2025)

3.5 Comparison

Both Japan and Southeast Asia have adopted non-binding approaches to AI governance, characterized largely by soft-law instruments, with no enforceable rights or obligations. Despite not having specific chapters or references to trade or digital trade, some principles, particularly those relating to AI ethics, standards, and interoperability, are highly relevant to cross-border digital trade.

A comparison between Japan and Southeast Asia is outlined in Table 2.

Table 2. Comparison between AI governance in Japan and Southeast Asia (in the context of digital trade)

Aspect	Japan	Southeast Asia
Core AI Framework(s)	• AI Promotion Act (2025) (strategic, non-binding) • AI Guidelines for Business (2024) (operational, voluntary) • Interpretive guidance on existing laws (APPI, Copyright Act)	• ASEAN Guide on AI Governance and Ethics (2024) • Expanded ASEAN Guide on AI Governance and Ethics – Generative AI (2025) • ASEAN Responsible AI Roadmap (2025–2030) • Mix of national AI strategies (e.g. • Singapore, Malaysia, Thailand, Indonesia)
Focus	Responsible and human-centred AI (ethical and safe AI, industrial competitiveness, international standards, human AI collaboration)	Balancing innovation with safety (ethical AI, regional cooperation, data protection, support for business)
Nature of Regulation	• Non-binding regulatory framework • Soft-law guidance for businesses • Encourages industry self-regulation	• Mixed binding and non-binding national laws • Regional efforts are non-binding
Data Protection and Cross-Border Data Flows	• APPI (revised 2022) governs personal data, permits cross-border transfer with safeguards • Clarifies privacy issues for AI systems	• ASEAN Framework on Personal Data Protection (2016) • ASEAN Framework on Digital Data Governance (2018) • ASEAN Model Contractual Clauses for Cross-Border Data Flows (2021) • ASEAN Data Management Framework (2021) • Varied national data protection laws (e.g. Singapore Personal Data Protection Act/PDPA, Malaysia PDPA)
International Alignment	• Explicitly linked to global norms (ISO/ Organisation for Economic Co-operation and Development principles) • Japanese guidelines designed for international interoperability	Regional cooperation encourages convergence but with diverse national approaches

Source: Setiawan (2025)

4 Challenges

As the previous sections have shown, AI governance in the context of digital trade, especially in Japan and Southeast Asia, faces a number of challenges. These include legal uncertainty arising from the soft-binding nature of current frameworks, digital trade barriers that may result from rigid data governance, skills gaps, and the limited presence of AI governance chapters in international trade agreements.

4.1 Regulatory Fragmentation and Legal Uncertainty

Although Japan and Southeast Asian countries have introduced AI acts, guidelines, roadmaps, and frameworks, governance approaches remain diverse and are mostly soft-binding in nature. In addition, AMS are at different stages of AI regulatory enforcement, digital readiness, and institutional maturity. This can create uncertainty and confusion for businesses operating across borders. Such fragmentation may increase compliance costs, discourage SMEs from expanding regionally, and slow the integration of AI-enabled digital trade.[4]

4.2 Data Governance and Cross-Border Data Flow Constraints

At this early stage of AI governance, with its largely non-binding nature, AI adoption in Japan and Southeast Asia relies heavily on data governance. However, in the context of digital trade, data governance can sometimes act as a digital trade barrier (Meng et al., 2020), for example through restrictions on cross-border data flows, data localization requirements, information protection rules, intellectual property infringement concerns, and related issues (Office of the United States Trade Representative, 2017). One study (Praveen, 2023) looks at how digital services trade restrictions could affect economic growth and hinder the further growth and cross-border delivery of internet services, including in Southeast Asia and Japan (Computer & Communications Industry Association, n.d.). Failure to address current digital trade barriers could also mean missing the opportunity to gain an additional $80 billion–$240 billion in intra-ASEAN trade (ASEAN-Business Advisory Council, 2025).

Moreover, unclear data localization requirements in some jurisdictions restrict seamless cross-border data transfers, inconsistent privacy safeguards complicate interoperability, and concerns over cybersecurity, surveillance, and misuse of personal data reduce trust.[5] This could constrain cross-border data flows between the regions.

4.3 Limited AI Provisions in Trade Agreements

As shown in the previous chapter, AI is generally not addressed explicitly in existing trade agreements involving Japan and Southeast Asia. The latest agreements may refer to AI as an emerging technology, but only in broad and aspirational terms. As a result, a regulatory gap remains between the rapid advancement of AI technologies and the current structure of regional trade agreements.

[4] Interview with the private sector, face to face, 2025
[5] Interview with the private and government sector, face to face and online, 2025.

4.4 Skills Gaps and Uneven AI Adoption

As shown in the Lazada case, Indonesia and Viet Nam show strong adoption in marketing and customer service, Malaysia and the Philippines lag in infrastructure-related functions, and Singapore, despite strong infrastructure, faces knowledge gaps in emerging AI tools. Workforce readiness is uneven. SMEs particularly struggle with AI literacy, technical integration, and resistance to change management. Without targeted upskilling programmes, AI risks widening digital divides within and between ASEAN countries and Japan. Despite the many strategies for capacity-building, implementation needs to be ensured, as well as finding the right partners to collaborate for funding and skills development.

4.5 Ethical Risks and Trust Deficit

AI systems introduce risks such as algorithmic and data bias, deepfakes and misinformation, and intellectual property disputes. If governance frameworks fail to address these issues effectively, public trust in AI-enabled trade systems may erode, undermining the growth of digital commerce.[6]

5 Opportunities

5.1 Productivity Gains and Trade Cost Reduction

As discussed earlier, adopting AI in trade can reduce costs and improve productivity. In addition, at the macro level, AI is projected to generate nearly $1 trillion in Southeast Asia and $331 billion in Japan by 2030, reinforcing its transformative economic potential.

5.2 Effort in Regional Integration

The efforts of ASEAN and Japan can be seen through their initiatives, such as the ASEAN Community Vision 2045, the ASEAN Digital Community 2045, and the development of AI governance through acts, guidelines, frameworks, and roadmaps (Ing, 2023). The approaches from ASEAN (risk-based) and Japan (flexibility) offer regional and international alignment that could create opportunities to co-develop interoperable AI standards that support cross-border digital trade. 7 In addition, the ASEAN-Japan AI Co-Creation Roadmap embeds AI within broader co-creation agendas between ASEAN and Japan. Progress includes AI policy discussions, joint forums, knowledge-sharing webinars, and innovation-oriented collaborations, which collectively contribute to building the

[6] Interview with the private and government sector, face to face and online, 2025.

foundations and operational pathways of the roadmap. While it remains an evolving initiative, its current emphasis is on governance alignment, stakeholder engagement, and ecosystem-building for responsible AI across ASEAN and Japan.

5.3 Advancing Data Free Flow with Trust

As AI increasingly shapes digital trade, cross-border data flows become a strategic necessity. The guiding principle of Data Free Flow with Trust (DFFT), introduced and actively promoted by Japan, is important to implement, especially in balancing data mobility and regulatory safeguards. Its objective is to prevent unnecessary data localization requirements while ensuring that cross-border data transfers maintain high standards of privacy, security, and intellectual property protection (Digital Agency Japan, 2026). Despite regulatory differences among AMS, DFFT still supports ongoing efforts to standardize digital trade and enhance cross-border data management. In addition, this principle can connect AI governance and digital trade policy by ensuring that data can flow freely across borders while preserving trust, security, and regulatory integrity.

6 Implications for ASEAN and Japan Cooperation

As the previous chapter has shown, AI can benefit digital trade. This potential also brings challenges, but it could also create opportunities for strategic collaboration between ASEAN and Japan. Some suggestions are as follows:

- ASEAN and Japan **could advance regulatory interoperability** through deeper cooperation to promote mutual understanding of regulatory frameworks. This could be done through regulatory dialogues and technical working groups on AI standards, as well as by developing interoperable compliance mechanisms to reduce cross-border trade friction.

- To **further promote the principles of DFFT**, certain standards need to be shared and harmonized, for instance those relating to cross-border data transfers, privacy protection safeguards, and cybersecurity standards. Moreover, the establishment of pilot projects or regulatory sandboxes for AI-driven trade systems could help boost business confidence in scaling up AI applications.

- Introducing **AI-related cooperation chapters** into FTAs between ASEAN and Japan, including commitments on algorithmic governance and the non-discriminatory treatment of AI-enabled services, especially in agreements still under negotiation, such as the DEFA.

- As AI adoption remains uneven across ASEAN, **strengthening SME capacity and inclusion** could help ensure that the benefits are shared more equally. This could be done through ASEAN-Japan AI capacity-building programmes, technical assistance and funding mechanisms to support SME digital transformation, and knowledge exchange between Japanese firms and ASEAN digital platforms.

7
Conclusion

AI could bring major economic benefits, with estimates suggesting a 10%–18% increase in GDP by 2030 in Southeast Asia and Japan. Moreover, the Lazada case study has shown that AI in e-commerce is important for boosting productivity and reducing costs. It could therefore improve the contribution of SMEs to cross-border trade. However, this potential also needs to be supported by a robust governance framework to ensure safe, ethical, and transparent AI systems.

Japan and Southeast Asian countries mostly have AI governance frameworks characterized by soft law and a largely non-binding nature. Reliance on more established data governance is fundamental to AI systems that depend on large volumes of cross-border data in digital trade. The promotion of the DFFT principle is essential to reduce trade friction and build confidence in AI-enabled commerce, and could increase trusted data flows, regulatory interoperability, and privacy safeguards.

AI governance in the context of digital trade presents both challenges and opportunities for Southeast Asia and Japan. The challenges include regulatory fragmentation and legal uncertainty, constraints in data governance and cross-border data flows, limited AI provisions in trade agreements, skills gaps and uneven AI adoption, and ethical risks and trust deficits. The opportunities include productivity gains and trade cost reduction, as well as ongoing efforts towards ASEAN-Japan digital integration, promotion of the DFFT principle.

ASEAN-Japan cooperation will be essential especially in advancing regulatory interoperability through dialogue and working groups, operationalizing DFFT through mutual recognition on selected data governance standards, encouraging the integration of AI provisions into trade agreements, and strengthening SME capacity and digital inclusion.

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Appendix

Table A1. ASEAN AI Guide Key Principles

Seven Key Principles of the ASEAN Guide on AI Governance and Ethics (2024)	Additional Considerations from the Generative AI Guide 2025
Transparency and explainability: AI systems should be designed and operated in a way that allows people to understand how they work and make decisions.	Need for transparency around content origin and model behaviour; disclosure when outputs may be synthetic or hallucinated
Fairness and equity: AI systems should be unbiased and avoid discrimination against any individual or group.	Awareness of bias propagation in generated content; ensuring linguistic, cultural, and demographic inclusivity in training data
Security and safety: AI systems must be secure and resilient throughout their lifecycle.	Mitigation of misuse risks, including deepfakes, impersonation, prompt injection, data poisoning, and adversarial vulnerabilities
Robustness and reliability: AI systems should perform consistently and as intended.	Addressing hallucinations and factual inaccuracies; establishing incident-reporting protocols and risk assessment regimes
Human-centricity: AI should prioritize human well-being and autonomy.	Introducing shared responsibility across developers, deployers, and users; human oversight over content-generated decisions
Privacy and data governance: AI systems must uphold data privacy and ensure responsible data management.	Strengthening IP compliance, anonymization, and traceability; preventing reconstruction of private data in outputs
Accountability and integrity: There should be clear responsibility for the development, deployment, and use of AI systems, with mechanisms in place to address any harm they may cause.	Clarifying liability among ecosystem actors; requiring governance frameworks for lifecycle accountability

Sources: ASEAN (2024; 2025a).

