

ASEAN TRANSITION PLAN HANDBOOK

A Practical Guide for Enterprises and Financial Institutions

NOVEMBER 2026

ASIAN DEVELOPMENT BANK

ADB

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Abbreviations

Acronym	Definition	Acronym	Definition
3-NOP	3-Nitrooxypropanol	GHG	greenhouse gas
ADB	Asian Development Bank	GreenRE	Green Real Estate
AGXC	Asia Green Transformation Consortium	IBS	industrialized building systems
ASEAN	Association of Southeast Asian Nations	IFRS	International Financial Reporting Standards
ATFG	ASEAN Transition Finance Guidance	IFRS SDS	IFRS Sustainability Disclosure Standards
BCA	Building and Construction Authority	LCA	life cycle assessment
BF-BOF	blast furnace–basic oxygen furnace	LEED	Leadership in Energy and Environmental Design
BIM	building information modeling	N_2O	nitrous oxide
BREEAM	Building Research Establishment Environmental Assessment Method	NDC	nationally determined contribution
CCUS	carbon capture, utilization and storage	O&M	operation and maintenance
CDW	construction and demolition waste	RCA	recycled concrete aggregate
CH_4	methane	RECs	Renewable Energy Certificates
CIDB	Construction Industry Development Board	SAF	sustainable aviation fuels
EAF	electric arc furnace	SBTi	Science-Based Targets initiative
EDGE	Excellence in Design for Greater Efficiencies	SLL	sustainability-linked loan
EPC	engineering, procurement, and construction	SOx	sulfur oxides
EV	electric vehicle	STs	Strategic Thrusts
FLAG	forest, land, and agriculture	TCA	Thai Contractors Association
GBI	Green Building Index	tCO_2e	tons of carbon dioxide equivalent
GDP	gross domestic product	TREES	Thailand's Rating of Energy and Environmental Sustainability
GFANZ	Glasgow Financial Alliance for Net-Zero		



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Foreword

Southeast Asia's transition to a low-carbon economy presents both significant challenges and unprecedented opportunities. As members of the Association of Southeast Asian Nations (ASEAN) seek to advance economic development while meeting increasingly ambitious sustainability commitments, transition planning is essential for converting long-term aspirations into credible, actionable, and time-bound pathways. Yet, many organizations face practical challenges in developing transition plans that are fit for purpose and responsive to evolving expectations from investors, financial institutions, regulators, and other stakeholders.

The *ASEAN Transition Plan Handbook: A Practical Guide for Enterprises and Financial Institutions* (the Handbook) was developed to help address this gap. It provides practical guidance to assist entities in developing and financial institutions in assessing transition plans that are proportionate to the entities' circumstances and aligned with the ASEAN context. By combining international good practices with regional perspectives, the Handbook aims to support organizations at different stages of transition readiness and encourage a more consistent and credible approach to transition planning across the region.

The Handbook is an output of the Asia Green Transformation Consortium, a collaborative platform established to advance sustainable finance and support the region's transition toward a low-carbon and sustainable future. The Asian Development Bank is honored to have worked closely with the ASEAN Capital Markets Forum and the Working Committee on Capital Market Development in developing this resource. We are particularly grateful to capital market regulators and government representatives across ASEAN for their invaluable guidance and support throughout the process. We also extend our appreciation to the financial institutions, industry representatives, and other stakeholders who participated in consultations and shared their expertise and practical insights. Their contributions helped ensure that the Handbook reflects regional priorities, practical implementation realities, and the diverse circumstances of organizations across ASEAN, while strengthening its value as a practical resource for supporting an orderly, inclusive, and credible transition.

The Asian Development Bank hopes that this Handbook will serve as a useful reference for organizations, financial institutions, policymakers, and regulators as they navigate the transition journey. Ultimately, credible transition planning is not solely about managing risks or meeting disclosure expectations. It is about identifying opportunities, strengthening resilience, mobilizing investment, and supporting sustainable and inclusive growth across the region.

Christine Engstrom
Director General
Sectors Department 3
Asian Development Bank

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This *ASEAN Transition Plan Handbook: A Practical Guide for Enterprises and Financial Institutions* (the Handbook) was prepared as a deliverable under the Asia Green Transformation Consortium (AGXC), a regional platform that brings together key stakeholders to advance sustainable finance and support the transition to a low-carbon and climate-resilient economy. AGXC includes the Financial Services Agency of Japan, financial market regulators from Association of Southeast Asian Nations (ASEAN) member states through the ASEAN Capital Markets Forum and the Working Committee on Capital Market Development, the Glasgow Financial Alliance for Net-Zero, and a broad range of financial institutions and market participants. Through this collaboration, AGXC seeks to promote practical solutions, strengthen market capacity, and accelerate the mobilization of capital to support transition and sustainable development across ASEAN.

