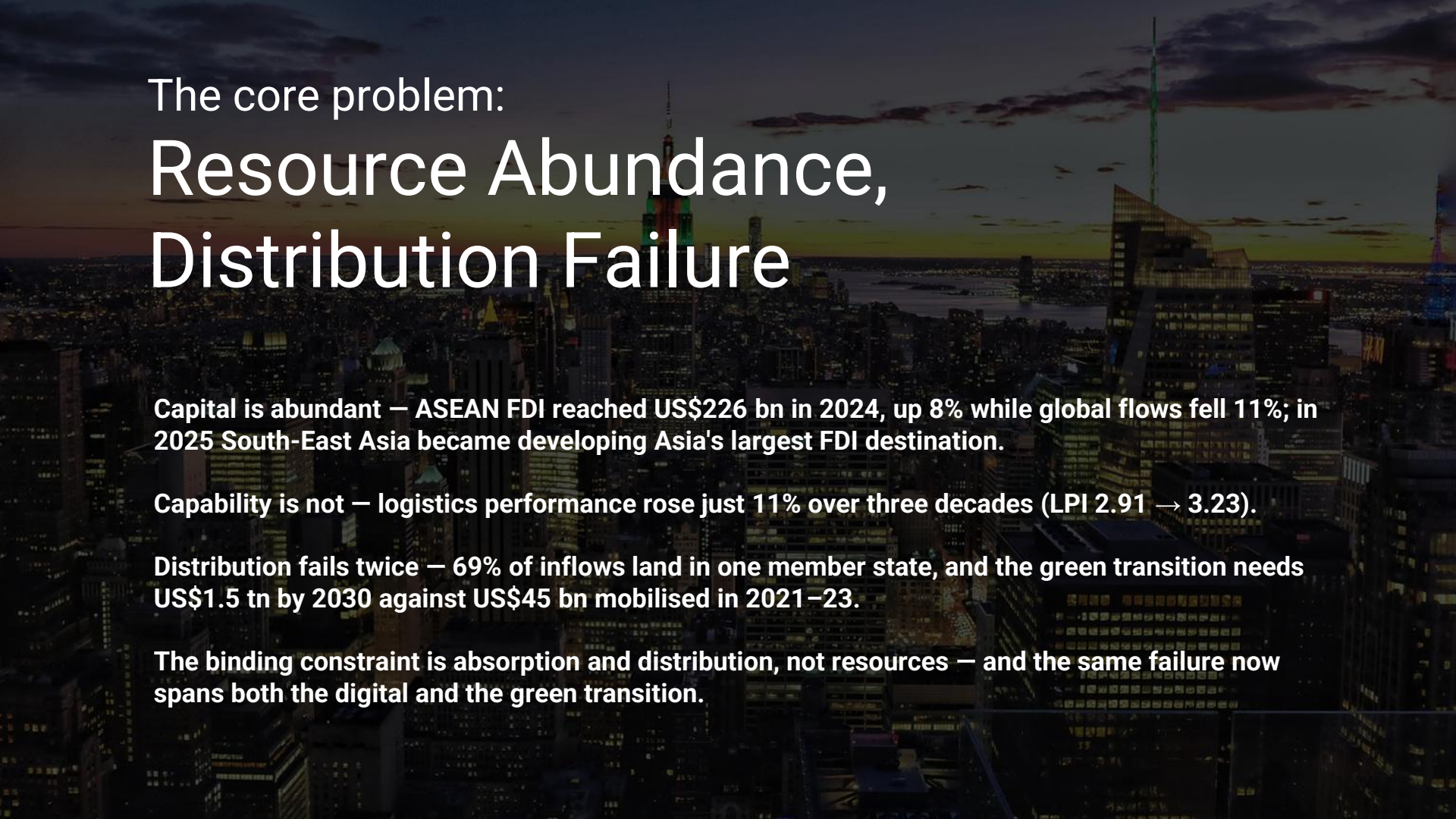
Leveraging the "ABCDE" Framework

Enhancing Supply Chain Resilience in Developing Asia

The Strategic Role of FDI in Green & Digital Transitions



The core problem:

Resource Abundance, Distribution Failure

Capital is abundant — ASEAN FDI reached US$226 bn in 2024, up 8% while global flows fell 11%; in 2025 South-East Asia became developing Asia's largest FDI destination.

Capability is not — logistics performance rose just 11% over three decades (LPI 2.91 → 3.23).

Distribution fails twice — 69% of inflows land in one member state, and the green transition needs US$1.5 tn by 2030 against US$45 bn mobilised in 2021–23.

The binding constraint is absorption and distribution, not resources — and the same failure now spans both the digital and the green transition.

Research Questions (RQ)

RQ 1

How does FDI in digital and connectivity technologies influence the resilience of supply chains in ASEAN?

Sub-question: What roles do AI and data-driven systems, supported by FDI, play in improving supply chain responsiveness to disruptions?

RQ 2

How do foreign-invested "anchor firms" utilize Blockchain-based provenance (the "B" in the ABCDE Framework) to integrate local SMEs into green GVCs, and what are the resulting spillover effects on SME inclusivity and sustainability metrics?

RQ 3

What are the regulatory barriers to "Data-as-a-Service" (DaaS) FDI in ASEAN, and how does this affect regional supply chain visibility?

The Policy Baseline *(Frameworks Exist — the Connective Tissue Does Not)*

Digital Stack

DEFA concluded May 2026, signing Nov 2026 — the world's first region-wide digital-economy agreement: data flows, digital ID, payments, AI.

Atop the Digital Masterplan 2025 and a live ASEAN Single Window. Prize: US$300 bn today → up to US$2 tn by 2030.

Green Stack

Strategy for Carbon Neutrality (2023); Sustainable-Finance Taxonomy v3 in force Dec 2024, v4 in drafting.

ASEAN Power Grid financing (APGF) launched Oct 2025 with the World Bank & ADB — against a US$800 bn grid need by 2045.

The Missing Link

The two stacks share no data layer: carbon, SME and digital metrics sit in unconnected datasets — no public digital-FDI or SME-GVC series exists. ODSF builds one from six open indicators.

Since Jan 2026, CBAM prices this gap at the EU border.

Methodology

Open Digital Synthetics Framework (ODSF)

Bridging Theory and Real-time Data

Stage 1: Ingest macro-economic and transport telemetry.