Table A2. Key Policy Recommendations for Generative AI Use in ASEAN

Explanation
1 – Establish shared accountability across the ecosystem • Clarify roles and responsibilities among AI developers, deployers, distributors, and end users. • Promote responsible behaviour and decision-making throughout the AI lifecycle.
2 – Ensure high-quality, lawful, and diverse training data • Use datasets that are accurate, representative, legally obtained, and inclusive (especially of ASEAN languages and cultures). • Protect against embedded bias and discrimination in training data.
3 – Design for trustworthy development and deployment • Integrate safety-by-design, explainability, and alignment mechanisms into model architecture. • Support "red-teaming" and adversarial testing before deployment.
4 – Implement incident reporting mechanisms • Create clear protocols to report, document, and respond to AI system failures or misuse (e.g. deepfake abuse or hallucinations). • Promote regional information-sharing across ASEAN.
5 – Develop testing, assurance, and evaluation standards • Use evaluation benchmarks and risk assessments tailored to ASEAN contexts (language, use cases, digital maturity). • Align with international standards while allowing local flexibility.
6 – Strengthen AI security • Protect generative AI systems from vulnerabilities, such as prompt injection, adversarial attacks, and data leakage. • Encourage "security by design" throughout model development and deployment.
7 – Enable content provenance and traceability • Promote watermarking, disclosure labels, and other tools to verify whether content is AI-generated. • Support user awareness and content authentication infrastructure.
8 – Invest in safety and alignment R&D • Fund collaborative regional research on value alignment, interpretability, and red-teaming methods. • Create testbeds and sandboxes across ASEAN Member States.
9 – Leverage generative AI for the public good • Encourage applications in education, healthcare, disaster response, and other Sustainable Development Goals. • Promote access for underserved communities and small businesses.

Source: ASEAN (2025a)

Table A3. Cross-Cutting and Targeted Activities: Pillars in the ASEAN Roadmap on AI 2025–2030

Agreement	Scope and Purpose
Cross-cutting	1. Skills and capacity building: Improving the skills and knowledge that are essential for a workforce to benefit from a digitalized global economy, with an emphasis on AI-related know-how. 2. Fairness and inclusion: Enhancing the visibility and voice of vulnerable, at-risk, or marginalized communities in the design and implementation of AI products, services, policies, and regulations. 3. Governance and participation: Fostering an inclusive, representative, and consultative approach in the development of AI governance and regulatory frameworks to ensure that AI systems remain human-centric and inclusive. 4. Integration and cooperation: Expanding platforms for regional and global dialogue on key AI trends and issues.
Targeted	1. Internal governance structures and measures: Promoting awareness of, and support for, the development and implementation of national AI policies, frameworks, strategies, and regulations. 2. Skills and knowledge for responsible, AI-augmented decision-making: Promoting and strengthening skills, capabilities, and knowledge-sharing among the public and private sectors, educational institutions, and civil society to develop and deploy AI responsibly. 3. Risk mitigation, monitoring mechanisms, and operations management: Strengthening and promoting the use of risk mitigation, monitoring, and evaluation tools across the public and private sectors to mitigate risks and biases, minimize harm from AI, and align with responsible AI principles. 4. Stakeholder coordination and regional cooperation on AI: Promoting regional efforts to develop common principles and a guiding approach to operationalizing responsible AI, and aligning national efforts with the work of the ASEAN Working Group on AI Governance.

Sources: ASEAN (2025b).

04

Strengthening ASEAN-Japan AI Collaboration: Enablers and Barriers

Mark Bryan Manantan, PhD

Section Outline

Abstract

As artificial intelligence (AI) collaboration increasingly becomes a defining component in Association of Southeast Asian Nations (ASEAN)-Japan relations, this article examines the current opportunities and challenges of Japan-led AI initiatives in Southeast Asia. It argues that, despite growing competition in the AI landscape, ASEAN-Japan AI collaboration continues to grow due to Japan's adaptive economic and technological statecraft. By analyzing three emerging cases of ASEAN-Japan AI collaboration – AI governance, the ASEAN Co-Creation Roadmap, and start-up collaboration and funding – this study unpacks the enablers and barriers to achieving practical ASEAN-Japan AI collaboration.

Overall, the article finds that the prospects for ASEAN-Japan collaboration in AI are moderately positive. Japan continues to enjoy a relatively high degree of trust in Southeast Asia. Japanese start-ups and technology companies are uniquely positioned to leverage the longstanding contextual knowledge and trust-based reputation networks of many Japanese companies in the manufacturing and electronics sectors that established a presence in the 1980s. Positive spillover effects from ASEAN-AI collaboration are also on the rise, especially in related technology sectors such as semiconductors, and data centres.

Still, challenges lie on the horizon, including fragmented approaches to cross-border data flows and widening gaps in AI readiness between Japan and ASEAN Member States. While the outsized dominance of the United States and China in the AI stack can impact the likelihood of ASEAN and Japan achieving their shared aim of developing sovereign AI capabilities in the short-to-medium term, they can harness their complementary and comparative strengths in workforce development, smart manufacturing, robotics, green technology, fintech, and entertainment. To enhance ASEAN-Japan AI collaboration and advance an interoperable technological ecosystem, the study suggests focusing on four areas: compute infrastructure, cross-border data flows, capacity building, and the promotion of use-case applications.

1 Context

During the 6th Association of Southeast Asian Nations (ASEAN)-Digital Ministers Meeting (ADDM) in January 2026, Japan's Ministry of Internal Affairs and Communications presented a proposal to ASEAN Member States (AMS) to enhance artificial intelligence (AI) collaboration through a tailored approach that considers the cultural and linguistic diversity across Southeast Asia.[1] Japanese Communications Minister Yoshimasa Hayashi stated that several countries have expressed interest in cooperating with Japan to

[1] Mayumi Hirosawa, "Japan to Help ASEAN Develop Local-Language AI amid China Concerns," *Nikkei Asia*, accessed March 28, 2026, https://asia.nikkei.com/business/technology/artificial-intelligence/japan-to-help-asean-develop-local-language-ai-amid-china-concerns.

create context-sensitive AI models and platforms to reduce overdependence on foreign countries. Japan views the growing interest among Southeast Asian countries in developing their respective sovereign AI capabilities as an opportunity for Japanese AI start-ups to further expand overseas.[2] As a point of differentiation from United States (US) and Chinese companies, Japan endeavours to pursue a more "tailored" approach to AI development and deployment that takes account of the cultural and linguistic nuances of target countries in Southeast Asia.[3] To demonstrate this, Minister Hayashi and Cambodia's Minister of Posts and Telecommunications Chea Vandeth agreed to develop a large language model (LLM) for Khmer, the country's official language, on the sidelines of the Japan-ASEAN ADDM. In the joint statement released after the event, officials set out action points to build an enabling AI ecosystem, ranging from building data centres, strengthening digital and security infrastructure, developing human resources, and strengthening regulatory frameworks, to addressing the misuse of AI.

While the aspirations of ASEAN and Japan are timely, and valid, developing sovereign AI capabilities is easier said than done, given the established market presence and scale of leading US and Chinese technology companies across the AI stack (hardware, software, and infrastructure). Moreover, current geopolitical headwinds arising from US-China strategic competition is also restructuring the global and regional trade and tech supply-chains. Crucially, the varying levels of AI readiness and cultural barriers among AMS and Japan, as well as the mobilization of adequate fiscal resources to build compute infrastructure and the availability of talent, remain in question.

Against this backdrop, it is puzzling as to why ASEAN and Japan continue to forge and deepen cooperation, especially in the highly competitive and rapidly evolving field of AI? More importantly, given ASEAN's similar or parallel AI partnerships with more established AI players such as the US and China, it is unclear why Japan continues to be a critical partner for the region. This research argues that the momentum behind ASEAN-Japan AI collaboration is largely anchored in Japan's longstanding position as ASEAN's most trusted dialogue partner, built through its strategic deployment of economic and technological statecraft. Conversely, while the US and China continue to dominate the AI stack, Japan co-creation model offers an alternative 'third path' in AI innovation that aligns with AMS preference towards developing local alternatives that reduces their exposure to both AI superpowers, while promoting culturally sensitive AI innovation.

Through a combination of expert interviews and open-source document analysis, the article identifies the enablers and barriers likely to shape the prospects for ASEAN-Japan AI collaboration moving forward. Overall, the analysis finds that Japan's legitimacy as ASEAN's trusted dialogue partner is a major enabler of its positive AI engagement in Southeast Asia. Although its AI innovation cannot compete with the sheer size, scale, and sophistication of the US and China, Japan continues to enjoy moderate support among key policy and industry elites in Southeast Asia. This support is rooted in its adaptive and flexible use of economic and technological statecraft over the past five decades.

This article defines "economic statecraft" as the use of economic tools, including trade, investment, overseas development aid, export controls, and investment screening. "Technological statecraft" refers to the development and deployment of digital assets, tools, and platforms, including cybersecurity, AI, data, and semiconductors, to accomplish foreign policy goals and objectives. Through the sustained provision of public goods and infusion of investment and technology transfer, Tokyo has incrementally gained ASEAN's trust. Japan seeks to build on this momentum to regain its competitive edge in AI in fields like robotics and semiconductors. Japanese start-ups and technology companies are leveraging the longstanding contextual knowledge and positive reputation of many established Japanese manufacturing and electronics companies. They

2 Hirosawa, "Japan to Help ASEAN Develop Local-Language AI amid China Concerns."
3 Akio Yaita, "Japan Backs ASEAN's Needs-Driven AI Initiative," *MediaConnect*, accessed March 28, 2026, https://mediaconnect.com/japan-backs-aseans-needs-driven-ai-initiative.

are capitalizing on the trust-based networks of Japanese firms to establish horizontal collaboration through strategic partnerships with local start-ups in Southeast Asia to advance research and development (R&D) and talent training. With the provision of funding support, accelerator programmes, and scholarships, opportunities for vertical collaboration are also increasing to help address shortages in the information technology (IT) workforce. This takes the form of joint ventures and partnerships involving start-ups and universities, as well as technical and policy training to enhance two-way exchanges among Japanese and Southeast Asian policymakers, innovators, and entrepreneurs.

However, barriers remain on the horizon to cementing ASEAN-Japan collaboration, such as fragmented data governance frameworks and widening gaps in AI readiness, which are reflected in the overall lack of adequate internet connectivity, compute infrastructure, and skilled IT professionals in Southeast Asia. While Japan and ASEAN aspire to reduce dependencies on US and Chinese technology companies, this remains infeasible in concrete terms over the short-to-medium term. Instead, Japan and ASEAN can shift their focus towards championing niche or targeted and complementary AI use-case applications in smart manufacturing, robotics, green technology, fintech, and entertainment that align with their mutual digital economic priorities, and comparative advantages.

