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# Navigating the Nexus in Southeast Asia: Legal Frameworks for Digital-Green Public-Private Partnerships in ASEAN's Twin Transition Era

## Abstract

This paper explores how Southeast Asia can build the legal foundations to support a "Twin Transition": the shift toward both digital transformation and green sustainability, through Public-Private Partnerships (PPPs). Given ASEAN's diverse legal systems, climate risks, and infrastructure gaps, PPPs are key to attracting private investment and innovation. But managing both digital and green goals in long-term contracts requires legal frameworks that are flexible, fair, and adapted to regional realities. This paper details a range of legal tools and mechanisms crucial for navigating this nexus in Southeast Asia. This includes the evolution of performance-based contracts to encompass both digital efficiency metrics and specific environmental outcomes, alongside innovative risk allocation strategies for technological obsolescence, cybersecurity, and climate-related events pertinent to the region. The paper examines the transformative potential of smart contracts and blockchain for enhancing transparency, accountability, and automated compliance in ASEAN's digital-green projects, while also addressing their inherent vulnerabilities and regulatory challenges across diverse jurisdictions. Furthermore, it delves into the critical role of comprehensive data governance frameworks, including privacy-enhancing technologies and emerging AI governance standards, to manage the vast data generated by smart green infrastructure. Finally, it highlights the importance of fostering adaptive regulatory sandboxes for accelerating innovation, establishing robust dispute resolution mechanisms for complex, integrated projects, and leveraging existing and emerging international legal norms (e.g., cross-border data privacy rules, ASEAN digital integration frameworks) for facilitating greater regional collaboration in the Twin Transition. Ultimately, this paper advocates for a proactive, adaptive,

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and ethically grounded legal architecture within ASEAN that can effectively bridge the divide between digital innovation and environmental stewardship, enabling PPPs to fully realize their potential as catalysts for a truly sustainable, technologically advanced, and resilient future across Southeast Asia.

KEYWORDS: Public-Private Partnerships (PPPs), Twin Transition, legal frameworks, ASEAN

## 1 Introduction: ASEAN's Twin Transition and the Imperative for Digital-Green PPPs

The Association of Southeast Asian Nations (ASEAN) stands at a pivotal juncture, navigating a profound "Twin Transition" that encompasses both rapid digital transformation and an urgent shift towards green sustainability[1]. These two strategic imperatives are not merely parallel policy tracks, but are increasingly recognized as deeply interconnected forces shaping the region's future development trajectory. The successful realization of ASEAN's ambitious goals within this dual transition hinges significantly on its ability to foster effective Public-Private Partnerships (PPPs).

### 1.1. Defining the Twin Transition: Digital Transformation and Green Sustainability in ASEAN

ASEAN's commitment to digital transformation is evident in its evolving digital landscape, which is undergoing a profound shift. This transformation is driven by a potent combination of digital sovereignty imperatives and evolving global geopolitics, leading to a nuanced "diverse cloud" approach that strategically balances local, US, and Chinese cloud service providers. This approach is not solely about technical merit, but reflects

1 Thuy Nguyen Thị Thu, "Improving the Legal Framework for Green Finance in Vietnam. A Comparison With Selected ASEAN Countries" *Prawo i Więź*, No. 4 (2025): 847-867.

a strategic alignment and risk mitigation strategy for digital autonomy.[2] Foundational initiatives, such as the ASEAN Digital Masterplan 2025[3] (ADM 2025), are charting a course towards a more connected, innovative, and inclusive ASEAN, recognizing technology's pivotal role in the socio-economic fabric of the region.[4] The economic potential is substantial, with projections indicating that ASEAN's digital economy could double to $2 trillion by 2030.[5]

Concurrently, ASEAN is intensifying its commitment to a green transition. This commitment is not merely an environmental obligation, but is viewed as a significant economic opportunity. Projections from the Boston Consulting Group suggest that pursuing carbon neutrality could add an impressive US3trilliontoUS5.3 trillion to ASEAN's GDP by 2050.[6] Key regional initiatives underscore this dedication, including the ASEAN Green Initiative, which aims to plant at least 10 million native trees across the ten member states over a decade, and the ASEAN Biodiversity Plan, which sets ambitious goals such as restoring 30% of degraded ecosystems by 2050[7]. Further solidifying this direction is the visionary ASEAN Strategy for Carbon Neutrality, endorsed in August 2023, which seeks to enhance ASEAN's global competitiveness through the development of regional green value chains, fostering green technologies, establishing credible standards for foreign capital flow, and cultivating green talent.[8] The UNESCO Science Report (2021) explicitly affirms ASEAN's growing commitment to this

2 Khwaja M. Mazher, "Review of Studies on Risk Allocation and Sharing in Public-Private Partnership Projects for Infrastructure Delivery" *Frontiers in Built Environment*, 11 (2025).

3 ASEAN, *ASEAN Digital Masterplan 2025* (ASEAN Secretariat, 2021).

4 Organisation for Economic Co-operation and Development, *Privacy Enhancing Technologies*. https://www.oecd.org/en/topics/privacy-enhancing-technologies.html. [accessed: 28.8.2025].

5 ASEAN, *ASEAN DEFA Study Projects Digital Economy Leap to US$2tn by 2030*, 25 May 2024. https://asean.org/asean-defa-study-projects-digital-economy-leap-to-us2tn-by-2030/.

6 ASEAN, *ASEAN Charts Course for a Sustainable Future with Ambitious ASEAN Strategy for Carbon Neutrality*. 20 August 2023. https://asean.org/asean-charts-course-for-a-sustainable-future-with-ambitious-asean-strategy-for-carbon-neutrality/.

7 ASEAN Centre for Biodiversity, *ASEAN Green Initiative*, 2024.

8 ASEAN, ASEAN Strategy for Carbon Neutrality: Public Summary (ASEAN Secretariat, 2023).

dual green and digital transition, underscoring its strategic importance for the region.[9]

A deeper examination of these two transitions reveals they are not simply parallel paths, but are profoundly interconnected and mutually reinforcing. The digital transition has the capacity to actively drive the green transition.[10] For example, sensors can dramatically increase the efficiency of energy and materials, such as through automatic lighting systems in homes and offices triggered by movement. Likewise, the Digital Economy Framework Agreement (DEFA) supports both digital and green innovation, highlighting the powerful impact of integrating these transitions. To maximize benefits, policies and investments should target and incentivize such synergies, avoiding fragmented approaches.

## 1.2. The Strategic Role of Public-Private Partnerships (PPPs) in ASEAN Development

Public-Private Partnerships are key tools for building and improving infrastructure and public services. Unlike standard procurement, PPPs involve shared risks and rewards between government and private entities, with payment often tied to performance. This model enables faster delivery and makes large projects viable, especially when budgets are tight or specialized expertise is needed. PPPs usually involve long-term contracts, often lasting 20 to 30 years or more. The duration is carefully considered based on the project type and overarching policy objectives, ensuring the project's long-term necessity and the private party's sustained capacity for service delivery.[11] A core aspect of PPPs is the meticulous distribution of risks, ideally allocating each risk to the party best equipped to assess, control, and manage its potential impacts.

Leading international development organizations, including the World Bank and the Asian Development Bank (ADB), provide extensive guidance and resources on establishing robust PPP legal frameworks, effective

9 United Nations Educational, Scientific and Cultural Organization, UNESCO Science Report: The Race Against Time for Smarter Development, 2021.

10 ASEAN, *ASEAN Digital Masterplan 2025*.

11 Fauziah Zen, "Public–Private Partnership Development in Southeast Asia" *ADB Economics Working Paper Series*, No. 553 (2018).

governance structures, and key contractual aspects. These institutions consistently emphasize the necessity of a transparent and accountable legal and regulatory environment to build sustainable projects that align with the public interest.[12] The World Bank, for instance, offers due diligence checklists, legislative examples, and various forms of regulation to guide effective project implementation.

PPPs are considered a critical enabler for bridging funding gaps and accelerating infrastructure development in ASEAN. The region faces substantial infrastructure investment needs, estimated by the Asian Development Bank at US2.8 trillion between 2016 and 2030, or US184 billion annually, to support economic growth and urbanization.[13] Relying solely on public funds is often insufficient to meet these demands. PPPs are not merely an alternative financing option; they are a strategic imperative to "bridge the digital divide" and "stimulate investments across the digital economy." The proven capacity of PPPs to mobilize significant private capital is demonstrated by the World Bank's Private Participation in Infrastructure (PPI) database, which lists over 6,600 projects in low- and middle-income countries with investments exceeding US$1.5 trillion between 1990 and 2019.[14] Without effectively leveraging private sector investment and expertise through well-structured PPPs, the region risks facing significant funding shortfalls and implementation delays, thereby hindering the pace and scale of its twin transition.

### 1.3. The Nexus: Why Digital-Green PPPs are Critical for ASEAN's Future

The merging of digital and green agendas unlocks powerful PPP opportunities in areas like smart cities, renewable energy, and sustainable agriculture. Digital tools enhance the efficiency and impact of green initiatives – such as sensor-driven energy savings and optimized waste systems. ASEAN's 2045 Vision firmly embeds both digital transformation and sustainability as

12 World Bank, World Bank Guidance on PPP Legal Frameworks. Public-Private Partnership Resource Center, 16 June 2022.

13 Asian Development Bank, *Framework for Improving ASEAN Infrastructure Productivity* (ASEAN Secretariat, 2020).

14 Anaïs Fabre, Stéphane Straub, "The Impact of Public-Private Partnerships (PPPs) in Infrastructure, Health, and Education" *TSE Working Paper*, No. 986 (2021).

strategic priorities. This vision articulates a future for ASEAN as a "Leading and connected Digital and Technological Community" and simultaneously as a "green ASEAN," underscoring the foundational importance of this nexus.[15] The ASEAN 2045 Vision aims to realize a resilient, innovative, dynamic, and people-centred ASEAN by 2045, where member states are united by regional solidarity and cooperation, envisioning a developed ASEAN as the epicentre of growth in the Indo-Pacific.[16]

The core premise of this report revolves around the synergistic intersection of digital, green, and PPPs. While ASEAN has developed distinct policy frameworks for its digital agenda, such as the Digital Economy Framework Agreement (DEFA), and its green agenda, including the ASEAN Strategy for Carbon Neutrality and the ASEAN Declaration on Environmental Sustainability, these are often crafted and implemented in parallel.[17] However, the available information demonstrates that digital capabilities are not merely complementary, but are transformative enablers for achieving green outcomes.[18] If these two transitions are managed in silos, ASEAN risks missing significant synergistic benefits and failing to fully capitalize on their combined potential. This implies a higher-order strategic challenge for ASEAN: to move beyond fragmented, sectoral policy approaches towards truly integrated legal and policy frameworks that explicitly consider and promote how digital solutions can accelerate green transitions, and vice versa, within the unique structure of PPPs. This integrated approach is critical for unlocking the full potential of the twin transition and ensuring that PPPs are designed to maximize both digital efficiency and environmental sustainability simultaneously.