Stage 2: Map supply chains via API and ledger engagement.

Stage 3: Align institutions via regulatory consultations.



ODSF live monitor — retrieved 7 August 2026

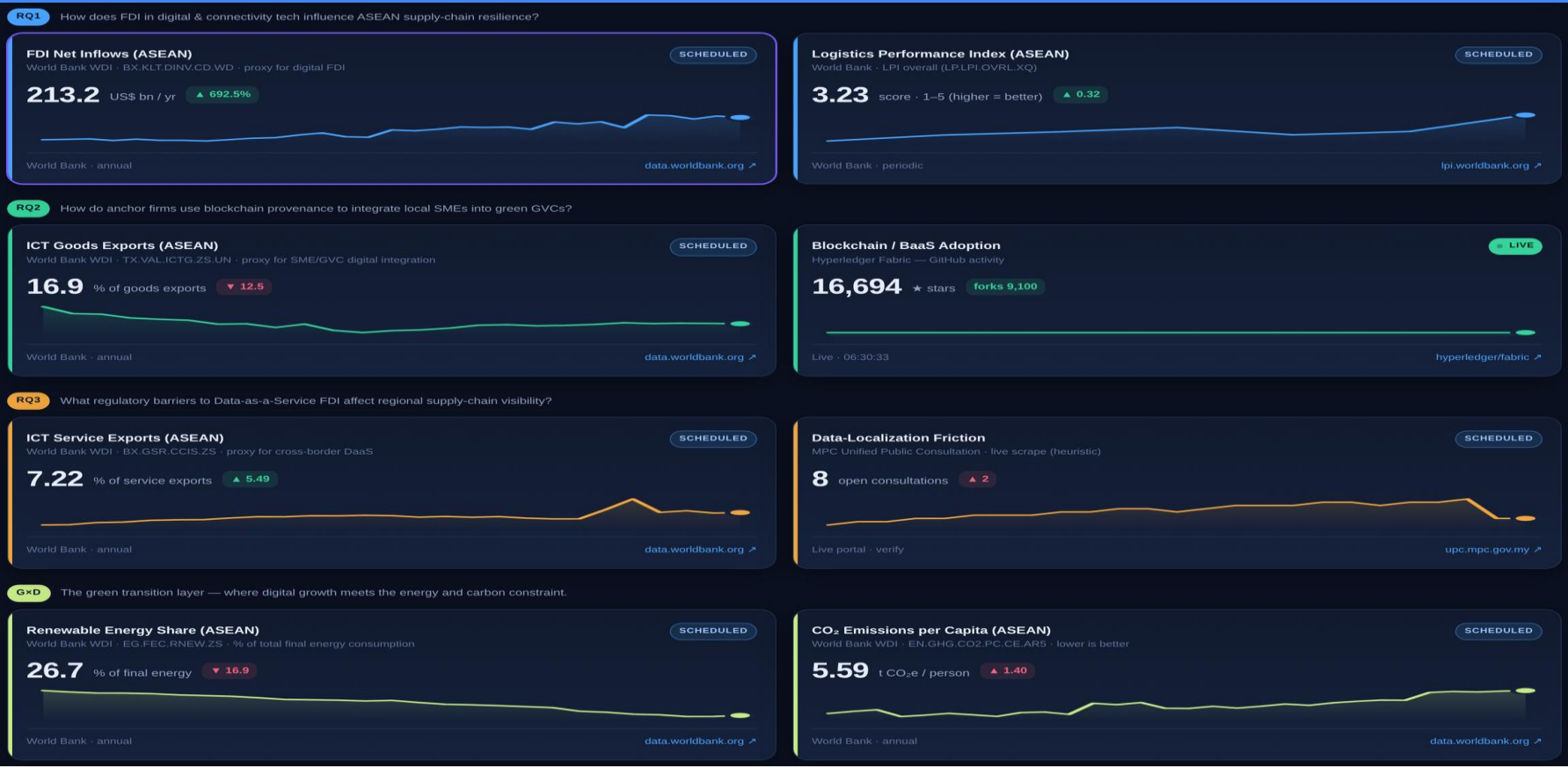
How to read this evidence

Provenance label	What it means	Applies to
LIVE	Queried in real time from a public API on page load	Hyperledger Fabric GitHub activity
SCHEDULED	Refreshed on a six-hourly server-side pull from an official open dataset	World Bank WDI series; World Bank LPI; MPC consultation portal
Proxy	No public source publishes the ODSF construct directly; a transparent stand-in is used and labelled	FDI total → digital-FDI intensity; ICT-goods share → SME/GVC integration; ICT-services share → cross-border DaaS; MPC consultations → regulatory friction
Status	Research use only. Figures are indicative and are not verified official statistics.	All tiles

Every figure in this deck is machine-readable at odsf.edisontkp.com/api/metrics and can be re-queried by any reviewer.

Only descriptive statistics and co-movements are reported. No causal identification is claimed.

The ODSF live monitor, 7 August 2026



odsf.edisontkp.com — Stage 1 (Open Data Aggregation). Eight indicators across the research-question and green layers — plus a live public-ledger layer (stablecoin float, Fabric dev velocity, node count) — each carrying source link, as-of timestamp and provenance label.

The ODSF live monitor, 7 August 2026

FOR RESEARCH PURPOSES ONLY

Not yet verified or acknowledged by any authority — figures are indicative and must not be cited as official.

OPEN DIGITAL SYNTHETICS FRAMEWORK · LIVE MONITOR · GREEN × DIGITAL

ASEAN Digital FDI & Supply-Chain Resilience

Real-time open-data monitor for RQ1–RQ3 · green transition layer · public-ledger layer · EdisonTKP Research