This study aims to make two important contributions. First, it examines the underlying factors that underpin the feasibility of ASEAN-Japan AI collaboration from the viewpoint of Japan's evolving economic and technological statecraft. Japan is clearly not the only state that utilizes economic and technological statecraft in its engagement with ASEAN. However, Japan's legitimacy as a trusted dialogue partner, based on its decades-long engagement, sets it apart from the US, China, the European Union (EU), and the Republic of Korea. The article expounds on such a claim by analyzing a brief historical overview of ASEAN-Japan relations since 1977 following the Fukuda Doctrine. In doing so, it traces the procedural and performative elements that support Japan's legitimacy as a trusted regional power. In adapting its statecraft from economic to technological, Japan has demonstrated agility in identifying and pursuing mutual goals with ASEAN. Japan's patient and flexible engagement anchor the foundational impetus behind its ongoing ASEAN-Japan AI collaboration and the feasibility of the article's suggested policy recommendations in the concluding section. Second, the article's analysis provides policymakers and practitioners across government, industry, academia, and civil society with preliminary insights into ASEAN-Japan AI collaboration, given the nascency of the topic.

This study proceeds in four parts. The first section elaborates on the evolution of Japan's statecraft, the main driver underpinning the positive momentum of ASEAN-Japan AI collaboration. The second section provides an overview of ASEAN-Japan AI initiatives. The third section unpacks the enablers and barriers that could cultivate or inhibit ASEAN-Japan AI collaboration moving forward. The fourth section concludes by noting that the AI prospects of ASEAN and Japan will be best advanced by harnessing their complementarities and comparative advantages and by incrementally embedding human-centred AI principles to promote a more inclusive and equitable AI ecosystem amid intensifying great power competition and rapid technological disruptions.

2

Japan's Evolving Economic and Technological Statecraft

Arguably, Japan's adaptive economic and technological statecraft is the main driver underpinning the prospects of ASEAN-Japan AI collaboration. As ASEAN's first dialogue partner, Tokyo's long track record of strategic engagement over the last 50 years has utilized economic tools and, more recently, technological tools to build trust and confidence in Southeast Asia. Although there is no objective scorecard for evaluating Japan's trust-building with

ASEAN, the State of Southeast Asia, a regional survey of ASEAN political, business, and academic elites, has consistently ranked Japan as one of ASEAN's most trusted partners. In 2023, Japan was crowned as the most trusted partner (54.5%), followed by the US (54.2%), EU (51.0%), China (29.5%), and India (25.7%).[4] Relatedly, the Lowy Institute's Asia Power Index regarded Japan in 2025 as the region's "quintessential smart power", with wide diplomatic influence despite its limited resources and ageing population.[5] To demonstrate how Japan's legitimacy as ASEAN's most trusted dialogue partner was built, the discussion below traces its patient engagement in Southeast Asia characterized by its evolving statecraft from economic to technological, across three stages:

1. Establishment: ASEAN and the Fukuda Doctrine (1977–2000)
2. Recalibration: Japan's economic stagnation and the rise of China (2000–2012)
3. Digitalization: The Fourth Industrial Revolution and great power rivalry (2016–present)

It should be noted that China's accession to the World Trade Organization in 2001 and its rise as the second-largest economy in 2008 were critical events that marked the shift in Japan's statecraft from economic to technological statecraft. This trend has continued since the 2010s amid the rapid adoption of digital technologies in Southeast Asia, the intensifying US-China rivalry that began in 2016, and China's climb to technological leadership beginning in 2020. Turning to ASEAN-Japan relations, the shared goal of harnessing the benefits of digitalization accelerated efforts by ASEAN and Japan to strengthen cooperation in cybersecurity and dual-use technologies such as space capabilities and AI.[6] As US-China competition intensified, ASEAN and Japan increasingly found themselves in a similar position, seeking to carve out strategic agency to achieve policy manoeuvrability. To this end, diversifying partnerships and increasing domestic and regional cooperation to stimulate innovation became a strategic decision aimed at reducing dependence on major global technology players, such as the US and China.

A. Establishment: ASEAN and Japan's Fukuda Doctrine

Since Japan became ASEAN's first dialogue partner in 1977, Tokyo has adopted a nimble approach in its statecraft. Whether such adaptiveness is the outcome of highly deliberate strategic calculations or mere serendipitous efforts, Japan has demonstrated its commitment to strengthening ASEAN's regional economic integration. Indeed, during his speech at the state banquet marking the 50th year of ASEAN-Japan Friendship and Cooperation, held in Tokyo in December 2023, former Japanese Prime Minister Kishida emphasized that the core of the enduring relationship lies in mutual trust.[7] That trust was built over the previous four decades, initiated by the Fukuda Doctrine announced in 1977, which set out Japan's foreign policy blueprint for reshaping its image after World War II. Overall, the Fukuda Doctrine has three pillars: "(i) Japan will not be a militaristic power in Southeast Asia; (ii) Japan will seek a 'heart to heart' relationship (kokoro to kokoro no fureai) with ASEAN, and (iii) Japan will forge an equal relationship with ASEAN and will support it as a regional organization".[8]

After the declaration of the Fukuda Doctrine in 1977, Japan's engagement with ASEAN began to flourish, with economic statecraft taking centre

[4] L. Peng Er, "Closer ASEAN-Japan Relations amid Great Power Transition in the 21st Century?" *Asia-Pacific Review* 30, no. 2 (2023): 44–65, https://doi.org/10.1080/13439006.2023.2248783.

[5] Lowy Institute, "Japan," *Asia Power Index* 2025 Edition, accessed March 28, 2026, https://power.lowyinstitute.org/countries/japan/.[5] https://www.mofa.go.jp/files/100596243.pdf

[6] "Implementation of Plan of the Joint Vision Statement on ASEAN-Japan Friendship and Cooperation Trusted Partners," *Ministry of Foreign Affairs*, December 17, 2023, https://asean.org/wp-content/uploads/2023/12/Final-Implementation-Plan-of-the-ASEAN-Japan-Joint-Vision-Statement.pdf; "The 28th ASEAN Japan Summit," *Prime Minister's Office of Japan*, October 26, 2025, https://japan.kantei.go.jp/104/diplomatic/202510/26asean.html.

[7] "Speech by Prime Minister Kishida at the banquet at the State Guest House, Akasaka Palace commemorating the 50th Year of ASEAN-Japan Friendship and Cooperation – Striving for Peace and Prosperity through Co-Creation based on Trust" *Ministry of Foreign Affairs of Japan*, accessed March 28, 2026, https://www.mofa.go.jp/files/100596243.pdf.

[8] Peng Er, "Closer ASEAN-Japan Relations."

stage. Japan was seen as a model of development by countries such as Singapore and Malaysia due to its re-emergence as an economic and technological frontrunner in East Asia. To buffer against the adverse effects of its trade war with the US, Japan saw Southeast Asia as a viable alternative for expanding its economic footprint.[9] In the mid-1980s, Japanese electronics and automobile companies started to move their production bases to Southeast Asia.[10] With the rapid expansion of regional supply chains, ASEAN became a direct recipient of Japanese investment, leading to the establishment of large-scale industrial parks in Thailand and Indonesia in the 1990s.[11]

Japan's provision of Overseas Development Assistance (ODA) was also a key hallmark of its economic statecraft among AMS and went hand in hand with the expanding presence of Japanese companies in Southeast Asia. Since the announcement of the Fukuda Doctrine, Japan has prioritized Southeast Asia as a key ODA recipient. Former Prime Minister Ohira even noted that Japan's ODA to China at the time should not exceed the amount provided to Indonesia, the largest recipient among AMS.[12] Compared with the Western notion of ODA, the Japanese model was described as the cooperative trinity comprising trade, investment, and economic cooperation. This meant that while Japanese ODA sought to achieve multiple policy goals, such as aiding reparations, supporting humanitarian assistance and enhancing diplomatic relations,[13] it also supported the growing footprint of Japanese companies across Southeast Asia. As a form of public-private partnership, Japanese ODA facilitated the construction of roads and ports to support socioeconomic development in Southeast Asia, while ostensibly creating a sound environment for Japanese industrial firms to flourish.

Amid the transactional views often attached to Japanese ODA in Southeast Asia, it was nevertheless instrumental in providing a safety net via grant aid during the Asian financial crisis, offering both technical and financial support.[14] When the 1997 Asian financial crisis hit, Japan launched the New Miyazawa Initiative, followed by Japan's financial cooperation in Asia under the ASEAN Plus Three Framework (with Japan, China, and the Republic of Korea) to support recovery. Through these efforts, Japan came to be seen as a positive force in East Asia, marking a new phase in ASEAN-Japan cooperation.

B. Recalibration: Japan's Economic Stagnation and the Rise of China

Despite Japan's economic rise through the 1980s, its economy began to stagnate from the early 1990s to 2001. In the first half of the 1990s, Japan's asset bubble burst, leading to a deep recession that was further aggravated by the 1997–1998 Asian financial crisis. Amid these challenges, ASEAN-Japan engagement continued with the announcement of the Obuchi Initiative during the ASEAN Plus Three process, involving Japan, China, and the Republic of Korea. This initiative sought to enhance human resource development and exchanges in East Asia, build social safety nets, revitalize the economy, and meet the challenges of the information age at the start of the new millennium.[15] In 2002, Prime Minister Koizumi Junichiro proposed the concept of an East Asian Community, and in the same year the ASEAN-Japan Comprehensive Economic Partnership was signed.

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[9] Peng Er, "Closer ASEAN-Japan Relations."
[10] Oba Mie, Endo Tamaki, Jimbo Ken, and Mieno Fumiharu, "50th Year of ASEAN-Japan Friendship and Cooperation: Roundtable Discussion of Track Record and Future Prospects," *Asia-Pacific Review* 30, no. 2 (2023): 30–68, https://doi.org/10.1080/13439006.2023.2254636.
[11] Oba et al., "50th Year of ASEAN-Japan Friendship and Cooperation."
[12] Mitsuya Araki, "Japan's Official Development Assistance: The Japan ODA Model That Began Life in Southeast Asia," *Asia-Pacific Review* 14, no. 2 (2007): 17–29, https://doi.org/10.1080/13439000701733218.
[13] Jiyeoun Song, "Japan's Official Development Assistance in Southeast and South Asia: Strategy for Economic Revitalization and Regional Security Cooperation," *Journal of International and Area Studies* 28, no. 1 (2021): 1–20, https://www.jstor.org/stable/27210932.
[14] Araki, "Japan's Official Development Assistance: The Japan ODA Model That Began Life in Southeast Asia."
[15] Narongchai Akrasanee and Apichart Prasert, "The Evolution of ASEAN-Japan Economic Cooperation" in *ASEAN-Japan Cooperation: A Foundation for East Asian Community*, ed. Tadashi Yamamoto, (Tokyo: Japan Centre for International Exchange, 2003), 63-74, accessed March 28, 2026, https://jcie.org/researchpdfs/ASEAN/asean_narongchai.pdf, 69–70.