15 ASEAN, *ASEAN 2045: Our Shared Future* (ASEAN Secretariat, 2025).
16 Ibidem.
17 ASEAN, *ASEAN Strategy for Carbon Neutrality: Public Summary.*
18 ASEAN, *ASEAN Digital Masterplan 2025.*

# 2 Foundational Legal and Policy Landscape for PPPs in ASEAN

The successful implementation of Public-Private Partnerships in Southeast Asia is deeply contingent upon the strength and clarity of its legal and policy environment. This section delves into the foundational aspects of PPP frameworks, key contractual considerations, and the inherent challenges and success factors for their effective deployment in the region.

## 2.1. Overview of PPP Legal Frameworks and Governance Models (World Bank, ADB perspectives)

Establishing robust governance for Public-Private Partnerships is a foundational requirement to ensure the selection of appropriate projects, promote fiscal responsibility, and avoid policy errors and associated costs.[19] Good PPP governance involves a clear functional organization of the PPP project cycle, which can manifest in centralized models (common in unitary states with a central PPP unit) or decentralized models (more typical in federal countries, relying on line ministries and public development banks).[20]

Developing a viable PPP framework is not a singular event but an intricate process involving a complex series of parallel and iterative initiatives.[21] It necessitates continuous updating of various framework elements based on lessons learned from implemented PPP transactions and the evolution of national best practices[22]. For instance, Indonesia's experience highlights the need for governments to select good projects for PPPs, ensure project preparation is thorough, and maintain commitment to the PPP process to attract private partners.

19 Inter-American Development Bank, *The Governance of Public–Private Partnerships: A Comparative Analysis*, 2020,

20 Ibidem.

21 International Telecommunication Union and Malaysian Communications and Multimedia Commission, *Digital Policy Action Areas for a Connected ASEAN: ASEAN Best Practice Benchmarking and an Action Plan for Regional Harmonisation* (ASEAN Secretariat, 2024).

22 Ibidem.

The World Bank offers extensive resources and comprehensive guidance on PPP legal and regulatory frameworks, emphasizing the critical importance of a transparent and accountable legal and regulatory environment for building sustainable projects that align with public interest.[23] These resources include due diligence checklists, legislative examples, and various forms of regulation to guide effective project implementation. The World Bank's guidance is intended for governments seeking to include PPPs in their toolkit for infrastructure development.

The Asian Development Bank provides valuable observations and suggestions for preparing and strengthening PPP laws specifically in developing Asia, with an emphasis on East Asia.[24] Their analysis, derived from practical experience across various countries, identifies a broad consistency in what are considered desirable and undesirable elements within the overall PPP legal framework. While the distribution of content between a core PPP law and supporting legal instruments varies, the underlying principles remain consistent.[25] A key observation is that a PPP law must ensure projects are affordable to users and government, and that the aggregated fiscal risk exposure of the government in the entire PPP program is assessed and managed.[26]

The development of PPP legal frameworks is a continuous, adaptive process. The explicit statement that a viable PPP framework involves "updating the different elements of the PPP framework [...] as each new lesson is learned from PPP transactions as they are implemented and national best practice as it develops"[27] underscores this dynamic nature. This ongoing adaptation is particularly pertinent for digital-green PPPs, where technological advancements in both digital and environmental domains are rapid and constantly evolving. Therefore, ASEAN's approach to legal frameworks for digital-green PPPs cannot be a one-time legislative act, but must incorporate institutionalized mechanisms for ongoing review,

23 World Bank, *PPP Legal and Regulatory Framework*. Public-Private Partnership Legal Resource Center. https://ppp.worldbank.org/public-private-partnership/node/9485. [accessed: 8.10.2025].

24 Asian Development Bank, *Public–Private Partnership (PPP) Handbook* (Asian Development Bank, 2020).

25 Jeffrey Delmon, *Creating a Framework for Public-Private Partnership (PPP) Programs: A Practical Guide for Decision-Makers* (World Bank Group, 2017).

26 Ibidem.

27 International Telecommunication Union and Malaysian Communications and Multimedia Commission, *Digital Policy Action Areas for a Connected ASEAN: ASEAN Best Practice Benchmarking and an Action Plan for Regional Harmonization.*

learning, and adaptation of legal and policy instruments to remain relevant and effective. This implies a need for agile regulatory bodies and processes capable of responding to emergent challenges and opportunities in a timely manner.

## 2.2. Key Contractual Aspects and Risk Allocation Principles in PPPs

The PPP contract serves as the central pillar of the partnership, meticulously defining the relationship between the public and private parties, their respective rights and responsibilities, the allocation of risks, and providing essential mechanisms for dealing with unforeseen changes over the project's long lifecycle. These contracts can encompass several documents and agreements, such as power purchase agreements and implementation agreements, and may not be effective until other contractual agreements, like financing agreements, are in place.[28] Contractual terms for PPPs typically range from 20 to 30 years, or even longer, with the specific duration contingent on the project type and overarching policy considerations. The project should be needed over the contract term, the private party should be able to accept responsibility for service delivery, and the procuring authority should be able to commit for the duration.[29]

Key contractual provisions that are fundamental to PPP agreements include: clearly defined performance requirements (quality and quantity of assets/services), robust payment mechanisms (user charges, government payments, bonuses/penalties), flexible adjustment mechanisms for changing circumstances (e.g., extraordinary reviews of tariffs or modifications to service requirements), comprehensive dispute resolution procedures (e.g., expert panels, international arbitration), and detailed termination provisions.[30] These provisions collectively establish the risk allocation within the contract, aiming to achieve the risk distribution determined during the project structuring phase.

28 Zen, "Public–Private Partnership Development in Southeast Asia".
29 Ibidem.
30 World Bank Group, *Guidance on PPP Contractual Provisions 2019 Edition*, Public-Private Infrastructure Advisory Facility (PPIAF), 2019.

A core principle of PPPs is the strategic allocation of risks, ideally assigning each risk to the party best equipped to assess, control, and cope with its potential impacts. Common risks for private enterprise include cost overruns, technical defects, and an inability to meet quality standards (availability risk), while for public partners, demand risk (e.g., for a toll road) or ultimate liability for project outcomes can be concerns.[31] The World Bank emphasizes that while well-designed contracts should be clear and comprehensive to create certainty, they are inherently "incomplete" given the long-term, complex nature of PPPs. Therefore, they must incorporate "bounded flexibility" to manage changing circumstances within the contract's framework, ideally preventing costly renegotiations or premature termination.[32]

A fundamental tension exists between the need for long-term contractual certainty and the rapid pace of technological evolution in PPPs. PPP contracts are designed for long durations, often decades, to provide the stability and predictability necessary for private investment. However, the context of the "Twin Transition" introduces an unprecedented pace of technological change, particularly in the digital domain. The acknowledgement that PPP contracts are "necessarily incomplete" and "cannot fully predict future conditions," thus necessitating "flexibility built in,"[33] highlights this inherent incompleteness. This, coupled with the rapid obsolescence of technology, creates a fundamental challenge: how to provide long-term contractual certainty for investors while simultaneously allowing for the agile integration of new, disruptive technologies and adaptation to unforeseen environmental changes. This implies that traditional PPP contract drafting, which often relies on fixed terms and predefined risks, may be insufficient for digital-green PPPs. Instead, it requires innovative contractual approaches that incorporate dynamic adjustment mechanisms, shared risk models for technological disruption, and provisions for continuous technological upgrades to maintain project relevance and efficiency over its lifecycle.

31 World Bank Group, *Allocating Risks in Public-Private Partnerships*. Public-Private Infrastructure Advisory Facility (PPIAF), 2016.

32 World Bank Group, *Managing Public-Private Partnership (PPP) Renegotiation*, 2021.

33 Mikel Tejada Ibañez, "Rightly Done PPPs Can Be the Right Tool for Green and Resilient Infrastructure" *World Bank Blogs*, 1 July 2021.

## 2.3. Challenges and Success Factors for PPP Implementation in Southeast Asia

Implementing Public-Private Partnerships on a large scale in Southeast Asia is a complex undertaking, requiring specific and sufficient knowledge in areas such as financing structures, effective risk allocation, intricate contract management, and robust dispute resolution mechanisms.[34] The transaction process itself is often protracted, adding to the complexity.[35] Singapore, for instance, has a highly developed infrastructure, but PPPs play a lesser role there due to abundant public funds and strong public institutions, in contrast to countries like Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam, where there are strong calls for PPPs.[36] Poorly structured risk allocation can significantly deter competitive tendering, potentially reducing the number of prospective bidders and fostering opportunistic behavior.[37] This is a critical factor, as adequate risk allocation and sharing (RAS) is considered a critical success factor in PPP project delivery, yet it is exceptionally complex to establish, structure, monitor, and enforce.[38]

Key success factors for PPP implementation include the presence of coherent government policies, adequate public sector capacity to manage PPPs effectively, a genuine willingness within the public sector to foster mutual and collaborative relationships with private partners, and strong, consistent leadership throughout the project lifecycle.[39] Investor confidence, particularly from international infrastructure investors, is highly sensitive to perceived political and commercial risks in unfamiliar economies. Therefore, an efficient, transparent, and predictable policy and institutional PPP framework is essential to attract and retain private capital.[40] The ASEAN Principles for PPP frameworks offer non-binding recommendations to member

34 Zen, "Public–Private Partnership Development in Southeast Asia."
35 Ibidem.
36 Ibidem.
37 Sam Higgins et al., "Navigating the Geopolitical Cloud: ASEAN's Diverse Approach to Digital Sovereignty" *Forrester*, (2025).
38 Mazher, "Review of Studies on Risk Allocation and Sharing in Public-Private Partnership Projects for Infrastructure Delivery."
39 Sri Mulyani, "Critical Success Factors in Public-Private Partnership" *Journal of Accounting, Auditing and Business*, No. 1 (2021): 81-86.
40 ASEAN Secretariat and Organisation for Economic Co-operation and Development, *ASEAN Principles for Public-Private Partnership Frameworks* (ASEAN Secretariat, 2014).

states, guiding them on how to implement effective PPP frameworks that prioritize value for money, affordability, financial sustainability, and the fulfillment of user needs and broader social objectives. These principles emphasize clear mandates, accountability, and sufficient resourcing for PPP units, as well as checks-and-balances between agencies that promote PPPs and those with oversight.