15:44:43
Fri, 07 Aug 2026

Refresh

ANALYTICAL TARGET	VARIABLE REQUIRED	OPEN DATA SOURCE	REFERENCE
RQ1 Resilience vs. FDI	Macro FDI inflows (proxy for digital-FDI intensity)	World Bank WDI · BX.KLT.DINV.CD.WD	data.worldbank.org ↗
RQ1 Supply-chain performance	Logistics Performance Index, ASEAN average	World Bank · LPI (LP.LPI.OVRL.XQ)	lpi.worldbank.org ↗
RQ2 SME digital integration	ICT goods exports (% of goods exports)	World Bank WDI · TX.VAL.ICTG.ZS.UN	data.worldbank.org ↗
RQ2 Blockchain / BaaS spillover	Enterprise ledger open-source integration & BaaS growth	Hyperledger Fabric · GitHub	github.com ↗
RQ3 Cross-border data services	ICT service exports (% of service exports, proxy for DaaS)	World Bank WDI · BX.GSR.CCIS.ZS	data.worldbank.org ↗
RQ3 Data localization	Active regulatory bottlenecks & industry objections	MPC Unified Public Consultation	upc.mpc.gov.my ↗
G×D Green transition delivery	Renewable share of total final energy, ASEAN average	World Bank WDI · EG.FEC.RNEW.ZS	data.worldbank.org ↗
G×D Carbon intensity of growth	CO_2 emissions per capita (t CO_2e), ASEAN average	World Bank WDI · EN.GHG.CO2.PC.CE.AR5	data.worldbank.org ↗
B Tokenized settlement liquidity	USD-pegged stablecoin float, global (US$ bn)	DefiLlama stablecoins API (keyless)	defillama.com ↗
B Enterprise-ledger dev velocity	Hyperledger Fabric commits/week (4-wk avg)	GitHub REST · stats/participation	github.com ↗
B Public-ledger infrastructure	Reachable Bitcoin nodes, global count	Bitnodes API (btcnodes.io, keyless)	btcnodes.io ↗

Key Findings *(The Capability Stagnation)*

FDI vs LPI

Capital: US$30 bn (1996, WDI) → US$226 bn (2024, AIR 2025), +8% in a year when global flows fell 11%. Capability: +11% in three decades (LPI 2.91 → 3.23).

Concentration persists — 69% of 2023 inflows to one member state; LPI spans 3.0–4.3.

SME Disconnect

The rails are free and mature — Hyperledger Fabric at 16,694 stars (live).

Yet ICT-goods share fell 12.6 pp to 16.9% and MSMEs supply 20.4% of exports. Tooling is not the constraint.

Regulatory Friction

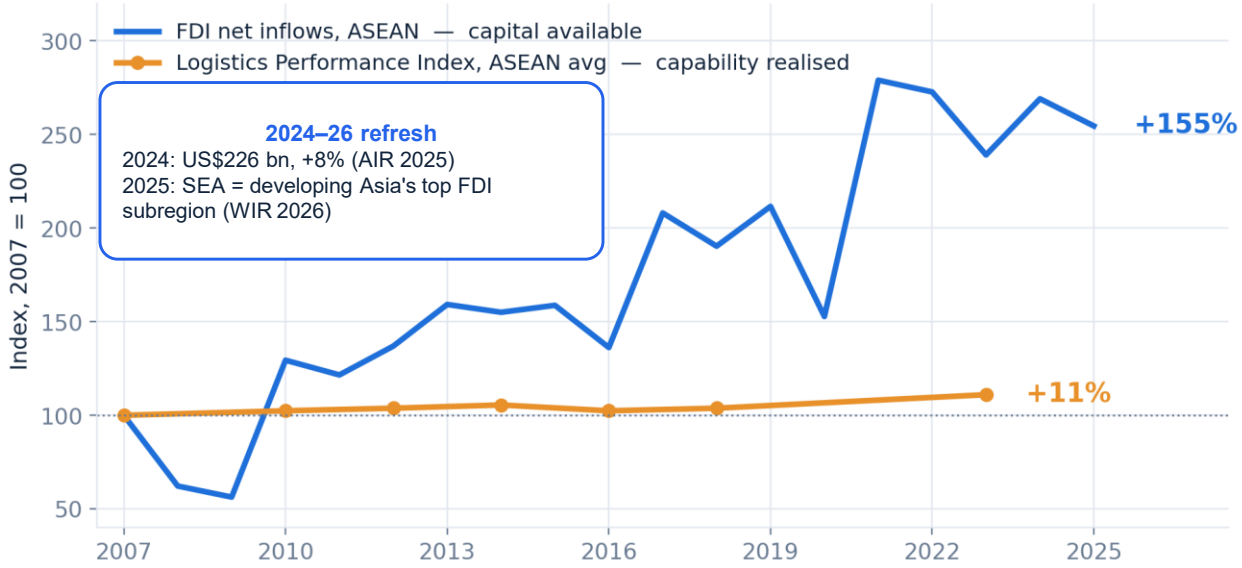
DaaS trade is thin and volatile — ICT services 7.22% of service exports, after a 13.3% spike in 2021.

Open consultations run continuously at 6–14. Rising demand meets standing friction.

Evidence 1 — Capital rose. Capability did not. (RQ1)

Since 2007, capital rose 155%. Capability moved 11%.

ASEAN — FDI net inflows vs Logistics Performance Index, indexed to 2007 = 100



Source: ODSF Monitor (odsf.edisontkp.com) · World Bank WDI BX.KLT.DINV.CD.WD; World Bank LPI LP.LPI.OVRL.XQ. Retrieved 1 Aug 2026.
Over the full series (1996-2025) FDI net inflows rose +602%, from US$30.4 bn to US$213.2 bn. LPI editions: 2007, 2010, 2012, 2014, 2016, 2018, 2023.

ODSF Monitor · World Bank WDI BX.KLT.DINV.CD.WD and LPI LP.LPI.OVRL.XQ, retrieved 1 Aug 2026.

