

Bringing Transition Finance from Ambition to Implementation in Asia: Findings from the AITF Catalyst Pilot Studies

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Preface and Acknowledgements

Southeast Asia's energy transition has reached a critical juncture. The region must meet rapidly growing energy demand, sustain economic and industrial development, and ensure reliable and affordable energy access, while accelerating decarbonisation. At the same time, geopolitical uncertainty and exposure to fuel-supply disruptions and price volatility have brought energy security and resilience to the forefront. Advancing the transition therefore requires pathways that are ambitious yet practical, aligned with long-term climate goals, and responsive to the circumstances of each country.

The publication is the inaugural output report of the AZEC Inclusive Transition Finance Catalyst (AITF Catalyst). The initiative was developed by the Economic Research Institute for ASEAN and East Asia (ERIA) and builds on previous discussions arising from the tripartite Memorandum of Cooperation between the Ministry of Economy, Trade and Industry of Japan (METI), the Asian Development Bank (ADB), and ERIA on Technology and Transition Finance for Practical Energy Transition in Asia.

Drawing on engagement with an initial portfolio of pilot projects, the report examines how transition-finance frameworks can be translated into credible and investable projects. It presents a practical approach centred on three interrelated dimensions – Feasibility, Eligibility, and Bankability – to help identify project-level constraints and the support needed to address them. It also highlights the importance of connecting early-stage and concessional support with commercial capital, while strengthening energy security and resilience in alignment with long-term decarbonisation pathways.

I hope that this report will serve as a useful reference for policymakers, project owners, financial institutions, development partners, and other stakeholders working to translate the transition ambitions of the Association of Southeast Asian Nations (ASEAN) into practical action and a stronger pipeline of investable projects.

I would like to express my sincere appreciation to METI and ADB for their close collaboration and valuable contributions to the AITF Catalyst initiative. I was privileged to provide strategic guidance for this work together with METI and ADB. The report was authored by Satoshi Shimayoshi, Sho Hayashi, and Nadiya Pranindita of ERIA.

The report also benefited from the careful reviews and comments of METI and ADB. Finally, I extend my sincere thanks to the project owners, government representatives, financial institutions, experts, and all other stakeholders who generously shared their time, experience, and insights in support of the initiative.

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List of Abbreviations

ACE	ASEAN Centre for Energy
ACMF	ASEAN Capital Markets Forum
ADB	Asian Development Bank
ADF	Ammonia Dual Fuel
AITF Catalyst	AZEC Inclusive Transition Finance Catalyst
ASEAN	Association of Southeast Asian Nations
ATF SG	Asia Transition Finance Study Group
AZEC	Asia Zero Emission Community
BCG	Boston Consulting Group
BECCS	Bioenergy with Carbon Capture and Storage
BESS	Battery Energy Storage System
BOT	Build-Operate-Transfer
CAPEX	Capital Expenditure
CBAM	Carbon Border Adjustment Mechanism
CBI	Climate Bonds Initiative
CCGT	Combined-Cycle Gas Turbine
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Utilisation and Storage
CDR	Carbon Dioxide Removal
DAC	Direct Air Capture
DFI	Development Finance Institution
DOE	Department of Energy (the Philippines)
DPPA	Direct Power Purchase Agreement
EGXC	Eastern GX Corridor
EPC	Engineering, Procurement and Construction
ERIA	Economic Research Institute for ASEAN and East Asia

ESG	Environmental, Social and Governance
ETS	Emissions Trading Scheme
EVN	Vietnam Electricity
EVNNPT	National Power Transmission Corporation (Viet Nam)
FID	Final Investment Decision
FOAK	First-of-a-Kind
FS	Feasibility Study
FSRU	Floating Storage and Regasification Unit
G2G	Government-to-Government
GHG	Greenhouse Gas
GIP	Green Investments Partnership
GSA	Gas Sales Agreement
GtP	Gas-to-Power
GX	Green Transformation
ICMA	International Capital Market Association
IEA	International Energy Agency
I-REC	International Renewable Energy Certificate
ITP	Industrial Transformation Programme
JCDA	Joint Collaboration Demonstration Agreement
JCM	Joint Crediting Mechanism
KPI	Key Performance Indicator
LGU	Local Government Unit (the Philippines)
LNG	Liquefied Natural Gas
MDB	Multilateral Development Bank
METI	Ministry of Economy, Trade and Industry (Japan)
MOIT	Ministry of Industry and Trade (Viet Nam)
MOU	Memorandum of Understanding
NDC	Nationally Determined Contribution

NEDO	New Energy and Industrial Technology Development Organization (Japan)
NSMO	National System and Market Operator (Viet Nam)
NZBA	Net-Zero Banking Alliance
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
OPEX	Operating Expenditure
PDP8	Power Development Plan 8 (Viet Nam)
PLN	Perusahaan Listrik Negara (Indonesia)
PPA	Power Purchase Agreement
PV	Photovoltaic
REC	Renewable Energy Certificate
RTS	Rooftop Solar
SPA	Sale and Purchase Agreement
SPO	Second Party Opinion
TA	Technical Assistance
TLIP	Thang Long Industrial Park
TNB	Tenaga Nasional Berhad (Malaysia)
TRL	Technology Readiness Level
UNFCCC	United Nations Framework Convention on Climate Change
WtE	Waste-to-Energy

Units of Measure

Unit	Definition
GW	Gigawatt (= 10^9 watts)
MW	Megawatt (= 10^6 watts)
TWh	Terawatt-hour (= 10^{12} watt-hours)
MtCO ₂	Million tonnes of carbon dioxide
Mt CO ₂ -eq	Million tonnes of carbon dioxide equivalent
US\$	United States dollar

Glossary of Terms

Term	Definition
AITF Catalyst	The AZEC Inclusive Transition Finance Catalyst, an initiative developed by ERIA that works with individual projects in Southeast Asia to identify project-level constraints and provide support through feasibility/ bankability/eligibility levers.
ASEAN Capital Markets Forum (ACMF)	A forum established in 2004 under the auspices of the ASEAN Finance Ministers that comprises capital market regulators from the ASEAN jurisdictions, and which issues regional guidance including the ASEAN Transition Finance Guidance.
ASEAN Taxonomy for Sustainable Finance	A multi-tiered classification framework issued by the ASEAN Taxonomy Board as the overarching guide for all ASEAN Member States, complementing their respective national sustainability initiatives and serving as ASEAN's common language for sustainable finance.
Asia Transition Finance Study Group (ATF SG)	A private-led initiative comprising private financial institutions and key stakeholders, including public authorities and industry players across Asia, which collaborates globally to support a just and orderly energy transition by facilitating dialogue and accelerating the implementation of transition finance.
Asia Zero Emission Community (AZEC)	A framework established in March 2023 to foster co-operation towards carbon neutrality and net zero emissions across Asia, comprising 11 partner countries.

Term	Definition
Carbon Border Adjustment Mechanism (CBAM)	The tool of the European Union (EU) to put a fair price on carbon emitted during the production of carbon-intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries.
Carbon dioxide removal (CDR)	Activities that remove carbon dioxide from the atmosphere and store it durably, whether in geological formations, in products or in terrestrial or marine reservoirs. Credits representing such removals are traded separately from emission reduction credits.
Climate Bonds Initiative (CBI)	An international organisation dedicated to mobilising global capital for climate action through the development of standards and certification for climate-related investments.
Co-firing	The simultaneous combustion of two or more fuels in a single boiler or turbine, most commonly the partial substitution of coal or natural gas with a lower-carbon fuel such as ammonia or biomass.
Contracted electricity quantity (Qc)	The volume of electricity that an offtaker commits to purchase at the contract price under a power purchase agreement. A long-term minimum Qc underpins fixed-cost recovery and is central to the bankability of gas-fired and other capital-intensive generation projects.
Development finance institution (DFI)	Specialised financial entities that provide funding for economic development projects, particularly in developing countries, to promote sustainable growth and social impact.
Final investment decision (FID)	The point at which a project's sponsors formally commit the capital required for construction, following the resolution of the principal technical, contractual, permitting and financing conditions.
Financing Asia's Transition Partnership (FAST-P)	A Singapore-led blended finance initiative in collaboration with key global public, private, and philanthropic partners to catalyse sustainable finance flows into Southeast Asia. FAST-P aims to mobilise up to US\$5 billion to de-risk and finance transition and marginally bankable green projects in Asia.
First-of-a-kind (FOAK)	A pioneering or novel infrastructure or technology project that is the first of its type deployed commercially at scale. FOAK projects often face higher risks, untested operational models, elevated capital costs, and limited financing options.

Term	Definition
Green Investments Partnership (GIP)	A partnership under FAST-P, managed by Pentagreen Capital, that mobilises capital for marginally bankable clean energy infrastructure in Asia.
Hard-to-abate sectors	High emissions-intensity industries that are difficult to decarbonise due to their dependence on fossil fuels for high-temperature heat, feedstocks, or process emissions or for which green technologies are not currently feasible at scale.
International Capital Market Association (ICMA)	A global organisation that develops frameworks for sustainable bonds, including the Green Bond Principles, the Climate Transition Finance Handbook and the Climate Transition Bond Guidelines.
International Renewable Energy Certificate (I-REC)	A standard for issuing and tracking certificates that represent the environmental attributes of renewable electricity generation, used by buyers to substantiate renewable electricity claims.
Joint Crediting Mechanism (JCM)	A bilateral offset crediting scheme operated by Japan with partner countries, under which emission reductions achieved through the deployment of low-carbon technologies are quantified and shared as credits between the two governments.
Multilateral development bank (MDB)	International financial institution that provides concessional loans, grants, and technical assistance to support development and climate projects, especially in low- and middle-income countries.
Nationally determined contribution (NDC)	National climate action plans submitted under the Paris Agreement, outlining each country's targets for emissions reduction and adaptation.
Net-Zero Banking Alliance (NZBA)	An industry-led, UN-convened alliance of banks committed to aligning their lending and investment portfolios with net zero emissions by 2050.
Project owner/ sponsor	The entity that develops, owns or leads the implementation of a project and bears primary responsibility for securing permits, contracts and financing. In this report the terms are used interchangeably.
Second party opinion (SPO)	An independent assessment by an external reviewer of whether a financing instrument or an issuer's transition strategy is aligned with a stated framework or with recognised market principles.

Term	Definition
Technology Readiness Level (TRL)	A scale from 1 to 9 used to measure the maturity of a technology, from basic principles (TRL 1) to commercial deployment (TRL 9). Commonly used in climate and innovation finance.
Tipping fee	The charge levied on the party delivering waste to a waste-to-energy or disposal facility, which forms a revenue stream alongside electricity sales and is central to the bankability of waste-to-energy projects.

Executive Summary

Southeast Asia's energy transition is entering a more demanding phase. The region must reduce emissions while continuing to expand energy access, support industrial growth, and strengthen the resilience of its energy systems. Important foundations are already in place – including regional taxonomies, transition-finance guidance, and a growing range of public and private funding mechanisms. The priority now is to turn these frameworks into investable projects that can move from concept to implementation.

AITF Catalyst was launched to help close this gap. Drawing on its first year of engagement across power, industrial decarbonisation, low-carbon fuels, waste-to-energy, and carbon management, Catalyst finds that projects often stall not because of a single technical issue, but because policy, market, technology, and financing conditions do not come together at the right time. The case studies in Chapter 2 illustrate how these challenges arise in practice. In Viet Nam's LNG-to-power projects and the Philippines' waste-to-energy case, investment depends on aligning revenue and cost-recovery mechanisms, risk allocation, infrastructure and contract timing, and local government arrangements. Across the other cases, recurring issues include establishing credible environmental attributes, identifying cost bearers or off-takers, and sequencing policy, infrastructure, and financing decisions.

To make these constraints easier to identify and address, Catalyst proposes a practical framework built around three dimensions: **Feasibility, Eligibility, and Bankability**. Together with the **Entry Point matrix**, this provides a shared language for project owners, governments, and financiers to diagnose the binding constraint and identify the support needed to move a project towards investment. The framework helps move beyond the broad conclusion that a project is 'not yet bankable' towards a more actionable understanding of what is holding it back. By separating constraints project by project, Catalyst can identify which policy, market, technical, or financing levers need to be combined, in what sequence, and with which stakeholders. This approach will facilitate dialogue with governments, MDBs, financial institutions, and other initiatives, while bringing recurring lessons from individual projects into wider policy and financing discussions. In this way, support to individual projects can also contribute to improving the enabling conditions for the wider project pipeline.

Catalyst is a co-ordination and problem-solving platform, not a financing or approval body. It neither creates demand for finance nor provides or guarantees financing. Instead, it helps projects address feasibility and bankability constraints so that public and private financiers can participate within their own mandates and risk appetites. Eligibility may broaden the range of potential capital providers, but does not by itself make a project financeable. Engagement with Catalyst does not provide or guarantee financing, constitute project approval or endorsement, or replace the technical and commercial due diligence undertaken by the relevant institutions.

The report also identifies several cross-project implications for strengthening transition finance in the region. First, **energy security and resilience** – including grid stability,

security of energy supply and/or greater self-sufficiency, localisation of supply chains, and system flexibility – should be re-emphasised as areas for further exploration. Second, it proposes an **ecosystem approach**, under which complementary technologies and infrastructure are assessed together as part of a decarbonisation pathway. This reflects the reality that many transition outcomes can only be achieved through co-ordinated action across an entire value chain or energy system. Third, it sets out practical actions to move projects towards FID, spanning policy alignment, regulatory and market design, technical evidence, and access to finance across project stages.

Going forward, Catalyst aims to build on these ideas by becoming a continuing platform for project diagnosis, cross-project learning, and dialogue amongst project owners, governments, MDBs, and financial institutions. Increasing the volume of financing mobilised is not the main focus. Rather, by linking practical project support with broader policy and financing reform, Catalyst aims to help projects overcome feasibility, eligibility, and bankability constraints and become investable, thereby strengthening Southeast Asia's pipeline of resilient and credible transition projects.

Chapter 1

Background and Objectives

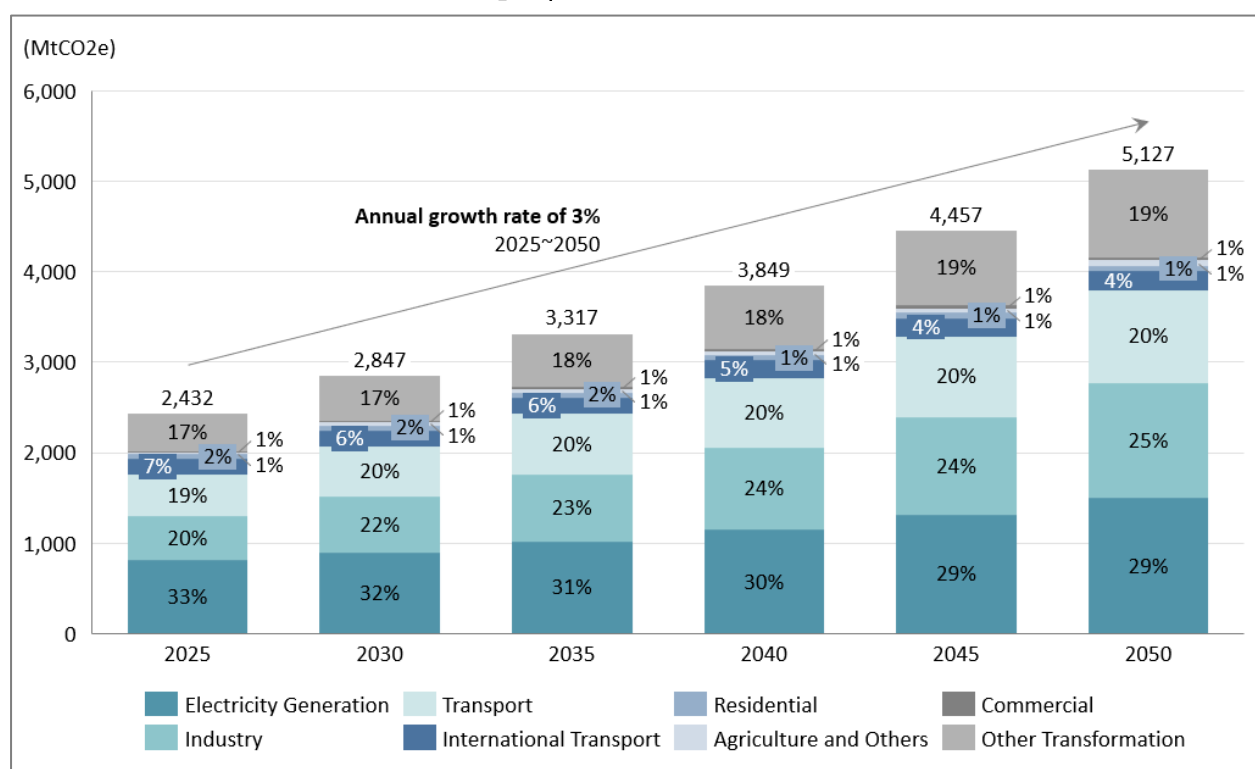
The discussion around Southeast Asia's energy transition has been driven largely by decarbonisation, yet geopolitical risk and energy security and resilience have rapidly come to the forefront as real, present-day constraints. Heightened tensions in the Middle East and concerns over supply can have a direct bearing on Southeast Asia – a region that depends on the Middle East for roughly 60% of its crude oil imports and around one-third of its gas imports, and where fossil-fuel subsidies, which stood at around US\$40 billion before the crisis, are set to rise sharply in 2026 as governments shield households and firms from higher fuel prices, resulting in fuel-price volatility and supply uncertainty (IEA, Southeast Asia Energy Outlook 2026). How to maintain a stable and reliable energy supply even amidst such external shocks has become a pressing issue that can no longer be discussed in isolation from decarbonisation.

ASEAN's unique position in the global decarbonisation agenda has been increasingly recognised and reflected in a growing regional consensus. Specifically, Southeast Asia must decarbonise while accommodating continued economic growth and rapidly rising energy demand. With power and industry accounting for roughly half of regional emissions, and fossil fuels still providing around 70% of electricity generation, annual emissions could grow by around 3% and double between 2025 and 2050 without further action (Figure 1.1, ACE 2024; ERIA–ADB–METI 2025). Addressing this challenge will require more than expanding renewable generation. Significant investment is also needed in grids, system integration and flexible capacity, as well as in hard-to-abate power and industrial assets where decarbonisation remains technically and economically challenging.

However, current financing remains concentrated in green assets, leaving many emissions-intensive sectors underserved. Achieving ASEAN's strengthened renewable energy targets and moving projects towards the decarbonisation pathway will therefore depend on mobilising transition finance¹ that directs capital not only to renewables, but also to the infrastructure, technologies and credible corporate transition strategies needed to decarbonise the region's expanding energy system – 'successful transitions need finance that goes where the emissions are' (IEA 2025).

¹ The LMA's Guide to Transition Loans (LMA/APLMA/LSTA, October 2025) distinguishes two related but distinct concepts: 'financing the transition'—the economy-wide mobilisation of all capital, labelled and/or unlabelled, that supports decarbonisation—and 'labelled transition finance', a transaction-level subset comprising instruments such as sustainability-linked loans, transition loans and hybrid structures. Unless otherwise stated, 'transition finance' in this report refers to the former – 'financing the transition'.

Figure 1.1. Annual Emissions of Southeast Asian Countries by Sector, 2025–2050
(Mt CO₂-eq, baseline scenario)



Note: Emissions roughly double over the period ($\approx 3\%$ annually), with electricity generation and industry together accounting for about half.

Source: 8th ASEAN Energy Outlook (ACE).

Additionally, in light of recent global developments, the importance of energy security and resilience has increased further in the region. In this report, energy security and resilience broadly refer to the ability of an energy system to maintain a reliable and affordable energy supply amidst disruptions. Energy security relates particularly to the availability and diversity of energy supply, while energy resilience refers to the system's ability to withstand, absorb, and respond to shocks, including supply disruptions, demand fluctuations, and grid instability. As used in this report, energy resilience does not refer to climate adaptation. Renewable energy expansion is indispensable. However, as the share of variable renewables rises, flexibility, grid stability and supply reliability become increasingly important. Renewable generation alone cannot yet guarantee a stable and reliable electricity supply, and a transition without these enabling conditions may increase the risk of disruptions and grid instability. This report therefore positions energy security and resilience as important considerations in transition finance, particularly in ASEAN. Extreme weather threatens infrastructure and supply reliability, while geopolitical and fuel-price uncertainty is driving divergent responses, including coal reversion, generation-mix diversification and faster renewable deployment (IEA, Climate Resilience for Energy Security in Southeast Asia 2024; Southeast Asia Energy Outlook 2024). A realistic pathway must advance the transition while preserving resilience and maintaining course on the decarbonisation pathway.

Initiatives and Existing frameworks to address unique ASEAN needs

Over the past several years, ASEAN has steadily built up the 'foundations' of transition finance. As a common regional classification framework, the **ASEAN Taxonomy for Sustainable Finance** (Version 4, November 2025) provides a common and flexible classification framework, with a traffic-light approach that classifies economic activities as green, amber (transitional), or red, together with two assessment frames (the principles-based Foundation Framework and technical screening criteria-based Plus Standard) to accommodate actors with different starting points towards a common ambition (ASEAN Taxonomy Board). National taxonomies and classifications of transitional activities in Singapore, Thailand, Indonesia, Malaysia, the Philippines, and others, as well as the **ASEAN Transition Finance Guidance** (version 2, October 2024), complement this framework by reflecting local conditions and supporting the assessment of credible transition plans (ACMF 2024). International norms on credibility, disclosure, and traceability are also taking shape, including ICMA's Climate Transition Finance Handbook, CBI, NZBA, and the loan market's Transition Loans Guidance. ERIA and the region's discussion platform, the ATF Study Group (ATF SG), have likewise contributed to building knowledge through the Asia Transition Finance Guidelines (2022), technology lists, and the joint ERIA-ADB-METI report, amongst others (ERIA-ADB-METI, 2025).