A significant disparity exists between policy ambition and practical implementation capability, highlighting an institutional capacity gap as a primary constraint on PPP scalability and innovation in ASEAN. While there are "strong calls for PPP" across key ASEAN economies like Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam, a critical observation is that "public sector commitment for PPP and the realization of planned PPP projects are not always in the same path with the ambitious calls."[41] This suggests that the fundamental bottleneck for scaling up PPPs, especially the more complex digital-green variants, is often not merely the absence of legal frameworks but a deeper deficiency in institutional capacity. This encompasses limitations in human capital, such as a lack of specialized expertise, inadequate organizational structures, and insufficient governance maturity within public agencies.[42] Addressing this gap through targeted capacity building, knowledge transfer, and institutional strengthening is therefore a critical precursor to unlocking the full potential of digital-green PPPs in the region.

## 2.4. From Soft Law to Hard Challenges: The Legal Status of ASEAN Frameworks

ASEAN's approach to regional governance is characterized by a reliance on soft law instruments as non-binding frameworks, guidelines, and strategies that reflect consensus but lack enforceability. This legal architecture, while fostering cooperation, presents significant challenges for private investment, particularly in long-term Public-Private Partnership projects.

41 Zen, "Public–Private Partnership Development in Southeast Asia."

42 World Bank, *The Role of Capacity Building in Strengthening PPP Institutions*. Public-Private Infrastructure Advisory Facility (PPIAF), 2022.

### 2.4.1. Non-Binding Nature of Key ASEAN Frameworks

The ASEAN Principles for Public-Private Partnership Frameworks are explicitly described as "non-binding recommendations" developed to guide member states in enhancing infrastructure investment through PPP.[43] These principles, while comprehensive, do not impose legal obligations, leaving implementation to the discretion of individual states.

Similarly, the ASEAN Guide on AI Governance and Ethics, released in 2024, adopts a voluntary approach. It offers a set of ethical principles, transparency, fairness, privacy, and accountability, but its adoption is not mandatory. ASEAN itself acknowledges that the guide is "not legally binding" and is intended to "encourage alignment" rather than enforce compliance.[44]

The ASEAN Strategy for Carbon Neutrality, launched in 2023, outlines ambitious goals for regional decarbonization and green investment. However, it functions as a strategic roadmap rather than a binding legal instrument. Member states retain full autonomy over their climate policies, and the strategy lacks enforcement mechanisms.[45]

Likewise, the ASEAN Digital Masterplan 2025 envisions ASEAN as a leading digital bloc, but operates as a visionary blueprint rather than a regulatory mandate. It calls for harmonization of standards and digital inclusion, but does not compel member states to adopt specific legal reforms.[46]

### 2.4.2. Institutional structure and legal implications

This reliance on soft law stems from ASEAN's institutional design. Unlike the European Union, which possesses supranational legislative authority through its Parliament and Commission, ASEAN is an intergovernmental organization. Member states retain full sovereignty, and decisions are made by consensus. As a result, regional frameworks are aspirational and non-enforceable. For private investors, especially those entering long-term PPP contracts, this legal reality introduces profound uncertainty. Regional frameworks cannot be invoked to enforce contractual obligations or resolve

43 ASEAN Secretariat and Organisation for Economic Co-operation and Development, *ASEAN Principles for Public-Private Partnership Frameworks*.

44 ASEAN Secretariat, *ASEAN Guide on AI Governance and Ethics* (ASEAN Secretariat, 2024), https://asean.org/book/asean-guide-on-ai-governance-and-ethics/.

45 ASEAN, *ASEAN Strategy for Carbon Neutrality: Public Summary*.

46 ASEAN, *ASEAN Digital Masterplan 2025*.

disputes. Instead, investors must navigate a fragmented legal landscape shaped by diverse national laws, regulatory capacities, and political priorities. This fragmentation is more than a lack of harmonization, it is a structural barrier to legal certainty and risk mitigation.

## 2.5. In-Depth Legal Analysis from the National Perspective

The most significant legal analysis must occur at the national level, where "soft" ASEAN principles translate, or fail to translate, into "hard" law and binding contracts. A detailed examination of legal frameworks in key ASEAN economies reveals three distinct approaches that offer these valuable case studies.

### 2.5.1. Vietnam: A Proactive and Law-Driven Approach

Vietnam has emerged as a regional leader in crafting binding legal frameworks to support digital-green Public-Private Partnerships. Unlike ASEAN's soft law instruments, Vietnam's legislative strategy provides enforceable rights, obligations, and incentives, creating a high degree of legal certainty for private investors.

#### 2.5.1.1. LAW ON DIGITAL TECHNOLOGY INDUSTRY (DTI LAW)

Passed by the National Assembly on 14 June 2025, and effective 1 January 2026, the DTI Law is the world's first standalone statute dedicated to the digital technology industry.[47] It defines digital technology as a strategic sector encompassing AI, semiconductors, cloud computing, and digital content.[48]

Key provisions include:

(i) Legal recognition of digital assets as "property rights under the Civil Code," enabling enforceable ownership, transaction, and protection of intangible assets like AI models and blockchain tokens;

47 Baochinhphu.vn, *Law on Digital Technology Industry Approved*, 14 June 2025.

48 Manh Hung Tran, Huu Tuan Nguyen, Huyen Minh Nguyen, "Vietnam: Digital Technology Law – Legal Foundations and Strategic Incentives to Accelerate Digital Economic Growth" *Connect On Tech*, 18 July 2025.

(ii) Risk-based AI governance: AI systems are classified by societal impact, with high-risk systems subject to stricter oversight. This mirrors the EU AI Act and aligns with OECD principles;[49]
(iii) Startups receive 50% cost coverage for acquiring advanced technologies and developing prototypes. SMEs gain access to infrastructure subsidies, talent development, and priority in public procurement;
(iv) Multiyear corporate tax reductions are offered to foreign firms that transfer technology and collaborate with local enterprises.[50]

These provisions create a robust legal ecosystem for digital infrastructure, directly supporting PPPs in emerging tech sectors.

#### 2.5.1.2. Law on Data (Effective 1 July 2025)

Although less publicized, the Law on Data complements the Digital/Tech regulatory framework by regulating cross-border data flows, data protection and privacy, and issues of digital sovereignty and national security. The law takes effect on 1 July 2025, and introduces obligations and classifications that affect both domestic and foreign entities handling data—measures that are directly relevant to data-driven PPPs (e.g., smart cities, AI environmental monitoring), because they create required legal guardrails for data transfer, storage, and access.[51]

#### 2.5.1.3. Decree 180: Incentivizing Digital-Green PPPs (Effective 1 July 2025)

Decree No. 180/2025/ND-CP (effective 1 July 2025) establishes exceptional incentive policies to promote PPPs in science, technology, innovation, and digital transformation. Key measures include generous tax and investment incentives, most notably the allowance to deduct up to 200% of actual R&D expenses for corporate income tax purposes, exemptions and reductions of land-use fees, support for technology acquisition and prototype development (up to 50% reimbursable for acquiring advanced technology/developing prototypes in certain cases), and mechanisms that can give state

49 Ibidem.
50 Baochinhphu.vn, *Law on Digital Technology Industry Approved*.
51 Law on Data, No. 60/2024/QH15, Law on Data (National Assembly of the Socialist Republic of Vietnam, 2024), https://thuvienphapluat.vn/van-ban/Cong-nghe-thong-tin/Law-60-2024-QH15-Data/639658.

agencies a procurement preference for products developed under PPPs. These incentives are intended to lower costs and share risks for private partners in innovation-heavy PPP projects.[52]

These incentives are codified, not discretionary, offering enforceable benefits that de-risk investment and attract private partners

#### 2.5.1.4. REVENUE-SHARING MECHANISM IN THE PPP LAW

Vietnam's PPP legal framework creates a downside revenue-sharing mechanism to protect private partners when user-pay or market revenues fall well short of the financial plan. Under the PPP law and implementing guidance, where actual project revenue drops below 75% of the revenue projected in the financial plan, the State will share 50% of the shortfall between actual revenue and the 75% threshold (i.e., the State covers half of the difference). This sharing is subject to conditions (for example, the shortfall must result from changes in planning, policy, laws or state action and investors must have exhausted remedial measures such as tariff adjustments or term extensions). The rule is framed to apply to classic market-risk PPP models (e.g., BOT/BTO/BOO) and aims to make user-pay projects more bankable by limiting downside exposure.[53]

In practice, the mechanism operates as a contingent fiscal/contractual backstop rather than an unconditional subsidy. Guidance and commentary emphasize (i) procedural conditions for eligibility, (ii) the State's ability to require investors to pursue mitigation measures first, and (iii) that the mechanism is intended to be applied on a project-by-project basis with implementing decrees and circulars fleshing out operational detail. Some official and legal-market summaries also note limited transitional or stronger protections in early operation periods for particular projects (e.g., exceptional arrangements in the first years under certain rules).[54]

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52 Decree No. 180/2025/ND-CP, Mechanisms and Policies for Public-Private Partnership in the Field of Science, Technology, Innovation and Digital Transformation (Decree No. 180/2025/ND-CP) (Government of the Socialist Republic of Vietnam, 2025), https://thuvienphapluat.vn/van-ban/EN/Dau-tu/Decree-180-2025-ND-CP-mechanisms-and-policies-for-public-private-partnership-in-the-field-of-science/671190.

