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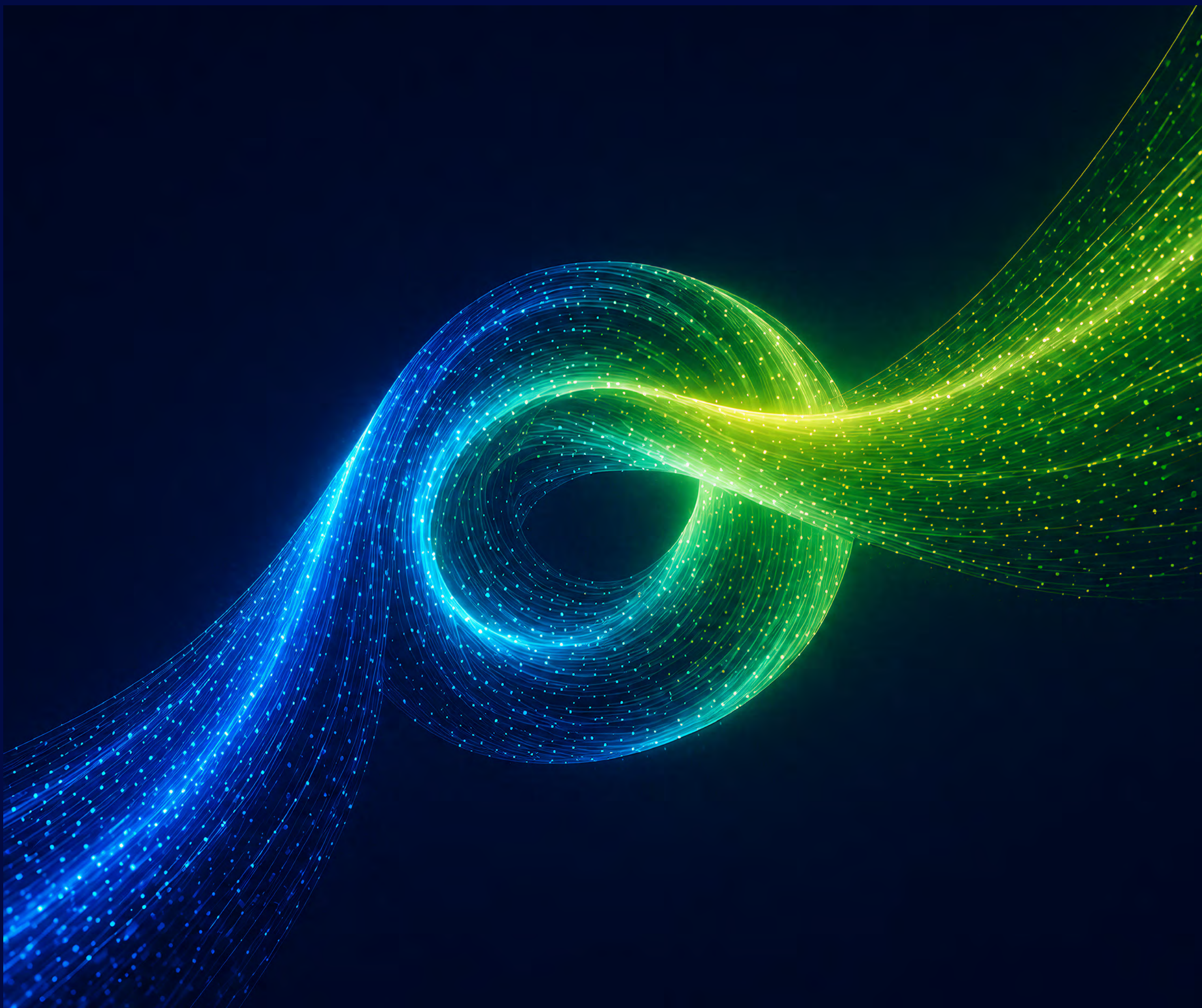
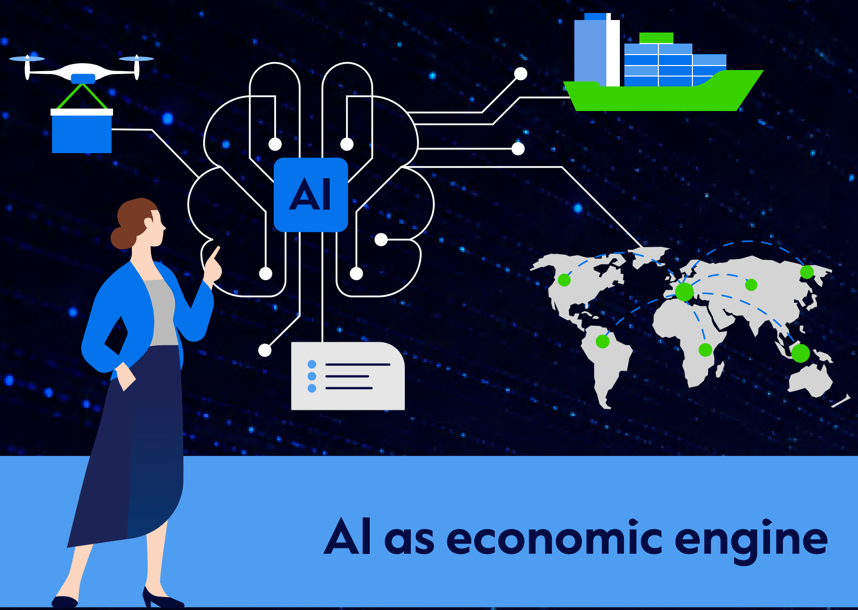
Chapter 1