Figure 1.2. The Contribution of ERIA and the ATF SG to Building the Foundations

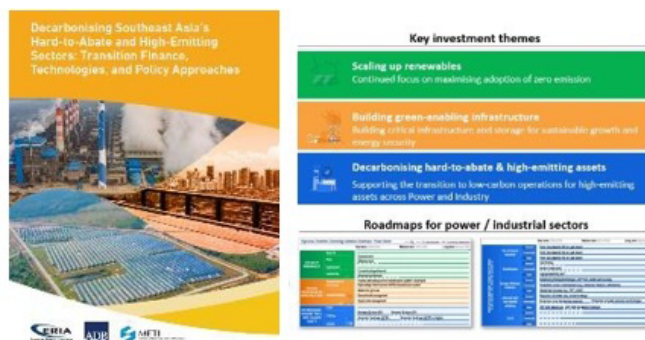
Asia Transition Finance Study Group (ATF SG)

- ATFSG offers a discussion platform for stakeholders within the region to share their challenges on transition finance and discuss way forward
- Joined by 40+ financial institutions and government organizations



ERIA–ADB–METI Joint Report (2025)

- ERIA engages with governments, industry players and financial institutions to take necessary actions
- The report is a joint study on financing the decarbonisation of Southeast Asia's hard-to-abate and high-emitting sectors (power and industry)



Technology List and Perspectives for Transition Finance in Asia (TLP, 2025)

- ERIA provides researches and insights to help stakeholders' understanding on topics related to transition finance and support their decisions
- TLP is a catalogue of transition-relevant technologies with technical overviews and perspectives on their role in transition finance



Source: Created by the Authors, based on Decarbonising Southeast Asia's Hard-to-Abate and High-Emitting Sectors: Transition Finance, Technologies, and Policy Approaches (ERIA, ADB and METI, 2025); and the Technology List and Perspectives for Transition Finance in Asia (ERIA, 2025).

These frameworks are complemented by several targeted financing mechanisms. The ASEAN Catalytic Green Finance Facility, an ASEAN Infrastructure Fund initiative managed by ADB that uses the ASEAN Taxonomy and national taxonomies as screening criteria, helps governments prepare and finance green infrastructure projects. ADB's Energy Transition Mechanism supports the early retirement or repurposing of coal assets and investment in clean energy. Singapore's Financing Asia's Transition Partnership, or FAST-P, aims to mobilise up to US\$5 billion for green and transition projects in Asia. The Just Energy Transition Partnerships for Indonesia and Viet Nam were launched with initial financing packages of US\$20 billion and at least US\$15.5 billion, respectively, to support power sector decarbonisation and a just transition.

Together, these efforts show that ASEAN is building a practical model based on common standards, flexibility for national circumstances and focused finance. The main challenge is now to turn these frameworks and financing commitments into bankable projects and measurable emissions reductions while maintaining energy security, affordability and economic growth.

Remaining challenges and the role of this report

Despite progress in transition finance frameworks, the number of projects in Southeast Asia that have reached final investment decision (FID) is still small compared to their potential, and capital is still not reaching projects at the pace required. The main constraint now lies in the final implementation phase, where policy, regulatory, market, and financing conditions must align for each project. Southeast Asia accounted for just 2% of global clean-energy investment as of 2023 — far below its share of global GDP (6%), energy demand (5%) and population (9%) (IEA, Southeast Asia Energy Outlook 2024). The challenge, therefore, is no longer solely to develop transition finance frameworks, but to translate them into investable projects that can secure capital.

With the foundations now in place, the region's common need is shifting from the stage of popularising transition finance as a high-level concept to the stage of moving individual projects forward and structuring them into concrete deals. AITF Catalyst is a pilot initiative launched with the intent of supporting this 'take-off'. Through its first year of project-level support, AITF Catalyst has worked to identify and diagnose the factors preventing projects from accessing capital and to address constraints across the policy, regulatory, market, and financing dimensions.

Drawing on this experience, the report presents Catalyst's first year of activities in Chapter 2, the resulting policy proposals in Chapter 3, its project-support methodology in Chapter 4, and the outlook ahead in Chapter 5. Its central aim is to translate recurring project-level barriers into broader structural challenges and actionable policy messages that can help accelerate project development and capital mobilisation across the region.

Chapter 2

AITF Catalyst Overview

AITF Catalyst is a pilot-stage initiative, launched to help individual projects reach financing – the ‘take-off’ at a time when the foundations of transition finance are coming together. This chapter gives an overview of what the initiative addresses, the thinking that guides it, who it has worked with, and the cross-cutting lessons drawn from its first year of activity.

2.1. Scope and design of AITF Catalyst

Catalyst focuses on projects that advance Southeast Asia’s energy transition, which, despite progress on the technology and the surrounding regulatory frameworks and guidelines, has yet to secure adequate financing. Catalyst aims to cover a wide range of projects, including renewable energy, grid infrastructure, and integration systems, as well as the hard-to-abate parts of the power and industrial sectors where decarbonisation is technically or economically challenging. Geographically, all ASEAN Member States are included in the scope, engaging with projects while taking account of differences in national energy plans and transition pathways. It is important to note that Catalyst does not endorse specific projects as ‘transition.’ Its role is to support each project while examining the conditions that these projects must satisfy to maintain alignment with the decarbonisation pathway. This report is also voluntary and non-binding; credit decisions and assessments of transition alignment are ultimately left to project developers and financial institutions. Catalyst serves as an enabling platform that helps create the conditions for private and public capital to participate, rather than a mechanism that guarantees financing.

For project selection, Catalyst deliberately engages with several projects at the same time, each with different constraints, so that the shared structural challenges become clear. The projects are initially introduced through memoranda of understanding (MOUs) concluded under the Asia Zero Emission Community (AZEC) framework, or through the pipelines of development finance institutions. When choosing amongst them, Catalyst reviews the full set of AZEC MOUs, maintains diversity across value chains, and checks the willingness of project owners to proceed. Catalyst has worked with project owners and the relevant institutions to diagnose and address the bottlenecks they face.

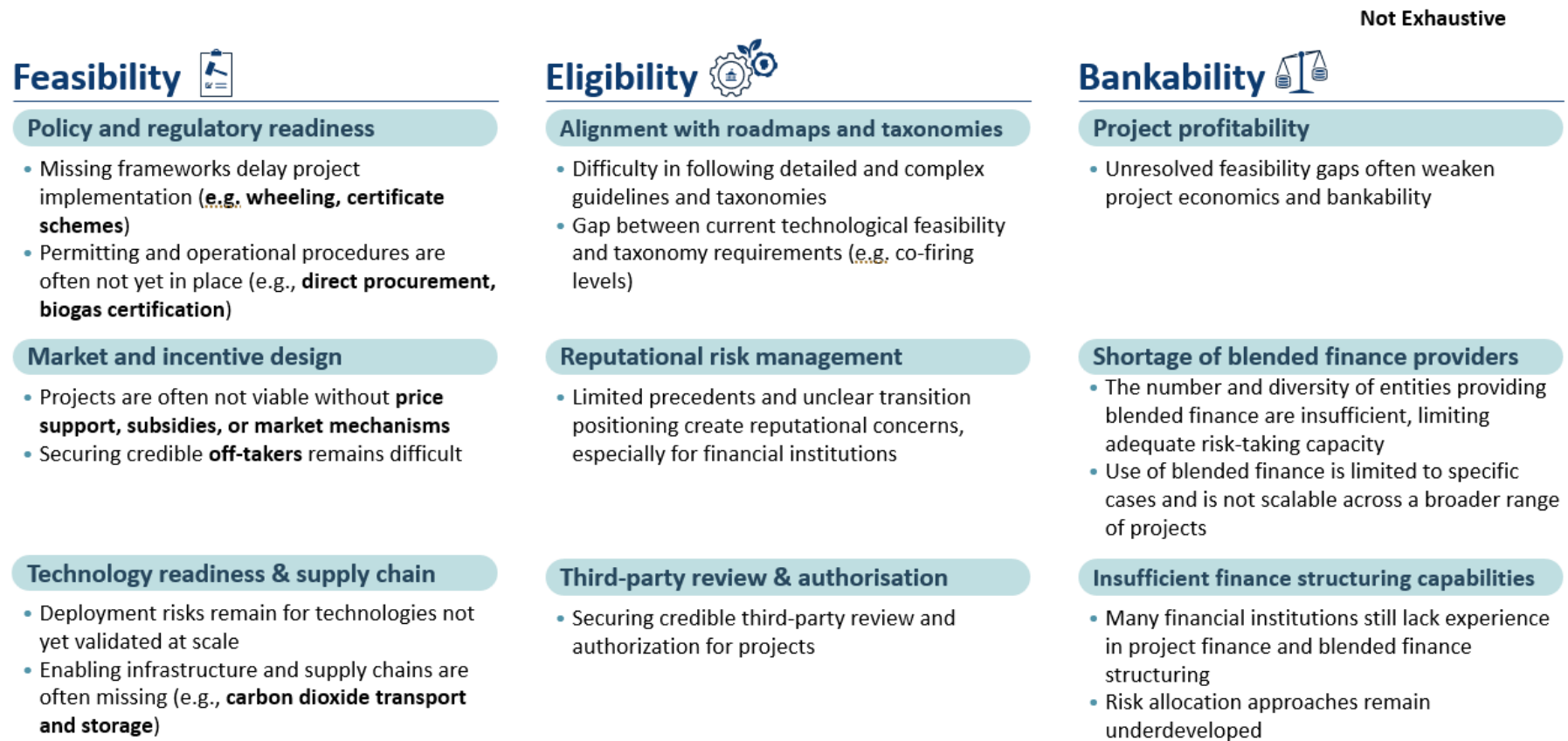
2.2. Support Approach

Catalyst’s starting point is to diagnose where a project is facing difficulties and contextualise these issues using a shared language or within a common framework of understanding. The constraints facing individual projects look diverse, but separating them along three dimensions – feasibility, eligibility, and bankability – provides a clearer picture

of where the essential bottleneck lies. Feasibility refers to the assurance of the necessary preconditions for a project to proceed. For example, the state of policy and regulation, technological maturity and the supply chain, and the design of markets and incentives. Eligibility concerns alignment with applicable transition criteria and the resulting ability to access pools of capital that apply those criteria. Meeting eligibility requirements can widen access to capital but does not by itself make a project bankable. This includes alignment with transition pathways and taxonomies, management of reputational risk, and third-party review and certification. Bankability covers whether the project is viable as an investment. The economics, allocation of risk, supply of blended finance, and financing and structuring capacity are emphasised.

These three axes form a map for diagnosing projects in a shared language, separating the constraints and applying the appropriate solutions for each (Figure 2.1). Following this map, Catalyst identifies where the binding constraint lies for a given project and works on core constraints that project owners cannot resolve independently. How the three axes are applied to position projects in practice is discussed in Chapter 3. The detailed methodology, from diagnosis through identifying the constraint to selecting the remedy and execution, is discussed in Chapter 4.

Figure 2.1. Feasibility, Eligibility, and Bankability – The Three Concepts and Their Typical Bottlenecks



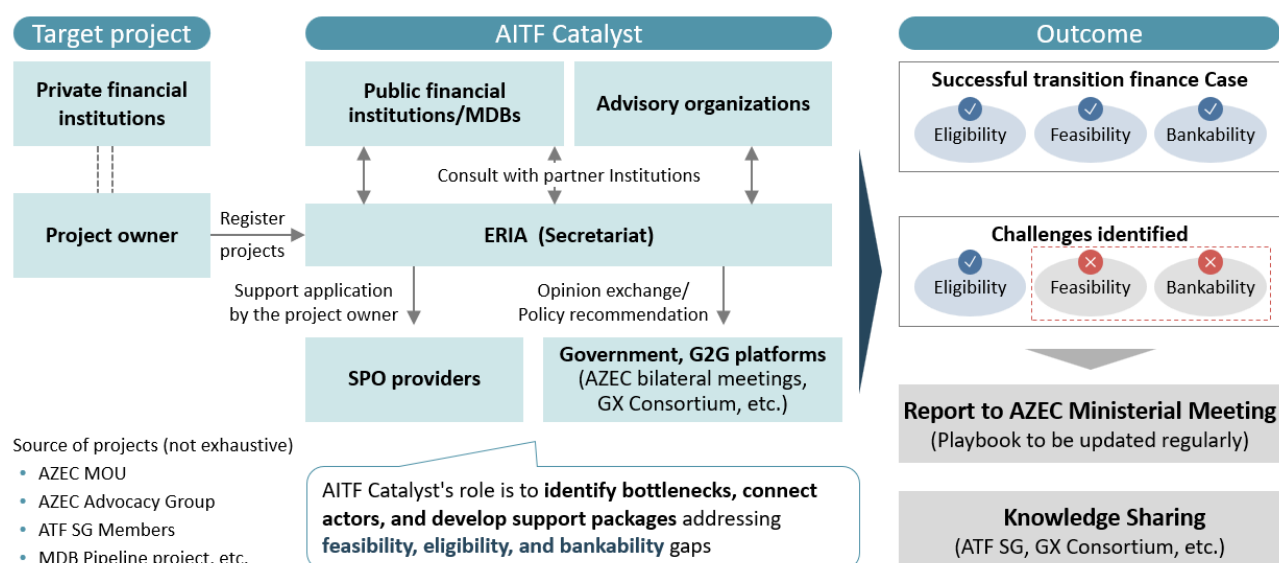
Source: Authors.

2.3. Stakeholders and Governance

Catalyst's work is based on the involvement of multiple actors with different characteristics. ERIA, as secretariat, supports the initiative as a whole and, receiving projects proposed by sponsors and private financiers, acts as a bridge between the parties. Government actors such as Japan's Ministry of Economy, Trade and Industry (METI) have provided direction and impetus through the AZEC framework, while multilateral development banks and public financial institutions such as the Asian Development Bank (ADB) have contributed perspectives as partners in blended finance and financing design. In addition, other advisory bodies and government-to-government (G-to-G) co-operation platforms also contributed to and advised on this initiative. Working together, these actors make it possible to address the constraints associated with a project from multiple perspectives.

Within this arrangement, Catalyst's role is to act as an impartial intermediary amongst projects, regulators or governments, and financial institutions. As a third-party facilitator, Catalyst decomposes complex challenges faced by projects into smaller, addressable issues that can be addressed from business, regulatory, and financial angles. This is a unique support structure, which is planned to be developed further in the future (Chapter 5).

Figure 2.2. The Catalyst-Centred Stakeholder Map



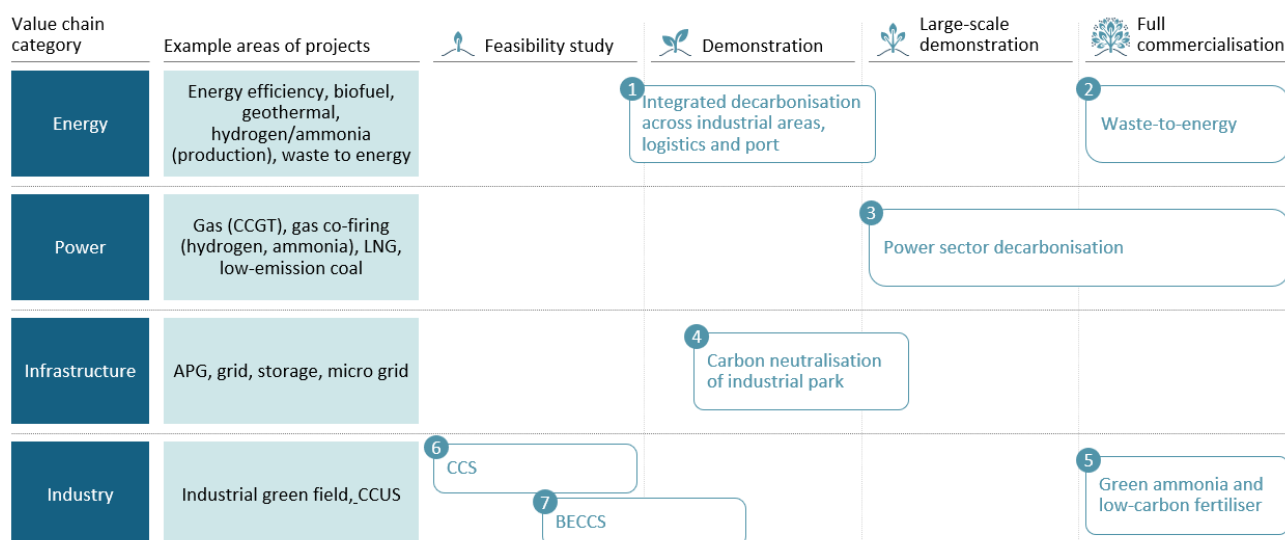
AITF = AZEC Inclusive Transition Finance, ATF SG = Asia Transition Finance Study Group, AZEC = Asia Zero Emission Community, ERIA = Economic Research Institute for ASEAN and East Asia, G2G = government to government, GX = green transformation, MDB = multilateral development bank, MOU = memorandum of understanding, SPO = second-party opinion.

Source: Authors.

2.4. Project Overviews

In its first year, Catalyst engaged simultaneously on a range of pilot projects spanning the energy, power, and industrial sectors. These projects are widely distributed across the technologies they address and their stages of development – feasibility study, demonstration, large-scale demonstration, and commercialisation. Yet, they share a common feature: rather than stopping at a single technology or a single facility, they seek to reconcile decarbonisation and energy resilience across the value chain, from procurement through supply to end use. Some take an integrated view of multiple uses and infrastructure components and seek to decarbonise across the whole supply chain. The sections below organise, by area, the challenges identified through these projects and the directions now under consideration. In all cases reviewed, the main constraint is the lack of alignment of policy, institutional, market, and financing factors during the implementation phase, rather than technical viability alone.

Figure 2.3. Mapping of Pilot Projects



APG = ASEAN Power Grid; ASEAN = Association of Southeast Asian Nations; BECCS = bioenergy with carbon capture and storage; CCS = carbon capture and storage; CCGT = combined cycle gas turbine; CCUS = carbon capture, utilisation, and storage; LNG = liquefied natural gas.

Source: Authors.

2.4.1. Integrated decarbonisation across industrial areas, logistics, and port – Indonesia

Project overview and current status

The Eastern GX Corridor (EGXC) is an area-based initiative linking three demand areas: industrial parks east of Jakarta, logistics between the parks and the port, and Patimban International Port and shipping. Under an MOU announced in 2024, PT Pertamina (Persero) and PT Toyota Tsusho Indonesia agreed to undertake a joint study and project development for the supply of carbon-neutral fuels across the EGXC. The concept intends to connect

industrial, transport, and port decarbonisation rather than treating each application in isolation (METI, 2024: 38).

Five principal pathways are planned: green electricity and electrification, B100 biodiesel,² biomethane, hydrogen, and ammonia. These pathways are at different stages of maturity and are relevant to different uses across the EGXC. The timeline, initial demonstration, final investment decisions, and demonstration construction will progress gradually from FY2026 depending on the development status. Commercial operation is expected to begin as early as FY2028 (METI, 2026b: 2–4 and 7).³

Bottlenecks

Based on Catalyst's review and stakeholder discussions, the central challenge is to align feasibility, eligibility, and bankability across several energy carriers and demand areas that do not mature at the same pace. A single EGXC vision can help aggregate demand and co-ordinate infrastructure, but it does not remove the need for each use case to establish a workable supply route, credible environmental claims, and a commercial structure suited to its stage of development.

On feasibility, green electricity and electrification depend on aligning power procurement, grid access, and connection arrangements with the timing and load profile of industrial, logistics, and port equipment. Wider use of B100 depends on a licence for trading B100, sustainable feedstock, fuel quality, distribution arrangements, and compatibility with the relevant vehicles and equipment. For biomethane, potential supply and industrial demand may be geographically separated, so pipeline connectivity, gas quality, transport options, and project scale affect whether physical delivery is practical. Hydrogen and ammonia are longer-term options whose deployment will require demand, production and transport infrastructure, compatible equipment, permitting, and safe handling arrangements to develop together. The issue is therefore one of realistic sequencing and co-ordination rather than selecting one pathway for immediate corridor-wide deployment.

On eligibility, users and financiers need confidence that the environmental benefit of each pathway is defined and can be evidenced. Renewable electricity claims must align with the applicable procurement and attribute accounting rules. Biodiesel and biomethane require credible sustainability and traceability evidence. Hydrogen and ammonia require transparent treatment of production emissions, chain of custody, and sector-specific safety requirements. Biomethane presents an additional issue when renewable gas is injected into a shared network or when the physical supply and demand are not directly connected. In such cases, any attribute mechanism must have auditable issuance, transfer, and retirement records, along with clear governance and explicit safeguards against

² 'B100' denotes a biodiesel blend level of 100%.

³ On the FY2026 demonstration and FY2028 commercialisation schedule, see METI (2026: 38, note 2).

double counting. Current sustainability certification can provide a useful foundation, but it does not by itself settle every downstream claim or domestic accounting question.

On bankability, the five pathways have different cost structures, infrastructure needs, and degrees of demand certainty. Early applications may be relatively small or fragmented, while enabling infrastructure requires sufficient utilisation and predictable revenues. Long-term or otherwise credible demand, an acceptable allocation of supply and performance risks, and clarity over who bears conversion and infrastructure costs will therefore be important. Biodiesel scale-up will depend on the development of sustainable feedstock sources. However, the long period between cultivation and revenue generation can discourage investment, highlighting the need for financing mechanisms that help bridge this gap. For biomethane, broader uptake depends not only on the ability to supply gas but also on whether customers can credibly recognise its environmental value and justify any premium. A certificate or registry could help organise that value, but it would support bankability only if its claims, governance, and market acceptance are sufficiently robust.

Future directions

The direction for support at this stage is to develop the EGXC through a phased, carrier-specific approach. Nearer-term assessment can focus on applications for which technology, demand, and operating requirements are more visible, including practical forms of green electricity procurement and electrification, selected biodiesel uses, and biomethane for industrial heat. Hydrogen and ammonia can remain within the longer-term corridor pathway, while suitable use cases, infrastructure, safety requirements, and policy conditions are developed further. This sequencing would preserve the integrated corridor concept while allowing each element to advance at a pace consistent with local business and regulatory conditions.

Biomethane has the potential to support decarbonisation of the corridor and create additional value for Indonesia's palm oil industry through the productive use of palm oil mill effluent (POME)-derived gas. To achieve this, the direction under consideration is to use physical delivery where supply and infrastructure can be connected economically, and to assess an auditable attribute mechanism where environmental attributes may need to be transferred separately. One option would be to establish a certificate or registry mechanism supported by recognised sustainability evidence and linked issuance and retirement records. To avoid double counting, sustainability credentials, carbon value, and renewable gas attributes would need to be distinguished and appropriately governed. The institutional arrangements, registry operator, claims rules, and compatibility with existing Indonesian and international systems would also need to be tested before any broader policy recognition or incentive mechanism is considered. At this stage, this should be treated as a design option for further assessment rather than a settled approach. However, it is important to align upstream producer incentives with downstream demand so that value is shared across the supply chain and feedstock supply remains dependable at a commercial scale.