While the early 2000s offered some relief to the Japanese economy, its recovery was further undermined by the global financial crisis in 2008.[16] At the same time, China's accession to the World Trade Organization had a profound impact on the global economy. By 2008, China had become the second-largest economy and was widely regarded as a peer competitor to the US. Concerned by China's growing economic influence and foreign policy assertiveness in Southeast Asia, especially regarding the maritime disputes in the South China Sea, Japanese policymakers became even more strategic in their dealings with Beijing. Japan pursued a multipronged strategy of mediating China's expanding strategic influence by maintaining the regional military balance through the continuing presence of the US under the US-Japan alliance, while reinforcing its strong engagement with Southeast Asia through the provision of aid, investment, and infrastructure.[17]

Tokyo's refinement of its economic statecraft revitalized Japan's strategic outreach to Southeast Asia, seeking to emphasize economic, environmental, and strategic benefits to differentiate itself from China.[18] This became highly evident when Japan launched its Partnership for Quality Infrastructure in 2015, which adhered to international standards in contrast to China's Belt and Road Initiative. Former Japanese Prime Minister Shinzo Abe's emphasis on Japan's high-quality infrastructure was intended to distinguish Japanese projects from Chinese ones, which at the time received mixed reviews regarding financial and environmental sustainability and governance standards.[19] Since then, Japan and China have poured additional funding into expanding their respective infrastructure development financing portfolios.

Through infrastructure development, Japan and China aimed to spur domestic growth while also generating geostrategic and economic influence. However, a degree of convergence started to emerge as Tokyo and Beijing tried to outbid and outperform each other. Over time, Japan and China complemented and learned from each other's practices, from contracting and technology transfers to additional diplomatic efforts, all of which to some degree has benefitted host countries.[20] These dynamics soon turned Japan and China into "competitive partners" that defied the conventional development financing represented by the Washington Consensus and the Development Assistance (DAC) Committee. Interestingly, this dynamic also underlined Japan's move away from the constraints of the DAC for aid donors, while tacitly endorsing fundamental Chinese practices that were apparently informed by earlier Japanese development practices.[21]

Despite Japan's stagnating economic performance, it has maintained its role as a leading bilateral development partner in Southeast Asia. From 2015 to 2021, Japan released a total of $28 billion in overseas development finance, of which 99% was ODA, accounting for almost 33% of the regional total.[22] In 2003, Japan also revised its ODA Charter to address human security. In moving beyond traditional security issues, Japan utilized ODA to support capacity-building activities related to maritime law enforcement among claimant states in the South China Sea as a way of countering China's grey zone tactics.[23] While Japan is not among the claimant states, the South China Sea is vital to its sea lines of communication, and any Chinese actions in the contested waters could set a precedent for Japan's disputes with Beijing over the Senkaku/Diaoyu Islands.[24]

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[16] Keiichi Tsunekawa, "Japan: The Political Economy of Long Stagnation," in *Two Crises, Different Outcomes: East Asia and Global Finance*, ed. T. J. Pempel and Keiichi Tsunekawa (Ithaca, NY: Cornell University Press, 2015), 185–215.

[17] Corey Wallace, "Japan's Strategic Contrast: Continuing Influence despite Relative Power Decline in Southeast Asia," *The Pacific Review* 32, no. 5 (2019): 863–97, https://doi.org/10.1080/09512748.2019.1569115.

[18] Wallace, "Japan's Strategic Contrast: Continuing Influence despite Relative Power Decline in Southeast Asia."

[19] Hong Zhao, "China–Japan Compete for Infrastructure Investment in Southeast Asia: Geopolitical Rivalry or Healthy Competition?" *Journal of Contemporary China* 28, no. 118 (2019): 558–74, https://doi.org/10.1080/10670564.2018.1557946.

[20] Zhao, "China–Japan Compete for Infrastructure Investment in Southeast Asia."

[21] Jing-Dong Yuan and Ngeow Chow Bing, "Competitive Partners in Development Financing: China and Japan Expanding Overseas Infrastructure Investment," *The Pacific Review* 32, no. 5 (2019): 771–800, https://doi.org/10.1080/09512748.2019.1569117.

[22] Lowy Institute, "Southeast Asian Aid Map 2023: Traditional Development Partners," *Southeast Asia Aid Map*, accessed March 28, 2026, https://seamap.lowyinstitute.org/analysis/2023/traditional-development-partners/.

[23] Kristi Govella, "The Adaptation of Japanese Economic Statecraft: Trade, Aid, and Technology," *World Trade Review* 20, no. 2 (2021): 186–202, https://doi.org/10.1017/S1474745620000543.

[24] Govella, "Adaptation of Japanese Economic Statecraft," 192.

C. Adaptation: The Fourth Industrial Revolution and Great Power Rivalry

On the eve of the ASEAN-Japan Commemorative Summit in 2023, several experts noted that Japan and ASEAN cannot remain complacent amid regional and global uncertainty, particularly amid the deepening US-China rivalry amid the Fourth Industrial Revolution.[25] Since 2009, Japan has gradually re-engineered its statecraft to emphasize critical and emerging technologies beginning with cybersecurity. This shift towards technological statecraft has been integral, given the growing threats that cyberattacks pose to Japanese companies operating in East Asia. From the lens of technological statecraft, Japan seeks to benefit from digital economic growth through the expansion of its technology companies and by building stronger diplomatic relations in Southeast Asia. In 2023, Tokyo was the leading source of foreign direct investment, with approximately $26 billion directed to the manufacturing, storage, and automotive sectors.[26] Connectivity, in both the infrastructure and digital fronts, has been a key priority area for Japan. In 2024, Japan contributed $100 million to the Japan-ASEAN Integration Fund and launched the Japan-ASEAN Comprehensive Connectivity Initiative.[27] With the wave of digitalization trend, Japan has expanded its technological statecraft portfolio, first with cyber capacity-building in late 2009 and later extending to dual-use technologies such as AI.

Cybersecurity

As Japan's economy and society have become increasingly dependent on the integration of physical and digital technologies, the country has placed greater emphasis on cybersecurity. With rapid internet penetration and digital technology adoption, the threat surface available to malicious actors has expanded, thereby posing serious risks to Japanese companies operating at home and abroad.[28] Given the borderless nature of cybersecurity threats, Japan embarked on international cybersecurity cooperation in the Asia-Pacific region, especially Southeast Asia, where Japanese companies have long maintained a presence.[29] This underscores the role of ASEAN as a focal point of Japanese government's cyber diplomacy efforts, encompassing a wide range of cyber capacity-building initiatives aimed at improving the region's capacity to confront the alarming rate of state-linked cyber threats stemming from geopolitical flashpoints like the South China Sea, and the increasing risks and vulnerabilities created by rapid digitalization, which cybercriminals have been gainfully exploiting through online scams and ransomware attacks.

During the first ASEAN-Japan Information Security Policy Conference in Tokyo in 2009, Japan and ASEAN established various formal mechanisms to promote high-level exchanges, such as the ASEAN-Japan Critical Information Infrastructure Protection Guidelines, the ASEAN-Japan Cybercrime Dialogue in 2014,[30] the ASEAN-Japan Policy Meeting on Cybersecurity Cooperation, the ASEAN-Japan Ministerial Meeting, and the Senior Officials Meeting on Transnational Crime. Aside from regular dialogue and consultations, Japan also embarked on major initiatives that raised the cybersecurity capacity of AMS across the technical, policy, and strategic levels. These included the Internet Traffic Monitoring Data Sharing Project, which expanded threat information-sharing cooperation between the Japan Computer Emergency Team Coordination Center and other Computer Emergency Response Teams in the region. The Japan-ASEAN Security Partnership was also established to enhance technical cooperation and facilitate the Proactive Response Against Cyberattacks Through Collaborative Exchange. In 2018, the ASEAN-Japan Cybersecurity Capacity

[25] Peng Er, "Closer ASEAN-Japan Relations;" Oba et al., "50th Year of ASEAN-Japan Friendship and Cooperation."
[26] Rupakjyoti Borah, "Japan's Opportunity in Southeast Asia," *Global Asia* 19, no. 2 (June 2024): 87–93, https://www.globalasia.org/v19no2/cover/japans-opportunity-in-southeast-asia_rupakjyoti-borah.
[27] Borah, "Japan's Opportunity in Southeast Asia."
[28] Bartlett, "Why Do States Engage in Cybersecurity Capacity-Building Assistance?."
[29] Benjamin Bartlett, "Why Do States Engage in Cybersecurity Capacity-Building Assistance? Evidence from Japan," *The Pacific Review* 37, no. 3 (2024): 475–503, https://doi.org/10.1080/09512748.2023.2183242.
[30] Mark Bryan F. Manantan, "Advancing Cyber Diplomacy in the Asia Pacific: Japan and Australia," *Australian Journal of International Affairs* 75, no. 4 (2021): 432–59, https://doi.org/10.1080/10357718.2021.1926423.

Building Centre (AJCCBC) was opened in Thailand to augment Southeast Asia's increasing demand for cybersecurity workforce development amid the region's maturing digital economies. The AJCCBC was indeed a critical turning point for ASEAN-Japan cybersecurity cooperation because it institutionalized regular training for many cybersecurity professionals in governments across the region. The centre offered courses ranging from incident response and forensic analysis for digital evidence to malware analysis.

During the 50th year of ASEAN-Japan Friendship and Cooperation, a performance report was published offering a snapshot of the depth and scope of cybersecurity collaboration.[31] In the report, Former Minister for Digital Transformation Taro Kono noted the importance of bolstering cooperation in information-sharing and capacity-building. At the conclusion of the 2023 International Conference on ASEAN-Japan Cybersecurity Community, ASEAN and Japan outlined new and prospective areas of collaboration suited to the challenges of the evolving cyber threat landscape. These efforts included joint awareness-raising, the Remote Cyber Exercise, or RCX, which simulated a series of incident detection, information deployment, analysis, and response activities using recent ransomware attacks as case studies, a regional table-top exercise to share knowledge and best practices on sensitive cybersecurity issues and updated Critical Information Infrastructure Protection Workshops. Japan's Computer Emergency Response Team, or JPCERT, also led Computer Security Incident Response Team Capacity-Building on network traffic analysis, and malware analysis hands-on exercises. As a next step, the Japan International Cooperation Agency (JICA) developed the Cluster for Cybersecurity in December 2022 to assess a target country's capability to optimize cooperation. Moving forward, the AJCCBC also committed to train 500 personnel over the next four years. As the pace of digitalization reaches unprecedented levels, the AJCCBC launched a joint project with JICA in June 2023, titled "Project for Enhancing ASEAN-Japan Capacity-Building Program for Cybersecurity and Trusted Digital Services", to provide training exercises to build capacity in the region.[32]

Dual-Use Technologies: Artificial Intelligence

Domestically, Japan's view of AI is deeply rooted in its concept of Society 5.0, or the rise of a human-centred society in which economic development and the resolution of social issues are compatible through a highly integrated system of cyberspace and physical space.[33] To realize Society 5.0 vision, Japan's cabinet issued the 6th Science, Technology and Innovation Basic Plan on 26 March 2021. As Japan transitions towards Society 5.0, the government will develop an integrated system based on knowledge derived from natural sciences, humanities and social sciences. Internationally, Japan's techno-statecraft in AI started to take shape under the leadership of the Ministry of Economy, Trade and Industry (METI) and was implemented by the Japan External Trade Organization (JETRO), which mobilized Japanese companies and technology start-ups across Southeast Asia to form joint partnerships.