The Dual Transition

AI x Sustainability Series



Overview and key statistics



AI as economic engine

Up to 1 USD tn economic growth by AI

46% SEA companies are scaling adoption

Up to 194 USD bn of AI infrastructure investments required by 2030

Energy as enabler

Up to 15GW of energy opportunity & low carbon potential

To accelerate **energy security** through low carbon energy solutions

2GW signed clean energy

Executive summary

A vision for Southeast Asia's dual transition

By 2030

Up to USD 1tn GDP uplift

AI adoption

17x growth of AI infrastructure

Energy security

Up to 15GW total energy deployment expected to meet AI-driven demand, with low-carbon potential

Southeast Asia (SEA) is entering a transformative period as AI supercharges the region's economic growth – with expectations that it could boost GDP by nearly USD1 trillion by 2030[1] – while simultaneously presenting an opportunity to catalyse the adoption of low-carbon solutions, thereby helping strengthen regional energy security[2].

This first chapter of our new AI x Sustainability series explores how Southeast Asia can realise this dual transition, as it experiences a likely 17x growth of AI infrastructure by 2030[3].

AI adoption across SEA[4] is accelerating rapidly, with uptake outpacing the global average. Already a global powerhouse for high-end manufacturing and packaging, the region's economy could further benefit from a surge in AI-driven demand for land, critical minerals, as well as electricity infrastructure and development amid an evolving geopolitical landscape.

The infrastructure super cycle[5] underpinning the AI economy is being led by hyperscalers and local data centre developers with public commitments to match demand with clean energy deployment. With 9 to 15 GW[3] of energy potential to be deployed to meet AI-driven demand by 2030, the rise of AI therefore presents a strategic opportunity to enhance energy security by accelerating the deployment of low carbon energy solutions. This will depend on the right conditions being met for developers to continue to pursue "responsible scale" rather than "scale at all costs".

In this new chaptered series on AI and sustainability, we explore how Southeast Asia can realise the potential of this dual transition. We unpack essential catalysts for progress, from supply chain white spaces to technological inflection points for low carbon firm power deployment and behind the meter solutions. We also examine how nature risks, impacts and dependencies can be managed, and what it will take to build resilience from the start.

Introduction: A vision for SEA's dual transition

With an additional 10 to 18 per cent uplift in SEA's GDP[3] expected by 2030 (Figure 1)[1], the region is well poised to capitalise on the rapid adoption of AI.

On one hand, its rapid growth is coupled with rising energy demands that risk straining infrastructure, undermining competitiveness and offsetting climate gains[2]. On the other hand, AI can help optimise the grid and related infrastructure growth could offer a much needed demand-side anchor for clean energy deployment, making it a critical tool to decarbonise energy systems.