For bankability, initial projects could be used to clarify demand, contracting terms, infrastructure requirements, and the residual risks that commercial finance cannot readily absorb. Once feasibility and eligibility are sufficiently stable, the potential role of catalytic capital, risk-sharing instruments, or development finance participation could be considered for those remaining gaps. Over the medium term, aggregation across multiple corridor applications may help create a more financeable scale, but any such structure would need to preserve transparent project selection, credible claims, and clear allocation of risks.

Looking ahead, the immediate analytical focus would be on whether a credible biomethane certificate and registry approach can support industrial decarbonisation and wider demand formation, alongside continued assessment of the other pathways as their use cases mature. Any pilot, policy recognition, financing structure, or wider regional co-ordination would remain subject to further assessment and stakeholder discussion.

2.4.2. Waste-to-Energy – Philippines

Project overview and current status

Waste-to-energy (WtE) is gaining relevance in ASEAN as cities face rising waste volumes and limited landfill capacity. ASEAN municipal solid waste generation is projected to increase from about 143.7 million tonnes in 2016 to 188.8 million tonnes in 2030; in the Philippines, it is projected to rise from around 14.6 million tonnes to 20.0 million tonnes over the same period (ASEAN, 2023: 139). WtE can complement recycling and other waste management measures by treating residual waste while recovering energy.

The Philippine government has moved towards a more concrete enabling framework and project pipeline. The Department of Energy has launched a dedicated Special Green Energy Auction for pioneer WtE projects, while the Energy Regulatory Commission approved a reserve price of ₱9.2959 per kilowatt-hour, and the auction target was increased to 400 megawatts (MW) in July 2026 (Department of Energy, 2026; Energy Regulatory Commission, 2026).⁴ The auction is structured in lots by the highly urbanised cities supplying the waste – Metro Manila, Bacolod, Cebu, Cagayan de Oro, and Davao – with further proposals under preparation including New Clark City (Public-Private Partnership Center of the Philippines, n.d.). These developments provide a strong platform for the sector. The next phase is to work through project-specific technical, commercial, environmental, and financing issues so that individual projects can advance towards implementation. Catalyst collaborated with a potential project owner to discuss WtE potential and bottlenecks in the Philippines.

⁴ See also Department of Energy Circular No. DC2026-04-0011 dated 17 April 2026 on Prescribing Amendments to Department Circular No. DC2025-12-0028.

Bottlenecks

Philippine WtE projects face three connected challenges. First, projects require sufficient and predictable residual waste with suitable quality. While aggregate waste volumes in the target cities suggest that overall availability is unlikely to be a major constraint, the Department of Energy framework still requires project-level feedstock assurance.⁵ Waste delivery and performance can be affected by fragmented collection and, in some cases, the need to co-ordinate supply across multiple local government units (LGUs). The commitment of LGUs and the reliability of collection and transport, including during the rainy season, therefore remain site-specific issues.

Second, bankability depends on several revenue and implementation elements working together. Electricity revenue must be aligned with an affordable tipping-fee structure, LGU payment arrangements, grid connection, permitting, technology performance, and emission controls. Uncertainty in any of these areas can affect the project cost, schedule, and financing. Permitting and co-ordination risks can increase when multiple LGUs and national agencies are involved. Location within an economic zone may streamline some administrative interfaces, although applicable environmental approvals are still required.

Third, financing structures for the larger pioneer projects targeted by the auction are still being established in the Philippine market. A World Bank review identified high investment costs, financial viability, and access to finance amongst the principal challenges for WtE adoption in the country (World Bank, 2025: 85–89). Projects that combine municipal waste obligations, power revenues, and technology-performance risks may therefore require more detailed due diligence, stronger contractual allocation, and targeted risk mitigation than established infrastructure assets. Social acceptability may also affect project timelines, particularly where stakeholders are hesitant to adopt unfamiliar technologies or move away from established waste management practices.

Future directions

The immediate priority is to advance credible projects with verified waste supply, workable tipping-fee and electricity-revenue arrangements, clear permits, and suitable technology. Feasibility work, environmental and social assessment, co-ordinated contracting, and early engagement with financiers can progressively increase confidence in each project.

Continued policy certainty – including a stable auction framework, clear environmental requirements, and durable LGU arrangements – would help government, local authorities, sponsors, technology providers, commercial lenders, and development finance or catalytic-capital providers allocate risks to the parties best able to manage them. Public or concessional support can be targeted to project preparation, specific early-stage risks,

⁵ Department of Energy Circular No. DC2025-11-0026 dated 3 November 2025 on the Framework for the Integration of Waste-to-Energy Facilities in the Country's Power Generation Mix to Implement the Clean Energy Scenario Under the Philippine Energy Plan 2023–2050, Providing Incentives for Pioneer Waste-to-Energy Projects and Supplementing the Green Energy Auction Program Guidelines Under Department Circular No. DC2021-11-0036 for the Purpose.

payment-risk mitigation, or financing tenor where it demonstrably helps mobilise private capital.

The Philippines can also draw on financing and operating experience that has been developed elsewhere in ASEAN, including municipal WtE investment in Viet Nam and financed WtE portfolios in Thailand (ADB, 2017; 2026). Successful delivery of one or more projects would provide the local track record needed to refine contracts, due diligence standards, and financing terms. These locally tested structures could then support replication across a broader domestic project pipeline.

2.4.3. Decarbonising the power sector

Major ASEAN Member States focus on expanding renewable energy in their power development and net zero plans. However, they still face challenges in securing the flexibility needed to complement variable renewables, reinforcing and connecting power grids, and shaping the transitional generation mix. Catalyst has engaged with projects related to power sector decarbonisation and has deepened its understanding of the challenges during implementation.

In several ASEAN Member States, gas-fired generation is expected to play an intermediate role as power systems transition from coal to greater renewable penetration. Depending on the national context, and taking into account the availability and economics of alternatives (e.g. storage, demand-side flexibility, grid reinforcement and interconnection, and other firm low-carbon resources), gas-fired generation can provide firm and flexible capacity alongside variable renewables. Its contribution to resilience is context-specific: domestic gas resources, diversified procurement, and fuel-storage arrangements can strengthen resilience, while high import dependence and additional infrastructure requirements may increase exposure to international prices and supply disruption. Where such assets are expected to operate into the net-zero target years, their development should be considered against the relevant national transition pathway, including the potential staged deployment of appropriate emissions-reduction measures such as carbon capture and storage (CCS), low-carbon hydrogen, biomethane, or synthetic methane. The appropriate mix and timing will vary by project and country context, reflecting technological maturity, lifecycle-emissions performance, availability, and economic feasibility, with project-specific milestones developed as the design and supporting evidence mature.

Several constraints have emerged for these projects. Key equipment, including floating storage and regasification units (FSRUs) and gas turbines, is in short supply, while large advance payments to reserve equipment are becoming a burden for developers. From a financial taxonomy perspective, several frameworks have established eligibility criteria for gas-fired generation. For example, the ASEAN Taxonomy for Sustainable Finance has set quantitative technical screening criteria for gas-fired power (ASEAN, 2025), and the IEA has provided a set of key performance indicators (KPIs) for supply chains, such as methane emissions intensity (IEA, 2025b). Yet, many projects in the pipeline that are necessary for

the country's energy plans (which have a net zero pathway) do not qualify as 'transition' projects under these eligibility criteria. This suggests a need to consider how these projects can be structured to maintain progress on decarbonisation while meeting regional energy needs.

Looking ahead, possible directions include designing energy transition projects in stages, not as a stand-alone asset but as an ecosystem that incorporates decarbonisation technology throughout the value chain, and evaluating it against the country's transition pathway. This 'ecosystem' concept and its considerations going forward are elaborated in Section 3.1.

LNG to Power – Viet Nam

Project overview and current status

Viet Nam's power development pathway places renewable expansion at the core, while rapidly expanding reliable power supply remains important to support the country's ambitious economic growth objectives. The large-scale power shortages experienced in northern Viet Nam in 2023 highlighted the importance of system adequacy and resilience (Ministry of Industry and Trade, 2023a; 2023b). At the same time, Viet Nam's coal-heavy generation mix contributes significantly to power sector emissions, which is becoming an increasingly important consideration for manufacturing and other power-intensive industries seeking to expand in the country.

In this context, Viet Nam's updated National Power Development Plan VIII (PDP8) includes gas-fired generation as part of the energy transition. This type of generation helps provide firm and flexible capacity alongside expanding renewables.⁶ Specifically, gas-fired generation can provide reliable and flexible capacity to complement variable renewables, while high-efficiency combined-cycle gas generation can displace more carbon-intensive alternatives, helping lower average grid emissions (IEA, 2024). With limited scope for major expansion of large-scale hydropower and coal-fired generation, gas and liquefied natural gas (LNG) can support both renewable integration and system stability. Recent geopolitical and energy market volatility has reinforced the importance of energy security, diversified fuel procurement, and increased fuel storage capability, including through the use of domestic gas resources and appropriately structured long-term LNG procurement. At the same time, since these assets may operate into the net zero target years, their development needs to remain consistent with the longer-term decarbonisation pathway, including the potential migration to hydrogen envisaged under the revised PDP8, subject to technological and economic feasibility.

Against this backdrop, the revised PDP8 plans for about 22.5 gigawatts (GW) of LNG-fired power, 10.9–14.9 GW of domestic gas-fired power, 46.5–73.4 GW of solar, and 10.0–16.3

⁶ Decision of the Prime Minister No. 768/QĐ-TTg dated 15 April 2025 on Approving the Adjustment of the National Electricity Development Planning for the 2021–2030 Period, With a Vision to 2050.

GW of battery storage by 2030. The projects described in Table 2.1 (Quang Ninh, Thai Binh, and O Mon II) are positioned as part of this policy effort to meet rising demand while diversifying sources of supply and improving system flexibility (AUS4GROWTH, 2026; Frasers Law Company, 2025). Other LNG-to-power initiatives are also being pursued under different development structures, including the Son My LNG-to-power chain (Tạp chí Năng lượng Việt Nam [Vietnam Energy Magazine], 2023). Son My 1 is being developed under a build–operate–transfer (BOT) structure by a consortium led by EDF alongside Pacific Corporation, Sojitz Corporation, and Kyushu Electric Power Co., Inc. (Tạp chí Năng lượng Việt Nam [Vietnam Energy Magazine], 2024; EDF, 2018). Son My 2 is planned with the AES Corporation (AES) as the generator and the associated LNG terminal development by AES and PV Gas (AES, 2021, 2023).

As part of Catalyst’s work in Viet Nam, stakeholder interviews covered projects involving imported LNG receiving, regasification, and power generation, as well as projects linking domestic gas fields, pipelines, and power plants. These need to be understood not as stand-alone power plants but as integrated value chains spanning fuel procurement, infrastructure, generation, grid connection, and electricity offtake. Table 2.1 provides an overview of these projects and their status.

Table 2.1. List of Related Projects in Viet Nam

Project	Project Overview and Status
Quang Ninh LNG to Power	The project integrates an onshore LNG receiving terminal and a 1.5 GW gas-fired power plant in Cua Ong, Quang Ninh Province, covering the chain from LNG procurement through electricity sales to EVN.^a PV Power, COLAVI, Tokyo Gas, and Marubeni have established Quang Ninh LNG Power JSC as the project company for the development and implementation of the project, and obtained approval for the feasibility study report from the Ministry of Industry and Trade in 2024. Negotiations for the main project agreements, including power purchase agreements, are ongoing.
Thai Binh LNG to Power	The project integrates an offshore LNG receiving terminal, FSRU/regasification facilities, and a 1.5 GW power plant in Dong Thai Ninh Commune, Hung Yen Province.^{b,c} Tokyo Gas, Kyuden International, and Truong Thanh Vietnam Group have established Thai Binh LNG Power JSC as the project company for the development and implementation of the project.
O Mon II Gas-to-Power	O Mon II forms part of a domestic gas-to-power value chain linking the Block B gas fields, pipelines, and the O Mon power plants.^{d,e} In 2023, an O Mon II GSA Heads of Agreement was announced, and approval was obtained for the feasibility study report from the Ministry of Industry and Trade. Negotiations for the main project agreements, including power purchase agreements, are ongoing.

Project	Project Overview and Status
	A decarbonisation roadmap study by EVN and the Marubeni Consortium was conducted, assessing potential options including hydrogen co-firing and CCS.

EVN = Vietnam Electricity, FSRU = floating storage and regasification unit, GSA = gas sale agreement, GW = gigawatt, JSC = joint stock company, LNG = liquefied natural gas.

^a Tokyo Gas (2022), 'Establishment of Joint Stock Company for Feasibility Study of LNG to Power Project in Vietnam', Press release, 4 November. <https://www.tokyo-gas.co.jp/en/IR/support/pdf/20221104-01e.pdf>

^b Tokyo Gas (2024), 'Establishment of Joint Stock Company for Project Development of LNG to Power Project in Thai Binh Province, Vietnam', Press release, 24 January. <https://www.tokyo-gas.co.jp/en/IR/support/pdf/20240124-03e.pdf>

^c Kyuden International (2024), 'Establishment of Special Purpose Company of LNG to Power Project in Vietnam', Press release, 24 January. <https://www.kyuden-intl.co.jp/en/news/detail/80>

^d Petrovietnam (2023), 'Petrovietnam Signs Framework Agreement on Gas Sale Contract for O Mon II Thermal Power Plant Project', News release, 23 February. <https://www.pvn.vn/sites/en/Pages/detail.aspx?NewsID=e359a256-c0cd-43c2-9bc3-739549266cc4>

^e Petrovietnam (2024), 'Petrovietnam Sign Commercial Agreements for Block B Project Chain', News release, 29 March. <https://www.pvn.vn/sites/en/Pages/detail.aspx?NewsID=d1e4ae17-e75d-41a1-9da8-38ba89473a31>

Source: Authors.

Bottlenecks

The interviews indicated that project progress depends not only on technical viability but also on continued alignment at the implementation stage amongst policy, institutional, market, contractual, and financing conditions. Although the position differs by project, the issues can be organised into three broad areas.

The first concerns the commercial and tariff arrangements that underpin investment certainty. Decree No. 100/2025/ND-CP (amending Decree No. 56/2025/ND-CP) sets out a mechanism for qualifying power projects using domestically exploited natural gas as their main fuel and beginning generation using that gas before 1 January 2036.⁷ Circular No. 29/2026/TT-BCT classifies these projects as indirect participants in the wholesale electricity market.⁸ Decree No. 100 provides that they are to be operated and dispatched at the maximum level permitted by gas availability, subject to fuel constraints, the plant's available capacity and output, and the demand and technical constraints of the national power system. Circular No. 29 also sets out a sequenced approach to curtailment in the event of overload or oversupply. Gas-fired plants subject to maximum gas-use requirements are excluded from the initial variable cost-based curtailment of thermal generation, but their output may be reduced or their units stopped at a later stage if

⁷ Decree No. 100/2025/ND-CP dated 8 May 2025 Amending and Supplementing Decree No. 56/2025/ND-CP dated 3 March 2025 Detailing the Electricity Law on the Electricity Development Master Plan, Electricity Supply Network Development Plan, Investment in the Construction of Electricity Projects, and Bidding for the Selection of Investors for Electricity Business Investment Projects.

⁸ Circular No. 29/2026/TT-BCT dated 2 June 2026 on Operation of the Competitive Wholesale Electricity Market.

required for secure system operation (Article 18(3)(i) and (l)). Accordingly, actual dispatch remains subject to system conditions. Where the applicable gas sale agreement (GSA) includes a minimum offtake or take-or-pay obligation, the project arrangements will need to address how the associated payment obligations are treated if dispatch is lower than the contracted fuel volume. Decree No. 100 further provides that, if domestic gas supply is insufficient to meet the plant's generation needs, the electricity seller and buyer are to agree in the power purchase agreement (PPA) on the fuel-use plan and electricity price in accordance with applicable regulations. In structuring the project, these arrangements will need to address the resulting cash-flow implications and the recovery of fixed costs – such as loan repayment, employment, insurance, and long-term maintenance – that arise regardless of the volume of power generation (gigawatt-hours).

The same Decree No. 100 (amending Decree No. 56) establishes a framework for imported LNG-fired power projects under which the long-term minimum contracted electricity quantity (Qc) must be at least 65% of the multi-year average generation during the loan principal and interest repayment period, for up to 10 years from the start of commercial operations. However, interviewees noted that this Qc level is insufficient to support long-term fixed cost recovery. For qualifying imported-LNG projects developed outside a BOT structure, project revenue is generally expected to combine electricity-market revenue with contract-based settlement under the PPA. The Qc mechanism provides compensation based on the difference between the contracted price and the market price (contract for difference (CfD)) applied to the Qc. However, because actual dispatch is not guaranteed, even a higher or longer Qc level may not provide sufficient certainty for recovering fixed costs and securing project bankability. Rather than further expanding Qc provisions in the PPA, a more effective approach may be to consider a capacity payment-type mechanism that would ensure recovering the fixed costs based on available capacity regardless of actual generation (Government of Viet Nam, 2025; Vietnam Energy, 2026).

Although the law clearly establishes the principle of fuel-price pass-through, it does not explicitly provide the principle of 'fuel-cost' pass-through. Therefore, project-level PPAs do not have sufficient legal ground to negotiate the inclusion of fuel costs and dispatch-related LNG and terminal costs arising under gas supply agreements (GSAs) and LNG sale and purchase agreements (SPAs), including take-or-pay obligations, LNG resale or diversion, demurrage, and other terminal-related charges when a plant is not dispatched into electricity tariffs. Qc, fixed cost recovery, and the allocation of these dispatch-related LNG and terminal costs therefore need to be designed as an integrated package so that sponsors and lenders can assess long-term returns and risks (Hogan Lovells Cadwalader, 2026).

The second is the synchronisation of infrastructure, contracts, and approvals. For imported LNG-to-power projects, the LNG terminal; FSRU; port and marine use; power plant; grid connection; and engineering, procurement, and construction (EPC)/original equipment manufacturer (OEM) procurement need to be managed along the same critical path. For the domestic gas chain, upstream gas fields, pipelines, the power plant, and the GSA/PPA need to progress in step. Delay in any one component can affect the value chain

as a whole. The main integration requirement is co-ordination from receiving the LNG to the electricity offtake for Quang Ninh and Thai Binh, and synchronisation from upstream development to generation for O Mon II.

The third is clarity over the roles and allocation of risk amongst the parties involved. Vietnam Electricity (EVN), the Ministry of Industry and Trade (MOIT), provincial authorities, fuel suppliers, sponsors, EPC/OEM providers, and financial institutions need to work from common assumptions on contractual terms, schedules, and decision points. One specific bottleneck to be considered is around the role of the National Power System and Market Operator (NSMO). As part of the reform of the electricity-sector institutional structure, the former National Load Dispatch Centre was separated from EVN, and the NSMO began operating as a separate state-owned enterprise in August 2024. The NSMO is now under the MOIT. Interview feedback indicates that this separation has created a contractual interface that needs to be clarified in project PPAs. EVN, as the PPA counterparty, has indicated that it cannot assume responsibility for a dispatch shortfall resulting from the NSMO's dispatch instructions, while the NSMO's role is to operate the power system and electricity market and, as it is not the PPA counterparty, it does not provide compensation under the PPA for such a shortfall. From the project perspective, this means that the allocation of revenue risk associated with dispatch shortfalls may not yet be expressly covered by the relevant contractual arrangements. Furthermore, Thai Binh has an important co-ordination requirement concerning the timely development of the associated transmission infrastructure. The responsible investor and implementation arrangements for the planned transmission lines from the power plant to the relevant substations have not yet been confirmed. Continued co-ordination with the MOIT, relevant local authorities, EVN, and/or the National Power Transmission Corporation (EVNNPT) and other relevant parties will therefore be needed to confirm the investment responsibility and delivery arrangements, including the potential role of EVNNPT or another eligible investor, and to align completion of the transmission lines with the power plant's commissioning schedule. This clarity will help provide confidence that the plant can transmit electricity to the grid and support the project's continued development.

To support project implementation, the relevant parties will need to clarify through the PPA or other appropriate arrangements which party bears this risk and what relief or payment mechanism applies where a dispatch shortfall arises for reasons not attributable to the project company.

It is important to note that, in addition to the issues discussed above, there remain other considerations relevant from a financing perspective. These include clearer arrangements for foreign exchange risk, currency convertibility, and overseas remittances; appropriate contractual protections for matters such as a change in law, force majeure, and termination payments; contractual recognition of lenders' rights and involvement; and clearer obligations of state-owned enterprises for enabling infrastructure, including appropriate protections where delays in such infrastructure affect project schedules or dispatch. Continued engagement amongst the relevant stakeholders and appropriate

institutional improvement will be important as these and other financing-related considerations are further developed.

Future directions

Future directions, reflecting the current position of each project, are set out in Table 2.2.

Table 2.2. Future Directions for Individual Projects

Project	Future Directions
Quang Ninh LNG to Power	The direction is to establish a clear and bankable fixed cost recovery mechanism, together with clear conditions for appropriate pass-through of LNG SPA take-or-pay costs and terminal-related charges into electricity tariffs, in a manner harmonised with the existing CfD mechanism. The level and duration of Qc under the PPA should be determined as appropriate in light of these mechanisms and conditions, while the overall arrangements should be aligned with the permitting and grid-connection schedule, with co-ordination and initiative from the relevant authorities as well. This would reduce revenue and schedule uncertainty, enabling project financing and an investment decision to proceed at a lower cost of capital for a project that supports stable LNG procurement and power supply.
Thai Binh LNG to Power	The direction is to align procedures for marine, port, and environmental approvals with FSRU/LNG supply, EPC/OEM procurement, and electricity offtake terms with EVN, while clarifying in the PPA the treatment of Qc, fixed cost recovery, and fuel-related costs. Moreover, close communication with the MOIT, relevant local authorities, EVN/EVNNPT, and other relevant parties will be needed to confirm the investment responsibility, ownership, and implementation arrangements for the transmission facilities required, and to align their completion with the project's commissioning schedule. This would reduce misalignment between infrastructure and contractual workstreams and lower revenue uncertainty, allowing an integrated LNG receiving and generation project that supports supply capacity and grid stability in northern Viet Nam to progress.
O Mon II Gas-to-Power	The direction is to integrate the schedules and to properly allocate the contractual protections and responsibilities of the related parties for upstream development, gas supply, pipelines, and the power plant, and to align the GSA/PPA, fixed cost recovery, and electricity offtake terms. This would resolve misalignment in investment timing and revenue

Project	Future Directions
	conditions between the upstream and generation components, allowing the value chain to progress in support of domestic gas use and stable supply in the Mekong Delta.