53 PricewaterhouseCoopers Vietnam, *New PPP Framework: Highlights of Vietnam's PPP Regime (legal brief)* (PwC, 2020).

54 *Vietnam's New PPP Law – Key Features and Implications*. Frasers Law Company. 2021.

#### 2.5.1.5. STRATEGIC IMPACT

By codifying revenue-sharing and related guarantees, Vietnam reduces regulatory and cash-flow uncertainty for projects that depend on variable user demand (e.g., renewables with merchant offtake, digital platforms, smart-city services). This statutory clarity helps lenders and equity investors model downside scenarios with greater confidence; (ii) Risk mitigation via fiscal and contractual tools. The sharing rule converts a portion of market risk into a quasi-public fiscal obligation when specified triggers occur. Paired with other incentives (tax, land, R&D support) set out in implementing decrees such as Decree 180/2025, these mechanisms materially lower project risk and cost of capital for innovation-heavy PPPs; (iii) Institutional capacity to regulate emerging technologies. Binding laws plus sectoral decrees create a predictable supervisory and implementation architecture (procurement preferences, cost-sharing for prototypes, R&D deductions, etc.) which is better suited to govern projects with technical, data, and security dimensions (e.g., AI-enabled environmental monitoring or urban digital platforms). This contrasts with instruments that only offer voluntary guidance; (iv) Vietnam's statute-plus-decree model, embedding enforceable revenue-sharing and concrete fiscal incentives, offers a different governance logic from ASEAN's primarily soft law approach (e.g., the ASEAN Guide on AI Governance and Ethics), which provides nonbinding principles and harmonization guidance, but lacks enforceable fiscal or contractual guarantees for investors. That difference makes Vietnam comparatively attractive for private capital seeking legal-backed risk sharing and tangible procurement/incentive pathways.

### 2.5.2. Indonesia: The Institutional and Regulatory Bottleneck

Indonesia's development ambitions are *clearly articulated in its* National Medium-Term Development Plan (RPJMN) 2024–2029,[55] which prioritizes infrastructure modernization, digital transformation, and sustainability. However, a critical gap persists between these strategic goals and the legal-institutional realities that govern Public-Private Partnerships and smart city initiatives.

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55 I.N. G. Putra, "Smart City Development in Indonesia: Challenges and Policy Directions," *Food and Fertilizer Technology Center for the Asian and Pacific Region*, August 30, 2021.

#### 2.5.2.1. LENGTHY PPP PROCESSES AND LEGAL FRAGMENTATION

Despite a robust pipeline of PPP projects, the process remains "too lengthy," often taking "one to two years" from project identification to financial close, a timeline that significantly deters private investment.[56] The complexity arises from overlapping mandates and fragmented coordination among key agencies, including BAPPENAS, the Ministry of Finance, LKPP, and sectoral ministries. Each plays a role in project appraisal, procurement, and monitoring, but the lack of streamlined governance creates bottlenecks that stall momentum.[57]

#### 2.5.2.2. SMART CITY POLICY: SECTORAL AND UNSUSTAINABLE

Indonesia has launched numerous smart city initiatives, including the 100 Smart Cities Program, but these remain "sectoral and unsustainable," lacking a unified legal framework for standardization and integration. There is no specific legal instrument to regulate smart city architecture, data governance, or interoperability standards. As a result, digital-green projects, such as an AI-powered waste management system, must navigate a fragmented legal landscape, facing multiple compliance regimes across environmental, data, and municipal laws.[58]

This regulatory fragmentation increases transaction costs and legal uncertainty, undermining investor confidence. In contrast, Vietnam's Decree 180 and DTI Law offer a unified legal foundation and targeted incentives for digital-green PPPs, streamlining project development and reducing risk.

#### 2.5.2.3. COMPARATIVE INSIGHT

Indonesia's institutional bottlenecks are not merely technical, they are structural. The country's fragmented, polycentric governance architecture and the persistence of siloed ministries and agencies inhibit the coordination needed for cross-sectoral digital-green projects, producing regulatory gaps and implementation delays that undermine integrated

56 McKinsey & Company, *Can PPPs Solve Indonesia's Infrastructure Needs?*, 2021.
57 Global Challenge Advisory, *A Brief Overview of Indonesian PPP Framework*, 2024.
58 King & Wood Mallesons, *Public-Private Partnerships in Asia – Indonesia Guide*, 8 July 2025.

PPP initiatives.[59] The absence of a consolidated, binding set of legal instruments, combined with uneven subnational capacity and overlapping agency mandates, means that ambitions for the Twin Transition often remain policy statements rather than bankable, law-backed programs.[60] For ASEAN to make credible progress on the Twin Transition, Indonesia will need to move from high-level policy ambition to legal precision: adopting enforceable statutes, clear assignment of regulatory responsibilities, and project-level risk-sharing rules so that multi-sector PPPs can be planned, financed, and governed coherently. Vietnam's recent turn toward binding laws and implementing decrees (e.g., national data legislation and Decree 180/2025) provides a practicable model, one that replaces voluntary guidance with statutory instruments and fiscal/contractual guarantees that materially improve bankability and investor confidence.[61]

### 2.5.3. Singapore: A Mature but Distinctive Legal Ecosystem

Singapore's legal environment plays a distinctive and enabling role in the Twin Transition. PPPs are used in Singapore, but they occupy a lesser role in financing major infrastructure relative to many other countries, not because of policy failure, but because Singapore's strong public finances, government-linked commercial entities, and sovereign investment capacity reduce the fiscal imperative to transfer financing risk to private partners.[62] When a government has ample fiscal space and low borrowing costs it can often finance and deliver public assets directly; the State may instead use PPPs selectively to co-create innovation and leverage private expertise rather than to fill funding gaps.

59 Natural Resource Governance Institute, *The Governance Challenge behind Indonesia's Resource Ambitions*, 23 June 2025.

60 King & Wood Mallesons, "Public-Private Partnerships in Asia – Indonesia Guide."

61 Vietnam Briefing (Dezan Shira & Associates), Vietnam's PPP Framework for Science, Tech and Digital Transformation (Decree 180/2025/ND-CP), 2025.

62 World Bank, *Singapore: Public-Private Partnership (PPP) Profile, Benchmarking Infrastructure Development 2023*, 2023.

#### 2.5.3.1. ROBUST PERSONAL DATA PROTECTIONS WITH PREDICTABLE CROSS-BORDER RULES

The Personal Data Protection Act (PDPA) provides a baseline data-protection standard and contains a transfer-limitation obligation: personal data may be transferred overseas only where steps are taken to ensure an overseas recipient provides a standard of protection comparable to the PDPA or other safeguards are in place. This framework combined with clear PDPC guidance on transfers, gives international, data-intensive projects a reasonably predictable legal pathway for cross-border data flows, which is essential for smart cities, regional platforms, and transnational environmental monitoring.[63]

#### 2.5.3.1. MATURE BREACH-NOTIFICATION AND ENFORCEMENT ARCHITECTURE

Amendments to the PDPA implemented a mandatory data breach notification regime in phases (first batch effective 2021) and strengthened enforcement powers and penalties thereafter. The PDPC's operational guides set out notification thresholds, timelines and procedural expectations, providing firms and public agencies with a clear compliance playbook and reducing regulatory ambiguity that can otherwise inflate legal and operational risk for international firms.[64]

#### 2.5.3.1. PRACTICAL AI GOVERNANCE THAT HAS REGIONAL INFLUENCE

Singapore's Model AI Governance Framework (first published 2019, updated 2020) supplies actionable, industry-oriented governance measures, accountability structures, explainability expectations, risk management steps that influenced the development of regional, non-binding instruments such as the ASEAN Guide on AI Governance and Ethics. The existence of such a tested, operational framework demonstrates how a mature legal-regulatory ecosystem can serve both as a domestic implementation

63 Personal Data Protection Commission (PDPC), *Personal Data Protection Act (PDPA)*. https://www.pdpc.gov.sg/overview-of-pdpa/the-legislation/personal-data-protection-act. [accessed: 8.10.2025].

64 Personal Data Protection Commission (PDPC), *Guide on Managing and Notifying Data Breaches under the PDPA*. 2021.

tool and as a regional reference model, helping to harmonize expectations without requiring supranational law.[65]

Taken together, these elements reframe the policy question: it is not the count of PPP contracts that matters most, but the predictability, coherence, and enforceability of the legal ecosystem that underpins digital-green projects. For international investors and implementers, Singapore's combination of legal clarity (PDPA and guides), operational governance (Model AI Framework), and fiscal capacity (sovereign) reduces transactional friction and legal risk making the city-state a reliable hub for designing, piloting, and scaling data-intensive digital-green initiatives in Southeast Asia.

Vietnam, Indonesia, and Singapore illustrate three distinct legal pathways for the Twin Transition: Vietnam pursues a proactive, law-driven model using binding statutes (and decrees such as Decree 180) and concrete fiscal/contractual tools (e.g., revenue-sharing, R&D incentives) to directly improve PPP bankability; Indonesia possesses a well-established, but fragmented framework where strong policy ambition is undermined by siloed institutions, overlapping mandates, and lengthy implementation processes that raise transaction costs for cross-sectoral digital-green projects; and Singapore relies less on traditional PPPs not from neglect, but because its mature legal ecosystem and fiscal capacity (clear PDPA cross-border rules, a tested AI governance model, and robust public financing) reduce the need to transfer risk to private partners while still offering high predictability for data-intensive initiatives. Together they demonstrate that regional progress will depend less on replicating a single financing model and more on combining legal precision, institutional capacity building, and targeted incentives, so that countries can choose the mix of statutes, regulatory clarity, and fiscal tools best suited to their fiscal context and development objectives.

65 Infocomm Media Development Authority (IMDA), *Model AI Governance Framework (First Edition)*, 2019.

# 3 ASEAN's Digital Transformation Agenda: Legal and Regulatory Dimensions

ASEAN's digital transformation agenda is underpinned by a series of strategic initiatives and evolving legal frameworks designed to foster a dynamic, secure, and inclusive digital economy. This section explores the key components of this agenda, including the Digital Economy Framework Agreement, data governance, AI governance, cybersecurity, and the role of regulatory sandboxes.