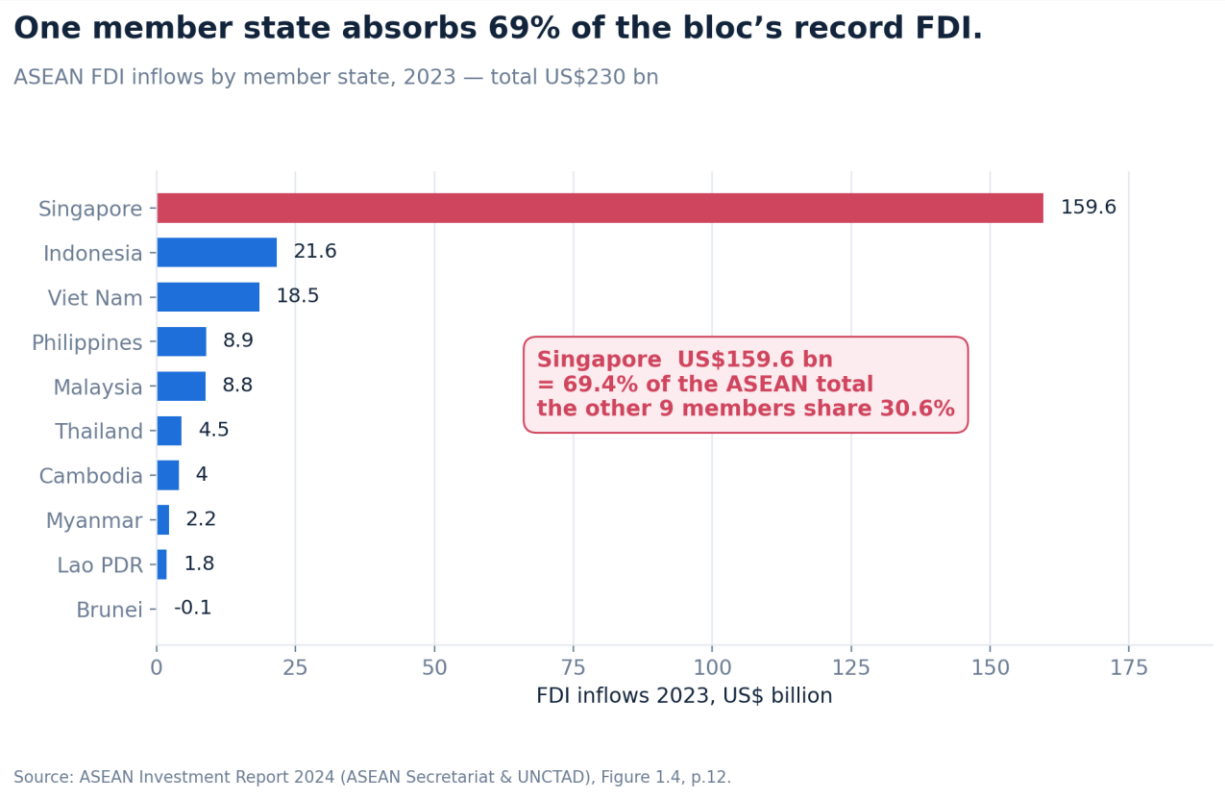
RQ1 indicator table

Indicator (proxy)	Source · code	Period (n)	Earliest	Latest	Change	Reading
FDI net inflows, ASEAN	World Bank WDI · BX.KLT.DINV.CD.WD	1996–2023 (WDI)	US$30.4 bn	US$213.2 bn	+602% (peak US$233.6 bn, 2021)	Capital abundant, near historic highs
Logistics Performance Index, ASEAN avg	World Bank · LP.LPI.OVRL.XQ	2007–2023 (7 editions)	2.91	3.23	+0.32 (+11%) on a 1–5 scale	Capability improving, still mid-range
FDI by member state, 2023	ASEAN Investment Report 2024, Fig. 1.4	2023	—	US$230 bn total	Singapore US$159.6 bn = 69.4%	Capital is concentrated, not distributed
LPI dispersion, 2023	World Bank LPI 2023	2023	Indonesia 3.0	Singapore 4.3	1.3-point spread	Capability is uneven inside one bloc

Reading. A 602% rise in inflows against an 11% rise in measured capability is the first quantitative signature of a distribution-and-absorption constraint rather than a scarcity one.

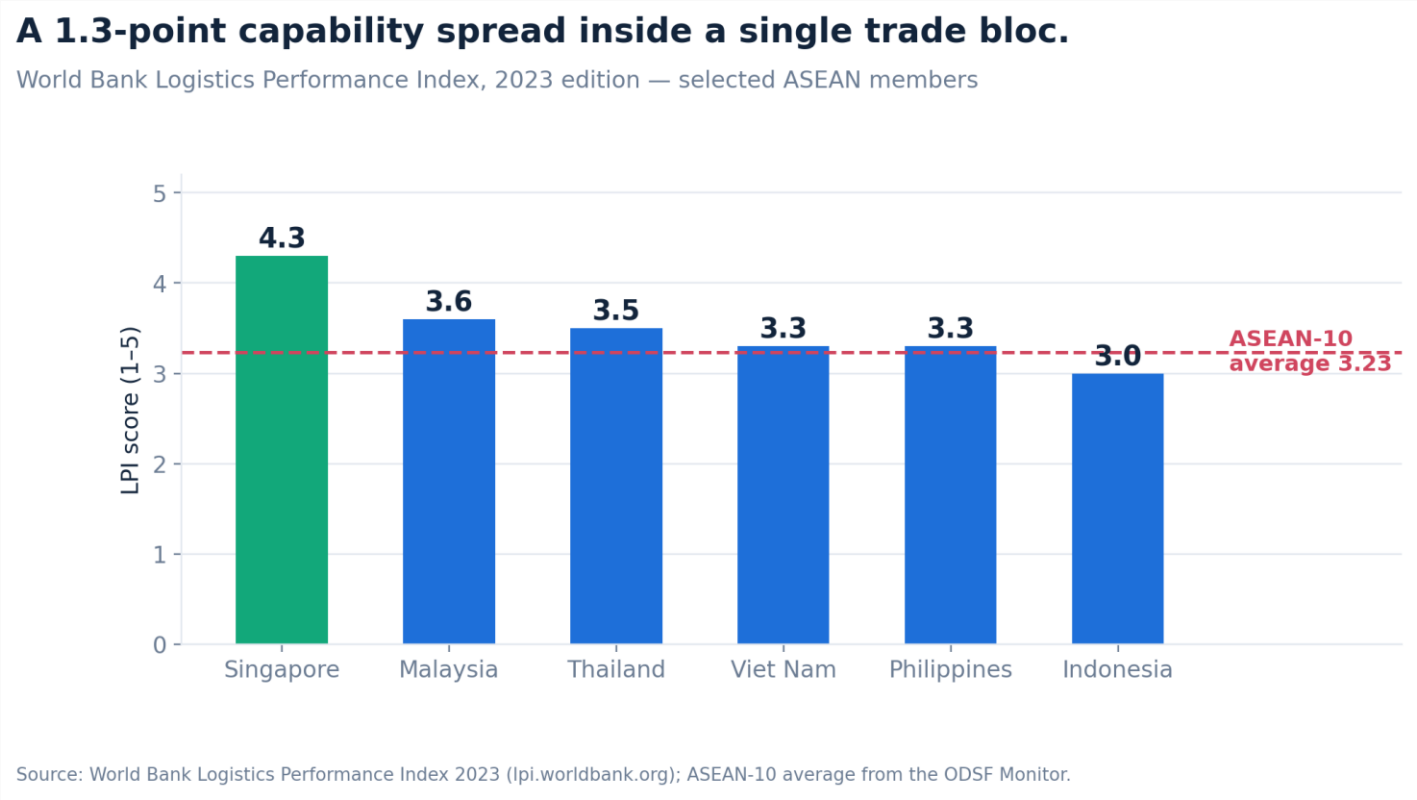
Vintage: the WDI series runs to 2023; AIR 2025 reports 2024 inflows at US$226 bn (+8%). Full 2024–26 refresh: Appendix A12.