CfD = contract for difference; EPC = engineering, procurement, and construction; EVN = Vietnam Electricity; EVNNPT = National Power Transmission Corporation; FSRU = floating storage and regasification unit; GSA = gas sale agreement; LNG = liquefied natural gas; MOIT = Ministry of Industry and Trade; OEM = original equipment manufacturer; PPA = power purchase agreement; Qc = contracted quantity; SPA = sale and purchase agreement.

Source: Authors.

Cross-project direction and Catalyst's next steps

Across the projects, the key is to bring together contractual terms – including Qc, capacity payment–type fixed cost recovery, and the tariff pass-through of fuel-related costs – with permitting, fuel supply, infrastructure schedules, and financing. However, these measures alone will not resolve all the bankability constraints, and further risk-allocation mechanism needs to be secured. This should be pursued while balancing investment certainty for project sponsors with Viet Nam's objectives of ensuring reliable electricity supply, maintaining appropriate electricity tariffs through effective market mechanisms and cost management, and making effective use of domestic resources. This would enable project owners, national and provincial authorities, EVN, fuel suppliers, and financial institutions to work from common assumptions and create greater scope for projects to progress in a way that offers shared benefits. Throughout the projects, co-ordination across authorities, project owners, and EVN is essential.

Looking ahead, Catalyst will continue dialogue with project owners and relevant authorities and support the clarification of common issues, while organising the critical path, responsible parties, and outstanding conditions for each project. Other LNG-to-power projects such as Nghi Son and Van Phong 2 face similar challenges, and Catalyst will provide the necessary support as co-ordination with project stakeholders progresses.

Ammonia co-firing/dedicated firing and e-methane – Indonesia and Malaysia

Project overview and current status

This project covers IHI Corporation's role as a contributor to a 'decarbonisation layer' that progressively incorporates decarbonisation technologies while continuing to make use of existing coal-fired and other assets. IHI has a long track record in Southeast Asia in boiler supply and operation and maintenance for coal-fired power. On this basis, IHI is proposing fuel-switching technologies such as ammonia co-firing, dedicated firing, and e-methane to decarbonise existing assets as pragmatic options for progressively reducing emissions. These options can contribute to the practical decarbonisation of the installed fleet, while the wider power system shifts towards lower-carbon sources.

In Malaysia, IHI has signed a joint collaboration and development agreement with Gentari, a wholly owned subsidiary of PETRONAS, to demonstrate a 100% ammonia-fuelled gas turbine (IHI's IM270, around 2 MW) at a PETRONAS integrated petrochemical complex in Terengganu, targeting the start of the demonstration in fiscal year (FY) 2027. This follows an MOU signed at the first AZEC Leaders' Meeting in 2023 and is supported under METI's Global South Future-Oriented Co-Creation Project (Large-Scale Demonstration in ASEAN Member States) (Gentari, 2023; IHI Corporation, 2026). IHI has also conducted a joint feasibility study with TNB Power Generation on a decarbonisation roadmap for its coal-fired power stations (including Jimah East) through ammonia and biomass co-firing (IHI Corporation, 2023).

In Indonesia, PLN Indonesia Power, Pupuk Kujang, and IHI conducted Indonesia's first green ammonia co-firing trial at the Labuan coal-fired power plant (2 x 300 MW, Banten). Using 50 tonnes of green ammonia derived from green hydrogen, the trial achieved a 3% co-firing rate over 8 hours, reducing coal use by about 4.5 tonnes per hour (a potential annual reduction in carbon dioxide (CO₂) of around 70,640 tonnes) (Petromindo, 2025; IHI Corporation, 2025).

IHI is also using METI-supported programmes to advance specific studies. Under the FY2026 Joint Crediting Mechanism (JCM) Feasibility Study programme, IHI is studying the introduction of IHI Power Systems' ammonia dual fuel engine on candidate islands in India, Indonesia, and the Philippines, including greenhouse gas reduction calculations, JCM-credit creation, and methodology development. A FY2025 study covered 20% ammonia co-firing at coal-fired power plants in Indonesia, Malaysia, the Philippines, and Viet Nam. Both studies consider monetising JCM credits to cover part of the equipment and ammonia-fuel costs (METI, 2026a).

Additionally, under METI's FY2025 supplementary budget Global South Future-Oriented Co-Creation Project (Small-Scale Demonstration/Feasibility Study), IHI is working with PLN in Indonesia and TNB in Malaysia to examine first-of-a-kind ammonia co-firing projects for coal-fired power plants. The study examines the technical specifications, economic factors, and institutional conditions at candidate power stations and receiving terminals (METI, 2025).

Bottlenecks

Based on related interviews, the issues facing this case fall broadly into two areas. The first is feasibility and bankability connected issues. Ammonia is significantly more expensive than coal as a fuel. Since electricity prices and PPAs are regulated and do not allow recovery of this cost difference, it is unclear who should cover the expenses related to this price gap. As a result, many projects stop progressing early on. Retrofitting existing plants also requires substantial additional capital expenditure, but funding sources are limited by concerns that this would be seen as extending the life of coal assets. In addition, the Organisation for Economic Co-operation and Development (OECD) guidelines on export credits do not permit officially supported export finance for equipment supplied to existing

coal-fired power plants unless the purpose is to reduce CO₂ or air pollutants and the equipment does not extend the plant's useful life or increase its capacity (OECD, 2021). This is a major factor behind the difficult international funding environment. In Japan, a 20% ammonia co-firing demonstration at JERA's Hekinan power station was carried out with the support of the New Energy and Industrial Technology Development Organization (NEDO) (JERA, 2024), and cases such as this are only viable with institutional support of this kind. The absence of a similarly durable price-gap bridging mechanism in Southeast Asia is cited as a key constraint on financing.

The second is uncertainty over the certification and recognition of the environmental value of co-fired power. Ammonia is not currently recognised as an eligible fuel under the International Renewable Energy Certificate (I-REC) standard, and uncertainty remains as to whether fractional or mixed certificates for co-fired electricity can practically be issued, whether regulators and certificate issuers would recognise such schemes, and whether buyers would accept them. It is also noted that RECs (which track the environmental value of clean electricity) and carbon credits (which trade emissions reductions) are distinct mechanisms, raising the risk of double counting if the same environmental attribute is claimed at both the ammonia production stage and the power generation stage.

Future directions

On the first issue – economics and financing – according to the interviews, the practical direction in the near term, rather than waiting for institutional development, is to identify customers that value environmental attributes (such as data centres) on a project-by-project basis and secure buyers willing to pay a premium. Over the medium to long term, as is the case for other potential energy resources, work could focus on building the evidence base and initiating policy dialogue on durable government-to-government mechanisms to bridge the price gap, alongside the possible use of blended finance and a phased approach of demonstration, early commercialisation, and scale-up. In Indonesia, this includes advancing new projects with PLN. In Malaysia, it includes deepening the economic assessment of existing projects alongside policy dialogue. For Catalyst, the direction is to draw on the common economic and financing issues emerging across multiple projects such as Gentari, TNB, and Labuan; organise them on a cross-project basis; and inform longer-term dialogue with policymakers and financial institutions through platforms such as AZEC on the possible design and implementation of such a mechanism.

On the second issue – certification and recognition of environmental value – the direction is to organise the issues through comparative analysis of certificate and carbon-credit schemes across ASEAN, including how these schemes define baselines and system boundaries and account for lifecycle emissions, including upstream emissions; research on demand for mixed or fractional certificates; and research on electricity market liberalisation; and to support dialogue with governments, regulators, and certification bodies at national and regional levels.

2.4.4. Carbon Neutralisation of Industrial Park – Viet Nam

Project overview and current status

In Viet Nam, industrial parks that host export-oriented manufacturing face strong renewable energy demand from tenant companies, driven by the requirements of their global customers, and securing decarbonised power has become directly linked to competitiveness. Rooftop solar is being deployed, but constraints on solar irradiation and installation conditions mean it cannot cover the demand of an industrial park as a whole, so further measures are needed to meet the park's broader decarbonisation needs. On the policy side, the direct power purchase agreement (DPPA), which allows large consumers to procure renewables directly from generators, was introduced under Decree 80/2024/ND-CP, Decree 57/2025/ND-CP, and Decree No. 243/2026/ND-CP, adding biomass as an eligible source, extending the buyer's eligibility to electricity retailers in zone/cluster models, and relaxing the requirements on large electricity consumers for private grid cases (Singh, 2025; Hauber, 2024).⁹

Under Catalyst, stakeholder interviews covered the advancement of a battery energy storage system (BESS) and off-site DPPA at Thang Long Industrial Park near Hanoi, operated by Sumitomo Corporation and Thang Long Industrial Park Corporation, as initial areas of focus within the broader plan to move the industrial park towards net zero. Thang Long Industrial Park has been expanding rooftop solar in stages since 2021 (Sumitomo Corporation, 2022), but this alone cannot cover the demand of the park as a whole. Off-site DPPA is currently expected to fill the gap between the demand and the supply by procuring renewable power directly from renewable energy generators. BESS is being examined for peak shifting, the use of surplus solar output, and grid stability services. Work is under way to examine the feasibility and structure of each topic towards its implementation.

Bottlenecks

Based on Catalyst's stakeholder interviews, several issues will determine whether this project reaches implementation. For the DPPA, one of the challenges is the gap in the expected contract tenure between the renewable energy generators and the buyers. Tenant companies tend to prefer relatively short contract periods because of uncertainty in their own demand outlook, whereas generators seek longer-term PPAs to manage offtake risk and support investment recovery. Stakeholder discussions indicate that a shorter tenure may be possible, but under specific conditions (e.g. governmental financial support to cover the investment cost, credit support, and pricing agreements to cover the risk of tenure mismatch), but its acceptability would depend on pricing, credit support,

⁹ Decree No. 80/2024/ND-CP dated 3 July 2024 Prescribing the Direct Power Purchase and Sale Mechanism Between Renewable-Energy Electricity Producers and Large Electricity Consumers; Decree No. 57/2025/ND-CP dated 3 March 2025 Stipulating Mechanism for Direct Electricity Purchase and Sale Between Renewable Energy Generators and Large Electricity Users, which replaced Decree No. 80/ND-CP; and Decree No. 243/2026/ND-CP dated 26 June 2026 Amending and Supplementing Several Provisions of Decrees Nos. 57/2025/ND-CP and No. 58/2025/ND-CP.

volume risk, and whether supply comes from new or portfolio assets; no directly comparable local precedent has yet been established. The question also remains whether a price advantage can be maintained while grid electricity prices remain relatively low.

Furthermore, while the guidelines are in place, there is still uncertainty in the additional cost components (e.g. transmission and distribution cost, and the implementation of a two-part tariff structure). While a DPPA can provide long-term renewable energy procurement and protection against future electricity tariff increases, its commercial and operational risks need to be clarified and resolved.

For BESS, the key issues are its economics and implementation readiness. High upfront costs mean that the BESS initiative remains sensitive to subsidies, permitting, available revenue streams, and future battery-cost reductions. The immediate priority is therefore to clarify the feasibility and policy conditions needed for sustainable operation and investment recovery. Once those foundations are more stable, the remaining financing gap can be assessed and consideration can be given to what form of catalytic capital, if any, would be appropriate.

Future directions

On contract tenure, one area for medium- to long-term exploration is whether features used in overseas cases – such as aggregating demand across multiple tenants, using shorter-tenure renewable PPAs, and utilising other credit support – could provide useful reference points. Their applicability in Viet Nam would need to be assessed against the local commercial and regulatory environment, including the legal status of the contracting party, allocation of volume risk, and interaction with the power market. The direction at this stage is therefore to examine whether and how such features could be adapted into a practical local structure, without presuming that a particular model should be adopted or that immediate regulatory change is required.

On BESS economics, the near-term direction is to continue examining the feasibility and policy conditions, including permitting, available revenue streams, the expected cost trajectory, and post-subsidy economics. As these foundations become clearer, potential sources of catalytic capital – including concessional or blended finance and other risk-sharing instruments – could be explored where they are suited to the remaining risks and financing gap. This sequencing would avoid presuming a financing structure before the underlying project conditions are sufficiently mature.

Looking ahead, the next step under consideration is to continue dialogue with project stakeholders and, where useful, relevant policy and finance institutions. The focus would be on testing whether international approaches to contract tenure can be adapted to Viet Nam's business and regulatory environment for the DPPA, and on identifying suitable catalytic-capital options as project feasibility and policy conditions for BESS develop. Future work in either area would remain subject to further assessment and stakeholder discussion.

2.4.5. Green ammonia and low-carbon fertiliser – Lao PDR

Project overview and current status

Tsubame BHB and Agri Laos are developing a project in the Lao People's Democratic Republic (Lao PDR) to produce renewable-based ammonia and low-carbon fertiliser using hydropower and other renewable energy. Under the parties' December 2023 Letter of Intent, the State Enterprise for Agriculture Service is the intended fertiliser off-taker. The project aims to establish local chemical-fertiliser production, substitute imports, and support agricultural productivity, using Tsubame BHB's ammonia-synthesis technology (METI, 2023: 33).

Public project materials indicate an investment scale of about US\$37 million and planned annual production of 5,000 tonnes of ammonia and 20,000 tonnes of low-carbon fertiliser. Under Catalyst, stakeholder discussions have focused on updating the project fact base and distinguishing the power- and product-economics constraints from offtake, capital support, and financing considerations (ERIA, 2025: 166, 318).

Bottlenecks

Based on Catalyst's stakeholder discussions, two interrelated areas will shape whether the project can progress further towards implementation.

The first is how to address the green hydrogen-derived cost premium in the project economics. Predictable renewable electricity supply and cost are central to the electrolyser, ammonia synthesis, and downstream fertiliser processes. Tsubame BHB's published production model adds reaction and crystallisation stages to hydrogen and ammonia production, so the process configuration and available power arrangement must support cost-competitive production of the selected product. The issue is therefore not what to produce or whether it can be sold: the intended product – ammonium sulphate – and its underlying demand are relatively clear. The central question is how to narrow, absorb, or monetise the green hydrogen-derived cost premium, particularly against conventional ammonium sulphate produced largely as a low-cost by-product (Tsubame BHB, 2024).

The second is how to translate the value of lower-carbon and locally produced fertiliser into bankable revenue. Potential off-takers may value different combinations of product performance, supply security, and lower-carbon attributes, but those preferences and contracting conditions still need to be tested. Any remaining price gap with conventional fertiliser, potentially narrowed by the increase in international urea prices projected by the World Bank for 2026 (World Bank, 2026), would then need to be allocated through the commercial or support structure. Grants, guarantees, concessional debt, and equity could be considered only after the operating case and residual gap are clearer; financing should not be treated as a substitute for viable project economics.

Future directions

On feasibility, the near-term direction is to continue dialogue with project stakeholders while updating the assumptions for power supply, product configuration, and market demand. This would clarify whether the production concept can progress to the next development stage and what conditions remain on the critical path.

On bankability, options could be explored for matching the project with potential off-takers and for allocating any remaining price gap without presuming a buyer commitment or a particular support mechanism. Engagement with global food, beverage, apparel, and other companies seeking to reduce agricultural supply-chain emissions could be explored, to assess potential carbon insetting, book-and-claim, or other value-chain decarbonisation partnerships linked to the project's low-carbon fertiliser production. Potential collaboration or consortium structures with relevant global players could also be explored. Once the operating case is sufficiently defined, grants, guarantees, concessional debt, equity, or a combination of these instruments could be assessed against the residual risks and capital gap.

Looking ahead, the next step under consideration is to maintain engagement with the project owner as the power, product, market, and financing conditions evolve. The focus would be on monitoring the individual bottlenecks and adapting the support approach accordingly, while keeping potential off-takers and financing options as areas for broad exploration rather than identified commitments or secured outcomes. Further potential Catalyst support areas include supporting dialogue with relevant stakeholders on the enabling conditions for partnerships with potential off-takers. Topics for possible discussion could include the credible measurement, verification, transfer, and recognition of low-carbon fertiliser environmental attributes, as well as potential policy and financial options that could facilitate corporate participation and help address any remaining cost gap during early market development.

2.4.6. CCUS – Malaysia

Project overview and current status

Malaysia has moved from policy development to the implementation of a dedicated federal carbon capture, utilisation, and storage (CCUS) framework. The Carbon Capture, Utilisation and Storage Act, 2025 (Act No. 870), which came into force on 1 October 2025, established the Malaysian Carbon Capture, Utilization and Storage Agency (MyCCUS). On 22 June 2026, the Ministry of Economy held a workshop to finalise draft import-permit and registration regulations under the CCUS Act, 2025; on 2 July 2026, it consulted on draft guidelines and standard operating procedures for offshore assessment permits in Malaysia's exclusive economic zone (MyCCUS, n.d.-a, n.d.-b).¹⁰ The National Energy Transition Roadmap sets a policy target of three CCUS hubs – Kerteh, Kuantan, and Bintulu – with total storage

¹⁰ The activities in MyCCUS (n.d.-a) refer to those dated 9 October 2025, 22 June 2026, and 2 July 2026.

capacity of 15 million tonnes per year by 2030 (Ministry of Economy, 2023: 50; MyCCUS, n.d.-b).

Under Catalyst, stakeholder discussions have examined a complementary demand-side question: Which party receives enough regulatory, market access, product, or offtake value to bear the additional cost of carbon capture in Malaysia's industrial sector? Catalyst has structured candidate cost-bearing pathways and a stakeholder-sounding approach, with an initial focus on export-market carbon pressure, demand for lower-carbon products, and captured-CO₂ offtake. The workstream is at the demand-validation and project-origination stage and not the development stage of a named capture, transport, or storage asset.

On the capture-technology side, one example project is Kawasaki Heavy Industries, Ltd., whose feasibility study on applying its proprietary carbon capture technology (Kawasaki CO₂ Capture (KCC)) to industrial emission sources in Malaysia was selected in October 2025 under Japan's METI Global South subsidy programme (small-scale demonstration/feasibility study scheme) (Kawasaki Heavy Industries, Ltd., 2025). As the demonstration/feasibility study progresses, the next step would be to identify demand-side players to collaborate and create use cases.

Bottlenecks

Based on the stakeholder discussions, the first challenge is to translate the national CCS opportunity into a concrete, investable industrial use case. Each candidate needs to compare CCS with efficiency, electrification, renewable power, material substitution, and other abatement options. It must also match the emissions source and capture solution with realistic transport, storage, or utilisation arrangements, including compatible CO₂ specifications, volumes, and timing. Until these elements are aligned, selecting a financing intervention would be premature.

The second challenge is eligibility and recognition. The policy framework alone does not establish eligibility or economic value for a specific project. Emissions reductions must be measurable and recognised under the relevant product standards, procurement rules, incentives, and export-market requirements. For lower-carbon materials, product-carbon data and certification need to allow buyers and financiers to identify the attribute; for CO₂ utilisation, source eligibility and robust life-cycle accounting are also required (IEA, 2025a, 2019).

The central bankability question is who ultimately bears the additional carbon capture cost. The European Union's Carbon Border Adjustment Mechanism (CBAM), which entered its definitive regime in January 2026, may strengthen the value of lower carbon production for exposed exporters, but it does not establish that CCS is the preferred abatement route (European Commission, n.d.). Interest in lower-carbon products becomes bankable only when measurable attributes, volume, buyer commitment or a price signal, and contract tenure are sufficiently clear. Captured CO₂ offtake likewise depends on source qualification, logistics, volume, tenor, and final product value. For pathways involving transport and storage, the financing assessment also extends to cross-chain risks, including

interruptions or shortfalls in CO₂ supply, and to geological uncertainty over available storage capacity. Across all three pathways, predictable revenue and clear risk allocation are needed before private finance can be mobilised (IEA, 2026).

Future directions

The near-term direction is to validate the three pathways with relevant industrial stakeholders, procurement and certification bodies, and CO₂ use platforms, and to identify one or more concrete use cases where an emitter, buyer, or off-taker has a defined economic incentive and CCS compares credibly with alternative abatement routes. In parallel, the applicable measurement and recognition requirements and the interfaces with transport, storage, or utilisation arrangements should be clarified. This would reduce the main uncertainties without presuming which pathway or technology should be adopted.

Once the use case and cost bearer are sufficiently defined, appropriate next steps can be clarified. Options could include policy clarification, procurement design, engagement with financial institutions, or targeted risk sharing, depending on the remaining gap. Catalyst can continue organising evidence and stakeholder dialogue for that assessment. This could connect Malaysia's advancing CCUS governance and storage strategy to investable capture demand without implying a secured cost bearer, partnership, or financing structure.

2.4.7. BECCS – Indonesia

Project overview and current status

This case concerns a bioenergy with carbon capture and storage (BECCS) project under study in Indonesia. The concept is to retrofit the biomass-fired power plant of an existing pulp and paper facility with carbon capture equipment. The boiler uses biomass by-products from the facility and supplies electricity and steam to its operations, providing a relatively stable source of biomass feedstock and biogenic CO₂. The captured CO₂ would be transported to a nearby geological storage site, with the project seeking revenue through the sale of CO₂ removal (CDR) credits in the international voluntary carbon market.

The project is at the feasibility-study stage. Its current concept combines an existing operating biomass source with established components, including capture equipment, a short onshore pipeline, and storage in a deep saline aquifer. Catalyst's assessment therefore did not identify the maturity of the principal technologies or continuity of biomass supply as the main constraints. The more significant issues arise from the project-specific regulatory, storage, environmental, and commercial conditions that must be resolved before investment can proceed.

Bottlenecks

On feasibility, two connected transport and storage issues remain. First, responsibility for CO₂ leakage and the associated monitoring, remediation, and financial liabilities need to be

allocated clearly across the capture, transport, injection, operating, and post-closure stages (Karki, 2026). Without a commercially workable allocation, project participants and financiers cannot determine the extent of their exposure or whether insurance and guarantees would provide sufficient protection. Second, the capacity and suitability of the proposed saline aquifer need to be confirmed through geological exploration, site characterisation, and a credible monitoring, reporting, and verification plan. The proximity of the proposed storage site reduces transport complexity, but it does not remove subsurface uncertainty.