This Handbook was developed by PwC Malaysia—led by Andrew Chan (Partner, Asia Pacific Sustainability Leader, PwC Malaysia), and Jimmy Tee (Partner, Sustainability and Climate Change and Financial Services Assurance, PwC Malaysia) under an initiative led by Kosintr Puongsophol (Principal Economist, Economic Research and Development Impact Department, Asian Development Bank [ADB]), Shohei Yano (Senior Financial Sector Specialist, Sector Department 3-FIN, ADB), and Tadashi Koyama (Senior Energy Specialist, Sector Department 1-ENE, ADB), with technical input and support from Fonthip Yuthaseree (ADB consultant). Christine Engstrom (Director General, Sector Department 3-FIN, ADB) and Jennifer Romero-Torres (Principal Sustainable Finance Specialist, Sector Department 3-FIN, ADB) provided overall strategic guidance and oversight throughout the development of the report. The team also benefited from the valuable inputs, comments, and reviews of stakeholders across the region, which helped strengthen the report's relevance, practicality, and regional applicability.

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Financial institutions and related associations that participated in the stakeholder engagement sessions and/or responded to the survey are listed below in alphabetical order:

1. ACLEDA Bank Plc.
2. Bank of Ayudhya Public Company Limited
3. Bank of the Philippine Islands
4. Bangkok Bank Public Company Limited
5. BNP Paribas S.A.
6. Daiwa Securities Co., Ltd.
7. Development Bank of Japan Inc.
8. Japan Bank for International Cooperation
9. Japan International Cooperation Agency
10. Kasikorn Asset Management Company Limited
11. Kasikornbank Public Company Limited
12. Malayan Banking Berhad
13. Mizuho Financial Group, Inc.
14. Mitsubishi UFJ Financial Group, Inc.
15. Nippon Life Insurance Company
16. Nomura Securities Co., Ltd.
17. Oversea-Chinese Banking Corporation Limited
18. PT Bank Mandiri (Persero) Tbk.
19. PT Manulife Aset Manajemen Indonesia
20. SBI Royal Securities Public Company Limited
21. Singapore Sustainable Finance Association
22. Sumitomo Mitsui Banking Corporation

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1. Introduction and Overview of Transition Plan

1.1 Introduction

The Association of Southeast Asian Nations (ASEAN) continues to pursue economic growth and development while responding to the risks and opportunities presented by climate change. It is among the most vulnerable regions in the world to the impacts of extreme weather and changing climate, with four ASEAN member states (AMS) ranking among the world's 10 countries most affected by climate-related disasters between 1999 and 2018.[1] Facing rising sea levels and increasingly extreme weather, its greenhouse gas (GHG) emissions continue to rise amid rapid economic expansion and dependence on carbon-intensive industries, with ASEAN's emissions growing 2.2% annually even as it accounts for just 6% of global gross domestic product (GDP).[2] Left unaddressed, the regional economy is projected to lose up to 35% of current GDP by 2050.[3]

Avoiding this outcome requires ASEAN to actively pursue a low-carbon transition, which is defined as the shift away from fossil fuels and carbon-intensive processes needed to reach net-zero GHG emissions globally. In line with the long-term goals of the Paris Agreement, most AMS have committed to their own net-zero targets, with a majority targeting 2050 or the years shortly after. Delivering on these commitments will require a whole-of-economy transition, with organizations across the real economy and financial sector playing a critical role in translating national ambition into tangible outcomes. Importantly, the objective is not to require all organizations to immediately pursue net-zero commitments but rather to encourage them to begin measuring, managing, and reducing emissions in a manner consistent with their circumstances, capabilities, and transition readiness.

Financial institutions across the region have started to introduce transition finance as a distinct financing category, moving beyond traditional green and sustainable finance frameworks to support the transition of real economy companies in a just, credible, and orderly way. The shift is reflected in the emergence of national, regional, and industry-led policy frameworks, including taxonomies, transition pathways, and transition finance guidance, equipping financial institutions with guiding principles and screening tools to assess and direct financing toward organizations, particularly those operating in hard-to-abate and high-emitting sectors.

Credible transition plans therefore play a central role in helping organizations chart and deliver their transition, and in enabling financial institutions to assess, engage with, and support the transition of their customers, counterparties, and investee companies. This *ASEAN Transition Plan Handbook: A Practical Guide for Enterprises and Financial Institutions* (the Handbook) is intended to support the development and assessment of transition plans in alignment with the ASEAN Transition Finance Guidance (ATFG), the region's framework for assessing and demonstrating a credible transition. As a complementary and non-prescriptive resource to the ATFG, the Handbook serves as reference material for organizations seeking to develop and enhance their own transition plans. This lens is applied throughout the Handbook to guide organizations and financial institutions in developing and assessing transition plans across ASEAN. This need is further intensifying amid rising stakeholder expectations, emerging and evolving regulatory frameworks, and shifts in global capital markets, all increasing the pressure on organizations to articulate credible strategies for navigating the transition to a low-carbon, future that is more resilient to a changing climate.