This makes possible the vision for SEA's Dual Transition; the AI-driven expansion of the region's digital economy by USD1 trillion[1], coupled with the scaled adoption of low-carbon solutions to help strengthen regional energy security.

Figure 1

Economic impact of AI in 2030 (Percentage of 2030 GDP)

AI is expected to provide a 10 to 18 per cent uplift in GDP across Southeast Asia by 2030

Indonesia	Malaysia	Philippines
+12%	+14%	+12%
USD366 bn	USD115 bn	USD92 bn

Singapore	Thailand	Vietnam
+18%	+13%	+12%
USD110 bn	USD117 bn	USD109 bn

Source: EDBI and Kearney (2020)

Realising this opportunity will depend on addressing near-term constraints such as time to market of renewable deployment and grid capacity.

Competitiveness in the AI era is increasingly defined by the ability to make strategic investments across the full AI supply chain[6] including the foundational, compute and infrastructure layers such as energy or data centres. As such, we frame the vision for SEA's dual transition in Chapter 1, before a more detailed analysis in the upcoming chapters regarding AI supply chain white spaces.

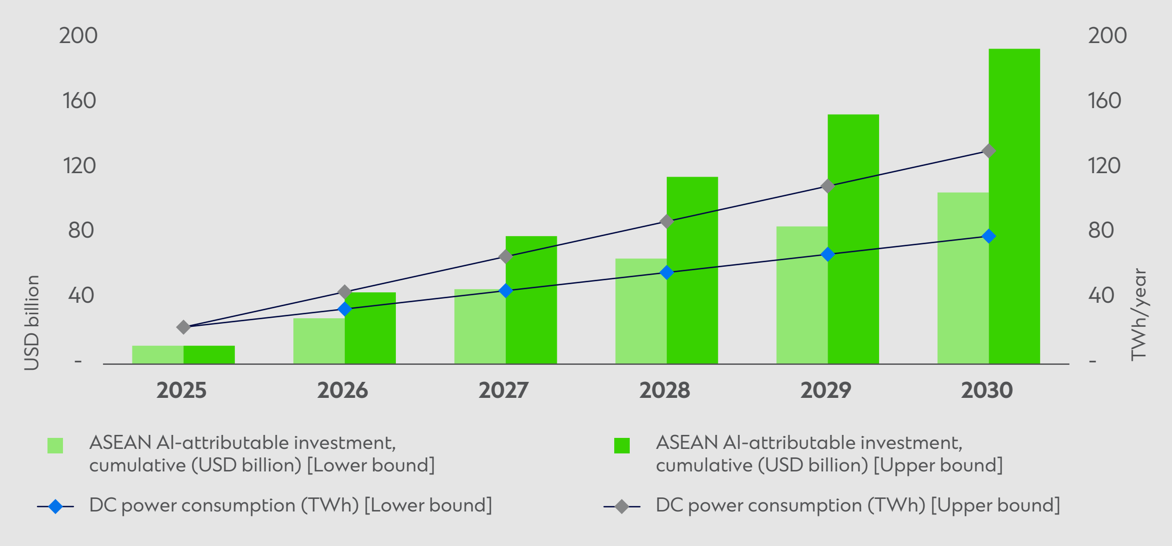
On the demand side, growth is both material and accelerating in the region. Energy consumption from AI infrastructure is estimated to grow by 5.8x by 2030 (Figure 2)[3]. Malaysia alone is expected to see a sharp increase in data centre energy consumption from 12 TWh in 2025 to 68 TWh by 2030[7]. AI workloads, from large language model (LLM) training and inference, are a primary driver with energy intensity up to 10x higher than traditional computing[8].