Where the capital actually lands (RQ1)



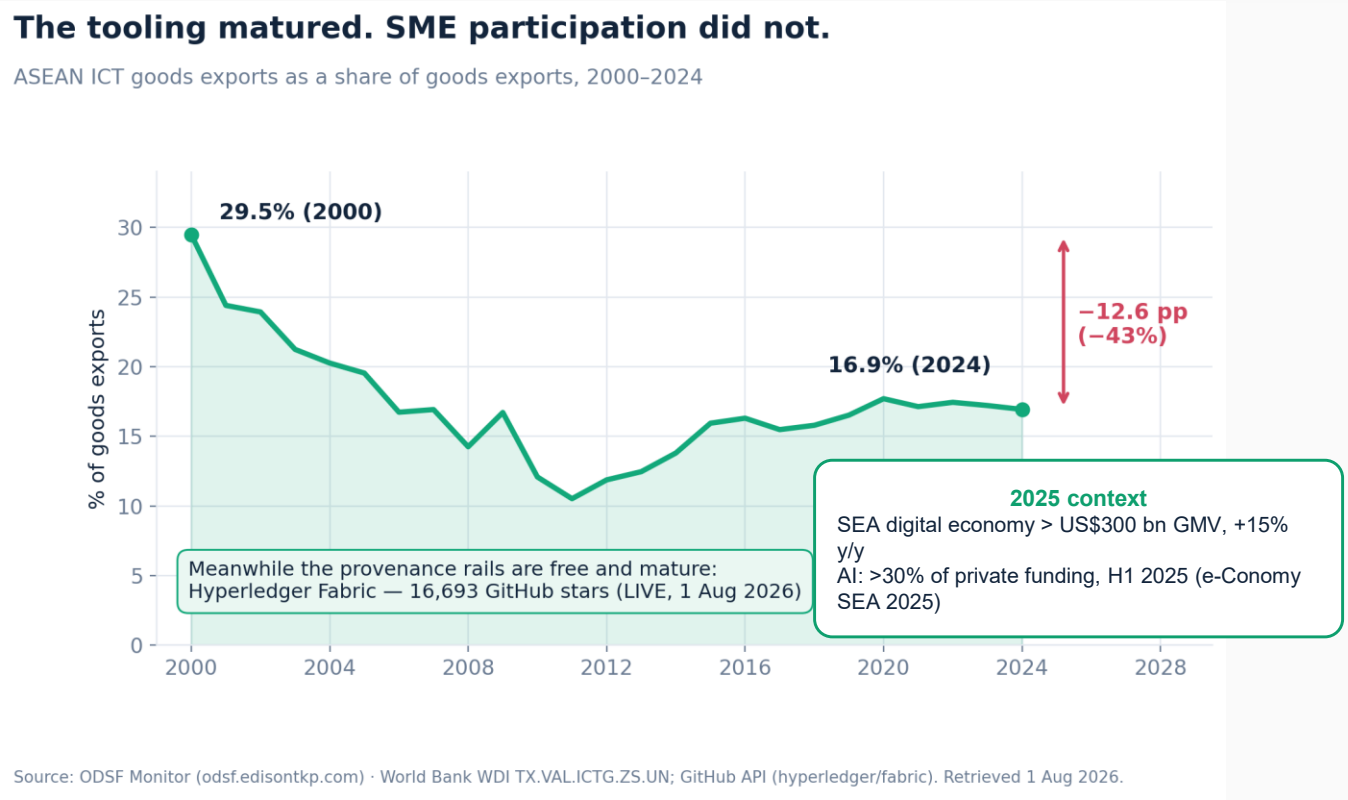
ASEAN Investment Report 2024 (ASEAN Secretariat & UNCTAD), Figure 1.4, p.12. Brunei recorded a small net divestment in 2023.

Capability is uneven inside one bloc (RQ1)



World Bank Logistics Performance Index 2023 (lpi.worldbank.org). ASEAN-10 average from the ODSF Monitor. LPI editions: 2007, 2010, 2012, 2014, 2016, 2018, 2023.

Evidence 2 — The tooling matured; SME participation did not. (RQ2)