This pressure is particularly acute for ASEAN companies, given the region's structural position in global trade. Companies across the region are deeply embedded in the supply of raw materials, components, and manufacturing capacity, with global value chain trade accounting for 40%–50% of ASEAN's total trade during the 2010s, a share that has since risen further.[4]

[1] ADB. 2021. *Bracing for the Typhoon: Climate Change and Sovereign Risk in Southeast Asia.*
[2] ERIA and ADB. 2025. *Decarbonising Southeast Asia's Hard-to-Abate and High-Emitting Sectors: Transition Finance.*
[3] Nanyang Technological University and University of Glasgow. 2021. *Adaptation and Resilience in ASEAN: Managing Disaster Risks from Natural Hazards.*
[4] ADB. 2023. *ASEAN and Global Value Chains: Locking in Resilience and Sustainability*; ASEAN Secretariat. 2021. *ASEAN+3 Regional Economic Outlook.*

Manufacturing alone contributes around 36.0% of ASEAN's GDP, with agriculture and other commodity-related activities contributing a further 10.5%.[5] This reflects the region's continued concentration in the earlier stages of global value chains, as a supplier of raw materials and intermediate inputs rather than final, consumer-facing products.

This upstream positioning matters because emissions in most value chains are concentrated well beyond a company's own operations. For most companies, Scope 3 (supplier and value chain) emissions represent 65%–95% of total carbon impact.[6] In fact, supply chain emissions are estimated at over 11 times a company's own direct operational (Scope 1 and Scope 2) emissions.[7] As global buyers and lead firms extend their decarbonization commitments across these supply chains, ASEAN suppliers sit at the center of their customers' transition strategies, making credible transition plans not merely a compliance consideration, but increasingly a condition of continued market access.

At the same time, national climate commitments and policy developments across ASEAN increasingly reinforce this market-driven pressure. AMS are advancing their climate commitments through a combination of policy, regulatory, and sector-specific initiatives. Understanding these developments enables organizations to align their transition strategies with national decarbonization pathways and emerging sustainability-related requirements. Most AMS have established net-zero targets for 2050, with Indonesia targeting net zero by 2060 or earlier, and Myanmar focusing on achieving net-zero emissions from the forestry and other land use sector by 2040. The Philippines and Timor-Leste have not yet announced national net-zero commitments. Across ASEAN, these commitments are supported by nationally determined contributions (NDCs), which generally set near- and medium-term targets for a common set of priority sectors, including energy, agriculture, industrial processes and product use; land use, land-use change, and forestry; and waste.

In parallel, AMS are progressively strengthening their corporate sustainability reporting frameworks, increasing expectations for companies to disclose sustainability-related information in line with internationally recognized standards: the International Financial Reporting Standards Sustainability Disclosure Standards (IFRS SDS) issued by the International Sustainability Standards Board. However, progress toward their adoption, together with related assurance requirements, remains uneven across the region. Approaches range from jurisdictions with no formal implementation roadmap to those with confirmed phased adoption programs from 2025 to 2028, including mandatory limited assurance requirements for Scope 1 and Scope 2 GHG emissions.

To support the development and assessment of credible transitions, the ATFG has emerged as a regional framework to help translate these commitments into action at the entity level.[8] It contextualizes global transition finance concepts, such as those developed by the Glasgow Financial Alliance for Net-Zero (GFANZ), while reflecting ASEAN's unique economic and market context, including the importance of high-emitting, hard-to-abate sectors and the significant role of micro, small, and medium-sized enterprises.[9] The ATFG provides a framework for assessing the credibility of an entity's transition based on both the ambition of its climate targets and its ability to deliver against them, primarily to support financing decisions while encouraging more ambitious transitions in the real economy.

This Handbook complements the ATFG by translating these principles into practical, step-by-step guidance that organizations across sectors and levels of maturity can use to develop or strengthen transition plans. It also draws on international guidance and emerging practices on transition planning—including those developed by GFANZ, the Transition Plan Taskforce (TPT), and other international initiatives—while tailoring the guidance to the ASEAN context.[10] Detailed ASEAN country-level analysis is provided in Appendix II.

[5] ASEAN Secretariat. 2023. *Investing in ASEAN 2023.*
[6] PwC Malaysia and Capital Markets Malaysia. 2023. *Corporate Malaysia's Journey Towards a Sustainable Supply Chain.*
[7] PwC and World Business Council for Sustainable Development. 2011. *Reaching Net-Zero: Incentives for Supply Chain Decarbonization.*
[8] ASEAN Capital Markets Forum. 2024. *ASEAN Transition Finance Guidance Version 2.*
[9] Glasgow Financial Alliance for Net-Zero. 2022. *Financial Institution Net-Zero Transition Plans November 2022.*
[10] Transition Plan Taskforce (TPT). 2023. *Disclosure Framework.*

1.2 What Is a Transition Plan?

Definition and Purpose

A transition plan is a part of an organization's overall strategy that is voluntarily developed as a business response to support long-term growth, strengthen resilience and competitiveness, and reduce GHG emissions. It provides a structured roadmap for translating climate ambitions to tackle the impacts of a changing climate (climate ambition) into action through governance, implementation measures, financing and resourcing, and mechanisms for monitoring, accountability, and reporting progress. A transition plan also serves as a key tool for communicating the organization's transition strategy, implementation approach, and overall credibility to financial institutions, investors, customers, suppliers, and other stakeholders.