For instance, in September 2024, Sony Research Inc., a subsidiary of Sony Corporation, signed a memorandum of agreement with AI Singapore to conduct joint research through Sea-Lion, an LLM project tailored to Southeast Asia. Sony will support efforts for testing and receiving feedback on AI models to accommodate the diversity of more than 1,000 Southeast Asian languages. In Thailand, METI and Thailand's Office of Small and Medium-sized Enterprises launched a business-matching service that utilizes AI-powered translation chat to connect Japanese SMEs with similarly sized firms in Thailand and facilitate direct negotiations. Relatedly, the Japanese company Kao Corp. is also collaborating with Thailand to co-develop an AI model that predicts the transmission of mosquito-borne viruses. In 2022,

[31] "ASEAN-Japan Cybersecurity Capacity Building Performance Report," *National Center of Incident Readiness and Strategy for Cybersecurity (NISC)*, accessed March 28, 2026, https://www.cyber.go.jp/eng/pdf/en_ASEAN-Japan_Performance_Report.pdf.
[32] "ASEAN-Japan Cybersecurity Capacity Building Performance Report," *National Center of Incident Readiness and Strategy for Cybersecurity (NISC)*.
[33] "Society 5.0, Tokyo," *Government of Japan, Cabinet Office*, accessed March 28, 2026, https://www8.cao.go.jp/cstp/english/society5_0/index.html.

the project was selected for the Japan-ASEAN Asia Digital Transformation initiative.[34]

As the examples highlighted above show, Japan's adaptation of its statecraft from economic to technological forms exemplifies Tokyo's nimble response to domestic and regional/international challenges. From the establishment of formal relations with ASEAN in the 1970s to the ongoing reconfiguration of the global order amid rapid technological disruptions, Japan and ASEAN have built a strong track record of collaboration enabled by established institutional linkages and regional mechanisms. Taken together, these provide Japan and ASEAN with a springboard in forging collaboration in the AI domain.

3

Emerging ASEAN-Japan AI Collaboration

Building on the previous discussion of the longstanding track record of Japan's engagement with ASEAN through its adaptive economic and technological statecraft, the subsection below examines the scope and depth of ongoing AI initiatives led by the Government of Japan through METI and JETRO in Southeast Asia. While not an exhaustive list, the analysis underscores that despite the nascency of AI, ASEAN and Japan can draw key lessons from their previous cybersecurity and more broadly, ICT collaboration which is highly relevant in the growing deliberations on AI governance principles, capacity-building, and start-up innovations. This section begins with an overview of the AI landscape in ASEAN and Japan, then identifies Japanese government-led AI initiatives, mainly through METI and JETRO. It then examines the enablers and barriers that may support or stifle ASEAN-Japan AI collaboration.

AI Governance: Japan and ASEAN

Under former Prime Minister Shinzo Abe, Japan published its first national AI strategy in 2017, built around the concept of Society 5.0. The second national AI strategy, released in 2019, focused on human resources and R&D. After a government review, a revised AI strategy was released in 2022 which prioritized the deployment of AI systems in society.[35] Multiple revisions to Japan's national AI strategies were attributed to the structural issues within METI, specifically the lack of adequate human resources and expertise, which had impacted implementation.[36] With the rapid emergence of Open AI's ChatGPT, Japan issued the Tentative Summary of AI Issues in May 2023 to address possible risks linked to generative AI. In May 2025, Japan established its AI Promotion Act, which takes a comprehensive approach to promoting AI utilization and innovation while addressing specific risks.[37]

[34] Yaita, "Japan Backs ASEAN's Needs-Driven AI Initiative."
[35] https://www.csis.org/analysis/norms-new-technological-domains-japans-ai-governance-strategy#h2-approaches-of-japan-s-ai-governance-policy
[36] Tagui Ichikawa, "Norms in New Technological Domains: Japan's AI Governance Strategy," *Center for Strategic and International Studies*, June 2025, accessed February 26, 2026, https://csis-website-prod.s3.amazonaws.com/s3fs-public/2025-06/250617_Ichikawa_Technological_Domains.pdf.
[37] Hiroki Habuka, "Japan's Agile AI Governance in Action: Fostering a Global Nexus Through Pluralistic Interoperability," *Center for Strategic and International Studies*, October 9, 2025, https://csis-website-prod.s3.amazonaws.com/s3fs-public/2025-10/251009_Habuka_Japan_AI.pdf.

Externally, Japan channels its engagement in regional and global AI governance through the Hiroshima AI Process, a set of guiding principles and a code of conduct that promote safe, secure, and trustworthy AI while fostering innovation. Early on, Japan recognized that it was still catching up with the US and China in terms of the scale and speed of AI innovation. However, like the EU, Japan possesses a distinct diplomatic influence in diffusing norms and principles that can foster interoperability and serve as the basis for internationally agreed principles. This approach was explored during the launch of the Hiroshima AI process in 2023 during Japan's G7 chairmanship. The membership eventually expanded in May 2024 and became known as the Friends Group of Hiroshima AI Process. Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam joined the expanded membership.[38] Japan's pivotal role as a founding member of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership also provides instructive pathways for setting standards on cross-border data flows, digital trade, and the responsible use of AI-enabled technologies.

In 2024, ASEAN shared its AI Guidelines comprising seven principles to promote the responsible use of AI in the public and private sectors. The guidelines aimed to establish interoperability across AI frameworks in different jurisdictions, given the dual-use applications of AI technologies in both military and commercial sectors. The document included national-level and regional-level recommendations for governments to design, develop, and deploy AI systems in a responsible fashion.[39] To address the emerging challenges brought by generative AI, ASEAN released the Expanded ASEAN Guide on AI Governance and Ethics in January 2025.[40] At the country level, AMS have also released their respective national AI strategies and roadmaps, as shown in Table 1.

Table 1. National AI Strategies and Roadmaps

Country	AI Strategy/Roadmap
Singapore	Singapore National AI Strategy 2.0 (2023) Singapore National AI Strategy (2019)
Thailand	Thailand's National AI Strategy and Action Plan 2022–2027
Indonesia	National Strategy for Artificial Intelligence 2020–2045
Malaysia	Malaysia National Artificial Intelligence Roadmap 2021–2025
Philippines	National AI Strategy and Roadmap (2021) National AI Strategy Roadmap 2.0 (2024) National AI Strategy Philippines (2025)
Viet Nam	National AI Development Strategy 2030
Brunei Darussalam	Draft Guide on AI Governance and Ethics (2024)
Cambodia	National AI Strategy (2025–2030)
Lao PDR	Drafting of National AI Strategy (2026)
Myanmar	Drafting of National AI Strategy (2026)
Timor-Leste	Timor Digital 2032

Source: Compiled by the author

[38] Hiroshima Process, "Friends Group," *Ministry of Internal Affairs and Communications*, accessed February 26, 2026, https://www.soumu.go.jp/hiroshimaaiprocess/en/supporters.html.
[39] "ASEAN Guide on AI Governance and Ethics," *ASEAN Secretariat*, 2024, https://asean.org/wp-content/uploads/2024/02/ASEAN-Guide-on-AI-Governance-and-Ethics_beautified_201223_v2.pdf.
[40] "ASEAN Expanded ASEAN Guide on AI Governance and Ethics for Generative AI," *ASEAN Secretariat*, 2024, https://asean.org/book/expanded-asean-guide-on-ai-governance-and-ethics-generative-ai/.

The respective AI policies of Japan and AMS at the national and regional levels lay the strategic groundwork for deeper collaboration. It is worth noting that the ASEAN AI Guidelines also drew on the Hiroshima AI process, the EU AI Act, and the UNESCO Recommendation on the Ethics of AI as key reference frameworks.[41] Through the ASEAN-Japan Summit and other relevant meetings, formal mechanisms already exist that will facilitate further discussion and implementation. During the 28th ASEAN Japan Summit held in October 2025, Japanese Prime Minister Sanae Takaichi stressed the importance of ASEAN-Japan AI collaboration as a key component of the relationship under the theme "Partners for Co-Creation of Economy and Society of the Future".[42] Conversely, the ASEAN Chairman's Statement in 2025 welcomed progress under the Future Design and Action Innovative and Sustainable ASEAN-Japan Economic Co-Creation 2023–2033 to advance the ASEAN-Japan Economic Co-Creation Vision, which includes the ASEAN-Japan Master Plan Initiative for the Next-Generation Automotive Industry and the ASEAN-Japan AI Innovation and Co-Creation Roadmap.[43]

ASEAN Co-Creation Initiative/Roadmap

In July 2024, METI launched the ASEAN-Japan AI Co-Creation Initiative with three main pillars: (1) innovation of AI and innovation by AI; (2) safety and security; and (3) promotion of international collaboration. Through the initiative, METI endeavours to strengthen its convening role for both the government and the Japanese AI industry to support Japan's AI Strategy Council's whole-of-government approach to enhancing Japan's AI competitiveness.[44] At the regional level, the initiative also underscores METI's commitment to deepening cooperation with the ASEAN Economic Ministers in the areas of the digital economy and emerging technologies, following the success of the ASEAN-Japan 50th year Commemorative Summit in 2023.[45]

Diving deeper into the ASEAN-Japan AI Co-Creation Initiative, the first two pillars are directed towards domestic stakeholders in Japan, while the third is focused on international partners. Under the first pillar on innovation of AI and by AI, METI will provide computing power and resources to spur domestic innovation, targeting AI developers and encouraging the exchange of knowledge and expertise. There is also assistance provided on the procurement of computing resources.[46] Under the second pillar, security and safety of AI, the AI Guidelines for Business were issued to promote a soft-law approach that encourages stakeholders to build internal AI governance systems that adopt or build on international best practices. Other salient aspects of the guidelines include the emphasis on a multistakeholder approach involving key stakeholders and the importance of accessibility to ensure that the public can comprehend the guidelines.[47]

The third pillar, on international collaboration, focuses on Japan's philosophy of "AI innovation for Asia", which essentially means the co-development of large language models (LLMs) between Japanese AI engineers and major companies and developers across AMS. A critical aspect of the third pillar is AI talent development, where Japan seeks to develop 100,000 advanced digital professionals in the next five years from the East Asian region. In addition, there is also momentum to develop an AI governance framework that is specific to the Asian context, given that notions of safety, security, and trustworthiness are shaped by specific sociopolitical, economic, and cultural factors. Moreover, Japan's AI Safety Institute

[41] "ASEAN Expanded ASEAN Guide on AI Governance and Ethics for Generative AI," *ASEAN Secretariat*.
[42] Ministry of Foreign Affairs, "The 28tH ASEAN Japan Summit," *Japan-ASEAN Relations*, October 26, 2025, https://www.mofa.go.jp/a_o/rp/page-ite_000001_00004.html#:~:text=October%2026%2C%202025,the%20meeting%20is%20as%20follows.
[43] "Future Design and Action Plan for Innovative and Sustainable ASEAN-Japan Economic Co-Creation 2023 – 2033," *Ministry of Economy and Trade*, accessed February 26, 2026, https://www.meti.go.jp/press/2023/08/20230822005/20230823005-8.pdf; "Chairman's Statement of the 28th ASEAN-Japan Summit," *ASEAN Secretariat*, October 26, 2025, https://asean.org/wp-content/uploads/2025/11/CHAIRMANS-STATEMENT-28TH-ASEAN-Japan-SUMMIT.pdf.
[44] Ryo Funakoshi, "Japan's AI Policy and AI-Co-Creation Initiative," PowerPoint presentation from the Ministry of Economy and Trade during CONVERGE: Indo-Pacific Critical Tech Forum, Tokyo, Japan, October 10-11, 2024,
[45] Funakoshi, "Japan's AI Policy and AI-Co-Creation Initiative."
[46] Funakoshi, "Japan's AI Policy and AI-Co-Creation Initiative."
[47] Ibid.

will also collaborate with the ASEAN Secretariat to establish the ASEAN AI Safety Network as part of implementing the ASEAN DEFA.[48] The network will convene experts to draft recommendations to support AI policy capacity-building, pilot testing of AI use-case applications, and regulatory sandboxing.[49]

In December 2024, the ASEAN-Japan Business Leaders' Summit released a joint statement emphasizing the formation of the ASEAN-Japan Co-Creation Ecosystem, highlighting the rebranding of the initiative as the ASEAN-Japan AI Co-Creation Roadmap in order to facilitate an integrated start-up ecosystem between Japan and Southeast Asia.[50] This latest development highlighted the importance of funding streams, talent mobility, and even the listing of ASEAN companies on the Tokyo Stock Exchange, which will be discussed in greater detail in the next section.