The wider policy and regulatory framework is also important. Presidential Regulation No. 110/2025 established the national framework for carbon economic value instruments, but the project assessment identified a need to clarify the implementing arrangements applicable to the international sale or export of CDR credits (Bachtiar and Safira, 2025).¹¹ The role of BECCS is also not yet explicit across the relevant national and sectoral planning documents. This does not in itself make the project infeasible, but it weakens the long-term policy signal and makes it more difficult to assess the availability of incentives and co-ordinate the ministries responsible for industry, energy, environment, finance, and national planning.

On eligibility, the preliminary technology-level assessment indicates that BECCS could be classified as 'green' under the ASEAN Taxonomy Plus Standard if the applicable requirements for bioenergy generation, CO₂ transport, and geological storage are met.¹² This conclusion is conditional rather than automatic. It depends on sustainable biomass sourcing, capture and system performance, storage integrity, leakage detection, and appropriate monitoring and verification. A project-level assessment would also need to consider environmental and social impacts and the applicable Do No Significant Harm requirements. Eligibility therefore depends on the evidence and safeguards established for the specific project, not solely on the general carbon-removal potential of BECCS.

On bankability, the proposed revenue model remains the central constraint. The project would require substantial upfront investment in carbon capture, transport, and storage, while its prospective revenue depends mainly on future CDR credit sales. No long-term offtake arrangement has yet been established, the voluntary market has a relatively concentrated buyer base (CDR.fyi, 2026), and the revenue required to recover project costs may exceed prevailing buyers' willingness to pay. This creates both demand and price-gap risks. Uncertain future revenue can also limit access to project finance even where the project participants themselves have adequate credit standing. Currency mismatch between largely foreign-currency credit revenue and local costs, together with interest-rate exposure on external borrowing, may add further volatility.

¹¹ Presidential Regulation No. 110 of 2025 on Implementation of Carbon Economic Value Instruments and National Greenhouse Gas Emission Control, replacing Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Pricing to Achieve the Nationally Determined Contribution Target and Control over Greenhouse Gas Emissions in the National Development.

¹² Analysis by authors based on ASEAN Taxonomy Board (2025).

Future directions

The near-term priority is to strengthen the foundations for feasibility before determining a financing structure. This would include clarifying the regulatory pathway for international CDR-credit transactions; defining liability for leakage across the project life cycle; completing the geological work required to confirm storage capacity and integrity; and establishing a project-level environmental, social, and monitoring framework. Dialogue on whether and how BECCS should be reflected in relevant national and sectoral plans could proceed in parallel, based on evidence of its potential contribution and safeguards.

For bankability, the immediate task is to test the demand and revenue case with credible CDR buyers, including the potential volume, price, duration, and integrity requirements of any future purchase arrangement. Broader options such as recognition in compliance markets or public procurement could also be explored as longer-term market development measures, subject to policy assessment and environmental-integrity requirements. Once the residual price gap and risk allocation are clearer, support could be targeted to the specific constraints that commercial parties cannot absorb. Potential options include assistance for geological exploration and project preparation, capital or price-gap support, blended-finance structures, and appropriately designed insurance or guarantees for storage and leakage risks. Currency and interest-rate instruments may be considered where they address a defined financing exposure.

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Chapter 3

Learnings from the Pilot Projects and Recommendations

3.1. Setting the Scene – Finance for Transition and Energy Security/Resilience

3.1.1. The imperative for energy security and resilience

The energy transition of ASEAN has entered a phase in which it must respond simultaneously to the long-standing imperative of decarbonisation and the rapidly rising imperative of energy security and resilience. Fuel-supply shocks,¹³ more frequent climate-driven disasters, and heightened geopolitical tensions have increased the policy importance of grid stability, security of supply, and the capacity to withstand disruption, while maintaining the goal of net zero.¹⁴ There is increasing recognition that transition finance should consider how regional energy resilience can be strengthened while maintaining alignment with the decarbonisation pathway (IEA, 2026).

One challenge emerging from the project-level work of the Asia Zero Emission Community (AZEC) Inclusive Transition Finance Catalyst (AITF Catalyst) concerns how eligible transition activities are identified. Specifically, investments that strengthen energy security and resilience, including grid stability and supply–demand flexibility, may not be fully captured – especially if the asset or technology’s decarbonisation path is not yet clearly defined. Stakeholder discussions suggested that such projects often receive insufficient attention. Financial institutions report a shortage of sufficiently developed opportunities despite high interest, while project owners face difficulty identifying suitable financing. A more proactive approach is needed to identify projects based on regional needs and structure them around an investable decarbonisation pathway.

These challenges cannot be fully resolved project by project. Neither decarbonisation nor energy resilience is achieved through a single technology or facility; both depend on complementary technologies, infrastructure, institutions, and capital. Decarbonising a power plant, for example, may require grid reinforcement, storage or flexible generation,

¹³ Disruptions to oil and gas flows through the Strait of Hormuz – through which around 20% of global liquefied natural gas (LNG) and a quarter of seaborne oil trade passed in 2025, with about 90% of that LNG destined for Asia – have exposed structural risks in Southeast Asia’s energy sector. Importing oil and gas at elevated prices has been estimated to add about US\$3.36 billion a month to ASEAN’s import bill, while several ASEAN Member States, including Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam, declared an energy emergency or adopted emergency conservation measures (IEA, n.d.).

¹⁴ Regional leaders responded directly. At the Asia Zero Emission Community (AZEC) Plus Summit on energy resilience (15 April 2026), participants agreed to evolve the initiative into ‘AZEC 2.0’ with a stronger focus on economic and energy resilience, while emphasising that this does not step back from the goal of net zero – asserting that energy security and decarbonisation ‘must go hand in hand’ (Prime Minister’s Office of Japan, 2026; Prime Minister’s Office of Singapore, 2026).

and infrastructure such as carbon capture and storage. Many decarbonisation technologies also mature in stages over time. Assessment of individual projects alone cannot fully capture this system-level optimisation or the staged pathway of the transition.

3.1.2. Framework for an energy security and resilience lens and an ecosystem approach

Based on this context, Catalyst proposes deepening the understanding of transition finance through two perspectives: (i) an energy security and resilience lens, and (ii) an ecosystem approach.¹⁵

The energy security and resilience lens aims to re-emphasise the importance of energy security and resilience. In addition to identifying projects bottom-up from individual decarbonisation technologies – an approach that remains valid – projects can be surfaced by starting from the question of what a country needs to improve its energy resilience, and how those investments can be made viable while remaining aligned with its decarbonisation pathway.

The ecosystem approach puts this perspective into practice by assessing a group of mutually complementary projects – for example, along a supply chain or within a defined geographical area – rather than individual projects or entities. What matters is that the ecosystem as a whole is coherent with relevant decarbonisation pathways or roadmaps. Where a fossil-fuel component is included, it should follow a credible, time-bound decline trajectory aligned with the relevant pathway. Where a national pathway is not yet fully elaborated, alignment can still be assessed using multiple Paris-aligned, science-based reference points. This approach is particularly relevant in hard-to-abate sectors, where decarbonisation is often achieved through a staged combination of technologies rather than a single leap (see also Box 3.1). It is important to note that this ecosystem approach is intended as an additional lens, not as a separate emissions-accounting framework. Greenhouse Gas (GHG) Protocol accounting, including Scope 3, and entity-level transition strategies would remain the primary basis for assessing the relevant entity. Where an ecosystem spans multiple entities, each participating entity would continue to be assessed against its own transition strategy and accountability framework. The ecosystem lens would add consideration of whether the relevant interdependent projects and infrastructure collectively support the transition pathway. As a baseline, ecosystem-level coherence should not offset material weaknesses in an individual entity's transition strategy or accountability.

¹⁵ Here, transition finance is used in the broad sense of financing the transition (as distinct from labelled transition finance).

3.1.3. Ensuring credible pathway alignment: safeguards and practical precedents

This approach would enable projects to be assessed through ecosystem-wide alignment with a credible pathway, measurable interim targets, and regular monitoring. For example, Japan's *Transition Finance Follow-up Guidance* (Financial Services Agency, METI, and Ministry of the Environment, 2023: 4) adopted a dialogue-based approach that calls for regular dialogue between fundraisers and financiers, taking into account the dynamic nature of transition finance and the post-execution changes in the external environment, to discuss progress, future developments, and other matters related to decarbonisation. When progress does not follow the assumed trajectory, the financier and fundraiser confirm the situation through dialogue and encourage the steady implementation of the transition strategy. Likewise, where deployment or emissions performance deviates materially from the pathway, financiers and project owners should agree on corrective action. If the deviation cannot be remedied, the eligibility of the affected component or ecosystem should be reconsidered with the applicable consequences specified in advance in the financing framework. Depending on the instrument, these may include ceasing further allocation or drawdown for the affected component, reallocating undisbursed proceeds, adjusting financing terms, or withdrawing the transition label. These safeguards make the time-bound trajectory a binding discipline and help maintain alignment with the decarbonisation pathway. Japan's sectoral technology roadmaps for emission-intensive sectors provide a relevant precedent (METI, n.d.). Consistent with national policy and the Paris Agreement, each roadmap sets out the staged sequence of currently available and future low-carbon technologies open to the sector. These roadmaps provide sector-level reference points against which companies can develop their transition strategies and financial institutions can assess those strategies. This preserves entity-level accountability while allowing individual investments to be considered within a staged sectoral pathway. Japan offers practical examples of related concepts. Kawasaki City's Carbon Neutral Port plan identified 108 projects by 40 public and private sector entities and provided a common framework through which eligible projects can access finance against port-wide targets of at least a 50% reduction in GHG emissions by 2030 and net zero by 2050. Eligible projects include energy-efficiency upgrades and renewable power; low-carbon port machinery and vessels; fuel switching and hydrogen or ammonia use; carbon dioxide (CO₂) and waste heat recovery; plastic recycling; and hydrogen transport, storage, and pipelines. The first transition loan under the framework was signed in March 2026. Tokyo Gas offers a related example: its ¥20 billion transition bond covered a new liquefied natural gas (LNG) terminal, a smart energy network, and a hydrogen pipeline project, positioning them within a corporate roadmap aligned with the gas sector roadmap of the Ministry of Economy, Trade and Industry (METI). Japan's sector roadmaps, developed under the *Basic Guidelines on Climate Transition Finance* (Financial Services Agency, METI, and Ministry of the Environment, 2025), provide a reference for such assessments.

3.1.4. Recommendations for applying the framework across country contexts

The application of this framework will differ across countries depending on their available infrastructure, technologies, energy demand outlook, and transition pathway. One important detail that needs to be captured concerns greenfield power projects. In countries with rapidly increasing energy demand, greenfield coal-to-power plants may still be considered. In such cases, greenfield LNG-to-power projects can provide an alternative that is more likely to align with the country's decarbonisation pathway as it may offer emissions-avoidance benefits through substitution of coal-to-power projects. At the same time, any greenfield project with a fossil-fuel component should be assessed rigorously since it would entail some form of carbon lock-in. For example, the International Energy Agency (IEA) and the International Capital Market Association (ICMA) recommend that such investments should either demonstrably replace higher-emitting fuels (e.g. coal or oil) or serve the specific purpose of providing power system flexibility to support renewable integration, rather than acting as simple baseload generation (IEA, 2025; ICMA, 2025b). These considerations should be assessed at both the macro and micro levels on a case-by-case basis to determine which pathway or configuration is rational for a specific country's decarbonisation pathway and its energy security and resilience needs.

Against this background, we recommend two complementary actions. First, countries and financial institutions should explicitly recognise energy resilience needs and consider how transition finance can address them while securing the decarbonisation pathway. A shared regional understanding can be advanced through AZEC-related communication, dialogue with multilateral development banks (MDBs), and discussions on national taxonomies. Second, relevant stakeholders should consider developing an ecosystem approach that assesses and supports groups of complementary technologies, infrastructure, and capital against credible, time-bound pathways. This framing aims to inform regional dialogue and does not override the energy or investment policies of individual institutions; financing decisions remain subject to each institution's own policies. Social considerations, including a just transition for affected workers and local communities, should also be recognised as an integral part of a sustainable transition, consistent with the ASEAN Capital Markets Forum and ICMA frameworks as well as the ASEAN Taxonomy (ASEAN Capital Markets Forum, 2024; ICMA, 2025a; ASEAN Taxonomy Board, 2025).

Box 3.1. A Sample Ecosystem – The Decarbonised LNG Ecosystem

An example of the concept explained in this chapter is the decarbonised LNG ecosystem. This relates to how major ASEAN Member States include gas-to-power (GtP) projects in their power development and net zero plans, alongside the expansion of renewables. GtP projects act as a flexible balancing capacity that complements variable renewables and contributes to energy resilience through diversified fuel procurement and the capacity to respond during disasters and grid disruptions. Because the operating life of these plants (25–30 years) reaches the net zero target year, decarbonisation technologies must be introduced at some stage during their operation.

The decarbonised LNG ecosystem refers to building a gas system with complementary decarbonisation technologies, instead of simply introducing gas. Decarbonisation technologies are progressively embedded at each stage of the LNG value chain (Figure 3.1), along a time-bound trajectory with monitoring requirements. This ensures that the system as a whole is consistent with the host country's transition pathway or roadmap. As a precondition, the abatement of upstream methane emissions across the value chain is treated as an integral part of the ecosystem, since uncontrolled methane leakage would otherwise offset the downstream emission reductions the ecosystem is designed to achieve. Relevant technologies include:

- Upstream: methane emissions reduction – carbon capture and storage
- Midstream: biomethane and synthetic methane (e-methane)
- Downstream: hydrogen and ammonia co-firing, methane pyrolysis
- All stages: reduction of methane leakage

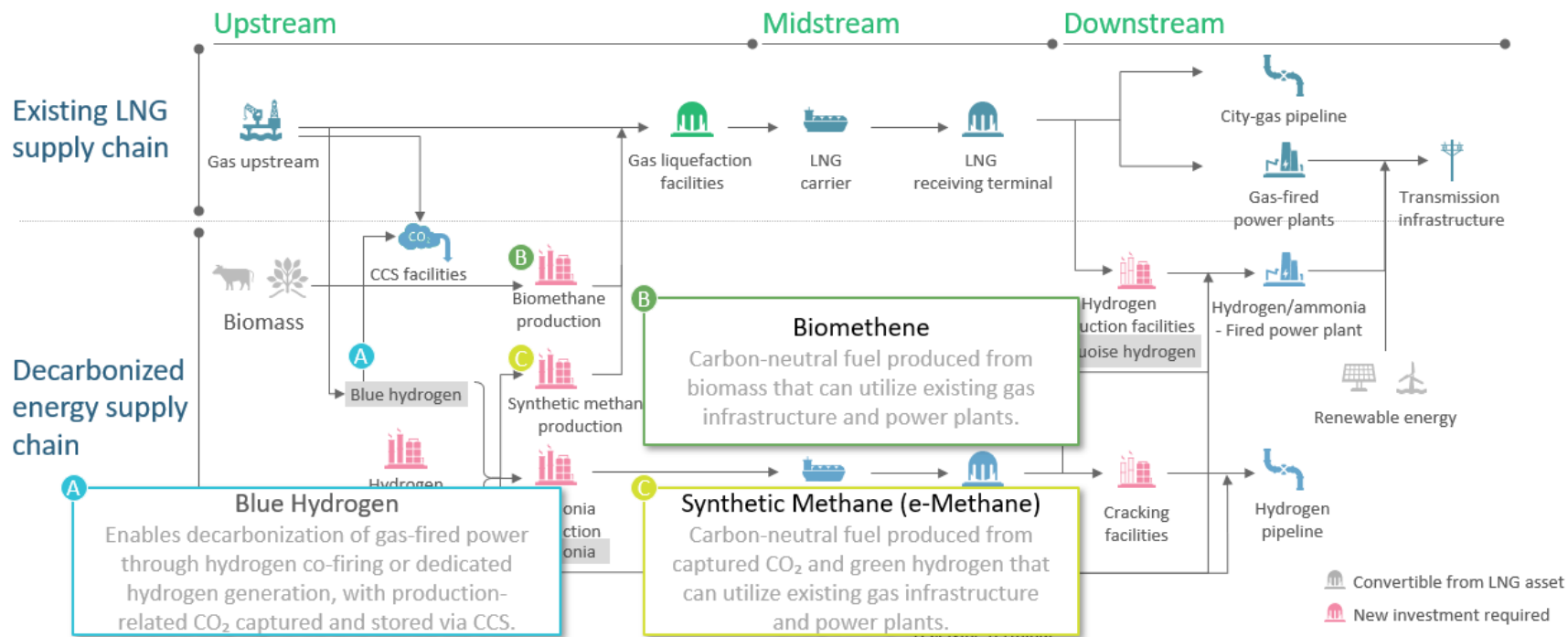
As the embedded technologies will develop in stages over the coming decades, they can be designed as a pathway built up along the lifetime of the GtP asset. For example, the 2025 gas sector roadmap of Japan's Ministry of Economy, Trade and Industry places hydrogen production and transport in the late 2020s; local hydrogen networks, hydrogen and ammonia combustion equipment, and carbon dioxide capture in the 2030s; and direct air capture and some innovative methanation technologies in the 2040s. The pathway would be designed to introduce each technology as it matures, depending on the affordability and availability of such low-carbon fuels.* This is consistent with the national energy plans of some ASEAN Member States, which view gas as near-term balancing capacity while envisaging a shift to carbon capture and storage or hydrogen/ammonia in the final stage.

GtP = gas to power, LNG = liquefied natural gas.

* In the longer term, widespread adoption of co-firing – whether with biomass, green ammonia, or hydrogen – will also depend on the affordability and availability of these low-carbon fuels, particularly as green ammonia and hydrogen are expected to become more viable later in the 2040s (ERIA, ADB, and METI, 2025).

Source: Authors.

Figure 3.1. Decarbonised LNG Ecosystem – Existing LNG Value Chain Plus Decarbonisation Technologies (blue/turquoise hydrogen, CCS, biomethane, and synthetic methane)



CCS = carbon capture and storage, CO₂ = carbon dioxide, LNG = liquefied natural gas.

Note: Illustrative only. Deployment of the technologies shown should be subject to project-specific lifecycle emissions assessment, a credible time-bound transition plan, measurable milestones, and independent monitoring and verification.

Source: Authors based on Boston Consulting Group analysis.

3.2. A Framework for Supporting Projects – Feasibility, Eligibility, and Bankability

To support projects and ecosystems, a framework is needed to diagnose the issue and identify an appropriate course of action. Through its initial activities, Catalyst places this diagnosis along three axes: feasibility, eligibility, and bankability. This is organised into an entry point matrix, formed by taking bankability and feasibility as the two main axes of reference.

Where the problem lies – untangling the issues to create a clear path forward

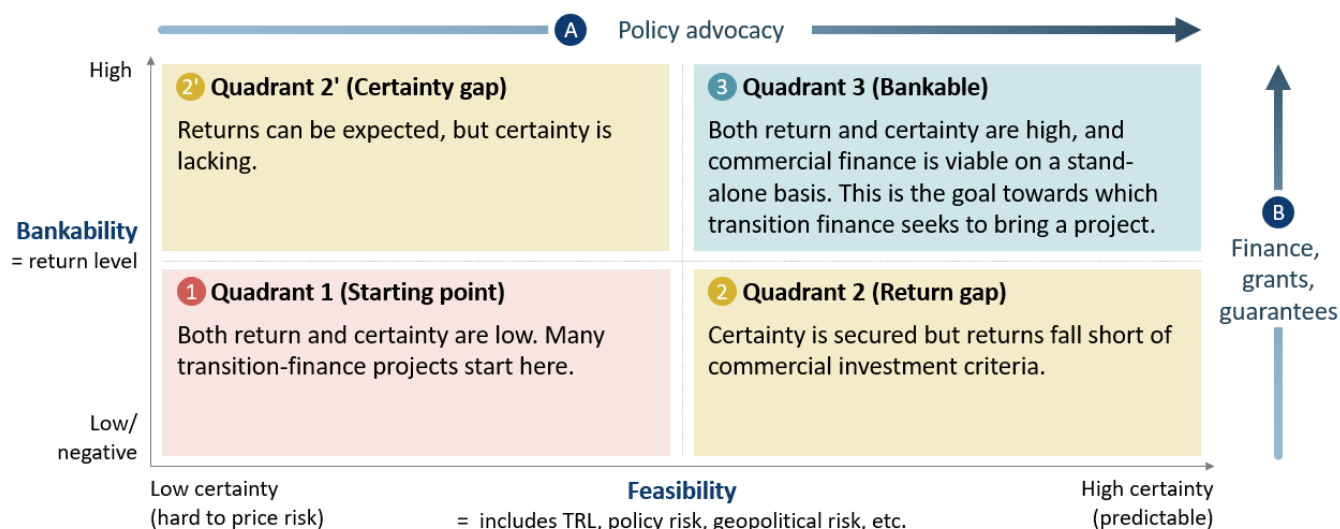
A challenge that emerged during Catalyst's initial activities was that, while individual project owners and relevant stakeholders generally had a strong understanding of the immediate bottlenecks, a more nuanced and multilayered assessment was often required to account for local policies, market conditions, applicable regulations, and available subsidies. In addition, different actors frequently focused on different aspects of the problem, resulting in varying views on which challenges should be prioritised, what approaches could be taken to address them, and which stakeholders should be engaged. To address this issue, Catalyst proposes an entry point matrix that enables capital providers and recipients to assess, using a shared language, the stage and circumstances of a project; and to identify appropriate action items based on the specific constraints it faces.

The entry point matrix – a map as a shared language

The matrix (figure 3.2) shows a project's bankability on the vertical axis and feasibility (certainty) on the horizontal axis. The vertical axis measures how well a project's returns meet commercial investment standards. The horizontal axis measures the reliability of the project's feasibility, based on factors like technology readiness level, policy and regulation stability, geopolitical risks, and other non-commercial risks. The combination of the two axes yields four quadrants, where individual projects fall into one of the four based on their status. For the purpose of the Entry Point matrix, bankability is used in a narrower diagnostic sense, focusing primarily on commercial return and economic viability, while policy, regulatory, contractual, and implementation certainty is captured under feasibility.