Figure 2

SEA AI infrastructure-related energy demand and investment, 2025 - 2030

5.8x Potential growth in AI infrastructure value chain energy consumption

Up to **194 USD bn** AI infrastructure investments required by 2030



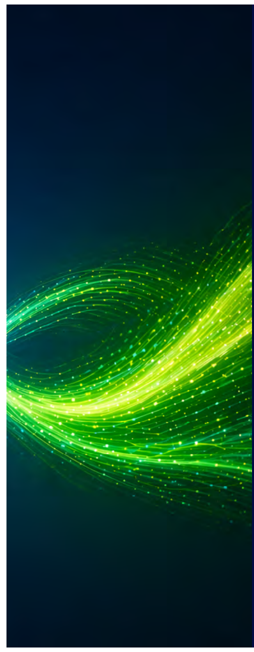
Source: IEA, Energy and AI; IEA, Key questions on energy and AI; Ember Energy, From AI to emissions; Cushman and Wakefield, Asia Pacific data center construction cost guide 2026; Deloitte, Southeast Asia's data centres and AI imperative; Deloitte, Powering Asia Pacific's data centre boom; Author's analysis

At the same time, if that demand is met in a way that is responsible, AI could play a role in accelerating the energy transition. This is because it is often led by hyperscalers with firm energy commitments, who recognise that the expansion of AI must be accompanied by the simultaneous development of clean power sources.

AI can also optimise grid dispatch and balancing, improve demand forecasting and load flexibility, and enhance the integration of variable renewable energy[6]. Beyond the power system, AI can improve complex systems efficiency and resilience, such as reducing industrial energy consumption through process optimisation, accelerating the discovery of advanced materials critical to clean technologies, and supporting long-term resilience through simulating climate-related stressors[9].

The convergence of megatrends in SEA

Megatrend 1: The rise of AI



Up to 194 USD bn
AI investments expected by 2030

46%
of companies in the region scaling AI beyond pilot stages

400m
digital users in 2026

Up to 40%
of technology budget allocated to AI currently

Up to 130TWh
by 2030

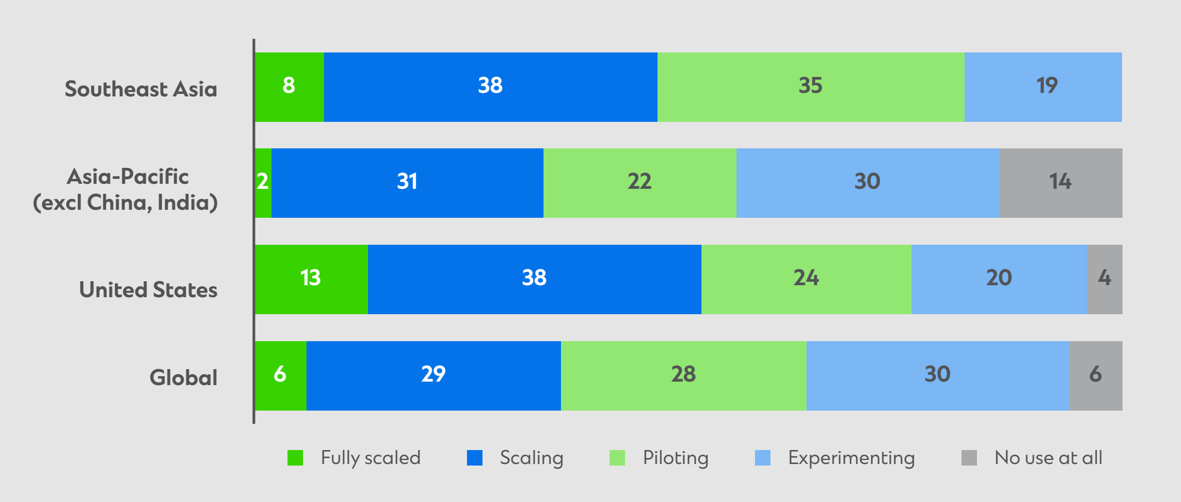
AI adoption across Southeast Asia is accelerating, with uptake already outpacing the global average. Around 46 per cent of the region's companies are scaling AI beyond the pilot stages[10], reflecting a shift from experimentation to enterprise-wide deployment. Organisations are increasingly embedding AI into core operations, with many allocating 11-40 per cent of technology budgets to AI initiatives, reflecting a shift toward enterprise-wide deployment[10].