A credible transition plan should be sufficiently ambitious and demonstrate the robustness of an organization's ability to deliver on that ambition.[11] A credible transition plan helps an organization to achieve the following:

- **identify a starting point** by establishing a baseline of its emissions footprint (across Scope 1, Scope 2, and material Scope 3 categories) and its exposure to climate-related risks and opportunities;
- **define its long-term ambition and targets** by setting a Strategic Ambition and time-bound long-term and interim targets, aligned with a credible decarbonization pathway;
- **chart an implementation pathway** by developing an appropriately resourced action plan, including operational changes, capital allocation and financing considerations, and clear governance;
- **support a whole-of-economy transition** by facilitating economy-wide decarbonization rather than shifting emissions elsewhere, such as helping value chain stakeholders (i.e., suppliers, customers, and partners) transition through capacity building, technology adoption, and access to sustainable finance;
- **demonstrate credibility** to internal and external stakeholders—including investors, lenders, insurers, regulators, and value chain partners—through transparent disclosure of its ambition, actions, and progress; and
- **identify key assumptions and dependencies** by explaining the extent to which their transition can be delivered through the organization's own actions and highlighting critical external factors such as policy support, market development, technology availability, and enabling infrastructure.

Relationship with Broader Sustainability Strategy

A transition plan is related to, but distinct from, a broader sustainability strategy. While a sustainability strategy may address a wide range of environmental, social, and governance issues, a transition plan focuses more specifically on how an organization will adapt its strategy, operations, financing approach, and value chain in response to the transition to a low-carbon, economy that is also resilient to the changing climate (climate resilience). The transition plan can therefore be understood as the climate-focused, action-oriented component that sits within and operationalizes the relevant ambitions of the wider sustainability strategy, with a focus on the elements related to the impacts of the changing climate.

Linkages with Sustainable Finance, Taxonomies, and Reporting

A transition plan does not exist in isolation; it connects closely with the broader sustainable finance, taxonomy, and sustainability disclosure ecosystem. It can serve as a key communication tool for engaging investors, lenders, insurers, and other stakeholders on an organization's transition objectives, plans, financing needs, and progress. It can also be informed by sustainable finance taxonomies, such as the ASEAN Taxonomy for Sustainable Finance (the ASEAN Taxonomy), which provides a common reference for classifying activities and assessing their contribution to environmental objectives and support activity-level transition pathways.[12] The ASEAN Taxonomy can help organizations identify relevant decarbonization

[11] Refer to footnote 8, p.2.
[12] ASEAN Taxonomy Board. 2025. *ASEAN Taxonomy for Sustainable Finance Version 4.*

levers, understand activity-specific transition considerations, and communicate how planned activities support a credible transition pathway. This is complemented by the ATFG, which is designed to work alongside the ASEAN Taxonomy in assessing an organization's transition.

While the ASEAN Taxonomy—and, where applicable, the national taxonomies developed by AMS—sets out the criteria for qualifying green and amber tiers, including specific requirements and deadlines applicable to amber tiers, the ATFG focuses on evaluating an organization's forward-looking transition plan. These amber-tier deadlines function as milestones along an activity's transition journey, signaling the point by which an activity is expected to progress toward green tier. Organizations should reflect these milestones within their transition plans, for example, by aligning interim targets, capital allocation, and action-plan timelines with the deadlines embedded in applicable amber-tier criteria. Thus, the ASEAN Taxonomy provides insights into individual transition activities, including the expected pace and sequencing of change, that collectively contribute to the organization-level transition pathways articulated in transition plans. Further guidance on the use of the ASEAN Taxonomy in assessing transition credibility can be found in the ATFG.

Transition plans and taxonomy-based approaches are complementary, with taxonomies helping to assess the sustainability of specific activities, while transition plans articulate how an organization intends to transition over time. Transition plans are also closely linked to sustainability reporting and disclosure prepared in accordance with internationally recognized sustainability disclosure standards such as the IFRS S2 Climate-Related Disclosures, through which organizations communicate their targets, actions, and progress to stakeholders. These linkages are introduced here at a high level and explored further in the relevant chapters of this Handbook.

Transition Plans as a Foundation for Stakeholder Dialogue, Financing, and Engagement

A transition plan is not only a roadmap for an organization's own transition, but also a tool for facilitating dialogue and building a shared understanding among stakeholders. By identifying key assumptions and dependencies, financing needs, and implementation pathways, organizations can clarify what can be achieved through their own actions and what requires support from the broader ecosystem such as policy support, market development, and infrastructure availability.

This information helps governments, financial institutions, investors, suppliers, customers, and other stakeholders better understand their respective roles in supporting the transition. In particular, financial institutions and investors often seek to understand not only individual projects or investments, but also an organization's overall transition direction, implementation approach, and contribution to the broader transition of the real economy. A transition plan therefore provides a basis for communicating its transition objectives, proposed investments, financing needs, implementation progress, and evolving assumptions.

Through ongoing engagements, transition plans can become more robust as organizations refine their strategies and improve the quality of available information. They also help strengthen transparency and credibility by providing stakeholders with a clearer understanding of how specific activities and investments contribute to an organization's transition pathway through mechanisms such as independent external reviews and ongoing post-issuance reporting.