- **Quadrant 1 (starting point):** both bankability and feasibility are low – many transition finance projects start here.
- **Quadrant 2 (return gap):** feasibility is secured, but returns fall short of commercial investment criteria.
- **Quadrant 2' (certainty gap):** bankability can be expected, but feasibility is lacking.
- **Quadrant 3 (bankable):** both bankability and feasibility are high, and commercial finance is viable on a stand-alone basis – transition finance aims to guide a project towards this goal.

Figure 3.2. Entry Point Matrix (Bankability x Feasibility)



TRL = technology readiness level.

Notes: The apostrophe in quadrant 2' distinguishes between the 2nd step of each project having either a return gap (quadrant 2) or certainty gap (quadrant 2'). Item B (Finance, Grants, Guarantees) also includes any bankability-related support through policy measures such as pass-through clauses in power purchase agreements or price gap support. Since they are initiated through policy advocacy, in this report they are organised as 'feasibility' levers.

Source: Authors.

The matrix can be leveraged to diagnose projects in terms of 'which quadrant it is in', so the path from the starting point (1) to the goal (3) can be described in a shared language. Many projects first secure either return or certainty (1→2 or 1→2'), then close the remaining gap to reach the goal (2→3 or 2'→3). The main line is 1→2→3, securing certainty first; for projects whose technology is immature, and which must establish commercial viability first, the route is 1→2'→3.

Feasibility, eligibility, and bankability – different problems call for different support

What matters here is that the challenges involved in moving a project towards quadrant 3 differ fundamentally across feasibility, eligibility, and bankability, and that the means to address them – and the actors who can carry them out – differ accordingly.

First, the **feasibility** issue concerns the factors that make a project outlook uncertain, such as technology maturity, the state of policy and regulation, and geopolitical risk. What moves this is policy-related levers, including institutional and regulatory development, market and incentive design, and support for demonstration and first-of-a-kind (FOAK) projects. One caveat here is that some of these levers also improve bankability (e.g. power purchase agreement (PPA)-related policy change that entails pricing), and this is why the 'main' path towards a final investment decision is 1→2→3.

Second, the **bankability (return level)** problem is one of economics: returns do not meet commercial investment criteria. As mentioned above, some policy levers will help improve bankability, such as pass-through clauses in PPAs, price gap support, and other market

designs that enable higher returns. However, these often need to be combined with finance support, such as concessional or subordinated capital (blended finance), grants, and guarantees.

Third, the **eligibility** problem is one of connection to capital: whether a project can access particular catalytic, concessional, or labelled funds. This does not change a project's return or certainty directly, but widens the range of capital a project can use.

These problems are different in nature, require different solutions, and involve different actors to address them. The entry point matrix is a map that helps stakeholders use a common language to make this distinction and understand the role each of them can play. Capital providers and recipients, policymakers, and public financial institutions should agree on the limits and roles using the same map as they work together to carry out transition finance projects.

Catalyst's role and the way forward

Catalyst's role is to identify the constraints of each project and determine which support levers to use, and in what order, to advise stakeholders. The detailed methodology for this diagnosis and support – from identifying the constraints to designing a path to move projects step by step towards bankability – is explained in Chapter 4.

3.3. Recommendations – Actions to Move Projects Towards Final Investment Decisions

ASEAN's transition finance ecosystem is evolving, with blended finance platforms, concessional facilities, and sector-focused initiatives beginning to support projects across the development cycle. These efforts build an important foundation. Discussions with individual project stakeholders, however, suggest that moving projects towards a final investment decision requires more than expanding the supply of finance. Projects often face connected constraints in policy alignment, regulation and implementation, market and incentive design, technology readiness and implementation evidence, and finance. The next priority is therefore to identify the binding constraints for each project and sequence the actions needed to resolve them.

Building on Sections 3.1 and 3.2, and drawing on Catalyst's engagement with project owners, this section proposes five mutually reinforcing actions: (i) aligning projects and technologies with national policy and roadmaps; (ii) building the regulatory and implementation frameworks required for execution; (iii) designing markets and incentives that support predictable revenues and demand; (iv) strengthening technical and implementation evidence through implementation partners; and (v) connecting finance, subsidies, and guarantees across project stages. Financing remains essential, but it is one component of the wider set of actions required to move projects towards a final investment decision. Section 4.2 translates these recommendations into a more detailed catalogue of support levers and clarifies the areas in which Catalyst and its partners can engage.

3.3.1. Aligning Projects with National Policy and Roadmaps

Project-level discussions suggest that otherwise credible projects can remain difficult to advance when the role of the relevant sector or technology is not clearly established in national energy plans, sector roadmaps, or transition strategies. The first action is therefore to connect project-level evidence with national and regional priorities. This should include demonstrating how a project contributes not only to the interests of an individual sponsor, but also to decarbonisation, energy security, resilience, and other relevant public policy objectives.

Governments should, where appropriate, clarify the role of relevant projects and technologies in national plans and roadmaps and identify the policy changes required for their implementation. Catalyst can support this process by organising evidence from project engagements and facilitating dialogue amongst project owners, national authorities, MDBs, and regional platforms, including AZEC-related channels.

3.3.2. Building regulatory and implementation frameworks

A supportive policy framework alone does not make a project executable; without clear implementation arrangements – including detailed rules on roles, responsibilities, and risk allocation amongst relevant parties – individual transactions may still be unable to proceed. Depending on the project, these may include PPA frameworks, fuel-cost pass-through provisions, crediting mechanisms, certification and measurement rules, licensing and permitting procedures, and arrangements that co-ordinate infrastructure across the value chain.

The next step is to identify the specific institutional or implementation gap holding back each project and to build the necessary framework through co-operation amongst the relevant national authorities, project owners, and regional or international partners. International precedents can provide useful reference points, but the resulting arrangements need to reflect the legal, market, and institutional context of the host country.

3.3.3. Designing markets, incentives, and predictable revenue frameworks

Another important limitation is whether a project has a credible source of revenue or demand. Relevant measures may include price gap support, carbon markets or emissions-trading systems, procurement mechanisms, and off-taker consortia that aggregate demand and allocate risk amongst emitters, technology providers, buyers, and public authorities. External market drivers, including the European Union's CBAM and demand for lower-carbon products, should also be considered where relevant.

For long-term transition investments, the effectiveness of these measures depends on policy continuity and predictability. Governments and implementing institutions should therefore provide sufficiently durable rules, price signals, and contractual arrangements to reduce the risk that projects are undermined by abrupt policy reversal.

3.3.4. Strengthening technical and implementation evidence through implementation partners

Some projects cannot progress because the technology performance, deployment readiness, or implementation feasibility has not yet been demonstrated sufficiently in the relevant country or operating context. The fourth action is to build the evidence needed to assess and reduce these uncertainties, drawing on feasibility studies, demonstration projects, implementation precedents, and technology roadmaps.

Identifying where a lack of technical evidence is a binding constraint and linking the project with institutions equipped to address the issue can help support this step. Several organisations already operate programmes that address this issue through the provision of feasibility study support. Collaboration across projects and locations to leverage these mechanisms can help accelerate the strengthening of each project's structure.

3.3.5. Connecting finance, subsidies, and guarantees across project stages

Finance, subsidies, and guarantees can address the return and risk gaps that remain as the relevant policy, implementation, market, and technical conditions are developed. These actions may proceed in parallel, but the forms of financial support should not be treated as isolated interventions. They should be connected sequentially across project stages, from grants and technical assistance (TA) through catalytic or subordinated capital, guarantees, and other risk-sharing instruments, and ultimately to commercial finance.

Bridging grants and early-stage support to commercial capital

ASEAN's financing ecosystem is beginning to address different parts of the pathway from project development to commercial finance. ADB, for example, is supporting the development of private sector industrial decarbonisation opportunities in Southeast Asia through TA focused on hard-to-abate sectors. The Green Investment Partnership (GIP), managed by Pentagreen Capital, provides blended debt, TA, and active structuring for marginally bankable sustainable infrastructure. Meanwhile, the emerging Industrial Transformation Programme, under the Monetary Authority of Singapore (MAS) Financing Asia's Transition Partnership (FAST-P), aims to mobilise capital for corporate decarbonisation, hard-to-abate sectors, and low-carbon technologies. Together, these initiatives demonstrate that regional financing is expanding beyond commercially mature renewable-energy assets.

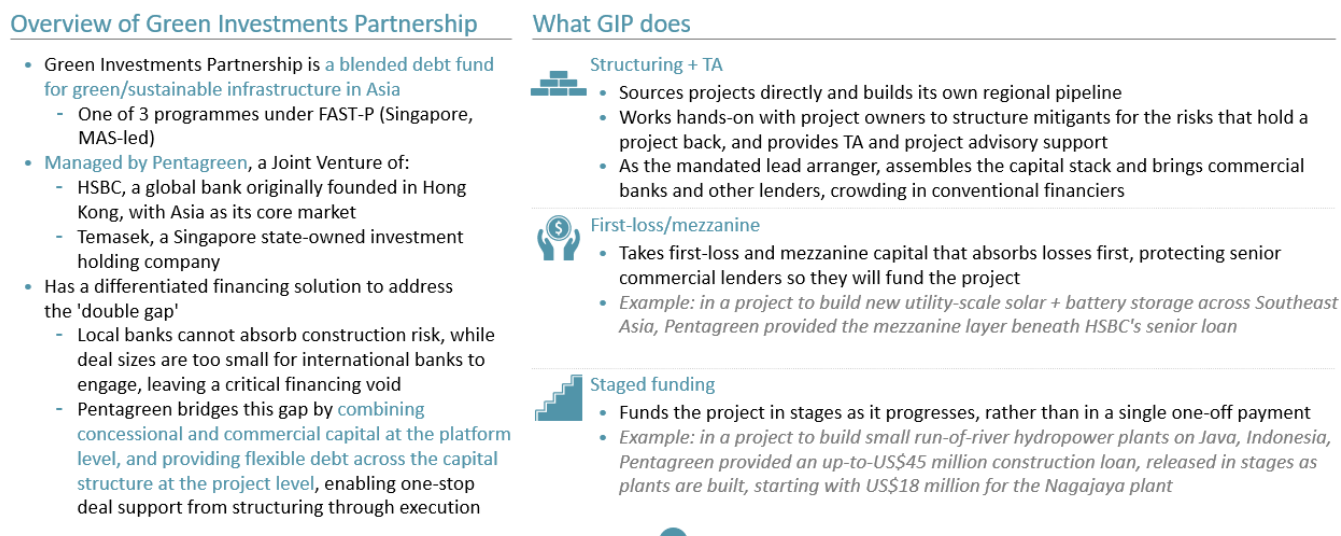
The remaining gap is more specific. While different facilities support individual stages of project development, few platforms provide an assured pathway across those stages. This is particularly relevant for FOAK and industrial decarbonisation projects, where technology performance, offtake, feedstock, policy, and construction risks may need to be resolved sequentially. FOAK projects are often too capital-intensive for venture equity but too novel and risky for conventional infrastructure capital; in practice, 'the least-resolved risk often sets the pace' (Zampieri et al., 2026: 8).

Supporting this lower part of the financing gap therefore requires more than a single source of risk capital. Ventures need to define the end-state commercial model; prove the integrated system; and build the delivery, governance, and project structures required by later-stage investors. In parallel, support should address the full set of risks required for the final investment decision – including permitting; offtake and feedstock; engineering, procurement, and construction and supply chain arrangements; project economics; operational readiness; and the capital structure. To achieve this, concrete actions include sequencing development capital, catalytic or first-loss capital, subordinated debt, milestone-linked guarantees, insurance or surety, and refinancing or take-out capital as evidence improves. Additionally, a dedicated FOAK finance facility can be considered to standardise due diligence, allocate capital based on risk-retirement milestones, and involve follow-on investors early in the process (Zampieri et al., 2026).

In contrast, the GIP shows how the upper part of the gap¹⁶ can be addressed once technology risk is better understood and the remaining constraints are primarily institutional, contractual, or financial (Figure 3.3). GIP combines three mutually reinforcing features: (i) subordinate and mezzanine capital with first-loss characteristics that lower risk; (ii) a dedicated structuring entity (a structuring agent or mandated lead arranger) that assembles projects into an investable package while providing TA where needed; and (iii) flexible debt financing that can support projects through development and construction, including through staged or expandable facilities where appropriate. This mix of active project structuring, TA, risk-absorbing capital, and staged funding enables marginally bankable projects to move closer to ordinary commercial terms. GIP's experience also shows that commercial capital can be mobilised when an established platform is capable of identifying projects, restructuring risks, and assembling an appropriate capital stack.

¹⁶ Ravi Menon (Singapore's climate ambassador and former MAS chief) illustrated this gap by stating that 'local banks were reluctant to take on the construction risks of these power plants, and the portfolio was too nascent for international banks' (cited in See (2026)).

Figure 3.3. Overview of the Green Investment Partnership



GIP is designed to address the financing gap between the risk appetite of local banks and the scale and maturity requirements of international lenders, reaching US\$800 million at second close, demonstrating the potential of a tiered blended-finance structure to crowd in commercial capital

GIP = Green Investment Partnership, FAST-P = Financing Asia's Transition Partnership, MAS = Monetary Authority of Singapore, TA = technical assistance.

Sources: MAS; International Finance Corporation; Pentagreen Capital; British International Investment; Environmental Finance; Markets Group; Uxolo; Transition Investment Lab; Climate and Capital Media; and Green Central Banking.

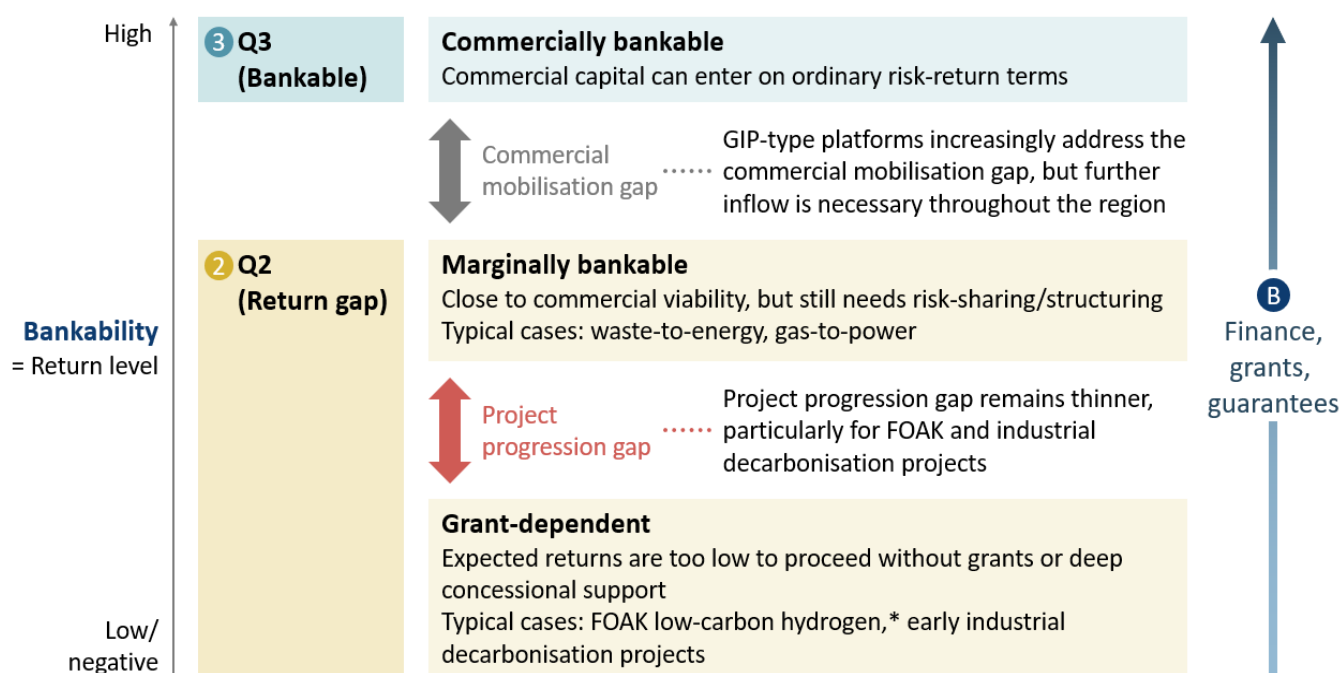
There are only a few players in ASEAN that currently combine these functions. This reflects a broader limitation of deal-by-deal blended finance: legal terms, risk-sharing arrangements, investor approvals, and reporting requirements are often rebuilt for each transaction. This raises costs and limits the reuse of structures and learning. Instead, platforms can provide a common architecture that co-ordinates capital, risk sharing, governance, and learning across multiple vehicles. They can place concessional and commercial capital where each is most effective, establish common eligibility and reporting principles, and combine opportunities in a form that is more familiar and investable for institutional partners (Madni et al., 2026).

FAST-P illustrates this broader platform role. Launched by the Monetary Authority of Singapore (MAS) in 2023, it operates as a family of specialised partnerships – including the Energy Transition Accelerator Financing Platform, GIP, and Industrial Transformation Programme – under a common framework for catalytic capital, governance, mobilisation, and impact. The Singapore Government's commitment of up to US\$500 million in concessional capital provides an important anchor, but the platform's role goes beyond supplying capital. As a 'strategic shaper', FAST-P helps define transition themes, shape capital structures and standards, provide a credible governance anchor and market signal, and generate repeatable approaches, while leaving day-to-day origination and execution to experienced fund managers (Madni et al., 2026).

The thinner part of the ecosystem is therefore not only the supply of capital between grants and commercial finance, but also the progression from projects that rely heavily on grants

or concessional finance. This gap can be addressed by adding platforms or players designed to help bridge this progression (Figure 3.4).

Figure 3.4. The Bridging Gap from Grants to Commercial Capital (Conceptual)



GIP = Green Investment Partnership, FOAK = First of a kind, Q = quadrant.

Note: Q1, Q2, and Q3 refer to the entry point matrix in Section 3.2.

*Hydrogen projects are expected to start from Q1, but is included here as it is expected to shift to Q2 once feasibility constraints are resolved

Source: Authors.

No single instrument can fill this project-progression gap. Rather, the bridge must be assembled according to each project's risk profile, drawing on concepts such as India's Viability Gap Funding and the World Bank's Output-Based Aid. These approaches use public or concessional support not simply to compensate for low returns, but to improve project viability and create a pathway towards commercial finance.

Results-based support is one potential exit mechanism from concessional funding. Under such a structure, additional capital could be released – or the terms of senior debt improved – as a project achieves predefined operational or commercial key performance indicators (KPIs). Bangladesh's solar home systems programme provides an illustrative precedent: subsidies were linked to verified results and progressively reduced as the market matured (Cabraal et al., 2021; Global Partnership for Results-Based Approaches, 2018; World Bank, 2013). Similar structures could be adapted to the sectors considered in this report, e.g. linking battery energy storage system financing terms to the share of customers willing to pay a premium, or aligning waste sector support with improvements in collection and sorting rates. The relevant KPIs and financial incentives should be developed on a project-by-project basis, drawing on established market guidelines for sustainability-linked instruments. These include the selection of KPIs, the calibration of corresponding

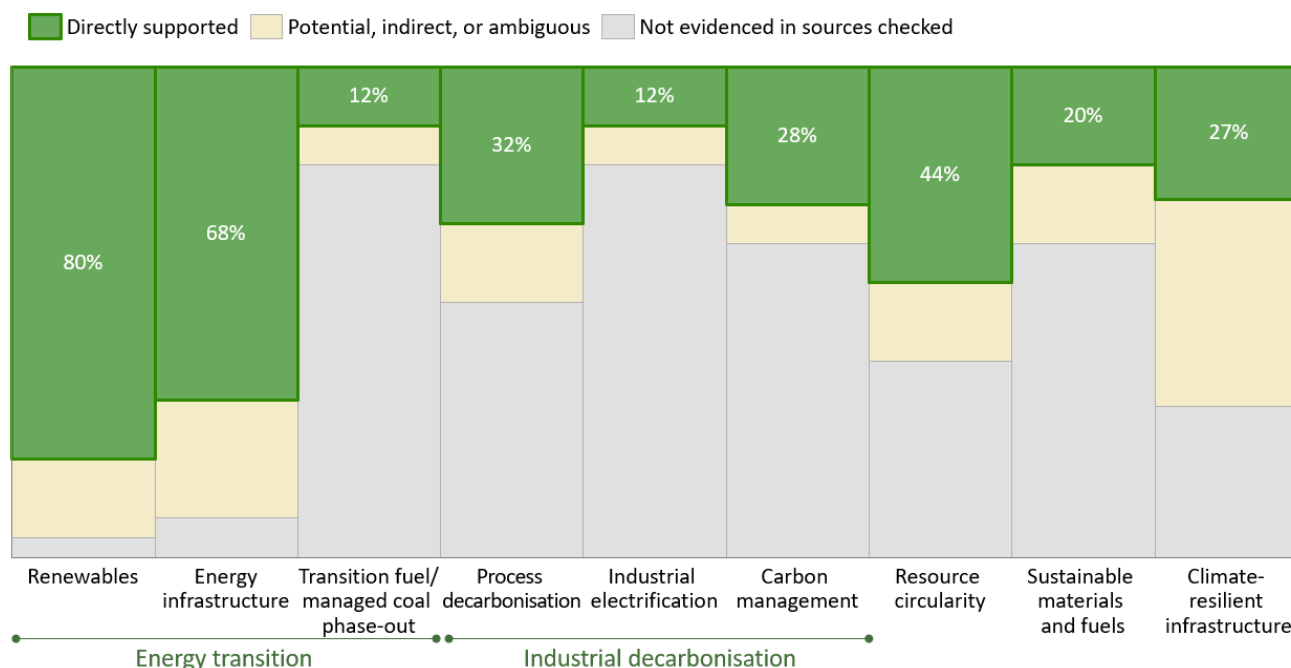
performance targets, and associated financial characteristics, as well as reporting and verification procedures. KPIs should be material to the issuer's core business and, particularly in hard-to-abate sectors, supported by a transition plan, with targets calibrated against science-based benchmarks or best available technologies (ICMA, 2024). Although this entails additional transaction costs, and greenwashing has emerged as an issue for certain sustainability-linked products, it represents an opportunity for hard-to-abate sectors, given that other forms of financing are similarly challenging and require further innovation.