## 3.1. The ASEAN Digital Economy Framework Agreement (DEFA) and its Objectives

The Digital Economy Framework Agreement stands as a landmark initiative currently under negotiation by ASEAN member states, poised to establish the world's first region-wide digital economy agreement. This agreement represents a pivotal moment for the region, acting as a strategic blueprint for how nearly 680 million people can access an open, secure, and inclusive digital future. Its primary objectives include harmonizing diverse digital trade rules, integrating fragmented digital markets across the region, and unlocking ASEAN's immense digital economic potential. The comprehensive scope of DEFA encompasses critical areas such as digital trade, e-commerce, emerging technologies (including artificial intelligence and blockchain), and cross-border data flows.[66] Negotiations for DEFA began in November 2023, with the bloc aiming to conclude at least a portion of the agreement by the end of 2025.[67] DEFA is designed to significantly reduce regulatory divergence, which currently imposes an estimated $15–20 billion annually in compliance overheads on ASEAN businesses. By harmonizing standards for data flows, e-payments, and digital product classification, it aims to lower transaction costs, particularly

66 World Economic Forum, *Why ASEAN's New Digital Economy Framework Agreement Is a Game-Changer*, 26 May 2025.

67 Naomi Wilson, "The Digital Economy Framework Agreement: ASEAN's Anchor in a Turbulent Digital Economy" *Information Technology Industry Council*, 17 July 2025.

benefiting small and medium-sized enterprises which often lack resources to navigate conflicting national rules. This unified approach is projected to cut cross-border transaction costs by 30 percent. Furthermore, binding commitments, such as banning data localization, are expected to attract substantial Foreign Direct Investment, with projections of $30–50 billion annually,[68] by signaling regulatory stability and aligning regional policies with global digital trade best practices. Crucially, DEFA also includes protocols for coordinated cyber defense, enhancing regional security in the digital domain, which is increasingly important for attracting AI investment. The successful implementation of DEFA is anticipated to unlock $2 trillion in regional digital trade by 2030, significantly boosting the digital share of GDP and creating millions of digital jobs.[69]

DEFA's ambitious objectives are fundamental to creating a predictable, efficient, and secure operating environment for any digital initiative, including complex digital-green PPPs. The agreement explicitly serves dual purposes as both a digital and a sustainability agreement, thereby laying a crucial foundation for green innovation. However, the ongoing negotiation process and the acknowledged "differences in development levels, regulatory capacity, infrastructure, and digital skills across the region" indicate that the implementation and enforcement of DEFA will be inherently complex. The success of digital-green PPPs will therefore heavily depend on how effectively DEFA translates its aspirational goals into genuinely harmonized, enforceable national regulations that reduce fragmentation, build trust, and provide the necessary legal certainty for long-term private investment.

68 ASEAN Secretariat and Boston Consulting Group, *Study on the ASEAN Digital Economy Framework Agreement (DEFA): Public Summary Report*, 25 November 2024.

69 Wilson, "The Digital Economy Framework Agreement: ASEAN's Anchor in a Turbulent Digital Economy."

### 3.2. Data Governance, Privacy Laws, and Cross-Border Data Flows in ASEAN

ASEAN is actively navigating the delicate balance between promoting the free flow of data, which is essential for digital economic growth, and ensuring effective data protection and privacy for its citizens.[70] The Digital Economy Framework Agreement is central to this effort, aiming to establish an open, secure, interoperable, competitive, and inclusive regional digital economy.[71] The evolving cyber laws of the People's Republic of China (PRC), which increasingly emphasize digital sovereignty and data localization, are significantly influencing Southeast Asia's digital regulatory environment.[72] This growing influence, supported by infrastructure investments and digital partnerships under initiatives like the Digital Silk Road, complicates ASEAN's efforts to foster seamless, cross-border data flows and can lead to regulatory fragmentation. This challenge is particularly acute, as ASEAN's push for cross-border data flows is directly challenged by the PRC's insistence on digital localization.

Individual ASEAN member states have established their own specific privacy laws, such as Singapore's Personal Data Protection Act (PDPA), Malaysia's PDPA, and Thailand's PDPA. These laws exhibit varying approaches to data transfer and localization. Generally, they require that overseas recipients provide a level of data protection equivalent to national standards or that specific legal conditions for transfer are met, such as obtaining consent from the data subject, fulfilling contractual obligations, or serving significant public interest reasons. For instance, Singapore's PDPA sets limitations on data controllers regarding the transfer of personal data outside the country, requiring legally enforceable obligations or specified certifications from overseas recipients.[73] Malaysia's PDPA generally restricts transfers unless specific conditions are met, though an upcoming

70 Keita Oikawa, "ASEAN Data Governance: Implications for the Digital Economy Framework Agreement" *Economic Research Institute for ASEAN and East Asia (ERIA)*, No. 10 (2025).

71 World Economic Forum, *Why ASEAN's New Digital Economy Framework Agreement Is a Game-Changer*.

72 Julia Rocio Gatdula, "The PRC's Evolving Cyber Laws and Implications for Southeast Asia's Digital Economy and Integration" *Center for Strategic and International Studies* (CSIS), 4 August 2025.

73 Personal Data Protection Commission, *Advisory Guidelines on Key Concepts in the PDPA: Chapter 19 – The Transfer Limitation Obligation*, 27 July 2017.

amendment will allow transfers provided the Act's conditions are met.[74] Thailand's PDPA also subjects transfers to strict limitations, generally requiring transfers to countries with adequate protection levels or under specific legal grounds.[75]

Recommendations for DEFA, as part of its data governance mandate, include the creation of a comprehensive and regularly updated data regulation repository to enhance transparency and reduce compliance costs for businesses. Furthermore, DEFA should establish minimum standards for personal data protection and a clear framework for addressing sensitive issues such as government access to both personal and non-personal data, all aimed at building trust in cross-border data exchanges.[76] Promoting regulatory interoperability and discouraging unnecessary data localization, drawing lessons from agreements like the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, is also advised. The proposed ASEAN Data Governance Hub could serve as a pivotal mechanism for supporting digital integration.[77]

Privacy Enhancing Technologies (PETs) are recognized as powerful tools that can complement existing privacy and data governance frameworks by enhancing data confidentiality and enabling secure collaboration.[78] PETs offer innovative solutions that could help address some of the complexities associated with cross-border data flows, for example, by obfuscating personal data to such an extent that it can no longer relate to an identifiable individual. While Privacy Enhancing Technologies offer valuable support for data protection, they should not be viewed as a one-size-fits-all solution. Their use involves notable challenges, including potential data breaches and substantial computational demands, which highlight the need for well-defined regulatory frameworks to manage their risks effectively.

The successful implementation of integrated digital-green PPPs, particularly those involving smart infrastructure, is inherently reliant on the efficient and trusted flow of large volumes of data. However, the rising

74 TMO Group, *Data Protection Laws in Southeast Asia: Overview by Country (2024)*, 18 July 2024.

75 Ibidem.

76 Oikawa, "ASEAN Data Governance: Implications for the Digital Economy Framework Agreement."

77 United Nations Conference on Trade and Development, *Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)*, 2018.

78 Organisation for Economic Co-operation and Development, "Emerging Privacy-Enhancing Technologies: Current Regulatory and Policy Approaches" *OECD Digital Economy Papers*, No. 351 (2023).

global trend of digital sovereignty, exemplified by China's data localization policies influencing the region, coupled with the diverse and often restrictive national privacy laws within ASEAN, creates a fundamental tension.[79] This tension between national control over data and the economic and operational benefits of cross-border data utility represents a significant legal and practical hurdle for digital-green PPPs, which often require seamless data exchange across borders and jurisdictions. This implies that ASEAN must develop a sophisticated and nuanced approach that carefully balances national security and privacy concerns with the imperative for data flow. This could involve promoting regulatory interoperability, developing regional data sharing protocols, and actively exploring the deployment of Privacy Enhancing Technologies to facilitate secure data exchange without compromising national interests.

### 3.3. AI Governance and Cybersecurity Frameworks in the Region

ASEAN has proactively addressed the governance of Artificial Intelligence by releasing the ASEAN Guide on AI Governance and Ethics[80]. This guide provides foundational principles for organizations, including transparency and explainability, fairness and equity, security and safety, robustness and reliability, human-centricity, privacy and data governance, and accountability and integrity. It outlines key focus areas for the design, development, and deployment of AI systems, along with national and regional recommendations for policymakers, such as nurturing AI talent and investing in AI R&D.

A subsequent Expanded ASEAN Guide on AI Governance and Ethics specifically addresses the unique opportunities and risks posed by Generative AI (Gen AI). This expanded guide explores risks such as mistakes and anthropomorphism, factually inaccurate responses and disinformation, deepfakes, infringement of intellectual property rights, privacy and confidentiality, and the propagation of embedded biases.[81] It recommends a range of policy actions for responsible adoption, emphasizing thoughtful,

79 Heylyung Yun, "China's Data Sovereignty and Security: Implications for Global Digital Borders and Governance" *Chinese Political Science Review*, Vol. X (2024).

80 ASEAN Secretariat, *ASEAN Guide on AI Governance and Ethics*.

81 ASEAN Secretariat, *Expanded ASEAN Guide on AI Governance and Ethics – Generative AI* (ASEAN Secretariat, 2025).

proportional, and regionally interoperable measures to ensure safety and promote a trusted Gen AI ecosystem.

Cybersecurity is identified as a critical and growing concern, as rapid digital transformation simultaneously increases ASEAN countries' vulnerability to cyber threats targeting their critical infrastructure, government institutions, businesses, and citizens.[82] Cybercrime in Southeast Asia, for instance, increased by 82% between 2021 and 2022, with data breach losses exceeding $3 million by July 2023.[83]

Cybersecurity Risk Management (CRM) has emerged as a fundamental framework for understanding organizational security posture and investment decisions, with empirical research demonstrating its strong influence on resource allocation.[84] The systematic identification, assessment, and mitigation of cybersecurity threats are particularly critical given the region's rapidly evolving threat landscape. Multi-group analysis reveals that critical infrastructure sectors exhibit significantly stronger direct relationships between risk management, governance, and cybersecurity investment, reflecting their heightened exposure and regulatory requirements compared to other sectors. This aligns with ASEAN's Cybersecurity Cooperation Strategy 2021-2025, which emphasizes risk-based approaches to securing the region's digital infrastructure.[85] Digital defense is recognized as a strategic priority, with countries like Indonesia actively strengthening their digital defense access and capabilities through synergy between the Ministry

82 Mahirah Mahusin, Hilmy Prilliadi, "Strengthening ASEAN's Cybersecurity: Collaborative Strategies for Enhanced Resilience and Regional Cooperation" *ERIA Policy Brief*, (2024).