Reviewing and Updating a Transition Plan

Organizations should regularly review and update their transition plans to assess lessons learned from implementation and ensure the transition plan remains relevant and credible.[13] As transition plans are commonly viewed as living documents, they are expected to evolve in response to implementation experience, stakeholder engagement, and changes in technology, markets, policy environments, and key assumptions. This may include

[13] TPT. 2024. Transition Planning Cycle.

- lessons learned from the implementation of the transition plan;
- insights gained through stakeholder engagement;
- changes within the organization such as business strategy and organizational structure; and
- new developments in the external environment like national climate commitments; regulatory and policy developments and market conditions; and technological advancements, including the availability, scalability, and cost competitiveness of transition technologies.

1.3 Key Findings from Survey and Stakeholder Engagement Sessions

A total of nine stakeholder engagement sessions were conducted, and 17 survey responses were received from financial institutions across ASEAN and Japan during development of the Handbook. The survey responses and stakeholder engagement sessions generated several key insights that informed the Handbook's development:

1. **There is a need for more practical, implementation-oriented transition planning guidance.** Feedback indicated that existing transition planning guidance is often principle-based and could be complemented by more practical guidance on target setting, implementation, monitoring, and governance. Clear differentiation between minimum requirements and more advanced practices could help organizations apply transition planning concepts more effectively and consistently.
2. **Transition planning approaches should reflect organizational maturity and market context.** The engagement process highlighted the diversity of organizations across ASEAN in terms of size, sector, value-chain position, and transition maturity. A proportionate approach to transition planning is therefore important, particularly for small and medium-sized enterprises and organizations operating in emerging markets, where capabilities, resources, and transition readiness may vary significantly.
3. **Clear criteria can support a more consistent assessment of transition plan credibility.** The development of credible transition plans requires clear expectations regarding targets, governance arrangements, implementation actions, performance indicators, financing considerations, and disclosures. Assessments of transition plan credibility should also recognize differences in technological readiness, commercial viability, and sector-specific transition pathways.
4. **Effective transition planning relies on a broader enabling ecosystem.** The successful adoption and implementation of transition plans depend not only on the quality of the plans themselves but also on the availability of practical examples, financing solutions, capacity-building initiatives, assurance mechanisms, and other market enablers. For transition activities involving emerging technologies, commercial maturity can be as important as technical feasibility and often depends on policy support, market development, infrastructure availability, and long-term visibility of future demand and revenue opportunities. Strengthening these enabling factors can help organizations build confidence, capability, and momentum in their transition journeys.
5. **Balance is needed between pursuing near-term opportunities and seeking long-term alignment.** Defining a transition pathway is both about setting long-term ambitions and targets and also demonstrating practical steps that can be taken immediately. While breakthrough technologies and supporting infrastructure may be critical to achieving decarbonization in the long term, their timing, availability, and cost often remain uncertain. Organizations can nevertheless make meaningful progress through readily available measures such as energy efficiency improvements and fuel switching, which can deliver immediate emissions reductions and business benefits. At the same time, organizations should ensure that near-term actions remain aligned with their long-term transition pathway and avoid creating carbon lock-in risks.

Collectively, these findings highlight the importance of providing practical, proportionate, and credible transition planning guidance that reflects the diverse circumstances of organizations across ASEAN. The subsequent chapters provide transition plan guidance for organizations at different levels of maturity.

1.4 How to Use This Handbook

As a complementary and non-prescriptive resource to the ATFG, this Handbook has been developed to support

- ASEAN organizations developing or strengthening their transition plans, across all levels of readiness—from those taking their first steps in transition planning to those refining more mature, established plans; and
- financial institutions—including banks, insurers, and institutional investors—that assess, engage with, or finance the transition plans of their customers, counterparties, or investee companies.

The Handbook is intended to be practical, non-prescriptive, and proportionate, recognizing that transition planning will vary according to an organization's size, sector, jurisdiction, and level of readiness. It aims to provide a foundation for developing credible transition plans in the ASEAN context, equipping organizations to engage their financing providers in more proactive, informed conversations about their transition and the data needed to support financing decisions. At the same time, it supports financial institutions in assessing the credibility, completeness, implementation readiness, and financing implications of transition plans presented by their clients, counterparties, or investees. The Handbook is not intended to constitute a disclosure standard or provide guidance on compliance with specific sustainability reporting requirements. Organizations should refer to applicable standards, such as IFRS S2 Climate-Related Disclosures, for specific reporting requirements.

In recognition of the diversity of organizations and operating contexts across ASEAN, the Handbook adopts proportionate guidance. Organizations at the early stages of their transition planning journey may begin with a foundational level of disclosure—appropriate to their circumstances and achievable without undue cost or effort—and progressively work toward more comprehensive disclosures. This approach is not intended to encourage organizations to limit their disclosures where they have the capability to do more; rather, it recognizes that transition planning is an evolving process and that organizations are expected to deepen the scope and detail of their plans and disclosures as their capabilities, data, and circumstances mature. The levels through which organizations may progress are explained in detail in Chapter 2.

For financial institutions, this proportionate guidance provides a lens for assessing and engaging with customers, counterparties, and investee companies at different stages of transition maturity—recognizing the level of disclosure appropriate to an organization's circumstances, while encouraging and supporting its progression toward more comprehensive plans. In this way, the Handbook supports financial institutions not only in evaluating transition plans, but also in engaging constructively with the organizations behind them and in channeling finance toward credible transitions.