Additional support from public finance in the form of grants or subsidies is also a powerful enabler, especially if aligned to some extent with the initiatives above. This progression pathway should ideally be defined when early-stage support is first provided. In practice, some projects receive grants or TA as one-off interventions, without clear milestones, follow-on financiers, or a route to concessional and commercial capital. Such projects may stall without appearing as explicit financing failures. Based on Catalyst's engagement with individual projects, addressing this less visible gap – by designing the onward financing pathway from the outset – may be as important as expanding the supply of capital itself.

Making eligibility for hard-to-abate transition more explicit and visible

A review of publicly available information on major regional and international funds suggests that it is often difficult for project owners to determine whether specific hard-to-abate activities fall within a fund's target scope. Renewable energy activities are frequently identified explicitly, while other areas related to hard-to-abate transition, such as transition fuel or managed coal phase-out, process decarbonisation, carbon management, and sustainable materials and fuels, are more commonly covered only implicitly under broader climate, infrastructure, or decarbonisation mandates (Figure 3.5). This does not necessarily mean that such activities are ineligible or that funds would not consider them. Rather, based on public disclosures alone, their eligibility often cannot be determined with confidence.

Figure 3.5. Target Scope of Hard-to-Abate Activities Across Major Funds



Note: 'Explicitly targeted' refers to funds for which publicly available information explicitly states that the sector is included as a targeted project area. 'Potentially targeted' refers to funds for which publicly available information does not explicitly state whether the sector is targeted, but the stated scope is broad enough to potentially include it. 'Likely outside target scope' refers to funds for which publicly available information does not explicitly state whether the sector is targeted, but the fund's stated purpose, investment focus, or other available information indicate that the sector is likely outside its target scope. 'Not targeted' refers to funds for which publicly available information explicitly states that the sector is not targeted, or limits targets to specific sectors that are unlikely to include the sector in question. 'Transition fuel/managed coal phase-out' includes gas to power, liquefied natural gas to power, and fuel switching for power generation; liquefied natural gas-related infrastructure such as floating storage regasification units; and coal phase-out and managed coal retirement.

Source: Authors.

This lack of visibility matters for hard-to-abate projects. Unlike established renewable energy activities, industrial transition projects may not fit neatly within conventional green investment categories and can involve sector-specific technologies, emissions pathways, and enabling infrastructure. If the treatment of these activities is not clearly communicated, sponsors and structuring entities may need to contact each fund separately before finding out if an opportunity is relevant. This can make it harder to identify appropriate capital providers and to design the financing pathway described above.

The ASEAN Taxonomy for Sustainable Finance Version 4 (ASEAN Taxonomy Board, 2025) provides a useful common reference for improving this visibility. In particular, its recognition of 'amber' activities offers a basis for identifying activities that are not yet fully green but are undertaking a credible transition while discouraging lock-ins through the sunseting of its Amber tiers. Environmental, social, and governance financing does not necessarily need to apply the taxonomy as a rigid eligibility threshold. Instead, it could be used, together with relevant sectoral pathways and transition finance guidance, to explain

more clearly which hard-to-abate activities finance providers are prepared to consider, under what conditions, and against which transition milestones.

The priority is therefore twofold. Existing funds can communicate more explicitly how hard-to-abate activities are treated within their mandates, including through sector examples, assessment principles, and representative transactions. At the same time, ASEAN would benefit from more vehicles that directly target industrial and hard-to-abate decarbonisation, rather than leaving such projects within broadly defined potential eligibility. Greater clarity and a wider range of explicitly targeted funds would make it easier for project owners to identify suitable capital and would help turn the ASEAN Taxonomy's transition framework into an investable pipeline.

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Chapter 4

Asia Zero Emission Community Inclusive Transition Finance Catalyst Playbook

In Chapter 3, the state in which a transition finance project cannot secure capital was diagnosed along three dimensions: feasibility, eligibility, and bankability. This was located on an entry point matrix defined by return level and certainty. This chapter describes how that map is used in project support – identifying where the constraint lies in each project (4.1); organising which support levers to pull and how, and what the Asia Zero Emission Community (AZEC) Inclusive Transition Finance Catalyst (AIF Catalyst) takes on (4.2); and presenting the structural lessons that have emerged through support to date and the ecosystem-level responses they point to (4.3).

4.1. AIF Catalyst Diagnostic Framework

The starting point for support is to determine where a project sits on the entry point matrix and what is the binding constraint to bringing it closer to the goal – quadrant 3 (bankable). As noted in Section 3.2, the forces that move a project towards quadrant 3 reduce, in essence, to two directions: (i) a horizontal move that raises the reliability of the revenue outlook and the business environment (including policy, regulatory, and market design levers); and (ii) a vertical move that increases returns to commercial criteria (by improving economic viability through concessional or subordinated capital, amongst other forms of transition finance). As mentioned previously, certain feasibility levers also improve bankability; however, since they are policy levers, this report categorises them under feasibility. Diagnosis entails the process of determining which of these two directions – or both – a project needs, and of identifying the key element within that axis.

4.1.1. Diagnosis

These two directions correspond directly to the two axes of the entry point matrix set out in Section 3.2 (Figure 4.1). In diagnosis, each axis is broken down into concrete elements. The horizontal axis – feasibility (certainty) – is captured through the state of policy and regulation, the presence of market and incentive design, technology readiness, and the maturity of infrastructure and supply chains. The vertical axis – bankability (return level) – is captured through elements such as the stand-alone economics of the project, the availability of blended finance providers, and finance structuring capability. The aim of diagnosis is to confirm these one by one in dialogue with the project owner, until it is possible to name which axis – return or certainty – and which element within it is the bottleneck.

Figure 4.1. Entry Point Matrix (Bankability x Feasibility)



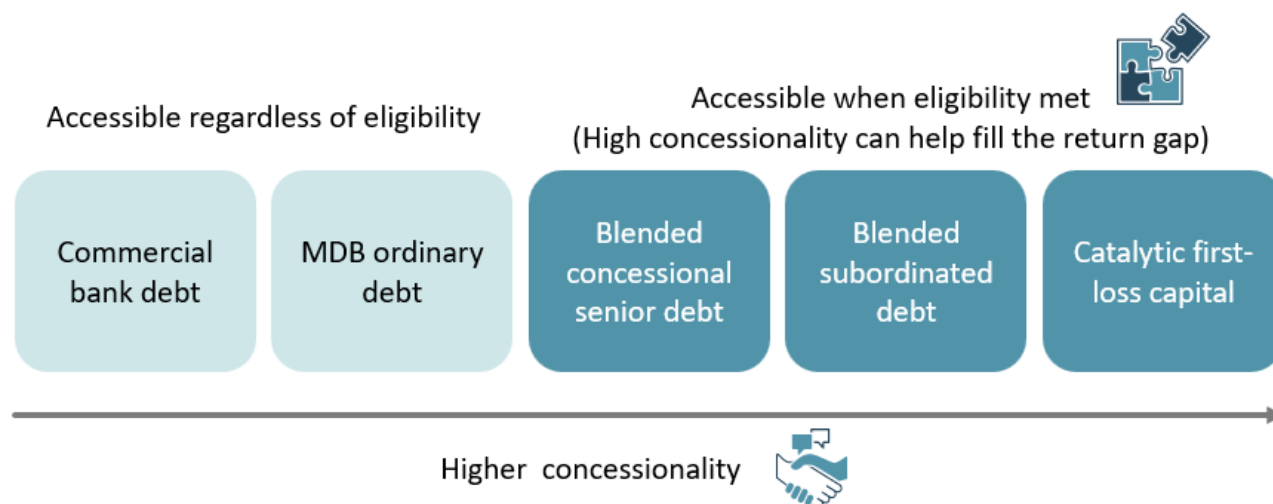
TRL = technology readiness level.

Notes: The apostrophe in quadrant 2' distinguishes between the 2nd step of each project having either a return gap (quadrant 2) or certainty gap (quadrant 2'). Policy measures such as pass-through clauses in power purchase agreements or price gap support can also support bankability improvement and can affect item B (Finance, grants, guarantees) – but since they are initiated through policy advocacy, in this report they are organised as 'feasibility' levers.

Source: Authors.

Of the three dimensions introduced in Section 3.2 – feasibility, eligibility, and bankability – eligibility differs in character from the other two. Eligibility does not move a project's position on the matrix – neither its return nor its certainty – but governs the range of catalytic, concessional, and labelled capital the project can use (Figure 4.2). As taxonomies, roadmaps, and fund mandates are established, the range of usable capital widens, and a project that does not meet a given eligibility requirement may still be viable through ordinary commercial finance. Eligibility is a lever that widens access to capital; it does not determine bankability. In diagnosis, in addition to the project's position on the two axes, one should also confirm how far eligibility widens – or narrows – its access to capital. Of course, requirements and assessments based on individual institution's policies apply to ordinary commercial finance, and transition finance eligibility itself is not the only requirement for blended or catalytic capital. Feasibility and bankability are also determinants of whether a project is ready for financing discussions. In general, projects in quadrant 1 or 2 may therefore depend initially on grants or concessional capital because ordinary commercial finance is unlikely to accommodate them at that stage. Conversely, some projects may be sufficiently bankable yet still face a financing gap because eligibility criteria restrict their access to particular sources of capital. Both types of constraint – insufficient feasibility or bankability and eligibility-related restrictions on access to capital – fall within the scope of Catalyst support.

Figure 4.2. Eligibility Widens the Range of Usable Capital



MDB = multilateral development bank.

Source: Authors.

The key risks categorised by the Asia Transition Finance Study Group (ATF SG) in 2025 are consistent with this diagnostic framework (Figure 4.3).

Figure 4.3. Simplified Mapping of Key Risks to Selected Technologies in Asia

	Risk Applicability						
	Strong				Partial		Limited
Risks	Zero-emission technologies				Transition technologies		
	Solar PV	Wind	BESS	Nuclear	CCUS	Coal plant retirement	Sustainable fuels co-firing
Cash flow risk	Complex dependencies e.g., business model, weather, market conditions, regulatory structure				No/uncertain revenue streams		Demand for coal and gas power
Credit risk	Complex dependencies e.g., capital structure, credit rating of project owner				Business model not proven at scale		Demand for coal and gas power
Development risk	Long and unpredictable permitting process			Complex permitting	Emerging regulation	Permitting & planning	Emerging regulation
Construction risk	Emerging technologies and best practices			Complex technology	Immature technology	Remediation & demolition	Emerging technology
Operating risk	Dependency on weather and energy market		Degradation and flammability	Feedstock availability	Immature technology	N/A	Emerging technology
Transport and storage risk	N/A			Prevention and mitigation costs	Leakage and capacity risks	N/A	
Technological risk	Mature technology				Not yet proven at industrial scale	N/A	Evolving technology
Environmental risk	Infra ecosystem interference		Limited impact	Radiation risk	Infra ecosystem interference	Positive impact	Continued emissions
Social risk	NIMBY		Limited impact	Potential societal health risks on HSE incidents		Labor force reduction	Fossil fuel burning health risks
Reputational risk	Neutral/positive societal perception			Potentially controversial	Neutral/positive societal perception		Greenwashing risk
Regulatory risk	Dependency on environmental, climate and energy policy and fiscal policy		Strong dependency on environmental, climate and energy policy, as well as energy security, social stability, and market development				
Political risk	Similar to regulatory risk		Similar to regulatory risk	Feedstock supplier	Similar to regulatory risk		
Currency and interest rate risk	Common risk						
Force majeure risk	Common risk			Magnifying potential	Common risk		
Legal risk	Common risk						

BESS = battery energy storage system; CCUS = carbon capture, utilisation, and storage; HSE = health, safety, and environment; N/A = not applicable; NIMBY = not in my back yard; PV = photovoltaic.

Note: Risk mapping may change depending on the nature of technology, country and market contexts, and the objective of the financing. Sustainable fuels co-firing is used as a broad category, as the associated transition and lock-in risks may vary depending on the fuel, technology, and application. Specific risks should therefore be assessed in the context of the individual co-firing pathway.

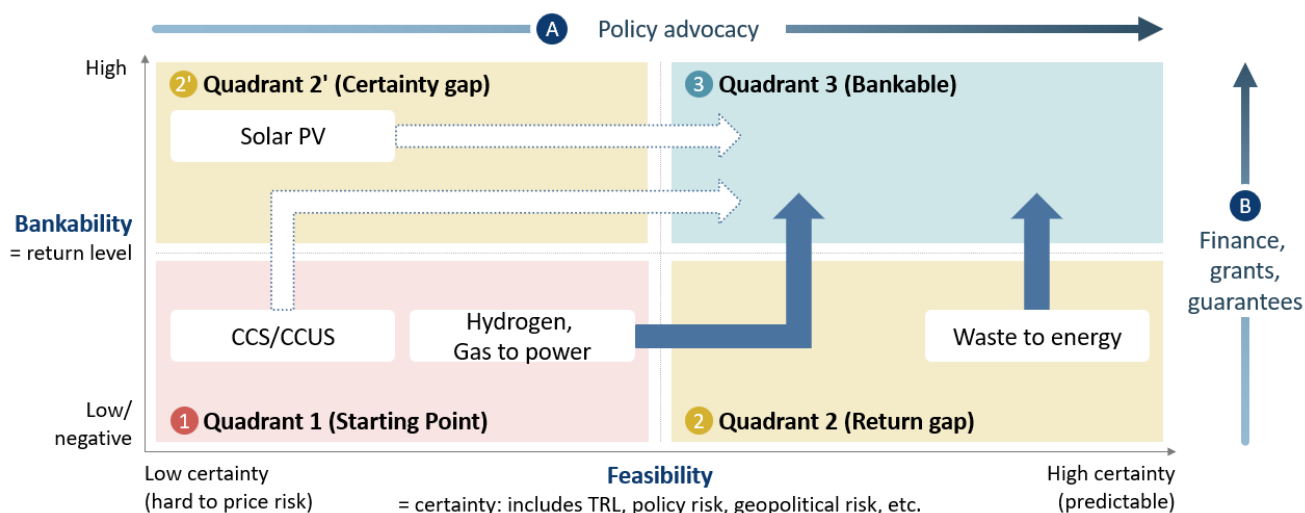
Source: ATF SG (2025).

Each of the key risks listed in Figure 4.3 can be mapped onto this chapter's two axes (feasibility/bankability) and the overlay (eligibility). For example, development, construction, operating, technological, regulatory, and political risks correspond to **feasibility**, relating to technology maturity and the certainty of policy, regulation, and execution. Cash flow, credit, and currency and interest rate risk correspond to **bankability**, relating to the project's returns and economics. Environmental, social, and reputational risk correspond to **eligibility**, relating to eligibility for transition capital and to taxonomy alignment.

4.1.2. Typical transition paths

What matters is that constraints follow typical patterns by type of project. Placing the projects Catalyst has engaged with on the two axes, the bottleneck axis and the route to the goal can be broadly typified according to the character of technology and business. Many projects start from quadrant 1 (starting point) and follow the main line, 1→2→3. Figure 4.4 shows typical routes.

Figure 4.4. Plotting of Major Assets on the Matrix and Their Routes to the Goal



CCS = carbon capture and storage; CCUS = carbon capture, utilisation, and storage; PV = photovoltaic; TRL = technology readiness level.

Note: The figure is illustrative, based on individual project experience through the Catalyst initiative. Other projects with the same transition technology may have different trajectories and should be assessed individually.

Source: Authors.

For instance, a project using emerging technology such as hydrogen typically starts from quadrant 1, where technology readiness is low, related infrastructure and institutions are not in place, and the economic factors do not yet meet the standards of commercial investment criteria. First, providing support for demonstration and first-of-a-kind (FOAK) deployment steadily raises technology readiness. At the same time, establishing the necessary infrastructure and legal and regulatory frameworks improves the certainty of project completion. This progress moves the project to quadrant 2 (return gap), where certainty is secured, but returns remain below commercial expectations (a horizontal shift). The

remaining return gap is then covered by concessional capital or government price gap support,¹⁷ which raises returns to meet commercial criteria and moves the position into quadrant 3 (a vertical shift). This is the most common 1→2→3 route: securing certainty first, then improving the economics.

Gas-to-power decarbonisation also follows the main 1→2→3 path, but the way returns are secured differs from that of hydrogen. Although the potential return as a power generation business is high, returns cannot be secured unless the offtake price and the pass-through of fuel-price fluctuations are assured. Therefore, the starting point is still quadrant 1. The project's position and revenue framework are settled through a power-capacity auction, raising certainty and moving it to quadrant 2 (horizontal). Almost simultaneously, including a fuel-cost pass-through and similar terms into the power purchase agreement (PPA) secures the returns, reaching quadrant 3 (vertical). Unlike the hydrogen example, where concessional capital supports returns, here the increase in returns is achieved through contract and market design. This shows that even for the same vertical move, different tools can be used (as explained in Section 4.2).

In contrast, a renewable energy project like solar photovoltaic, where costs have already decreased and there is little chance of costs rising after it starts operating, has inherently higher return expectations. However, unless there is an offtake mechanism like a PPA and transmission grid infrastructure to handle the power, the certainty of revenue does not increase. Such a project belongs in quadrant 2' (certainty gap), where returns are stable but certainty is lacking. Instead of a vertical lift, this requires a horizontal shift through policy levers like establishing offtake agreements and grid infrastructure (2'→3).

Carbon capture and storage (CCS) or carbon capture, utilisation, and storage (CCUS) typically start from quadrant 1, where both return and certainty are low, as the economics of the capture (emitter) do not meet commercial criteria, and the institutions and markets – such as credit frameworks, price gap support, and value chain arrangements – are often undeveloped. It does not have to follow the 1→2'→3 path, which prioritises commercial viability first. However, drawing on examples like Europe, a technology-first approach is also possible. This approach starts by ensuring economic support through measures such as price-gap support, then strengthens the certainty of institutions and markets (as explained in Section 3.3.2).

These types are not a basis for re-evaluating a project from scratch, but a cue for accelerating diagnosis by forming a hypothesis about which axis tends to be blocked for a given kind of project. Which constraint is ultimately decisive is confirmed project by project.

Finally, not all constraints are within the scope of AITF Catalyst. Verifying how mature the technology is, offering third-party assurance, and assessing the commercial viability of an individual project are best left to specialist institutions or to the project owner. Whether AITF

¹⁷ Price-gap support is a feasibility lever that also works on bankability. Thus, in this case, it is more of a diagonal move from quadrant 1 to 3, which leans more towards quadrant 2.

Catalyst should get involved depends on whether the constraint can be addressed through structural remedies – such as policy, regulation, market design, and finance structuring – and whether it can be elevated to a structural challenge that applies broadly to other similar projects (criteria for engaging or pausing are explained in Section 4.3).

4.2. Catalogue of Support Levers

Once the constraint is identified, the appropriate support lever is selected and pulled. The guiding principle here is to understand a lever not by who provides it or what it is called, but by which axis of the project it moves. Even within financial support, a government guarantee of the offtake price directly underpins revenue and can therefore act vertically. Similarly, within technical assistance, advice that improves feasibility acts horizontally, whereas support for building a finance structure enables the downstream blended finance and thus underpins the vertical lift.

The following section organises the support levers corresponding to the three dimensions – feasibility, eligibility and bankability. For each lens, the levers are first listed, then their content and the extent to which Catalyst can engage are described.

4.2.1. Eligibility

The usual approach to eligibility is for the capital recipient to set its own targets and transition strategy, in line with the eligibility criteria used by capital providers, such as national and regional taxonomies and the International Capital Market Association (ICMA) principles (ICMA, 2025) as is illustrated in figure 4.5. In contrast, Catalyst can use the support levers listed below. These do not change a project's position on the matrix but work to widen the range of catalytic, concessional, and labelled capital available. The levers can be grouped into two categories:

- **E-1:** transition eligibility advocacy
- **E-2:** project eligibility evidence support

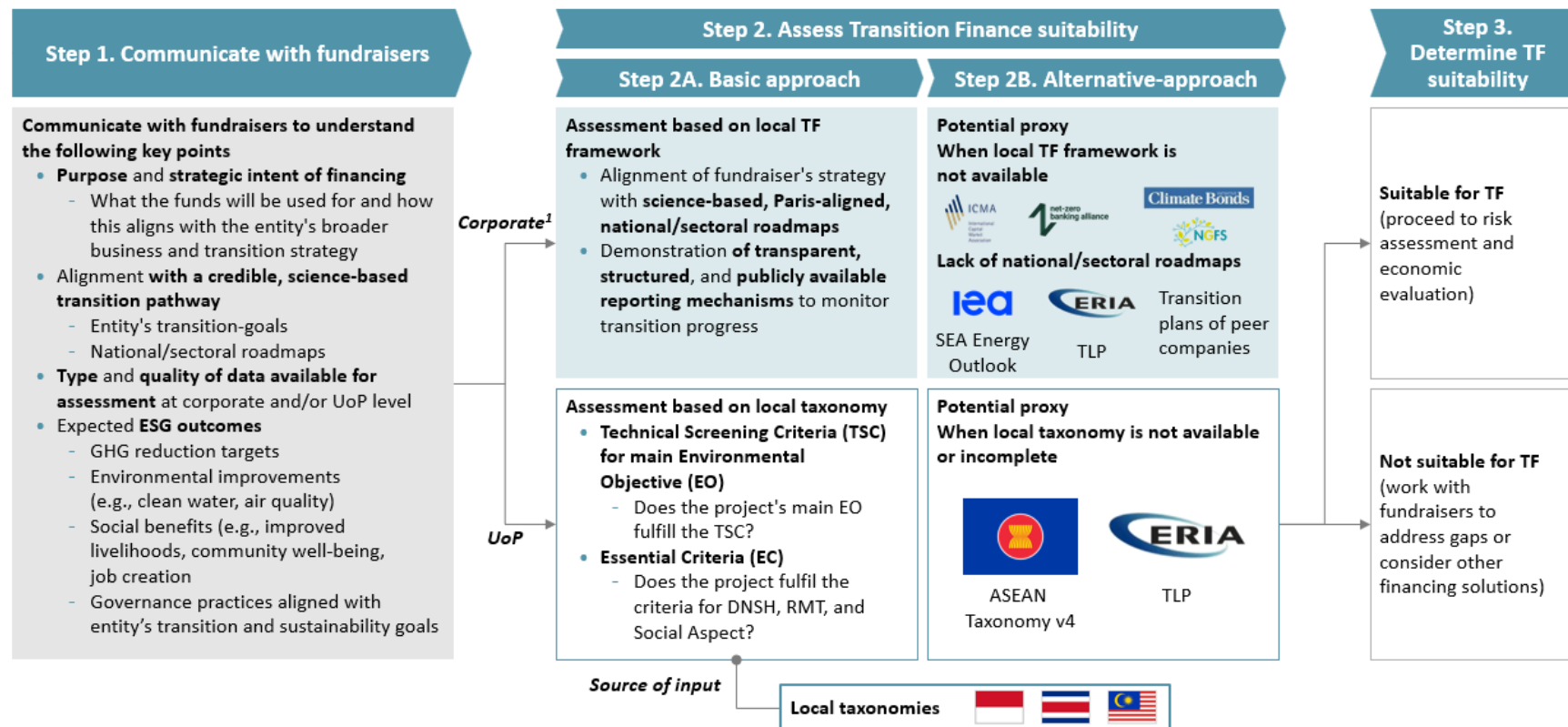
E-1 Transition eligibility advocacy

This lever determines where the transition is positioned within society. This may involve highlighting successful examples of transition finance, explaining clear transition pathways and roadmaps at both national and sector levels, and embedding the advantages (incentives) of choosing transition projects into institutions. Catalyst can pursue these directions by engaging in AZEC-related communication and discussions with national governments and multilateral development banks. For example, it can promote taxonomy alignment for assets whose treatment may be unclear. While existing taxonomies have become more comprehensive, there are cases where local taxonomies are not available or do not clearly address specific projects. In such cases, the alternative approach presented in Figure 4.5 can provide a useful basis for assessing the suitability of a project for transition finance.