83 Moises B. Carandang, Roxanne Jacutan, "Southeast Asia Is Tackling Cyberattacks on the Underbanked" *World Economic Forum*, 15 October 2024.

84 Phasikha Rattanapong, Narongsak Sukma, Smitti Darakorn Na Ayuthaya, "Determinants of Cybersecurity Investment in ASEAN Organizations: An Integrated Structural Equation Modeling Approach" *Frontiers in Communications and Networks*, 6 (2025); Dominik Bierecki, Christophe Gaie, Mirosław Karpiuk, Jean Langlois-Berthelot, "Creating Resilient Artificial Intelligence Systems. A Responsible Approach to Cybersecurity Risks" *Prawo i Więź*, No. 5 (2025): 131-149; Dominik Bierecki, Mirosław Karpiuk, Claudio Melchior, Nicola Strizzolo, "Security in the Era of Cybersecurity Threats" *Prawo i Więź*, No. 4 (2025): 73-87; Christophe Gaie, Mirosław Karpiuk, Nicola Strizzolo, "Cybersecurity of Public Sector Institutions" *Prawo i Więź*, No. 6 (2024): 347-363.

85 Phasikha Rattanapong, Narongsak Sukma, Smitti Darakorn Na Ayuthaya, "Determinants of Cybersecurity Investment in ASEAN Organizations: An Integrated Structural Equation Modeling Approach" *Frontiers in Communications and Networks*, 6 (2025).

of Communication and Digital Affairs and the National Armed Forces. This collaboration extends to expanding internet connectivity in remote regions and strengthening national defense in the digital domain, acknowledging that digital warfare is a component of modern geopolitical conflicts.

The urgency of harmonized and sector-specific AI and cybersecurity governance for critical infrastructure PPPs is paramount. Digital-green PPPs, particularly those involving smart cities, energy grids, and other critical infrastructure, are inherently reliant on advanced digital technologies, including AI, and are highly susceptible to cyber threats.[86] The information highlights the "diverse digital landscapes" and varying maturity of national laws related to data protection and cybersecurity across ASEAN member states. This fragmentation, coupled with the significant vulnerability of critical infrastructure,[87] suggests that a siloed or inconsistent approach to AI and cybersecurity governance could create systemic vulnerabilities across regional PPPs, undermining trust and deterring investment. The stronger influence of risk management and governance factors on cybersecurity investment in critical infrastructure sectors further underscores the need for a targeted approach. Therefore, a crucial implication is that ASEAN must prioritize the development of harmonized, sector-specific AI and cybersecurity frameworks for digital-green PPPs, potentially through a dedicated working group as suggested in the ASEAN Guide on AI Governance and Ethics. This is essential not only for mitigating risks but also for attracting and securing the necessary private investment in these high-stakes, high-impact projects, ensuring their long-term resilience and operational integrity.

### 3.4. Role of Regulatory Sandboxes in Fostering Digital Innovation

Regulatory sandboxes are structured, time-bound environments that allow innovators to test emerging technologies under relaxed regulatory conditions. These frameworks help regulators observe risks in real time, while enabling businesses to validate commercial viability without the full burden

86 Jianguo Ding, Attia Qammar, Zhimin Zhang, Ahmad Karim, Huansheng Ning, "Cyber Threats to Smart Grids: Review, Taxonomy, Potential Solutions, and Future Directions" *Energies*, 15 (2022): 6799.

87 Rattanapong, Sukma, Ayuthaya, "Determinants of Cybersecurity Investment in ASEAN Organizations: An Integrated Structural Equation Modeling Approach."

of compliance. Across ASEAN, countries like Singapore, Malaysia, Thailand, Indonesia, Brunei, and Vietnam have adopted fintech-focused sandboxes with varying durations and scopes. For example, Singapore's MAS sandbox spans banking and securities sectors,[88] Thailand emphasizes blockchain and biometrics,[89] and Brunei explores Islamic.[90] Vietnam has taken a notable step forward by expanding its sandbox under the IFC Resolution to include digital technologies, crypto assets, and green finance, demonstrating a commitment to digital transformation and sustainable innovation.[91]

This expansion signals a strategic evolution in regulatory thinking. Vietnam's inclusion of green finance and carbon credits within its sandbox reflects a growing recognition that the model, proven effective in fintech, can accelerate the twin digital-green transition. Specialized sandboxes could support innovations like AI-powered smart grids, blockchain-based carbon credit tracking, and IoT-enabled sustainable agriculture platforms.[92]These environments offer low-risk experimentation, generate real-world data, and inform agile, future-proof policy frameworks. As ASEAN economies pursue sustainable growth, adopting digital-green sandboxes could strengthen public-private partnerships and position the region as a leader in climate-conscious innovation.

### 3.5. The Jurisdictional Fragmentation of National Laws

The existing treatment of ASEAN's digital transformation agenda in the paper gives a good descriptive account of instruments and principles but falls short of a project-level legal analysis. That omission matters because high-level convergence on principles (e.g., the ASEAN Guide on AI Governance and Ethics) does not by itself resolve concrete, transaction-level frictions that arise when a single PPP spans multiple national legal regimes.

88 Monetary Authority of Singapore, *FinTech Regulatory Sandbox*, 2023.

89 Bank of Thailand, *Regulatory Sandbox Framework*, 2023.

90 Brunei Darussalam Central Bank, FinTech Regulatory Sandbox Guidelines, 2020.

91 Tram Ngoc Bich Nguyen, Duong Duy Nguyen, *Vietnam's Regulatory Sandboxes: Paving the Way for Digital Innovation* (Tilleke & Gibbins. Mondaq, 2025).

92 Liyuan Liu, Meng Han, "EcoIntegrity: AI-Augmented Blockchain Framework for Carbon Footprint Tracking and Incentives in IoT," [in:] *Smart Grid and Innovative Frontiers in Telecommunications* (Springer, 2025).

Singapore: Under the PDPA, organisations may transfer personal data overseas only if they have taken "appropriate steps" to ensure the overseas recipient is bound by legally enforceable obligations or a comparable standard of protection (e.g., contractual clauses, binding corporate rules, or certification mechanisms).[93] This means that for a Singapore data provider to ship live, personal-identifiable traffic or mobility data to a foreign host, the Singaporean partner must secure enforceable contractual protections or rely on an adequacy mechanism. That requirement is contract-focused: private law obligations can clear the transfer gate, but they must be sufficiently binding and enforceable.

Indonesia (PDP Law No. 27/2022): Indonesia permits cross-border transfers where (1) the recipient jurisdiction has an equivalent or higher protection level, (2) adequate and binding safeguards are in place (e.g., appropriate contractual safeguards or BCRs), or (3) where the data subject consents (with narrow practical utility for large machine-generated flows).[94] Implementation rules add reporting/notification duties and a tiered approval process that can delay operational transfers. In short, Indonesia also accepts contractual or adequacy routes, but supervisory reporting and administrative review add time and compliance steps.

Vietnam (Law on Data / 60/2024 and related measures), Vietnam's recent data legislation expands regulatory reach beyond personal data to broader categories such as "important data" or "core data," with prior-authorization or localization risk for certain categories and a broad government access/remit in defined circumstances.[95] The practical effect reported in contemporaneous coverage and sectoral analysis, is that some cross-border transfers may require prior authorization or be restricted on national-security grounds, creating a potential hard stop for transfers that would otherwise be permitted under Singapore PDPA contracting solutions.

Illustrative Impact at the Project Level (Smart-City PPP): Consider a scenario where a Singapore-based systems integrator manages a smart-city mobility platform that collects and processes live traffic data. The platform

93 Personal Data Protection Commission (PDPC), *Advisory Guidelines on Key Concepts in the Personal Data Protection Act (PDPA)*, 17 May 2022.

94 "Indonesia Personal Data Protection Law (Law No. 27/2022) and Commentary on Cross-Border Transfers (Articles 55–56)," [in:] *Lexology*. https://www.lexology.com/library/detail.aspx?g=3d7e6476-a8b4-4dc3-bbd5-b7ba70507b2c.

95 Reuters, "Vietnam's Planned Data Law and Industry Reaction," U.S. Tech Firms Warn Vietnam's Planned Law to Hamper Data Centres, Social Media, 4 November 2024.

is designed to transmit anonymized, real-time telemetry to a regional analytics cloud located in Vietnam, supporting cross-border optimization and collaborative research. Under Singapore's legal framework, such data transfers are permissible if the Vietnamese data processor is bound by enforceable contractual safeguards. However, Vietnam's Data Law introduces a different legal reality. The same traffic feed could be deemed "important data" if it intersects with definitions related to critical infrastructure or national security. This classification may trigger regulatory requirements such as prior government approval, data localization, or mandatory in-country processing, obligations that cannot be bypassed through contractual agreements alone. In practice, this legal asymmetry turns what was expected to be a routine API integration into a prolonged regulatory negotiation. It may require a fundamental redesign of data architecture, including where data is stored and who has access. These legal constraints also ripple into financial modeling, affecting projected revenues, contract structuring, and how insurers evaluate political and regulatory risk exposure.

### 3.5.1. The Legal Status of ASEAN Soft Law, how Non-Binding Instruments can Nevertheless have Legal Effect

ASEAN soft-law instruments (for example, the ASEAN Guide on AI Governance and Ethics) are formally non-binding, but scholarship and practice show soft law can shape behaviour, contractual drafting, and interpretive frames in disputes. Soft law's normative force operates through (a) uptake into domestic guidance and agency practice, (b) incorporation into contractual specifications and procurement standards, and (c) citation by arbitral panels and courts as persuasive authority.