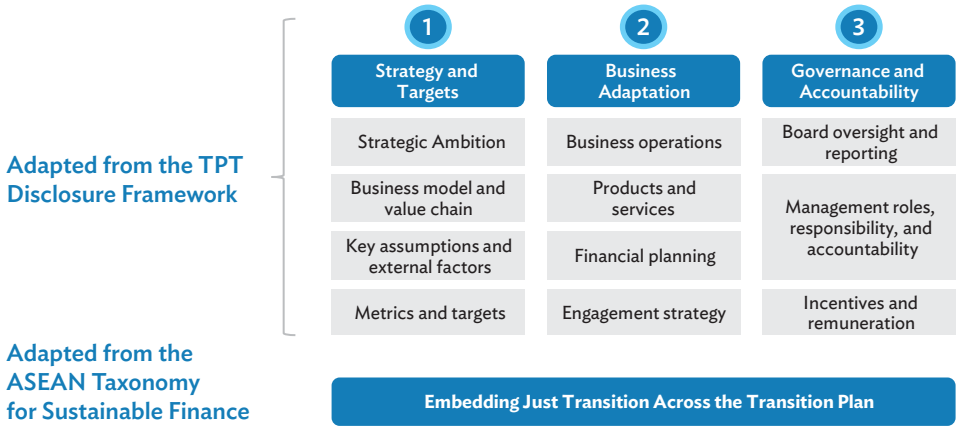


2. Key Pillars of a Transition Plan

2.1 Core Pillars of a Transition Plan

For the purpose of this Handbook, the overall transition plan structure is adapted from the ATFG and informed by the Transition Plan Taskforce (TPT) Disclosure Framework. The TPT Disclosure Framework draws on international good practices and transition planning guidance, including work undertaken by GFANZ, and has since been incorporated into IFRS Foundation implementation guidance supporting climate-related transition plan disclosures under IFRS S2 Climate-Related Disclosures.[14] Entities are encouraged to have their transition plans reviewed and verified by an independent third party (**Box 1**). The structure comprises three interconnected pillars: (i) strategy and targets, (ii) business adaptation, and (iii) governance and accountability. In addition, the Just Transition principles outlined in the ASEAN Taxonomy for Sustainable Finance have been incorporated as a cross-cutting consideration across all pillars to support fair, inclusive and equitable transition outcomes. These pillars provide a structured approach for organizations to develop, implement, monitor, and govern their transition journey (**Figure 1**).

Figure 1: Key Pillars of the ASEAN Transition Plan Handbook



ASEAN = Association of Southeast Asian Nations, TPT = Transition Plan Taskforce.
Sources: TPT. 2023. *Disclosure Framework*; ASEAN Taxonomy Board. 2025. *ASEAN Taxonomy for Sustainable Finance Version 4*.

Embedding Just Transition Across the Transition Plan

According to the International Labour Organization, Just Transition refers to "greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind."[15]

In the context of this Handbook, the concept of Just Transition is embedded across all pillars by focusing on the social aspects of the transition plan, including the impacts on both internal and external stakeholder groups. Companies should consider the relevant social aspects of the ASEAN Taxonomy, as these considerations support credible and inclusive transition. The ASEAN Taxonomy for Sustainable Finance outlined the following key social aspects:

- promotion and protection of human rights,
- labor rights and worker protection, and
- impact on people living close to investments.

[14] Refer to footnote 9, p.2; IFRS Foundation. 2025. *IFRS Sustainability: Disclosing Information about an Entity's Climate-Related Transition, including Information About Transition Plans, in accordance with IFRS S2.*

[15] International Labour Organization Greening Economies. 2026. *Enterprises and Jobs.*

As the third aspect is framed primarily around investment-related activities and is more relevant to financial institutions, it has been adapted in this Handbook to focus on the impact on communities and stakeholders surrounding an entity's operations and value chain to ensure relevance across industries beyond financial services. Since these social aspects may arise across multiple elements of the transition plan, organizations should consider the above and embed the relevant Just Transition principles throughout their governance, strategy, and implementation and monitoring processes to support a fair, orderly, and inclusive transition.

Pillar 1: Strategy and Targets

This pillar sets the strategic foundation for the transition plan. It guides organizations in articulating their ambition, assessing the implications of the transition on their business model and value chain, identifying key assumptions and external factors, and establishing metrics and targets to track progress. The pillar helps ensure that the transition plan is grounded in a clear, coherent, and measurable strategic direction (**Table 1**).