Start-Up Collaboration: Funding and Accelerator Programmes

To support the expansion of Japanese companies and start-ups into the ASEAN region, JETRO has launched the Global Acceleration Hub Programme, which provides Japanese companies with mentorship opportunities to gain a better understanding of specific markets in Southeast Asia, as well as match-making opportunities with possible local partners. JETRO has established three types of partnership: programme partners, ecosystem partners, and co-working space partners. So far, JETRO's engagement has begun to gain traction in Southeast Asia. For instance, JETRO Bangkok has confirmed that, with almost 6,000 Japanese companies operating in Thailand, many Japanese start-ups have expressed interest in entering the market and exploring opportunities to provide software as a service. Zeroboard, a Japanese climate technology startup has partnered with a Thai clean innovation company, Innopower. Under this partnership, Zeroboard provides greenhouse gas calculation, and reporting platform capabilities to support Innopower's clients in achieving carbon neutrality goals. In Malaysia, Sunway Innovation Labs (iLabs) and JETRO launched the J-StarX Malaysia Deep Tech programme in November 2025 to fast-track the expansion of Japanese start-ups.[51] The accelerator supports start-ups in developing proof of concept, facilitating market entry, and leveraging extensive support from JETRO and Sunway iLabs. This latest partnership is an iteration of the Digital Transformation Accelerator programme for top Japanese start-ups in Malaysia to localize their technologies, which the two organizations have been hosting since 2019.[52]

To further support Japan's international AI collaboration, METI launched the Generative AI Accelerator Challenge, or GENIAC. Recognizing the unprecedented impact of generative AI, the GENIAC programme seeks to accelerate Japan's competitiveness by supporting start-ups through funding, computing resources, training, and mentorship to co-develop LLMs tailored to Southeast Asian languages and cultures. For instance, Tokyo-based Elyza, a unit of mobile carrier KDDI, is developing a Thai LLM, a use-case application that can be replicated in other Southeast Asian markets through the funding allocation provided by GENIAC.

Over the last few years, several start-up companies from Southeast Asia have also entered the Japanese market. Since 2018, Malaysian drone service provider Aerodyne Group has been expanding its operations in Tokyo. Aerodyne's unmanned aerial vehicles are deployed to gather data to tackle complex industrial challenges, specifically in the infrastructure sector. Meanwhile, Singapore's Umami Bioworks is also collaborating with Maruha Nichiro, Japan's second-largest seafood seller, to cultivate seafood in response to rising ocean temperatures. Another Singapore-based start-up, Eureka Robotics, which

[48] Interview, ASEAN Secretariat, online.
[49] Interview, ASEAN Secretariat, online.
[50] "ASEAN-Japan Business Leaders Summit 2024," *Ministry of Economy, Trade and Industry*, December 2024, https://www.meti.go.jp/press/2024/12/20241225002/20241225002-b.pdf.
[51] "Sunway iLabs and JETRO Prepare Four AI and Deeptech Japanese Startups for Entry into Malaysia and ASEAN," *Digital News Asia*, accessed March 28, 2026, https://www.digitalnewsasia.com/startups/sunway-ilabs-jetro-prepare-four-ai-and-deeptech-japanese-startups-entry-malaysia-and-asean.
[52] "Japan-Malaysia Accelerator Program: Japanese Startups Tackle Social Issues Overseas," *JETRO*, accessed March 28, 2026, https://www.jetro.go.jp/en/invest/insights/japan-insight/japan-malaysia-accelerator-program-japanese-startups-tackle-social-issues-overseas.html.

offers automation software for industrial robots, has also partnered with robot manufacturer Denso Wave and optical equipment Sigma Koki.

In 2023, METI and JETRO, in partnership with ASEAN government agencies launched a cooperation scheme called the ASEAN-Japan Co-Creation Fast Track Initiative in commemoration of the 50th anniversary of the ASEAN-Japan Friendship Cooperation.[53] The Fast Track Initiative aims to accelerate tangible collaboration efforts between Japanese and ASEAN companies, start-ups, and small and medium-sized enterprises. METI has encouraged Japanese companies to utilize the initiative to develop strategic partnerships and seize the momentum of the burgeoning digital landscape in Southeast Asia.[54] As of January 2025, the Fast Track Initiative has been held in Indonesia, Malaysia, Viet Nam, and Singapore.

Building on the ASEAN-Japan Co-Creation Vision, Japan announced Tokyo Stock Exchange (TSE) Asia Startup hub, a ¥10 trillion start-up investment, to facilitate cross-border capital market integration that goes beyond traditional initial public offering preparation. The TSE hub will address specific challenges that Southeast Asian companies face when entering the Japanese market.[55] Through its integrated support structure, involving securities companies, audit firms, law firms, venture capital investors, and information vendors, the TSE hub will provide start-ups with resources to support market entry, including deep local expertise, strategic partnerships, and cultural understanding that will hopefully lead to eventual public listing.[56] The 2025 cohort includes 20 companies specializing in healthcare, fintech, e-commerce, and logistics, with Singapore leading with seven companies.[57]

4

Prospects for Collaboration: Enablers and Barriers

After analyzing the ASEAN AI innovation landscape, this section tackles the opportunities and challenges facing Japanese and Southeast Asian technology companies and start-ups. Using document analysis, and expert interviews, the findings below seek to provide a clear-eyed assessment of the current state of AI collaboration.

Enablers

Long History of Knowledge and Tech Transfer: From Manufacturing to AI, Robotics, and Smart Automation

The longstanding presence and contributions of Japanese companies in Southeast Asia's manufacturing sector provide Japanese technology start-ups with a strong foundation. The decades-long experience of many Japanese companies in engaging with public and private sector partners across various AMS affords start-ups with contextual knowledge of specific markets and countries.[58] At the same time, Japan's historical record of knowledge

[53] "METI Held the Inno Vietnam-Japan Fast Track Pitch Event 2023 in Hanoi to Accelerate Global Open Innovation of Japanese Companies/Start-ups," METI, November 6, 2023, https://www.meti.go.jp/english/press/2023/1106_001.html.
[54] "August FY2023," Ministry of Economy, Trade and Industry, accessed February 28, 2026, https://www.meti.go.jp/english/press/nBackIssue202308.html.
[55] Paolo Joquino, "Japan's Y10 Trillion Bridge Extends to Southeast Asia: How the TSE Asia Startup Hub is Reshaping Cross-Border Innovation," Insignia Ventures Review, September 25, 2025, https://review.insignia.vc/2025/09/25/tse-asia-startup-hub/.
[56] 56 Joquino, "Japan's Y10 Trillion Bridge Extends to Southeast Asia: How the TSE Asia Startup Hub is Reshaping Cross-Border Innovation."
[57] Ibid.
[58] Interview, ASEAN-Business Advisory Council, online.

and technology transfer with many Southeast Asian companies is another unique selling point.[59] Parallels are now being drawn between Japan's automotive industry and critical and emerging technologies like AI, along with its growing application in robotics, precision manufacturing, and embedded software and hardware systems as automation takes centre stage.[60]

Despite strong competition from China and the Republic of Korea, leading Japanese companies such as Fanuc, Keyence, Omron, and SMC continue to occupy vital segments of robotics supply chains.[61] The increasing integration of AI and industrial robotics is paving the way for the adoption of smart manufacturing technologies in essential services, supply chains, and manufacturing in Singapore, Indonesia, Malaysia, Thailand, and Viet Nam. For instance, Hitachi and the Standards and Industrial Research Institute of Malaysia launched the Smart Manufacturing Experience Centre to promote Industry 4.0 in Malaysia and support small and medium-sized enterprises in adopting smart manufacturing technologies. In Singapore, Hitachi also offers industrial and collaborative robotics. The former deals with industrial tasks, from multi-axis robotic arms to automated guided vehicles, while the latter works alongside employees to complement specific tasks.[62]

Because commercial and business ties in Southeast Asia are mostly built around trust-based social networks, experts suggest that Japanese technology companies are often associated with high-quality standards. This halo effect thus gives incoming Japanese technology companies a competitive edge. Combining contextual or market knowledge with positive impressions can support Japanese technology companies or start-ups in effectively finding potential local partners to pursue joint partnerships. Furthermore, Japanese companies can also take advantage of the digital strategies and roadmaps of individual AMS, which incentivize foreign investment. For instance, Singapore, Indonesia, and Viet Nam have their respective digital transformation plans, while Malaysia and the Philippines have launched digital economy blueprints, Malaysian tax incentives, and the CREATE bill to attract investors with substantial reductions in power costs.

Parallel Technological Development: Semiconductors and Data Centres

Some experts have noted that Japan's increasing AI collaboration in Southeast Asia is generating positive spillover effects in the current drive to develop highly relevant and equally critical technologies, such as semiconductors, and the proliferation of data centres across the region. Advanced semiconductors provide the computational power and memory needed to process data and train machine learning algorithms. Within the AI technology stack, semiconductors provide the hardware responsible for increasing computational efficiency and enabling the transfer of large data sets through memory and storage.[63] Experts argue that ASEAN and Japan can leverage each other's comparative strengths in semiconductors in tandem with the AI boom, especially amid growing concerns about supply chain disruptions.[64] Japan's expertise in high-quality semiconductor materials and manufacturing equipment can augment ASEAN's desire to move beyond assembly, packaging, and testing to chip design and wafer fabrication.[65] Japanese company Fujitsu is also collaborating with NVIDIA to develop energy-efficient AI chips by 2030 in support of Japan's push towards developing its AI infrastructure, which will be vital to its sovereign AI capa-

[59] Interview, tech company executive, online.
[60] Interview, tech company executive, online.
[61] Global X Research Team, "Four Japanese Companies Leading Robotics and Automation," *GlobalX ETFS*, September 29, 2023, https://www.globalx-etfs.com.au/insights/post/four-japanese-companies-leading-robotics-and-automation/.
[62] Hitachi Global, "Smart Automation Matters in Southeast Asia," *Hitachi*, accessed March 28, 2026, https://www.hitachi.com/en-sea/insights/articles/smart-automation-matters-in-southeast-asia/.
[63] McKinsey Global Institute, "Artificial Intelligence Hardware: New Opportunities for Semiconductor Companies," *McKinsey & Company*, accessed March 28, 2026, https://www.mckinsey.com/~/media/McKinsey/Industries/Semiconductors/Our%20Insights/Artificial%20intelligence%20hardware%20New%20opportunities%20for%20semiconductor%20companies/Artificial-intelligence-hardware.pdf.
[64] "Inducing Innovation: Reinvigorating ASEAN-Japan Growth and Collaboration in the Semiconductor Industry with AI," *ASEAN-Japan Centre*, April 2, 2025, *Tokyo: ASEAN-Japan Centre*, https://www.asean.or.jp/en/event-report/20250402/.
[65] "Inducing Innovation: Reinvigorating ASEAN-Japan Growth and Collaboration in the Semiconductor Industry with AI," *ASEAN-Japan Centre*.

bilities.[66] NVIDIA Chief Executive Officer Jensen Huang remarked that they are connecting Fujitsu's central processing units on electronic boards and servers powered by NVIDIA chips so that they function as a single processor. Fujitsu, NVIDIA, and the Riken research institute are expected to launch the supercomputer FugakuNEXT, which will be 10 times faster than its predecessor.[67] If successful, Fujitsu and NVIDIA's AI-optimized chips will be beneficial to ASEAN, considering the region's push towards more environmentally friendly data centers.