Arbitration and comparative-law literature documents how non-binding codes, model guidelines, and technical standards are routinely used in international arbitration to interpret parties' expectations and to supply "industry standard" benchmarks (soft law thereby exerts normative pressure in private dispute resolution). In infrastructure and technology disputes, arbitrators often rely on recognized technical or ethical frameworks to assess reasonableness or best practice.[96] In the ASEAN context, regional guides (e.g., ASEAN AI Guide) have already been repackaged in national

96 Gabrielle Kaufmann-Kohler, "Soft Law in International Arbitration: Codification and Normativity" *Journal of International Dispute Settlement*, (2010).

guidance documents and agency toolkits (for instance, Singapore's PDPC and IMDA frameworks predated and shaped ASEAN's guide), showing an evident pathway from national model to ASEAN soft law to national adoption/interpretation loop. The PDPC's Model AI Governance Framework and Singapore's operational guides contributed templates and practical use cases that informed ASEAN's approach. Thus, soft law functions as both a transmission belt of best practice and a menu that national regulators can import, sometimes turning voluntary principles into de facto requirements through procurement rules or regulation. Soft law's persuasive power depends on (i) whether domestic authorities adopt or reference it, (ii) whether contracting parties expressly incorporate the guide into contracts (e.g., "the parties shall comply with the ASEAN AI Guide and the PDPC Model AI Framework"), and (iii) whether dispute-resolution actors regard it as authoritative.[97] Evidence suggests the path from soft law to practical legal effect is real but conditional, not automatic.

## 4 ASEAN's Green Sustainability Agenda: Legal and Policy Frameworks

ASEAN's commitment to green sustainability is a cornerstone of its long-term vision, evolving from foundational environmental protection efforts to a proactive strategy for fostering a green economy. This section explores the region's vision for sustainability, key environmental policies, and the emerging landscape of green finance.

### 4.1. ASEAN's Vision for a Green Economy and Carbon Neutrality

ASEAN's commitment to a "green ASEAN" is rooted in its 2045 Vision, which emphasizes sustainable growth across terrestrial and aquatic ecosystems through the integration of both green and blue economies. This strategic direction positions ASEAN as a leader in climate resilience and

97 Kristina Fong, "From Paper to Practice: Utilizing the ASEAN Guide on Artificial Intelligence (AI) Governance and Ethics" *Trends in Southeast Asia*, No. 18 (2024).

sustainability within the Indo-Pacific. Far from being a regulatory burden, the green transition is framed as a major economic opportunity. According to Boston Consulting Group, achieving carbon neutrality could add between USD 3 trillion and USD 5.3 trillion to ASEAN's GDP by 2050, attract up to USD 6.7 trillion in green investments, and generate up to 66 million jobs.[98] This economic upside is a compelling driver for ASEAN's push toward digital-green public-private partnerships (PPPs), transforming sustainability from a moral imperative into a competitive advantage.[99]

To operationalize this vision, ASEAN launched the Strategy for Carbon Neutrality in August 2023, outlining four key outcomes: building green value chains, enabling green technology exchange, establishing globally credible standards, and cultivating green talent.[100] The strategy is supported by eight targeted initiatives, including harmonizing policies for green manufacturing, upgrading trade agreements to support circular products, and standardizing infrastructure for clean vehicles and power trading. It also includes frameworks for carbon credit verification, climate reporting, green finance instruments, and regional qualifications for green skills.[101] These efforts collectively aim to accelerate ASEAN's transition to a carbon-neutral economy while enhancing its global competitiveness and investment appeal.

### 4.2. Key Environmental Laws, Policies, and Initiatives

ASEAN's environmental cooperation dates back to 1977 and is currently guided by the ASEAN Socio-Cultural Community (ASCC) Blueprint 2025, which envisions a sustainable, inclusive, and resilient regional community. The Blueprint promotes collaboration in biodiversity conservation, climate change mitigation and adaptation, sustainable urban development, and circular economy practices.[102] The 2007 ASEAN Declaration on Environmental Sustainability further solidifies this commitment through three pillars: Environmental Protection and Management, Responding to Climate

98 VNTR, *ASEAN's Carbon Neutrality Strategy Could Unlock $5.3 Trillion Economic Potential*, 26 November 2024.

99 ASEAN, *ASEAN for Business Bulletin – January 2024* (ASEAN Secretariat, 2024).

100 ASEAN, *ASEAN Strategy for Carbon Neutrality: Public Summary.*

101 Ibidem.

102 ASEAN Secretariat, *ASEAN Socio-Cultural Community Blueprint 2025* (ASEAN Secretariat, 2016).

Change, and Conservation of Natural Resources.[103] These include honoring multilateral agreements, promoting renewable energy, enhancing energy efficiency, and supporting biodiversity initiatives like the ASEAN Centre for Biodiversity, which launched the ASEAN Green Initiative to plant 10 million native trees and the ASEAN Biodiversity Plan targeting 30% ecosystem restoration by 2050.[104]

Recent developments mark a strategic shift from reactive environmental protection to proactive green economy development. Initiatives such as the ASEAN Green Future research project, launched in 2021 with support from the UN Sustainable Development Solutions Network, aim to build regional capacity for climate policy and decarbonization research.[105] The ASEAN Institute for Green Economy (AIGE), established in 2014, serves as a hub for green technology and capacity building. Complementing these efforts, the ASEAN Strategy for Carbon Neutrality and the ASEAN Catalytic Green Finance Facility (ACGF) promote green value chains, carbon markets, and sustainable infrastructure investment.[106] This evolution signals a broader economic integration of sustainability, urging legal frameworks to support digital-green public-private partnerships not just as compliance mechanisms but as engines of innovation and competitiveness.

### 4.3. Green Finance and Investment Mechanisms in ASEAN

ASEAN is rapidly advancing its green finance ecosystem through strategic initiatives like the ASEAN Catalytic Green Finance Facility (ACGF), launched in April 2019 by the ASEAN Infrastructure Fund. The ACGF provides over US$1 billion in loans to help governments de-risk green infrastructure projects, making them more attractive to private investors.[107] Complementing this, the ASEAN Strategy for Carbon Neutrality promotes the deployment of green and sustainability-linked bonds and sukuk standards, while encouraging the development of local green funds and fund managers.[108] These efforts reflect a regional push to deepen

103 ASEAN Secretariat, *ASEAN Declaration on Environmental Sustainability*, 2007.
104 ASEAN Centre for Biodiversity, *ASEAN Green Initiative*, 2024.
105 United Nations Sustainable Development Solutions Network, *ASEAN Green Future Project*, 2021.
106 ASEAN, *ASEAN Strategy for Carbon Neutrality: Public Summary.*
107 Ibidem.
108 Ibidem.

capital markets and mobilize private sector investment for climate-aligned infrastructure. Institutions like the Asian Development Bank play a pivotal role through platforms such as the Southeast Asia Green Finance Hub and the Blue Southeast Asia Finance Hub, which support bankable green and ocean health projects across the region.[109]

Vietnam's inclusion of green finance and carbon credits in its IFC Resolution regulatory sandbox further signals a progressive regulatory stance, allowing experimentation with novel financial instruments.[110] However, despite these promising developments, ASEAN's green finance landscape still faces challenges in regulatory clarity and standardization. The ASEAN Strategy for Carbon Neutrality highlights the need for globally credible standards and a regional measurement, reporting, and verification framework to facilitate seamless carbon credit trading.[111] Without harmonized taxonomies and transparent reporting mechanisms, investor confidence may remain limited, and cross-border digital-green public-private partnerships may struggle to scale. Strengthening the legal and regulatory infrastructure is essential to unlock the full potential of green capital and position ASEAN as a competitive hub for sustainable finance.

## 5 Navigating the nexus: Legal frameworks for Digital-Green PPPs

The convergence of digital transformation and green sustainability in ASEAN creates a unique opportunity for Public-Private Partnerships to drive innovative and impactful development. This section explores the synergies between these transitions, identifies specific opportunities for digital-green PPPs, and highlights the need for integrated approaches in policy and project planning.

109 Asian Development Bank, *Blue Southeast Asia Finance Hub*, 2023.
110 VnEconomy, *Carbon Credit Exchange and Green Finance in Vietnam*, 13 August 2025.
111 ASEAN, *ASEAN Strategy for Carbon Neutrality: Public Summary.*

### 5.1. Synergies and Interdependencies between Digital and Green Transitions

Digitalization is increasingly recognized as a transformative force in advancing environmental sustainability across ASEAN. Technologies such as sensors, smart meters, and AI-driven energy systems are enabling more efficient resource use and greener infrastructure. For example, motion-triggered lighting systems and predictive energy forecasting tools help reduce consumption, while integrating solar and wind energy into data centers supports decarbonization efforts.[112] The ASEAN Digital Economy Framework Agreement further amplifies this potential by promoting interoperable digital tools that reduce trade-related emissions, enhance supply chain transparency, and foster green innovation. Initiatives like paperless customs, e-invoicing, smart agriculture, and eco-friendly logistics are foundational to building a digital economy that aligns with sustainability goals.[113]

Smart city Public-Private Collaborations (PPCs) exemplify the convergence of digital and green agendas. These partnerships deploy technologies such as automated waste collection, smart lighting, and traffic optimization to achieve both operational efficiency and environmental impact. For instance, smart lighting systems can cut energy use by up to 60%, while intelligent waste management improves recycling and reduces landfill dependency.[114] This synergy highlights the need for a "digital-green by design" approach in policy and infrastructure planning. Rather than treating digital and green elements as separate or optional, ASEAN should embed their integration from the outset of PPP projects. Doing so will unlock compounded benefits, enhancing resilience, efficiency, and sustainability, while positioning the region as a leader in climate-smart digital development.[115]

112 Rajesh Singh, et al., "Energy System 4.0: Digitalization of the Energy Sector with Inclination towards Sustainability" *Sensors* 22 (2022): 6619.

113 Economic Research Institute for ASEAN and East Asia, *Understanding the ASEAN Digital Economy Framework Agreement* (Economic Research Institute for ASEAN and East Asia, 2023).

114 World Economic Forum, *Primer for Smart City Public-Private Collaborations*, 2023.

115 Singapore Institute of International Affairs, *Building a Digital-Green ASEAN: Growing Intersections between Digital Growth and Sustainability Goals* (Infocomm Media Development Authority (IMDA), 2023).