This momentum is being driven by a confluence of structural factors: over 400 million internet users, rapid digital economy expansion, strong demand for cloud services and fintech platforms, and increasingly supportive regulatory and investment environments. Data localisation[11] practices across the region are also compelling hyperscalers to build in-country infrastructure capacity rather than routing through hubs.

Figure 3

Adoption of AI across regions

Southeast Asia shows stronger pace of adoption compared to the global average



Source: EDB Singapore, McKinsey, and Tech in Asia (2026)

In Southeast Asia, the pace and scale of the opportunity is substantial. AI infrastructure investments are projected to surge from USD11 billion in 2025 to between USD106-194 billion by 2030 – representing up to 17x increase over the period[3]. This includes a combination of core data centre infrastructure such as construction, IT equipment, cooling and power, AI-attributable spend assumed up to 50 per cent, together with grid capital expenditure such as connections or back up power.

This will further need to be powered by a potential 9 to 15 GW[3] of firm energy alongside the growth of compute intensity embedded in modern AI workloads. Early GPU chips for AI ran at roughly 400 watts; by 2022 this had risen to 700 watts for frontier models, and next-generation chips in 2024 are rated at 1,200 watts per chip[12]. As per-chip power consumption increases, rack-level density scales accordingly. Average rack power density is expected to rise from 36 kW per rack in 2023 to 50 kW per rack by 2027[12], with leading hyperscalers already adopting high-density configurations of up to 120 kW per rack to support AI-optimised workloads[13]. Electricity consumption from AI and generative AI workloads is projected to increase by 10 times, with AI GPUs consuming five to seven times more power per chip compared to traditional CPUs[8], underscoring the growing energy intensity of compute infrastructure.

Megatrend 2: Enhancing energy security

5
largest SEA digital infrastructure developers and operators have committed to at least 85% RE commitments by 2030

~2GW
clean energy signed by data centre operators in SEA to date (2026)

Low carbon technologies & electrification as **energy security**

~130GW
clean energy contracted by hyperscalers to date across the globe

Critical near term risks
including time to market & grid capacity requires policy, market structure and bankability

Energy security is a central priority for SEA, and the ongoing energy transition is expected to play an increasingly important role in enhancing the resilience of its energy systems and infrastructure. SEA is particularly sensitive to energy security risks arising from global volatility, supply shocks, and geopolitical events as demonstrated in recent years. The latest IEA's Southeast Asia Outlook shows the region faces rising oil import dependencies, and could become a natural gas net importer by 2027 with a widening deficit until 2050.

Low carbon technologies combined with electrification offer the principal avenues to mitigate fuel import dependence and enhance energy security[14]. With each of Southeast Asia's member states having submitted Nationally Determined Contributions under the Paris Agreement and an aggregated target of around 30 per cent renewable energy in primary supply[15], a structural transformation of energy systems in line with announced climate goals would reduce these energy security vulnerabilities[16].

If AI infrastructure development – including supporting power generation and storage – is done in a way that is responsible, prioritising 'sustainable scale' over 'scale at all costs', it presents a potential opportunity to play a role in accelerating low-carbon technology deployment and electrification in the region in support of this ambition.

Today, hyperscalers represent the majority share of AI supply chain infrastructure demand. Reliable foundational inputs such as high-quality power supply are critical to digital infrastructure. In practice, for every dollar invested in data centre IT infrastructure, a further ~25 cents is typically required to enable power readiness, including grid connection works, on site substations and electrical systems, and backup power infrastructure to meet reliability and redundancy standards[17]. As such, at least USD21 billion will potentially be required by 2030 to enable the power readiness to support AI infrastructure.

These large-scale infrastructure developers recognise that the expansion of AI must be accompanied by the simultaneous development of clean power sources, and are therefore partnering with utility companies to accelerate these efforts through Power Purchase Agreements (PPAs) by acting as major corporate buyers, financing developers, with 130 GW of renewable energy contracted globally[18].

At a regional level, the five largest digital infrastructure developers and operators within SEA have also made commitments to achieving at least 85 per cent renewable energy sourcing by 2030[19].