Table 1: Pillar 1—Strategy and Targets

Disclosure Recommendation	Key Planning Content	Guidance and Examples (Not Exhaustive)
1.1 Strategic Ambition	• Define the organization's overall ambition and intended contribution to transition toward a low-GHG emission, climate-resilient economy over the time horizon, including the basis for the ambition and any relevant reference pathways. • Explain how the transition ambition aligns with the organization's broader business strategy and value creation objectives. • Describe any commitments relating to climate adaptation, resilience, nature, or Just Transition considerations, where applicable.	• Net-zero commitment year and interim targets and milestones • Science-based emissions reduction targets (e.g., Science-Based Targets Initiative) • Sectoral pathways or roadmaps (national or regional) Further guidance is presented in **Box 2** • Any voluntary commitments (e.g., 100% phase out fossil-fuel-based heating systems in operations)
1.2 Business model and value chain	• Describe the organization's current business model and value chain. • Describe the current and anticipated implications of the Strategic Ambition on the business model and value chain. • Identify the strategic changes required to the business model and value chain to deliver the transition plan. • Describe the expected timeframe over which these changes are anticipated to occur.	• Adoption of low-carbon materials and technologies in the operations and production processes • Shift to electrification and renewable energy sources across operations • Sustainable procurement practices
1.3 Key assumptions and external factors	• Describe the key assumptions underpinning the transition plan. • Identify external factors that may influence the organization's ability to achieve the Strategic Ambition of its transition plan. • Describe significant dependencies, uncertainties, and constraints that could affect implementation of the transition plan. • Explain how assumptions and external factors are monitored, reviewed, and updated.	• Policy and regulatory change and support • Decarbonization trajectory of the economy, geographies, and sectors • Macroeconomic trends, microeconomic and financial factors • Technological developments • Access to counterparty data and reliability of data • Shifts in consumer and client demand • Levels of warming over the time horizon

Continued on next page

Table 1 continued

Disclosure Recommendation	Key Planning Content	Guidance and Examples (Not Exhaustive)
1.4 Metrics and targets	• Disclose metrics and targets organizations use to drive execution of the transition plan and monitor progress of results over the relevant time horizons—including, where applicable, objective, scope of application, baseline, performance against targets, and underlying methodologies—and definitions or assumptions on which the metrics and targets rely on.	• Targets set for reducing absolute GHG emissions • Emissions-intensity targets • Investments in renewable energy and energy efficiency upgrades • Sustainable finance mobilized

GHG = greenhouse gas.
Note: Time horizon refers to the short-, medium-and long-term periods used by an organization to assess and manage a transition plan. Organizations should establish definitions that are relevant to their circumstances and apply them consistently across the plan. The Transition Plan Taskforce recommends that the short term is defined as no longer than 3 years. This would align with the recommended publication cycle of stand-alone transition plans. If the entity defines short term as exceeding 3 years, it would be good practice to provide an explanation for why this is the case.
Source: Asian Development Bank and PwC analysis.

Box 1: Independent Third-Party Verification

While independent third-party verification is not mandatory, it is encouraged as a means of strengthening the credibility of an entity's transition plan. This is particularly relevant in developing markets, including many Association of Southeast Asian (ASEAN) countries, where greater data gaps and limited track record have, in part, tempered market reception toward transition finance amid greenwashing concerns. Independent verification can help build investor confidence in the reliability of an entity's disclosures and help entities identify key gaps in their transition plans.

The scope of independent verification should include an

- up-front assessment of all requisite elements of a credible transition, including metrics, targets, and implementation strategy;
- annual assessment of progress against targets; and
- ad hoc assessment where material revisions are made to targets or implementation strategy.

Entities are encouraged to publicly disclose the relevant credentials of their verifier and the verification assurance report(s) during the term of the financing instrument. External verifiers should demonstrate that they have the appropriate qualifications and experience in the sectors of assessment. This is consistent with the reporting guidance of the ASEAN Sustainability-Linked Bonds Standards.

Refer to section 4.3.3 of the ASEAN Transition Finance Guidance for more information.

Source: ASEAN Transition Finance Guidance.

Box 2: Selecting Reference Pathways for Entities with Multiple Business Segments

Entities with multiple business segments operating across different sectors (e.g., diversified conglomerates) should assess each material business segment individually against its own relevant sector-specific reference pathway, rather than applying a single pathway across the entity. For example, an entity involved in both crude steel and aluminum production should assess its steel business against a steel-sector reference pathway, and its aluminum business against an aluminum-sector reference pathway. This segment-specific target setting has been practiced by some leading corporations in the Association of Southeast Asian Nations (ASEAN) and should be followed by the rest of the market for entities' overall transition plans to be considered as demonstrating a credible transition.

Entities should exercise judgment in determining which segments warrant their own sector-specific reference pathway and decarbonization targets. It may not be necessary or practical to do so for segments that are immaterial to the entity's overall greenhouse gas emissions.

For more information, entities may refer to Section 4.2.2 of the ASEAN Transition Finance Guidance, including section 4.2.2.2 for a list of reference pathway options by sector.

Source: ASEAN Transition Finance Guidance.

Pillar 2: Business Adaptation

This pillar focuses on how the organization plans for and implements the changes needed across its business and wider ecosystem to deliver its transition objectives. It covers the practical actions and enabling measures required to translate Strategic Ambition into implementation, including changes in business operations, products and services, and financial planning. It also encompasses engagement with the value chain, industry, and broader external stakeholders where this supports effective delivery of the transition plan (**Table 2**).