Japan and Southeast Asia also display complementarity in data centres. For context, Japan was the world's third-largest data centre market in 2024, after the US and China. Much of Japan's data centre growth is linked to its stable regulatory environment, especially the open and free flow of data, talent competitiveness, and political stability. However, the country's limited power supply, rising labour and construction costs, and vulnerability to natural disasters such as earthquakes and tsunamis pose serious problems that may encourage investors to look elsewhere.[68] In this regard, Indonesia, Malaysia, Thailand, the Philippines, and Viet Nam could be viable alternatives due to lower labour costs and the availability of land. Over the past two years, Southeast Asia has been riding the data centre boom, with governments upgrading infrastructure and energy supplies while relaxing regulatory rules on foreign ownership to attract investment.[69] With stronger demand for cloud services to support robust AI R&D, the Asia-Pacific data centre market will remain robust, making it a promising area that ASEAN and Japan can cultivate further to support the region's AI innovation ecosystem.

Norm-Setting and Institutional Capacity-Building

As demonstrated in the field of cybersecurity and ICT, Japan's role in norm-setting and rulemaking is a defining pillar of its evolving statecraft. This is exemplified in the rapidly changing AI policy space. Japan's efforts, whether through the Data Free Flow with Trust (DFFT) and the Hiroshima AI process, have influenced regional AI governance, including ASEAN's AI Guidelines. However, Japan goes the extra mile. It has been highly entrepreneurial in utilizing trade agreements to make soft law or non-binding principles, such as DFFT on cross-border data transfers, enforceable.[70] This is highly evident in the legal provisions enshrined in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which reflect the same language as DFFT and can serve as an important reference framework in the ongoing negotiations on cross-border data flows under the ASEAN-led DEFA. It should also be noted that Singapore, Malaysia, Thailand, and Brunei Darussalam are also members of the CPTPP.

Japan's historical track-record in institutional capacity-building in Southeast Asia is deeply rooted in its regionalization strategy, which began in the 1980s and spanned technology transfer, physical infrastructure development, and human resource development.[71] Aside from trade and infrastructure development, Japan is also a major ASEAN partner in education, training, and capacity building. In the 1980s, the expansion of Japanese companies in the region ushered in new industrial human resource development and higher education opportunities, which continued

[66] Tsubasa Suruga, "Fujitsu and Nvidia to Develop Energy-Efficient AI Chips by 2030," *Nikkei Asia*, accessed March 28, 2026, https://asia.nikkei.com/business/technology/fujitsu-and-nvidia-to-develop-energy-efficient-ai-chips-by-2030.
[67] Suruga, "Fujitsu and Nvidia to Develop Energy-Efficient AI Chips by 2030."
[68] Yoshiki Tsurumaki, Tomoyuki Miyazaki, Munetoshi Esaki, and Shuhei Sugai, "Navigating Data Centre Opportunities across APAC – Japan," *King & Wood Mallesons*, July 16, 2025, https://www.kwm.com/global/en/insights/latest-thinking/navigating-data-centre-opportunities-across-apac-japan.html.
[69] CBRE Research, "Asia Pacific Data Centre Trends & Opportunities," *CBRE*, May 29, 2025, https://www.cbre.com/insights/reports/asia-pacific-data-centre-trends-opportunities.
[70] Mark Bryan Manantan, "Japan's Data Free Flow with Trust: Progress and Prospects in Data Governance," in *Navigating the New Political Economy in Southeast Asia*, ed. Alan Hao Yang and Masahiro Matsumura (Singapore: World Scientific Publishing, July 2023), https://doi.org/10.1142/13124.
[71] Kaoru Natsuda and Gavan Butler, "Building Institutional Capacity in Southeast Asia: Regional Governed Interdependence," *ASEAN Economic Bulletin* 22, no. 3 (2005): 331–39, https://muse.jhu.edu/article/387995.

until the 1990s.[72] In the early 2000s, Japan's human development cooperation with individual AMS became increasingly institutionalized through the establishment of Japan-supported human development centres geared towards capacity-building projects for government and education institutions, including the provision of scholarships for Southeast Asian students to enrol in Japanese universities. In 2022, JICA confirmed that Japan-supported programmes had cultivated 12,508 industrial talents in Southeast Asia. Additionally, Japan is the biggest provider of ODA in the education sector in Southeast Asia, totalling $1.03 billion spent on 2,760 projects from 2015 to 2021, surpassing the US and China respectively.[73] Japan also launched short-term educational initiatives that further enhanced people-to-people exchanges, such as the Japan-East Asia Network of Exchange for Students and Youths.[74]

Amid Japan's shrinking population and ageing workforce, Viet Nam, the Philippines, and Indonesia have increasingly become sources of foreign workers for Japan. In response to this growing labour demand, the Japanese government has made changes to its existing Specific Skilled Worker scheme, which facilitates the recruitment of foreigners to work in specific industrial fields. The pending amendment to the framework seeks to reflect the changing nature of labour cooperation between Japan and Southeast Asia, which goes far beyond a benefactor-beneficiary relationship.[75] This is evident in the 2023 ASEAN-Japan Joint Vision Statement, which seeks to reduce barriers to entry for foreign workers in professional and technical fields in Japan, which may include AI-related fields such as data science. Such efforts require language training, educational and skill programmes for Southeast Asian workers, and exploration of mutual recognition of workers' skills. However, some experts noted that, while this is a positive step to ensuring talent mobility, especially among Southeast Asian professionals seeking experience in Japan, the country's conservative corporate nature, which often shies away from foreign talent, as well as language proficiency barriers, remains an obstacle. Others also pointed out that some Southeast Asian professionals with postgraduate qualifications view Japanese AI companies as less competitive than AI companies in Hong Kong, the Republic of Korea, and even Singapore for obtaining experience and certifications.

Nevertheless, there is strong evidence to support ASEAN-Japan AI collaboration in talent mobility. With its young demographics and improving economic prospects, especially through its digital economy, Southeast Asia offers considerable scope for accelerating talent mobility exchanges through university-to-university partnerships or company internships between Japan and AMS. Both sides have substantial experience on which to draw in developing a region-wide qualifications and training framework.

[72] Hoang Thi Ha and Pham Thi Phuong Thao, "Japan and Southeast Asia Set to Co-Create an Interwoven Future," *ISEAS Perspective*, no. 24 (Singapore: ISEAS – Yusof Ishak Institute, 2024), https://www.iseas.edu.sg/wp-content/uploads/2024/03/ISEAS_Perspective_2024_24.pdf.
[73] Hoang Thi Ha and Pham Thi Phuong Thao, "Japan and Southeast Asia Set to Co-Create an Interwoven Future."
[74] Ibid.
[75] Hoang Thi Ha and Pham Thi Phuong Thao, "Japan and Southeast Asia Set to Co-Create an Interwoven Future."

Barriers

While the prospects are high for ASEAN and Japan to move forward with their AI collaboration, several roadblocks may hinder the realization of their mutual goals.

Japan Playing Catch-Up?

Although Japan had an early start in AI development in the 1980s, which led to its specialized knowledge in auto-drive and voice command systems and neural networks, the AI landscape has undergone tectonic shifts. AI innovation has since moved towards a scale that demands vast data sets, deep capital markets, and energy-intensive compute infrastructure. Rather than setting the scale and pace of AI development, Japan's AI advancement has been incremental and more niche and specialized.

Japan has recently expressed its intention to reduce its dependence on foreign AI players and to strengthen its sovereign AI capabilities, or more broadly, indigenous AI innovation. While progress is ongoing, there remain opportunities to further advance these efforts, especially in the presence of strong competition from the United States and China.[76] Major obstacles to Japan's AI innovation capacity lie in the lack of skilled IT labour. METI already projects that Japan's technology workforce will face a shortfall of 3.2 million workers.[77] This labour shortage stems from Japan's limited number of advanced educational programmes in computer science and data science, and is further exacerbated by brain drain and a lack of competitive salary levels in the industry over the last three decades.[78] Japanese companies also lack access to the vast amounts of data needed to train foundational AI models. There is a shortage of Japanese-language text data compared with English and Chinese, in terms of both quantity and quality, in large part because of the absence of major Japanese internet platforms like Facebook or WeChat.[79] Unlike English or Chinese language systems, which benefit from continuous feedback loops, Japanese-language data remain comparatively scarce, affecting model performance.

Moreover, Japan caters to a narrower market, which consequently limits commercial reach and makes it harder to incentivize private sector investment. As a result, AI capital investment in Japan remains relatively modest compared to that in the US and China. In addition, the high pace of AI development, which demands low-cost power and large-scale data centres, serves as another challenge for Japan, given its limited land, high energy costs, and reliance on imported resources.

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[76] Atsushi Sumikawa, "Inside Japan's Struggle to Build Sovereign AI," *Asia Times*, September 10, 2025, https://asiatimes.com/2025/09/inside-japans-struggle-to-build-sovereign-ai/.

[77] "Ministry of Economy, Trade and Industry estimates a shortage of 3.26 million people to handle the use of AI and robots by 2040," *Nikkei*, accessed March 28, 2026, https://www.nikkei.com/article/DGXZQOUA1948E0Z10C25A5000000/.

[78] Richard Katz, "Last place out of 27 countries...The fundamental reason why Japan lacks IT talent," *Toyo Keizai*, May 2, 2023, https://toyokeizai.net/articles/-/669331.

[79] Courtney Radsch, "Dismantling AI Data Monopolies Before It's Too Late," *Tech Policy Press*, accessed March 28, 2026, https://www.techpolicy.press/dismantling-ai-data-monopolies-before-its-too-late/.

Disparity in AI Readiness

The prevailing disparity in AI readiness remains an Achilles heel in Southeast Asia's AI journey.[80] As shown in Table 2: Oxford Insights' annual index released in 2025, which employs six interrelated pillars – policy capacity, AI infrastructure, resilience, development and diffusion, public sector adoption, and governance – reveals this clearly. In extreme cases, Singapore obtained an overall score of 76.42, while Timor-Leste, the most recent member of ASEAN, scored 18.39.[81] Understandably, Singapore and Timor-Leste vary greatly in economic status, but the implications of such a wide gap in government AI readiness among AMS are significant, because they may undermine ASEAN's aspiration for inclusive growth and regional economic integration.