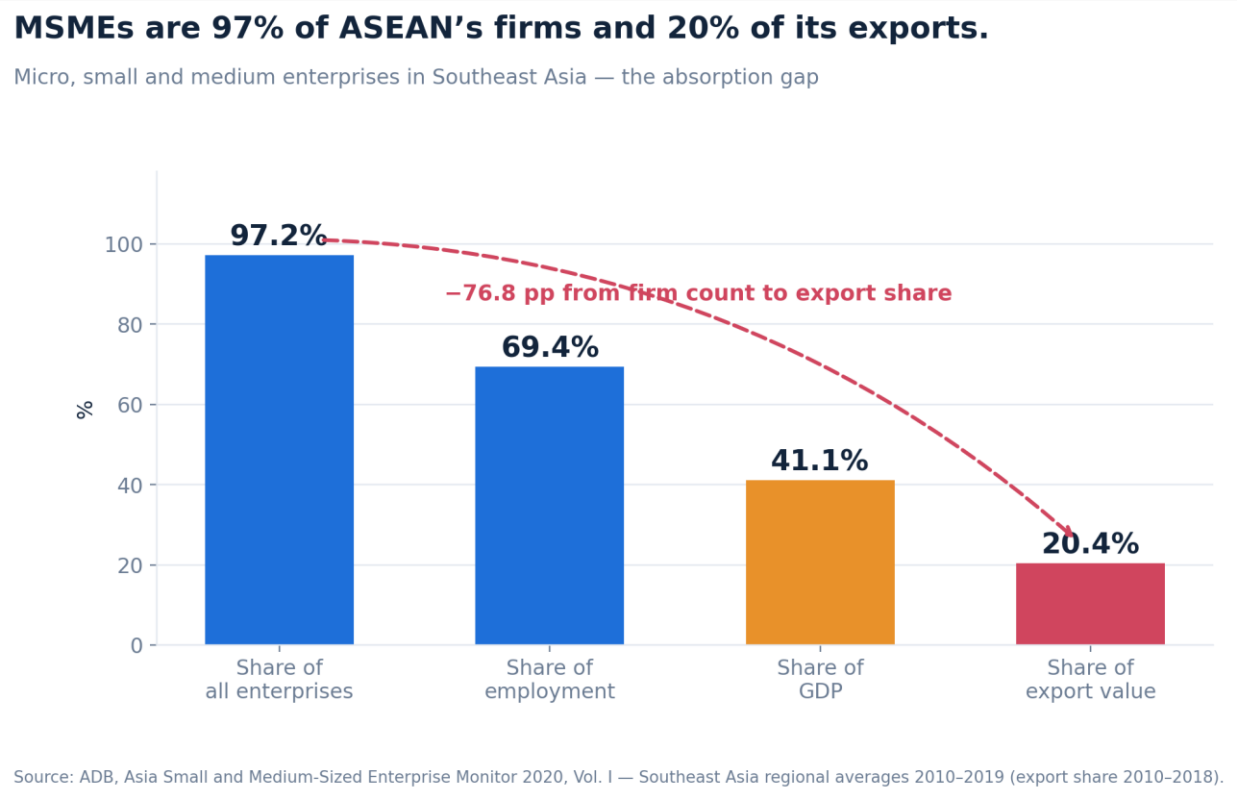
ODSF Monitor · World Bank WDI TX.VAL.ICTG.ZS.UN; GitHub API (hyperledger/fabric), retrieved 1 Aug 2026.

RQ2 indicator table

Indicator (proxy)	Source · code	Period (n)	Earliest	Latest	Change	Reading
ICT goods exports, ASEAN	World Bank WDI · TX.VAL.ICTG.ZS.UN	2000–2024 (25)	29.5%	16.9%	−12.6 pp (−43%)	Relative ICT-goods footprint thinning
Hyperledger Fabric (enterprise BaaS)	GitHub API · hyperledger/fabric (LIVE)	point-in-time	—	16,694 stars	rising	Provenance infrastructure mature and free
MSME share of enterprises	ADB Asia SME Monitor 2020, Vol. I	2010–2019 avg	—	97.2%	—	Almost every ASEAN firm is an MSME
MSME share of export value	ADB Asia SME Monitor 2020, Vol. I	2010–2018 avg	—	20.4%	—	…yet they supply a fifth of exports
MSME export share by country	ADB Asia SME Monitor 2020	2018	Indonesia 14.4%	Thailand 28.7%	Malaysia 17.3%	Absorption gap is regional, not one-country

Reading. The technical means to integrate SMEs became cheaper and more available while measured SME participation did not rise. Caveat: ICT-goods share is a coarse proxy; firm-level provenance data would be needed to test the anchor-firm mechanism directly.

The absorption gap in one chart (RQ2)

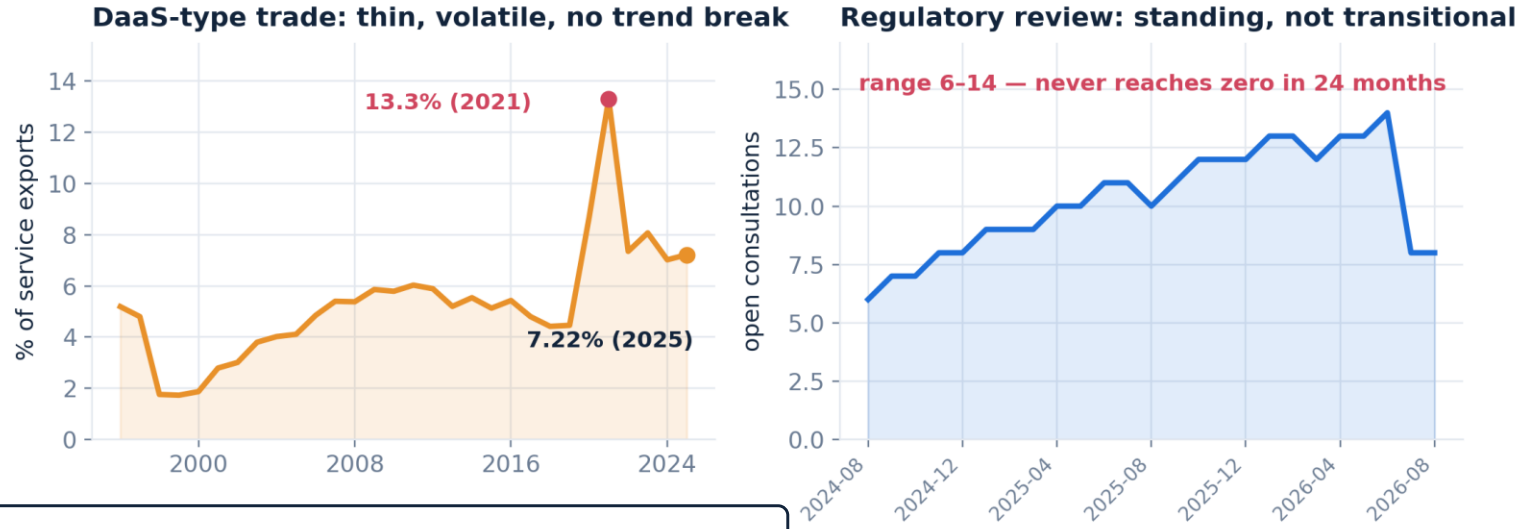


ADB, Asia Small and Medium-Sized Enterprise Monitor 2020, Vol. I — Southeast Asia regional averages 2010–2019; export share 2010–2018.

Evidence 3 — Data friction is standing, not transitional. (RQ3)

Cross-border data rules are a permanent operating condition, not a transition cost.

Left: ASEAN ICT service exports, 1996–2025. Right: open public consultations, MPC portal (Malaysia), Aug 2024 – Aug 2026.