E-2 Project eligibility evidence support

This lever confirms whether an individual project is eligible based on technical criteria. It may involve working with the sponsor to create the project's transition narrative and presenting it in a way that can withstand third-party review (e.g. a second-party opinion). This function is mainly undertaken by the sponsor and assessment bodies; rather than taking the lead, Catalyst engages as needed.

Figure 4.5. Updated Asia Transition Finance Guidelines (TF Suitability Assessment)



ASEAN = Association of Southeast Asian Nations; DNSH = do no significant harm; EC = essential criteria; EO = environmental objective; ESG = environmental, social, and governance; GHG = greenhouse gas; RMT = remedial measures to transition; SEA = Southeast Asia; TF = transition finance; TLP = technology list and perspective; TSC = technical screening criteria; UoP = use of proceeds.

Source: Authors, based on *Asia Transition Finance Study Group (ATF SG) Annual Report 2025*, Exhibit 34.

4.2.2. Feasibility

Feasibility (certainty) constraints are, in principle, resolved by policy and regulatory authorities through institutional development, as well as through market- and contract-side solutions. These constraints cannot be resolved solely by increasing the amount of capital. In this regard, the support levers that Catalyst may deploy are listed below. These domains represent the context in which Catalyst's value is most clearly realised, and the levers can be grouped into four categories:

- **F-1:** policy advocacy (clarifying the positioning of a sector or technology)
- **F-2:** regulatory and implementation support (designing frameworks, contract terms, and permitting)
- **F-3:** market and incentive design (matching supply and demand; assembling the business arrangement)
- **F-4:** technical readiness evidence development (building evidence on implementation cases and deployment readiness)

F-1 Policy advocacy

This lever presses governments to position clearly, in policy and roadmaps, the role a particular sector or technology plays in the regional transition, thereby raising the predictability of revenue. Although there is some overlap with the E-1 'Transition eligibility advocacy' lever, there are feasibility-specific advocacy levers such as those related to emerging technologies, which are sometimes not sufficiently clarified in national energy policy. For example, hydrogen's role in policy and roadmaps may be unclear or undetermined even though it can play an important role in realising the future decarbonisation of steelmaking, gas-to-power, and similar processes. Catalyst can advocate for clarifying the role of such technologies in policy and roadmaps. These are hard for a sponsor to move alone, and the value lies in Catalyst standing between the project and the policy authorities to build the proposal jointly.

F-2 Regulatory and implementation support

This lever builds the institutional vessel that underpins the predictability of revenue. Drawing on international precedents, it may involve designing the regulatory framework, contract terms, and permitting procedures. Catalyst can engage – by bridging precedents – in the institution-building that is a precondition for a project, such as putting a PPA framework in place, a CCS credit framework, or certification designs.

F-3 Market and incentive design

This lever underpins a project's revenue directly from the market side, or matches supply and demand, to help the project come together. Concretely, it spans the introduction of government price gap support, the provision of incentives through an emissions trading system or carbon market, and the design of a consortium that bundles the several actors – emitters, technology providers, demand-side off-takers, and policy authorities – without

which the project cannot be realised. Catalyst can engage in designing these market and incentive mechanisms. Note that F-2 regulatory and implementation support (building the institutional vessel) and the incentive design here are connected: the design of price gap support or a carbon market, for instance, is often a cross-cutting measure spanning both institutional design and incentive design. Additionally, this lever directly contributes to improvement of bankability. Here it is categorised as 'feasibility' since the leverage point itself is around policy, but it can also be considered a cross-category lever.

Across these levers (F-1 to F-3), policy continuity and predictability are a prerequisite: because these are large, long-horizon investments, announced incentives, prices, and carbon market rules must hold over time (Singapore's multi-year carbon-price roadmap is a good example). Catalyst can encourage governments to commit to such durable, predictable policy.

F-4 Technical readiness evidence development

This lever builds evidence on implementation cases and deployment readiness, thereby raising the perception of certainty. Catalyst can contribute through documentation such as Technology List and Perspectives for Transition Finance in Asia by ERIA.

4.2.3. Bankability

Gaps in bankability (return level) are, in principle, filled through the project owner's own improvement of economics and through credit and structuring by capital providers. However, for transition projects that struggle to reach commercial investment criteria, the market alone has limits. The financing ecosystem of ASEAN is increasingly able to support different parts of the pathway from project development to commercial finance. The remaining challenge is therefore not only the amount of capital available, but also whether the relevant forms of support are connected across project stages. In this context, the support levers Catalyst can deploy include a vertical solution, which improves the economics, and solutions that link stages and widen access to capital. The levers can be organised into three categories:

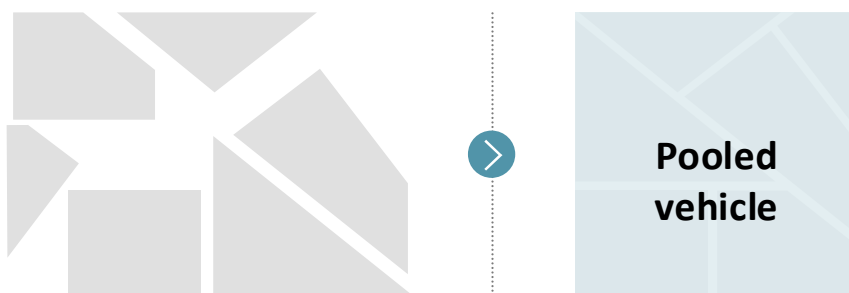
- **B-1:** finance structuring support
- **B-2:** navigation of existing financing options
- **B-3:** finance Structuring Capacity Building

B-1 Finance structuring support

This lever, in co-operation with financial institutions and multilateral development banks, supports building the finance structure needed to incorporate blended finance into a project. An important factor here is an anchor investor – a credible first mover like a national development finance institution, a globally trusted fund, or multilateral development banks – whose early commitment crowds in other investors. Catalyst can help advance the blended finance arrangement by bringing together pilot projects and acting as a bridge between the project owner and capital providers.

In building a finance structure, it is important to consider aggregation, which means combining several small or frontier projects. These projects often stay in quadrants 1 and 2 because they are limited by their size in attracting more capital. Bundling them yields a ticket size institutional investors can handle and a credit profile equivalent to investment grade, allowing the pool to reach quadrant 3 (Figure 4.6). Aggregation mainly works on the capital-provider side, but Catalyst can complement this by organising how projects are bundled and by developing the project pipeline.

Figure 4.6. Securing Scale Through Aggregation (Pooling)



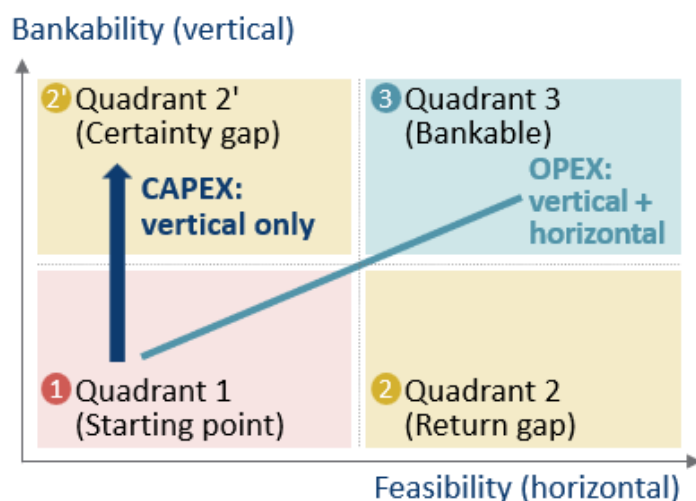
Source: Authors.

B-2 Navigation of existing financing options

This lever guides the use of available funds and facilities for a project owner and helps connect appropriate forms of support throughout the project stages. In areas where supply is limited, particularly early-stage catalytic and subordinated capital that helps move a project from the starting point (quadrant 1) towards commercial viability, recommendations for needed forms of capital can also be provided, thereby improving access to capital. Catalyst can contribute by organising entry-level information on the project side so that projects and capital can find each other more readily, and by helping define the onward financing pathway from early-stage support to commercial finance.

In guiding access to capital, it is important to remember that the impact differs depending on whether the support targets capital expenditure (CAPEX) or operating expenditure (OPEX). Support for CAPEX lifts the return level (vertical), whereas OPEX-type support – such as operating subsidies and price-gap payments – acts on both the lifting of returns and the predictability of revenue (vertical and horizontal) (Figure 4.7). For the same capital, the axis it moves depends on which project costs it underpins.

Figure 4.7. CAPEX/OPEX and the Axis Moved



CAPEX = capital expenditure, OPEX = operating expenditure.
Source: Authors.

B-3 Finance Structuring Capacity Building

The structuring capability needed for blended finance is in short supply in the region, particularly the capability to connect project development, risk reduction, and financing across multiple stages. Building these skills will be important in the future. Catalyst can contribute by sharing knowledge from pilot projects and by helping project owners and capital providers use more consistent methods for structuring projects. This issue is being discussed at the ATF SG. The gap exists not only in the amount of capital but also in the functions that allow available capital to be used as projects progress.

4.3. AITF Catalyst's Institutional Learning

Sections 4.1 and 4.2 explain the general process of providing support. However, Catalyst has identified a set of structural challenges that cannot be solved by addressing individual project constraints alone. These issues occur frequently across projects and should be addressed through ecosystem-level thinking, as set out in Section 3.1, rather than treating symptoms on a project-by-project basis. What follows is not a complete list but several points that have proved especially important in the field of support.

First, feasibility bottlenecks are common in a structural, cross-cutting way rather than being specific to individual projects. Several projects faced similar obstacles: there was no established PPA framework, no group of demand-side off-takers, and no plan to address the price gap. These problems cannot be solved simply by adding capital; they can only be addressed through the design of policy, regulation, and markets – Catalyst's core role. The key implication is that, in many cases, creating certainty is a precondition for establishing a project's baseline bankability. There is also potential for blended finance, but unless the certainty gap is resolved first, many projects never even reach the investment table.

Second, regarding eligibility, the challenge is not the absence of an overarching framework. The ASEAN Taxonomy, national taxonomies, and transition finance guidance already provide an important foundation. The remaining gap is that the treatment of particular hard-to-abate and enabling activities is often not explicit or sufficiently visible at the level of individual funds and facilities. Sponsors may therefore be unable to determine with confidence whether a project falls within a fund's mandate, under what conditions, and against which transition milestones. This uncertainty makes it harder to identify suitable capital providers and design an onward financing pathway, even where a project can demonstrate alignment with a credible, time-bound transition pathway. More explicit communication by funds – using the ASEAN Taxonomy's recognition of 'amber' activities, together with relevant sectoral pathways, assessment principles, and examples – and more vehicles directly targeting hard-to-abate decarbonisation, would widen projects' access to capital and help translate the region's existing transition finance framework into a stronger investable pipeline.

Third, regarding bankability, the catalytic and subordinated capital that improves the returns of projects that do not meet commercial criteria is growing rapidly but is not yet consistently connected to projects at all development stages, so it can remain underused. Commercial finance is widely available for projects that are viable on a stand-alone basis (quadrant 3), whereas targeted gaps in early-stage catalytic and risk-bearing capital remain, particularly for FOAK and industrial decarbonisation projects. However, the availability of capital alone does not explain why many projects remain at the starting point (quadrant 1). Different facilities may support individual stages, but early-stage support is not always provided with clear milestones, identified follow-on financiers, or an assured pathway towards concessional and commercial finance. In addition, the state in which capital and projects cannot find each other (mutual waiting, leading to underuse) also delays projects from approaching bankability. These issues cannot be resolved through individual project negotiations; they require addressing the structure of capital supply and the structuring functions that link projects, instruments, and investors at different stages.

What the three points have in common is that none can be solved in individual project negotiations alone; each can only be addressed by making changes at the structural level of policy, institutions, and capital supply. Catalyst's role is to bring such structural challenges to the surface through individual project support and to elevate them into policy recommendations. As these recommendations progress, the new projects approach bankability more readily. Moving back and forth between individual projects and structural challenges, advancing both at once, is the essence of the Catalyst initiative.

References

- ATF SG (2025), *Asia Transition Finance Study Group (ATF SG) Annual Report: Accelerating Transition Finance in Asia – Key Solutions, Systems, and Risks to Unlock Investment*, Jakarta: Asia Transition Finance Study Group. <https://www.atfsg.org/report/asia-transition-finance-study-group-atf-sg-annual-report-2025>
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Chapter 5

Conclusions and Way Forward

So far, the Asia Zero Emission Community (AZEC) Inclusive Transition Finance Catalyst (AITF Catalyst) has helped individual projects identify structural challenges and address specific bottlenecks. This chapter sets out directions for enhancing this function and how the project pipeline can be expanded. These are tentative suggestions at this stage, based on the idea that they will be developed through ongoing discussions with related stakeholders.

5.1. How to Enhance the AITF Catalyst's Value

5.1.1. AITF Catalyst value proposition

As shown so far, Catalyst has identified the conditions in which a transition finance project cannot reach a final investment decision in the shared language of feasibility, eligibility, and bankability (Chapter 3). Through the methodology of applying appropriate remedies across policy, regulation, markets, and finance structuring (Chapter 4), it has played a role in bringing projects closer to final investment decisions. Through engagement with project owners and related stakeholders, we have re-articulated the importance of energy security and resilience and promoted dialogue with policymakers and multilateral development banks (MDBs) towards specific policy advocacy and assembling blended finance. Moreover, extracting the structural challenges that recur during such individual support and communicating them as policy messages is also a value Catalyst delivers.

The source of this value lies in Catalyst's ability to survey both projects and capital/policy from an outside-in perspective and to bridge the two in a shared language.

5.1.2. Directions for strengthening AITF Catalyst

Based on this value proposition, there is room for Catalyst to broaden its contribution even further. Through accumulation of cross-project knowledge, as well as collaboration with related initiatives and additional stakeholders, Catalyst aims to strengthen its role in the four directions outlined below.

First, strengthening the capability to address structural challenges. The lessons gained from individual project support could be carried beyond ad hoc responses, by combining information and learnings across projects systematically into policy recommendations and institutional design. For example, updating the diagnostic methodology set out in Chapter 4 (the entry point matrix and action levers across feasibility, eligibility, and bankability) by accumulating the correspondence between types of bottlenecks and the levers that proved effective. Catalyst can also co-ordinate across projects and platforms by taking stock of constraints that recur across projects (e.g. to what extent do contract terms need to be

articulated, and how can uncertainty over offtake be resolved) and feeding them back into the relevant regulatory reform agendas and regional policy dialogues, including ASEAN forums. As this accumulation and recirculation of knowledge accelerates, each successful project or support thereof, has a stronger impact in increasing the confidence of future projects.

Second, deepening co-operation with related initiatives. ASEAN-related institutions and MDBs each pursue their own goals, but their roles could be divided to work together effectively. For example, the lessons learnt through Catalyst could be shared with the Asia Transition Finance Study Group (ATF SG) or other financial sector collaboration platforms, so that financial institutions have a clearer understanding of how projects can become bankable and help project owners address the gaps. MDBs can also collaborate, especially by using blended finance and applying lessons learnt from the AITF Catalyst pilot projects. For policy discussions, early Catalyst activities revealed that individual projects are not always linked to or referenced by related stakeholders when discussing bottlenecks. This gap might be resolved through Catalyst co-ordination. This way of organising roles and counterparts helps prevent duplication of efforts while connecting diagnosis through to implementation without gaps.

Third, continuing and strengthening the communication function. Policy communication like the kind in this report could be repeated periodically, continuing to inform stakeholders about the structural challenges and recommendations that arise from project support. Additionally, sharing stories about transition finance, communicating through AZEC-related forums, and diffusing a shared language such as the entry point matrix across the region are all effective in sustaining momentum for the transition and aligning the perceptions of sponsors and capital providers. Communication is meaningful, especially when updated periodically in line with the accumulation of diagnosis and learning through continued activities.

Finally, evolving as a dialogue platform. The role of a platform that connects actors with different positions and interests – such as sponsors, national governments, MDBs, and private financial institutions – could be developed into a more permanent form. For example, to fix the situation where capital and projects cannot find each other, a matching platform could be established that brings together basic project information and the interest of capital providers (while addressing any conflicts of interest beforehand). Alternatively, diagnostic sessions could be held to bring together key project participants to identify constraints and assign roles to address specific bottlenecks. Such public–private dialogue platforms could help individual projects advance and solve broader structural challenges.

5.1.3. Concrete activities for the next phase

In the next phase, Catalyst will carry out the type of activities outlined below. Each takes individual project support as its starting point, while connecting the knowledge gained there to structural recommendations and moving forward by drawing in relevant actors.

- Continue supporting existing projects and apply the Chapter 4 methodology, including diagnosis of feasibility, eligibility, and bankability, as well as the entry point matrix, for new projects. Work with the sponsor to move from identifying the constraint to selecting and executing the support levers.
- Aggregate, through the diagnosis, the constraints that recur across projects, and compile them into policy and institutional recommendations addressing the common constraints. Feed these continuously to AZEC, related authorities, MDBs, and other stakeholders.
- Design a dialogue platform for key regional collaboration stakeholders (e.g. ASEAN and dialogue partners and MDBs) to share information and promote collaborative solutions for common bottlenecks. Next, by avoiding conflicts and using careful planning, create a forum for project owners and capital providers (MDBs, funds, and private financial institutions) to connect over potential future project opportunities.
- Update and communicate this report periodically, diffusing transition-project success stories and a shared language across the region.

These activities will focus on specific themes and projects, based on the pipeline approach set out in Section 5.2. It is also important to note that these activities are envisioned as a temporary, mid-term initiative, not a permanent one. Once multiple success cases are visible and the involved stakeholders are connected naturally through existing forums or direct contacts, Catalyst will have achieved its purpose.

5.2. How AITF Catalyst Will Engage with Projects Going Forward

Continuously cultivating the project pipeline is important to enhance Catalyst's value. This involves both calibrating the level of support to existing projects as they progress and identifying new projects where Catalyst activities could add value. This will be conducted under the following directions.

5.2.1. Who AITF Catalyst is designed to support

Catalyst is intended primarily for project owners and stakeholders pursuing energy transition projects in Southeast Asia who face barriers that the project owner cannot readily address alone. These may include uncertainties concerning policy and regulation, technology and infrastructure, transition finance eligibility, commercial structure, risk allocation, or access to suitable capital. Projects need not already be bankable; rather, there should be an identifiable project owner, a credible transition rationale, and a willingness to work with relevant public and private sector stakeholders.

5.2.2. What AITF Catalyst can – and cannot – provide

Catalyst can help project owners diagnose constraints using the feasibility, eligibility, and bankability framework; identify potential support levers and relevant counterparties; and

bring project-level lessons into wider policy and financing discussions. Depending on the project, this may include facilitating dialogue with governments, MDBs, financial institutions, and other initiatives. Catalyst does not provide or guarantee financing, approve projects, replace technical or commercial due diligence, or imply endorsement by any participating institution.

5.2.3. How AITF Catalyst plans to cultivate the project pipeline

Catalyst will continue discussions with relevant partners and stakeholders to explore how and where to source new projects. In addition to choosing from AZEC-affiliated projects, referrals from stakeholders or submissions from project owners may be options. These alternatives will be examined and considered carefully so that Catalyst can provide maximum value in addressing the region's energy security and resilience needs by financing the transition.

Project owners can also use the framework in Chapter 4 to self-evaluate their projects in a way that supports focused engagement with policymakers and capital providers. A useful starting point is a concise description of:

- the project, its owner, location, and stage of development;
- its expected contribution to decarbonisation, energy security, or resilience;
- the principal constraint under feasibility, eligibility, or bankability;
- the evidence available to support the project and its transition rationale;
- the action or counterpart needed to address the constraint; and
- the next practical milestone and the conditions required to reach it.

This initial diagnosis does not have to resolve every issue. Its purpose is to clarify where the project stands, what prevents it from advancing, and where co-ordinated support may be most effective. Project owners can also present these points to Catalyst for discussion. Although final project intake is not guaranteed, Catalyst remains open to discussions with project owners to deepen understanding of the transition landscape in ASEAN.

5.3. Conclusion

AITF Catalyst's first year has demonstrated the value of examining transition efforts in ASEAN from the perspective of individual projects. While regional frameworks and financing mechanisms continue to develop, projects often remain constrained by the interaction of technical, policy, market, and financial factors. By distinguishing between feasibility, eligibility, and bankability, Catalyst provides a shared language through which project owners, governments, and financial institutions can identify these constraints and consider appropriate responses.

Going forward, Catalyst aims to deepen its role as a continuing platform for project diagnosis, cross-project learning, and dialogue amongst project owners, governments, development partners, and financial institutions. Its goal is not to increase financing directly, but to help stakeholders identify and address the constraints that prevent projects from becoming feasible and bankable. By helping create – but not guaranteeing – the conditions under which financing can be mobilised, Catalyst can strengthen ASEAN's pipeline of credible and investable transition projects.