Table 2. Comparison between AI governance in Japan and Southeast Asia (in the context of digital trade)

Country	Rank	Score
Singapore	2	76.42
Japan	4	72.24
Thailand	6	63.22
Malaysia	7	62.34
Philippines	8	60.51
Viet Nam	9	59.98
Indonesia	10	59.87
Brunei Darussalam	12	40.51
Cambodia	13	33.91
Lao PDR	14	29.92
Myanmar	17	20.54
Timor-Leste	18	18.39

Source: Compiled by the author, with East Asia regional analysis from Oxford Insights' Government AI Readiness Index 2025.[82]

A number of experts involved in the current rollout of UNESCO's AI Readiness Assessment Methodology in Southeast Asia, a more detailed micro-level assessment of AMS such as Indonesia, the Philippines, Malaysia, and Timor-Leste that complements the high-level analysis of Oxford Insights' Governance Readiness AI Index, agree that many governments in Southeast Asia are struggling to implement a holistic approach to AI strategy and policy implementation. As UNESCO's Recommendation on the Ethics of AI remains a key reference point for ASEAN's AI Guidelines, experts argue that the concept of "AI readiness" must not only factor in the conventional building blocks of AI innovation, such as infrastructure, legal, economic, and technical capacity, but should equally emphasize other dimensions, such as sociocultural, environmental, scientific, and educational aspects. In practice, this means that the widening gap between advanced and emerging economies in AI adoption can further entrench existing inequalities. Well-resourced and more developed countries are better able to extract value from data because they have the infrastructure and talent to do so. In contrast, those with limited resources may simply release or store data without deriving much value from it to enhance their societies and economies. Southeast Asia's technology drive is warranted amid the region's potential to grow its digital economy. However, policymakers must also remain alert to the consequences of adopting a very techno-

[80] Ikumo Isono and Hilmy Prilliadi, "Accelerating AI Discussions in ASEAN" Addressing Disparities, Challenges, and Regional Policy Imperatives," *ERIA Discussion Paper Series* no. 488, November 2023, https://www.eria.org/uploads/media/discussion-papers/FY23/Accelerating-AI-Discussions-in-ASEAN-.pdf.

[81] https://oxfordinsights.com/ai-readiness/government-ai-readiness-index-2025/#:~:text=The%202025%20edition%20is%20here,Explore%20the%20index.

[82] Oxford Insights, *Government AI Readiness Index 2025*, (Oxford, UK: Oxford Insights, 2025), https://oxfordinsights.com/ai-readiness/government-ai-readiness-index-2025/.

deterministic lens in which AI is seen as a silver bullet for solving the region's major challenges without being mindful of ensuring an equitable AI ecosystem for all.

Data Localization and Digital Sovereignty

The fragmentation of data regulations in Southeast Asia is another roadblock to cementing ASEAN-Japan AI cooperation. As shown below, the patchwork of personal data protection frameworks in the region is characterized by differences in (i) the maturity of personal data regulations, (ii) personal data transfer requirements, and (iii) the lack of common legal definitions on terminologies such as consent.[83]

Table 3: Data Governance Frameworks

Country	Regulation	Data Transfer Requirements
Singapore	**Personal Data Protection Act 2012** Updated in 2020 and 2024, with recent amendments effective in 2025	Specific requirements on data transfers
Thailand	**Personal Data Protection Act of 2022** Enforced on 1 June 2022	Permit transfer based on adequate personal data protection standards and compliance with other conditions specified
Indonesia	**Personal Data Protection Law 2022** Enacted in 2022 Enforced on 17 October 2024	Consent-based model for data processing
Malaysia	**Personal Data Protection Act 2020** Updated: Personal Data Protection (Amendment) 2024	Data controller can transfer under specific conditions (adequate level of protection, part of a contract)
Philippines	**Data Privacy Act of 2012**	No specific requirements for cross-border transfers; voluntary adoption of model contractual clauses
Viet Nam	**Law on Personal Data Protection** Enforced on 1 January 2026	Consent-based approach
Brunei Darussalam	**Personal Data Protection Order 2025**	Accorded a standard protection under the Order; will provide more guidance
Cambodia	**Law on Personal Data Protection 2025** (Draft)	No regulations or provisions
Lao PDR	**Law on Electronic Data Protection No, 25, May 2017**	
Myanmar	No comprehensive data protection law	No explicit requirements
Timor-Leste	No comprehensive data protection law	

Source: Compiled by the author.

[83] Poomthawat Wachirapornpruet, "Mind the Gap: How Southeast Asia's Fragmented Personal Data Rules Impact Digital Finance," *Asia House*, accessed March 28, 2026, https://www.asiahouse.org/files/documents/Poomthawat-Wachirapornpruet-Mind-the-Gap-How-Southeast-Asias-fragmented-personal-data-rules-impact-digital-finance.pdf.

The differing regulatory approaches in ASEAN on cross-border data flow can hamper the region's ability to establish a seamless and interoperable approach for cultivating a vibrant AI ecosystem. Japanese start-ups are struggling to deepen cross-border collaboration through joint R&D because they must navigate regulatory complexity in different countries across the region. The patchwork of regulations on data protection complicates the operations of Japanese start-ups and tech firms, as they need to allocate additional resources to achieve operational sufficiency. Likewise, multinational corporations share similar frustrations because they must adjust their internal compliance practices to address the complexity of moving important data or information in each AMS market. Cumulatively, the implications of rising data localization policies are twofold. First, Japanese companies are unable to support the establishment of robust regional R&D and supply chains. Second, as a result, many companies will become more hesitant to expand their business operations across the region, which will undermine the prospects of technology transfer resulting from R&D investment.[84]

5

Way Forward: Conclusion and Policy Recommendations

With five decades of partnership and a broad collaborative portfolio, ASEAN and Japan have helped shape the agenda in East Asia to realize mutually beneficial outcomes. The current wave of geopolitical transition and the rapid AI revolution present myriad opportunities and challenges to ASEAN-Japan relations. While Japan and ASEAN both face stiff competition – comprising the data, hardware, software, R&D, talent, infrastructure, and capital investment – with other global leaders such as US and China, they are well positioned to harness their complementarities and comparative advantages to advance sovereign capabilities and lead in targeted AI use-case applications.

With its human-centred approach, Japan can translate its credibility in global AI policymaking into support for narrowing Southeast Asia's AI readiness gap. Japan's AI Safety Institute can play a crucial role in supporting the ASEAN AI Safety Network by helping to embed AI principles such as safety, accountability, transparency, and explainability in national legislation to spur the holistic adoption and public recognition of trusted and reliable AI-enabled systems and technologies. Through more sustained and holistic investment in human talent development, ASEAN can help address Japan's looming workforce deficit in STEM fields. Given the growing two-way exchanges between ASEAN and Japan among start-ups and technology companies, enabled by strategic partnerships, R&D, digital innovation, and investment hubs, ASEAN and Japan must forge

[84] Shota Watanabe, Ema Ogura, and Keita Oikawa, "Current Status of ASEAN Data Governance and Its Implications for the Digital Economy Framework Agreement," *ERIA Discussion Paper Series* no. 539, January 2025, https://www.eria.org/uploads/Current-Status-of-ASEAN-Data-Governance-and-Its-Implications-for-the-DEFA.pdf.

ahead towards equitable and productive collaboration amid uncertainty stemming from China's sluggish economy and the US' erratic international economic, trade, and technology policies.

As this article has demonstrated, the pathways to collaboration are already established and remain highly dynamic. Both Japan and ASEAN have learned that proactive dialogue combined with collective action is indispensable for preserving strategic agency and maneuverability amid the fluctuations of uncertainty. By building on their early successes in the cybersecurity and ICT sector, ASEAN and Japan can leverage the lessons learned into new and emerging domains such as AI. Japan and ASEAN's contributions in the AI space may be less visible than the breakthroughs produced by US or Chinese start-ups, but if the AI principles set out in the Hiroshima Process or ASEAN Guidelines are incrementally embedded in national AI legislation, the result could be a more lasting positive impact that makes AI a tool for equity rather than just exploitation.

Considering the enablers and barriers discussed above, the following policy recommendations are suggested to ensure that ASEAN and Japan continue along a path of AI collaboration built around inclusivity, openness, and equity.

Enhancing Cross-Border Data Flows

- Japan could continue to invest in institutional capacity to support AMS in harmonizing technical, policy, and regulatory standards on cross-border data flows. In light of ASEAN's ongoing negotiations on the DEFA, Japan could also play a convening role in regional and multisectoral discussions to help introduce more specific rules on the protection of personal data, building on the ASEAN Framework on Personal Data Protection.

- To achieve long-term interoperability on cross-border data flows, the CPTPP can provide guidance on the specific conditions and measures on data transfer that meet policy objectives. It should be noted that Singapore, Malaysia, Brunei Darussalam, and Viet Nam are already members of the CPTPP and thus provide a foundation for future discussions aimed at better aligning regulatory approaches. As negotiations are still under way, more targeted and practical approaches, such as the ASEAN Model Contractual Clauses and certification systems, can facilitate cross-border data transfers in compliance with national data protection laws and support existing R&D and digital economic investments.

Supporting Compute Infrastructure

- Japan can mobilize funding support through the ASEAN-Japan Co-Creation Initiative for AI to help address the region's shortage of compute infrastructure.

- The Japanese government may also tap into the growing investment and operations in energy-efficient data centres, cloud services, and graphics processing unit systems of multinational Japanese companies, including NTT Data, KDDI, NEC Corporation, Mitsubishi Heavy Industries, and Sakura Internet, to support collaboration involving Japanese and Southeast Asian start-ups. This will help Japanese and Southeast Asian start-ups and technology companies produce meaningful AI innovations that address social and economic challenges, while also enhancing the implementation of regulatory frameworks based on human-centric approaches to AI.

Building Capacity and Strategic Partnerships

- Through the Japan-ASEAN Science, Technology, and Innovation Platform and the ASEAN-University Network, Japan and ASEAN can prioritize strengthening human capital development dedicated to STEM courses by benchmarking research ecosystems and establishing institutional academic mobility schemes, research commercialization mechanisms, and the production of international publications. This will deepen strategic partnerships, raise visibility, and create pathways for future joint initiatives.

- Another key area for strengthening capacity and human talent exchange is the pilot testing of academic exchanges and internship opportunities for STEM graduates between Japan and Southeast Asia. This would help address the lack of awareness and cultural knowledge among many Japanese professionals about Southeast Asia. Such a collaborative, two-way dynamic will be crucial in helping students gain knowledge of specific demographics, which is vital to the development of localized LLMs. It will also help foster new entrepreneurial mindsets across the region.

Raising Awareness of Use-Case Applications through a Public Repository

- Given strong competition in the international AI landscape, Japan and Southeast Asia must continue to showcase their respective joint-innovation by leveraging its comparative strengths in robotics, smart manufacturing, and the electronics sector. Demonstrating actual use-case applications that deliver tangible benefits will help further develop localized LLMs through growing collaboration and raise the profile of Japanese and Southeast Asian AI actors.

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