Policy answer in motion — DEFA's trusted-data-flows pillar (concluded May 2026, signing Nov 2026): the friction measured here is what it must clear.

Source: ODSF Monitor (odsf.edisontkp.com) · World Bank WDI BX.GSR.CCIS.ZS; MPC Unified Public Consultation portal (heuristic scrape). Retrieved 1 Aug 2026.

RQ3 indicator table

Indicator (proxy)	Source · code	Period (n)	Earliest	Latest	Change	Reading
ICT service exports, ASEAN	World Bank WDI · BX.GSR.CCIS.ZS	1996–2025 (30)	5.2%	7.22%	+2.0 pp (+39%); peak 13.3% in 2021	DaaS-type trade rising from a low base, volatile
Open public consultations (MPC)	MPC Unified Public Consultation portal (live scrape)	Aug 2024 – Aug 2026 (25)	6	8	range 6–14, never zero	Regulatory review is standing, not transitional

Reading. Rising DaaS-type trade coexisting with continuous consultation activity is consistent with cross-border data rules acting as an active bottleneck to supply-chain visibility — the constraint the Data and Ethics pillars are designed to resolve.

Caveat. MPC consultations are Malaysia-specific and captured heuristically. They indicate regional regulatory tempo, not a comprehensive ASEAN measure.

Evidence 4 — The Green × Digital Collision (cross-cutting)

Twin-Transition Capital

Semiconductors, digital infrastructure, AI and energy-transition tech drew 44% of global greenfield investment in 2025 (WIR 2026).

ASEAN manufacturing FDI rose ~150% to US$44 bn in 2024 on supply-chain and digital momentum (AIR 2025).

Digital's Energy Bill

4,600 MW of new SEA data-centre capacity is planned — +180% — while the Power Grid needs US$800 bn by 2045 (e-Conomy SEA 2025; APGF).

Digital growth is now a grid question; green power is now digital infrastructure.

Carbon = Access

CBAM enforcement began Jan 2026: US$1.4 bn Indonesian and US$0.9 bn Thai EU exports exposed; Vietnamese steel & aluminium −4–5% (The Asia Group).

No verifiable emissions data, no market access. Provenance is now a trade requirement.

Every policy claim, and the evidence behind it

Policy instrument	Quantified claim	Status	Evidence base
Regional DPP + automated Rules of Origin	Export time −24% to −44%; direct transaction costs −17% to −31%; US$36 bn (partial) to US$257 bn (full) in added annual Asia-Pacific exports	Sourced estimate	Shepherd, B., Estimating the Benefits of Cross-Border Paperless Trade, prepared for UNESCAP in support of Resolution 68/3 (2014)
ABCDE upskilling tax credit (RIIF)	≥30% of local workforce verifiably certified within three years; 15-year tax holiday on digital operations	Policy design threshold — not an empirical finding	Need established by WEF, Future of Jobs — South-Eastern Asia (2025): 62 of every 100 workers require training by 2030; 43% of employers expect core-skill disruption; 60% say skills gaps block adaptation
AI-driven operational resilience (digital twins, predictive maintenance)	30–40% cost saving versus reactive maintenance; 8–12% versus preventive	Sourced estimate	US DOE FEMP / PNNL, O&M Best Practices Guide — Maintenance Approaches
Sovereign Data Zones & regional data cloud	Digital-infrastructure capital is already mobilised: greenfield communication, data processing and hosting up more than fivefold to US$4.4 bn; information & communication greenfield +64% to US$19 bn (2023)	Sourced context	ASEAN Investment Report 2024 (ASEAN Secretariat & UNCTAD)



Recommendation 1

Provenance & Ethics-First FDI

Digital provenance — one regional Digital Product Passport on an open Hyperledger standard. An SME reports once, not once per MNE portal.

Evidence: paperless trade cuts export time 24–44% and transaction costs 17–31% (UNESCAP, 2014).

Ethics-first incentives — RIIF tax relief conditional on verified upskilling and AI stress-testing.

Evidence: 62 of every 100 South-East Asian workers need training by 2030; 60% of employers say skills gaps block adaptation (WEF, 2025).

Green link — the same provenance rail carries CBAM-grade emissions data: one SME report serves EU border compliance, taxonomy screening and green-finance access at once.



Recommendation 2

Data as a Regional Public Good

Sovereign Data Zones — privacy-preserving computation inside SEZs: residency law met, cross-border visibility kept.

Shared value — anonymised logistics and inventory feeds released to SMEs as a regional public good.

Evidence: greenfield investment in communication, data processing and hosting rose fivefold to US$4.4 bn; ICT greenfield +64% to US$19 bn in 2023 (AIR 2024).

Capital is already pointed at digital infrastructure. Rules are the binding constraint.

Policy fit — this is the implementation layer for DEFA's trusted-data-flows pillar (signing Nov 2026) and the Carbon-Neutrality Strategy's interoperability outcome: ASEAN operationalises what it just agreed.