As early signals of the role they could play in accelerating low-carbon technology deployment, data centre operators in SEA have secured PPAs totalling up to 2 GW of renewable capacity[20].

If 30–50 per cent of total data centre electricity demand were met through dedicated renewable PPAs, the resulting offtake could support renewable energy investment on the order of tens of billions of US dollars across Southeast Asia over 2025–2030, with the final magnitude depending on technology mix, capacity factors, and country specific costs of capital[21].

Key to this will be to overcome short-term constraints around the cost, scalability, and time-to-market of renewable power and supporting grid infrastructure. There are growing risks that digital infrastructure expansion may outpace the development of power systems and renewable supply[22]. Without parallel investment in grids, transmission, and clean generation capacity, SEA risks facing short-term power bottlenecks, increasing power price volatility and slower renewable integration as AI infrastructure deployment accelerates[23].

This will require alignment across policy, market structures, transmission planning, and infrastructure bankability, with AI acting as both a demand signal and source of long-term offtake certainty. There is a need for coordinated action across energy systems, digital infrastructure and environmental considerations[24] to ensure long-term resilience and sustainable scaling of the region's data centre supply chain. Herein lies a critical window for SEA to accelerate renewable energy and grid uplift so that clean power deployment can converge with the pace of AI infrastructure rollout.

With the ASEAN Power Grid envisioned as a fully integrated regional electricity network over the medium term, the dual transition represents a credible source of demand to act as both a lever and intermediate solution. Without this, the investment in electricity networks across Southeast Asia requires over USD100 billion by 2045[25], to enable grid expansion, renewable integration, and system resilience. In the upcoming chapters, we provide technological solutions including firm low carbon and behind the meter solutions.

Understanding the Southeast Asia AI supply chain

Understanding the Southeast Asia AI supply chain

4 key AI supply chain layers

Up to **30%** of global semiconductor exports

44% of hyperscale led demand

SEA has the **fastest** growing data centre in APAC

Sustainability as a competitive advantage

This evolving AI supply chain presents both a strategic opportunity and a coordination challenge. The region is increasingly positioned as a key destination for data centre investment, electronics manufacturing, and supply chain diversification, as global firms seek both economic value and resilience beyond traditional hubs. At the same time, the broader economic upside is significant: AI adoption could boost the region's growth prospects, expand talent pipelines and catalyse cross-industry collaboration[10].

However, SEA's current participation remains uneven across the value chain: significant in back-end manufacturing and infrastructure, but more limited in platforms and frontier technologies. Capturing a greater share of value will depend on the region's ability to align industrial development with sustainability, particularly through scaling clean energy supply, upgrading grid infrastructure, and embedding sustainability into the design and financing of AI-related assets.

Figure 4

The AI supply chain

Foundational inputs	Hardware inputs	Infrastructure	Data, models and applications
Land	**Chip hardware & computational supplies** Semiconductors, CPU / GPU, memory, printed circuit boards (PCBs)	**Critical infrastructure** Cooling, electrical, mechanical systems	**Data** Collection, aggregation, structuring
Energy	**Equipment components** Cooling, networking, electronic	**IT infrastructure** Servers, computer rack, storage, switches	**Model** Training, optimisation, inference
Water		**Shell construction**	**Applications**
Critical minerals & materials			

The AI supply chain spans a multi-layered ecosystem, beginning with foundational inputs that enable infrastructure development. This is followed by compute systems or hardware inputs such as semiconductor design, fabrication or servers and equipment manufacturing. Next comes critical infrastructure which includes cooling and electrical networks, together with IT Infrastructure comprising servers and compute hardware that translate capacity into usable workloads. At the highest layer are data, models, and applications, where hyperscalers, enterprises, and digital platforms deploy AI capabilities.

With a highly integrated system that is globally distributed but increasingly concentrated, SEA is emerging as a strategic node that provides resilience and flexibility. Traditionally, advanced chip manufacturing has been dominated by a few institutions, while downstream deployment is driven by hyperscalers and large enterprises. SEA economies are emerging as strategic nodes within this global supply chain, particularly in assembly, testing, packaging, and electronics manufacturing, with the region's share of global semiconductor export growth rising from ~20 per cent in 2015 to nearly 30 per cent in 2024[26].