## 5.2. Identifying Opportunities for Digital-Green PPPs in ASEAN

Digital-green Public-Private Partnerships are emerging as transformative mechanisms across ASEAN, particularly in smart cities, renewable energy, and sustainable agriculture. In urban development, cities like Singapore and New Clark City in the Philippines are pioneering integrated digital-green solutions. Singapore's Housing and Development Board is deploying smart technologies such as motion-triggered lighting, smart fans, and advanced wastewater systems to optimize energy use and enhance livability.[116] Meanwhile, New Clark City is implementing autonomous electric buses, climate-resilient infrastructure, and smart mobility systems to reduce congestion and environmental impact.[117] These smart city PPCs not only improve operational efficiency and sustainability, but also shift financial models from capital-intensive to service-based, lowering barriers for urban innovation.[118]

In the energy sector, the ASEAN Power Grid (APG) initiative exemplifies regional ambition for renewable energy integration and cross-border electricity trade. PPPs are central to mobilizing investment in climate-resilient infrastructure, with mechanisms such as climate-smart contracts and risk assessments ensuring long-term viability.[119] Similarly, ASEAN-China cooperation in agriculture is driving the adoption of smart farming, biodiversity protection, and circular economy practices.[120] Foundational digital infrastructure, fiber-optic networks, mobile towers, data centers, and cybersecurity, underpins these sectoral efforts, enabling scalable and interoperable solutions.[121] The convergence of digital and green agendas across sectors highlights the need for legal frameworks that promote cross-sectoral integration, shared platforms, and regional standards. Such alignment will accelerate ASEAN's connectivity goals and unlock synergistic benefits for sustainable development.

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116 Singapore Economic Development Board, *Singapore's Advanced Wastewater Recycling*, 2022.

117 New Clark City, *Green and Resilient Urban Planning*, 2025.

118 Singapore Institute of International Affairs, *Building a Digital-Green ASEAN: Growing Intersections between Digital Growth and Sustainability Goals* (Infocomm Media Development Authority (IMDA).

119 R.J. Silitonga, "Trading Renewable Energy through the ASEAN Power Grid," *ASEAN Centre for Energy*, August 7, 2018.

120 Ministry of Foreign Affairs of the People's Republic of China, *ASEAN-China Action Plan on Green Agricultural Development 2023–2027*, 2024.

121 ASEAN, *ASEAN Digital Masterplan 2025*.

# 6 Recommendations for ASEAN

## 6.1. Develop Integrated Digital-Green PPP Legal and Policy Frameworks

ASEAN should move beyond parallel policy development for digital and green agendas towards truly integrated legal and policy frameworks that explicitly promote and incentivize digital-green synergies within PPPs.

First, mandate "digital-green by design" in project planning: Legal frameworks should encourage, and where appropriate, mandate the integration of digital efficiency and environmental sustainability from the initial design phase of PPP projects. This ensures that new infrastructure and services are inherently optimized for both digital and green outcomes from conception, maximizing synergistic benefits and avoiding siloed development.

Second, harmonize cross-sectoral digital-green standards: Building on initiatives like the ASEAN Strategy for Carbon Neutrality and DEFA, develop harmonized regional standards for digital-green technologies, data interoperability, and environmental performance metrics. This includes establishing common taxonomies for green finance, standardized measurement, reporting, and verification (MRV) frameworks for carbon credits, and interoperability standards for smart infrastructure. Such harmonization will reduce compliance costs and attract international investment.

Third, establish clear risk allocation for emerging risks: Update PPP contractual guidelines to explicitly address and allocate risks associated with rapid technological obsolescence, cybersecurity threats, and climate change impacts. This requires innovative contractual approaches that incorporate dynamic adjustment mechanisms, shared risk models for technological disruption, and provisions for continuous technological upgrades to maintain project relevance and efficiency over its long lifecycle. Cybersecurity risk management frameworks, particularly for critical infrastructure, should be integrated into PPP contracts, with clear responsibilities and investment priorities.

## 6.2. Strengthen Institutional Capacity and Governance for PPPs

Addressing the institutional capacity gap within public sectors is crucial for scaling up complex digital-green PPPs.

First, enhance public sector expertise: Invest in targeted capacity building programs for government officials involved in PPPs, focusing on specialized knowledge in digital technologies, green finance, complex contract management, risk assessment (including climate and cyber risks), and dispute resolution specific to digital-green projects. This includes providing high-quality financial, legal, economic, and project management capacities to relevant public actors.

Second, promote agile regulatory bodies: Foster regulatory bodies with clear mandates, sufficient resourcing, and the flexibility to adapt to rapid technological advancements and evolving environmental challenges. This involves institutionalizing mechanisms for ongoing review, learning, and adaptation of legal and policy instruments to ensure their continued relevance and effectiveness.

Third, improve project selection and preparation: Implement robust, merit-based project selection processes for digital-green PPPs, ensuring projects are well-prepared, financially viable, and aligned with national and regional strategic goals. This includes utilizing project preparation funding and viability gap funding to make projects more affordable and bankable.

## 6.3. Foster Innovation Through Expanded Regulatory Sandboxes

Leverage regulatory sandboxes as a strategic tool to accelerate the development and adoption of digital-green innovations.

First, expand sandboxes to digital-green technologies: Actively promote and develop specialized regulatory sandboxes that specifically target integrated digital-green solutions. This includes exploring sandboxes for AI-driven smart grid technologies, blockchain-based carbon credit tracking systems, IoT-enabled sustainable agriculture platforms, and green finance instruments.

Second, facilitate cross-border sandbox collaboration: Encourage cross-border collaboration among national regulatory sandboxes within ASEAN. This would allow for the testing of digital-green solutions across multiple

jurisdictions, providing invaluable real-world data and insights to inform regional policy harmonization and reduce regulatory fragmentation.

Third, prioritize policy learning from sandboxes: Ensure that regulatory sandboxes are designed not just for product testing but also as explicit mechanisms for regulatory learning and policy adoption. This means actively using the insights gained from sandbox experiments to inform and evolve broader legal and policy frameworks for digital-green PPPs.

### 6.4. Enhance Green Finance and Investment frameworks

To strengthen the green finance ecosystem to unlock capital for digital-green PPPs:

First, standardize green finance instruments: Accelerate the development and adoption of globally credible standards for green/sustainability-linked bonds and sukuk, as well as clear taxonomies for green investments, to attract more foreign capital flow into ASEAN.

Second, de-risk green infrastructure projects: Continue to support and expand mechanisms like the ASEAN Catalytic Green Finance Facility (ACGF) to provide loans and de-risk commercially viable green infrastructure projects, making them more attractive to private investors.

Third, promote public-private dialogue on green investment: Foster continuous dialogue between public and private sectors to identify impediments to green sector investments and develop innovative financing mechanisms, including leveraging social impact investment within PPP structures.

### 6.5. Policy Recommendations for ASEAN: Operationalizing Digital-Green PPPs

First, integrate digital and green dimensions into national and regional PPP frameworks: Embed twin-transition imperatives at the design stage to ensure PPPs deliver synergistic benefits. For instance, mandate performance-based contracts with dual metrics, e.g., digital efficiency (IoT uptime >95%) and environmental outcomes (carbon reduction targets aligned with the 2023 Carbon Neutrality Strategy), while incorporating "bounded flexibility" clauses for tech upgrades, as critiqued in Section 2.2.

ASEAN Secretariat should facilitate model clauses by 2026, drawing from World Bank toolkits, to harmonize across diverse jurisdictions and reduce renegotiation risks (e.g., 30% project delays noted in ADB data).

Second, enhance regional cooperation on data governance and AI ethics: Develop binding guidelines from soft-law like the ASEAN Guide on AI Governance (2024/2025 expansions) to manage data in smart green infrastructure. This includes harmonized standards for privacy-enhancing technologies and cross-border flows, addressing vulnerabilities in blockchain applications (Section 3.3). Replace voluntary adoption with mandatory audits for PPPs, piloted in high-risk sectors like renewable energy grids, to counter fragmentation, e.g., Singapore's PDPA interoperability vs. Vietnam's gaps.

Third, promote structured public-private dialogues for green-digital investment: Evolve ad-hoc forums into annual multi-stakeholder summits, leveraging the 2025 ASEAN Forum on Sustainability's focus on AI-driven financing. This should identify barriers (e.g., political risks in unfamiliar economies, per Section 2.3) and co-develop mechanisms like green bonds or social impact funds within PPPs, targeting $5.3T in carbon-neutral GDP gains. Critically, integrate doctrinal tools from member states, such as Vietnam's 2025 carbon credit exchanges, to ensure equitable risk-sharing.

Fourth, build institutional capacity for agile regulation and innovation: Invest in training PPP units via ADB's capacity-building programs, focusing on adaptive sandboxes (Section 3.4) to test digital-green technologies without regulatory silos. Recommend mid-term reviews every 5 years, aligned with ASEAN 2045's policy correction mechanisms, to incorporate lessons from pilots like Singapore's wastewater recycling PPPs.

Fifth, leverage innovative financing for resilient infrastructure: Prioritize blended finance models, such as the Blue SEA Finance Hub for sustainable projects, to attract private capital for digital-green PPPs in vulnerable sectors (e.g., smart cities). This addresses funding gaps (Section 1.2) by tying incentives to ESG metrics, with ASEAN-wide guarantees to mitigate climate risks.

# 7 Conclusion

This research paper examines how Southeast Asian nations can establish robust legal foundations to support the "Twin Transition," the concurrent advancement of digital transformation and green sustainability, by emphasizing the pivotal role of Public-Private Partnerships in mobilizing private investment and innovation. It argues that ASEAN's diverse legal systems must adopt flexible, equitable, and regionally tailored frameworks to enable effective PPPs, focusing on four critical areas: evolving traditional contracts into performance-based agreements that measure digital and environmental outcomes; developing innovative risk allocation mechanisms for challenges such as technological obsolescence and climate-related disruptions; leveraging emerging technologies like blockchain and smart contracts to enhance transparency and automate compliance; and fostering regional collaboration through adaptive legal architectures and instruments such as regulatory sandboxes and the ASEAN Digital Economy Framework Agreement. Ultimately, the paper advocates for an integrated legal strategy that aligns digital innovation with environmental stewardship, positioning ASEAN to lead in building a resilient, sustainable, and future-ready regional economy.

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