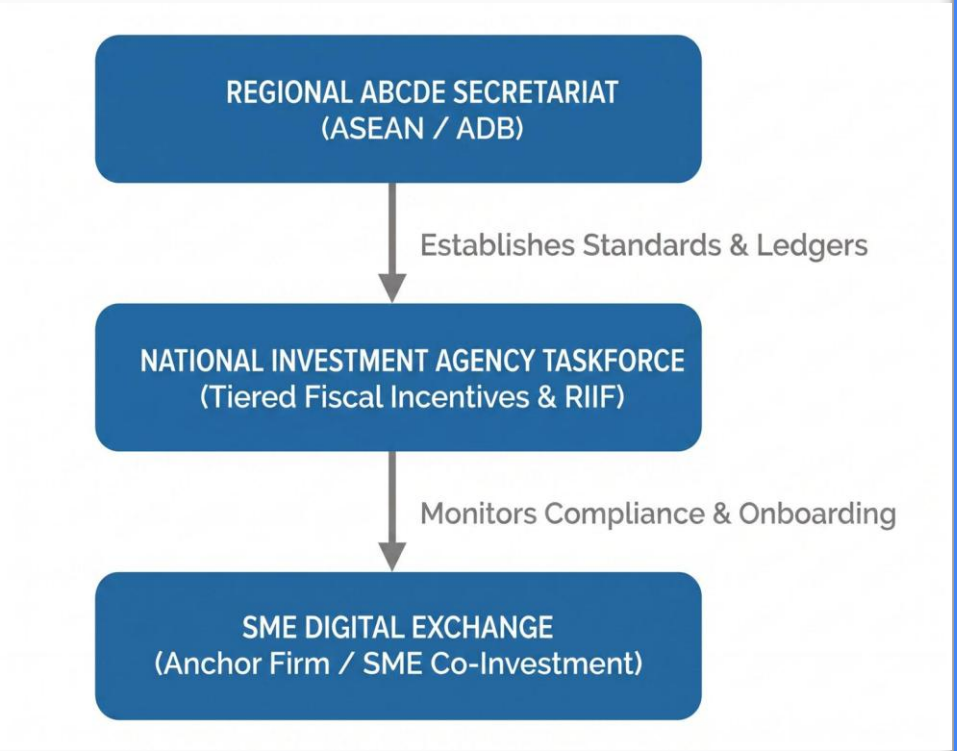
Policy instrument → gap → ABCDE bridge

Instrument	Where it stands (Aug 2026)	The gap it leaves	ABCDE bridge
ASEAN DEFA	Negotiations concluded May 2026; signing targeted Nov 2026 (49th Summit)	Rules agreed; execution rails unbuilt	Rec 2 Sovereign Data Zones operationalise the trusted-data-flows pillar (C·D)
Digital Masterplan 2025 · Single Window	ADM2025 closes this year; ASW live for customs documents	Customs digitalised; commercial provenance still siloed	Rec 1 Digital Product Passport rides ASW rails (B·D)
Strategy for Carbon Neutrality	Adopted Aug 2023 — green industries, interoperability, standards, green talent	No shared measurement layer	ODSF green indicator layer; DPP carries emissions fields (A·D·E)
Taxonomy for Sustainable Finance	v3 in force Dec 2024; v4 in drafting	Classification exists; project-level proof scarce	Provenance rail supplies taxonomy-grade evidence (B·E)
Power Grid · APGF	APGF launched Oct 2025 (World Bank + ADB); US$800 bn need by 2045	US$1.5 tn needed by 2030; US$45 bn mobilised 2021–23	Micro-grid + green data-centre corridors — Borneo PoC (C)
EU CBAM (external)	Enforcement from Jan 2026; ID US$1.4 bn, TH US$0.9 bn exposed	Exporters lack verifiable emissions data	One SME report → border compliance + green finance (B·D·E)

Reading. Every recommendation lands inside an instrument ASEAN has already adopted — the framework supplies the execution layer those instruments still lack, not new institutions.

Implementation Architecture

The Three-Tiered Structure



The ABCDE Framework

A New Operating System for GVCs

A: Artificial Intelligence

B: Blockchain

C: Connectivity

D: Data

E: Ethics

The Borneo Thesis

Borneo to becoming world’s wealthiest island.

Greenfield Sandbox:
Deploy decentralized micro-grids and agentic AI on Borneo.

Civilizational Leapfrogging:
Proving the framework through "software-defined eco-civilization" using local initiatives like Baram DeepTech solar-BESS.

Green–Digital Nexus: hydropower-rich Borneo is where the two transitions physically meet — green power for green data centres and micro-grids.



Thank you.

By: Koh How Tze & Edison Tan Khai Ping, 2026

Mentor: Grace Shu Tian

Appendix 1 — Limitations, provenance and replication

Proxies.

FDI is total, not digital-specific. ICT-goods and ICT-services shares describe national trade composition, not firm-level SME participation. MPC consultations are Malaysia-only. All indicators are directional, not definitional.

Inference.

Only descriptive statistics and co-movements are reported. No causal identification is claimed. The LPI series is short (n = 7 editions) and irregularly spaced.

Cadence.

World Bank series are annual and refreshed on a scheduled pull; the GitHub feed is live; the MPC series is a heuristic scrape. Each indicator's provenance and primary-source link are displayed on the dashboard.

Known data-labelling issue.

The monitor currently labels the seventh LPI observation as 2022; it corresponds to the World Bank's 2023 edition. Editions are 2007, 2010, 2012, 2014, 2016, 2018 and 2023. To be corrected in the backend.

Replication.

Aggregated values are served as machine-readable output at odsf.edisontkp.com/api/metrics. Any reviewer may re-query the same interface and reconstruct every figure cited here.

Appendix 2 — The 2024–26 evidence refresh (sources)

Investment.

AIR 2025 (ASEAN Sec. & UNCTAD, Oct 2025): 2024 inflows US$226 bn, +8% against a global −11%; fourth consecutive year as top developing-region destination; manufacturing FDI +150% to US$44 bn. WIR 2026 (Jun 2026): in 2025 SEA overtook East Asia as developing Asia's largest recipient subregion; semiconductors, digital infrastructure, AI and energy-transition technologies took 44% of global greenfield value.

Digital economy.

e-Conomy SEA 2025 (Google · Temasek · Bain; now ASEAN-10): GMV above US$300 bn (+15% y/y), revenue US$135 bn; US$2.3 bn into 680+ AI startups in twelve months; 4,600 MW of new data-centre capacity planned (+180%).

Digital policy.

DEFA negotiations concluded 27–29 May 2026 (ASEAN SEOM statement); signing targeted at the 49th Summit, Nov 2026 — the first region-wide digital-economy agreement. Projected to lift the digital economy from a US$1 tn 2030 baseline toward US$2 tn.

Green policy.

Strategy for Carbon Neutrality (Aug 2023); Taxonomy v3 in force 20 Dec 2024, v4 in drafting; ASEAN Power Grid Financing initiative launched Oct 2025 with the World Bank and ADB against an US$800 bn grid need by 2045; financing gap US$1.5 tn required by 2030 vs US$45 bn mobilised 2021–23 (ISEAS/Fulcrum).

Carbon at the border.

EU CBAM enforcement began Jan 2026 (The Asia Group): US$1.4 bn Indonesian (6.2%) and US$896 m Thai (3.8%) EU-bound exports exposed; Vietnamese steel and aluminium −4–5%; Singapore carbon tax US$35/t → US$38–62 by 2030. Verifiable emissions data is now a condition of market access.

Use.

These figures replace or supplement the 2023-vintage series flagged in A3–A8. Dashboard ingestion of the green indicator layer is scheduled on the live monitor.