Across this value chain, sustainability is becoming a defining competitive advantage to overcome operational constraints of foundational inputs. Within hardware inputs, semiconductor institutions are investing in energy efficiency, water usage reduction, and decarbonisation of manufacturing processes. At the infrastructure layer, hyperscalers are among the largest corporate buyers of renewable energy globally[27]. AI creates a structural tension across the supply chain, where growth in AI compute must be matched by parallel investments in clean energy and resilient infrastructure[6].

A strategic opportunity: SEA's resilience

226 USD bn FDI inflows

Over 50 USD bn in AI infrastructure investments by top hyperscalers

Attractive foundation inputs for AI long-term competitiveness

Top 30 global semiconductor companies

Top 15 global PCB companies are found in SEA

With a global landscape that is often characterised by volatility, SEA is emerging as an attractive destination for investment inclusive of the AI supply chain. The region has demonstrated resilience with the highest inflows of foreign direct investment to date with a growth of 8.5 per cent to USD226 billion, a sharp contrast to the global FDI landscape which declined by 11 per cent during the 2024 period[28].

The region's economic advantages further strengthen the case with its cost competitiveness and operational flexibility. This includes lower costs of foundational inputs such as land or energy, expanding infrastructure ecosystems, and increasing government support for digital investment.

Together, these factors position SEA not only as a high-growth demand market, but as a strategic and resilient node in the global AI infrastructure network (Figure 5). With an expanding cluster of players including the top 30 global semiconductor companies, top 15 global PCB companies and multiple manufacturing hubs in the region, this underscores the vibrancy of the manufacturing ecosystem and the emergence of regional hubs[29].

It is no surprise that hyperscalers have now also invested over USD50 billion[10]. Amazon Web Services, Microsoft, Google, and ByteDance, have made investments across markets such as Singapore, Malaysia, Indonesia, and Thailand, reflecting strong demand for AI and cloud capacity.

Figure 5

SEA as a strategic and resilient node

AI supply chain layer	Key SEA markets and core strengths	Strategic value to AI ecosystem
Hardware	**Malaysia & Vietnam:** Assembly, packaging & testing (APT) hubs **Singapore:** R&D, semiconductor equipment, advanced manufacturing **Thailand:** Electronics manufacturing	Critical backbone of global chip supply chain, particularly in back-end processes; enabling compute scalability and supply chain resilience
Infrastructure	**Singapore:** Regional hub (connectivity, high-value infra) **Malaysia & Indonesia:** Land, power, cost advantages for hyperscaler expansion **Thailand & Vietnam:** Emerging capacity markets	Fastest-growing layer; primary destination of hyperscaler capital; converts compute into AI services and drives electricity demand
Foundational	**Indonesia & Vietnam:** Large-scale renewable potential (solar, hydro, geothermal) **Malaysia & Thailand:** More developed grids and industrial ecosystems	Enables sustainable scaling of AI infrastructure; key determinant of data centre siting and long-term competitiveness

Conclusion

The expansion of AI and SEA's increased focus on enhancing energy security are individually transformative trends, but their convergence marks a new and distinct structural shift in the global economy. For SEA, it arrives at a moment of rare strategic advantage. If it aligns digital infrastructure investment with clean energy system deployment, the region has a credible pathway to unlock large-scale capital flows, accelerate decarbonisation, strengthen energy security, and capture greater value across the AI supply chain.

The time is now and the window to capture Southeast Asia's AI-energy nexus opportunity will not remain open indefinitely. Deliberate coordination is needed to ensure the materialisation of value across the supply chain including new technologies and accompanying policies. The subsequent chapters will examine the specific levers required to turn this convergence into a defining economic opportunity for the region.

This reframes the challenge from one of competing resource demands to one of alignment: the key unlock lies in coordinating the deployment of compute infrastructure, clean energy systems, and digital capabilities in tandem. By siting data centre where renewable energy is available, aligning grid expansion with infrastructure investment, and leveraging AI to optimise energy systems, Southeast Asia can transform rising AI-driven demand into a catalyst for clean energy scale-up and system modernisation.

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