Table 2: Pillar 2—Business Adaptation

Disclosure Recommendation	Key Planning Content	Guidance and Examples (Not Exhaustive)
2.1 Business operations	• Describe the planned actions and operational changes across business operations over relevant time horizons to achieve the Strategic Ambition. • Describe the changes to key operational activities, capabilities, and resources required to support implementation of the transition plan. • Describe climate adaptation strategies and resilience initiatives to implement as part of the transition plan.	• Changes to production processes, equipment, facilities, and other physical assets • Supply chain and procurement practices • Improvements in energy, resources, or operational efficiency • Workforce adjustment • Skills development
2.2 Products and services	• Describe the planned actions and changes to products and services over relevant time horizons to achieve the Strategic Ambition. • Describe how the product and service portfolio is expected to evolve to support the transition plan.	• Introduction, enhancement, or phase-out of products and services • Changes in product and service portfolios • Research and development and innovation activities to adopt alternative low-carbon materials, technologies, or production methods
2.3 Financial planning	• Describe the financial effects of the transition plan on the organization's financial position and financial performance and cash flow across relevant time horizons, taking into consideration planned investments, disposals, expenditure, and sources of funding required to support implementation. • Explain how transition-related activities are incorporated into financial planning and decision-making processes to support delivery of the Strategic Ambition.	• Capital expenditure for mergers and acquisitions, joint ventures, business transformation initiatives, innovation, and new business opportunities • Investments in research, development, and deployment of climate-related solutions, including asset replacement or retirement • Operating expenditure associated with energy efficiency initiatives • Sources of funding to support implementation of the transition plan
2.4(a) Engagement with value chain	• Describe the current and planned engagement activities with other organizations across the value chain. • Describe the escalation processes or criteria in place to manage instances where engagement activities do not lead to the desired changes.	• Identifying and addressing implementation barriers across the value chain • Joint initiatives to reduce emissions or strengthen resilience across the value chain
2.4(b) Engagement with industry	• Describe the current and planned engagement and collaborative activities with membership bodies, industry associations, industry counterparts, and other relevant initiatives or organizations. • Describe the steps to monitor the activities of membership bodies or industry bodies in which the organization participates and minimize any actions that may conflict with its own Strategic Ambition.	• Participation in industry associations, alliances, and focus groups • Joint research, innovation, and pilot programs to support industry-wide progress • Collective action to address common transition challenges and barriers

Continued on next page

Table 2 continued

Disclosure Recommendation	Key Planning Content	Guidance and Examples (Not Exhaustive)
2.4(c) Engagement with government, public sector, communities, and civil society	• Describe the current and planned engagement activities with government, public sector, communities, and civil society.	• Policy and regulatory engagement • Public consultation with regulators • Engagement with academic institutions, nongovernment organizations, and civil society organizations

Source: Asian Development Bank and PwC analysis.

Pillar 3: Governance and Accountability

This pillar focuses on the governance, oversight, and accountability arrangements that support implementation of the transition plan. It covers board and management responsibilities, monitoring and reporting processes, and the alignment of incentives and remuneration with the organization's transition objectives (**Table 3**).

Table 3: Pillar 3—Governance and Accountability

Disclosure Recommendation	Key Planning Content	Guidance and Examples (Not Exhaustive)
3.1 Board oversight and reporting	• Describe the governance structure responsible for overseeing the transition plan. • Describe how progress, performance, and key transition-related matters are reported to and reviewed by the board or governing body.	• Board or board committee oversight of the transition plan • Reporting and escalation processes • Review of progress against established metrics and targets
3.2 Management roles, responsibilities, and accountability	• Describe how roles, responsibilities, and accountabilities for implementing the transition plan and achieving the Strategic Ambition are assigned across management and business functions.	• Allocation of responsibilities across management and business functions in supporting implementation of the transition plan
3.3 Incentives and remuneration	• Describe how the organization aligns or plans to align its incentive and remuneration structures with the Strategic Ambition of its transition plan.	• Performance metrics and targets included in the remuneration policies (e.g., percentage of executive management remuneration recognized in the current period that is linked to greenhouse gas emissions target) • Recognition and incentive plans aligned with the Strategic Ambition

Note: IFRS S2.29(g)(ii) requires disclosure of percentage of executive management remuneration recognized in the current period that is linked to climate-related consideration.

Source: Asian Development Bank and PwC analysis.

2.2 Coverage of This Handbook's Pillars Across Other Frameworks and Standards

Table 4 illustrates the coherence of the pillars of this Handbook with those of a credible transition plan, as defined in other frameworks, standards, or guidance. While certain details may vary, the core components are broadly consistent across these frameworks.

Table 4: Alignment of the ASEAN Transition Plan Handbook with Other Relevant Frameworks

ASEAN Transition Plan Handbook Pillars		Alignment with Frameworks, Standards, or Guidance			
		GFANZ	TPT	IFRS S2	ATFG
Strategy and Targets	Strategic Ambition				
	Business model and value chain				
	Key assumptions and external factor				
	Metrics and targets				
Business Adaptation	Business operations				
	Products and services				
	Financial planning				
	Engagement strategy				
Governance and Accountability	Board oversight and reporting				
	Management roles, responsibility, and accountability				
	Incentives and remuneration				
Embedding Just Transition across the Transition Plan					

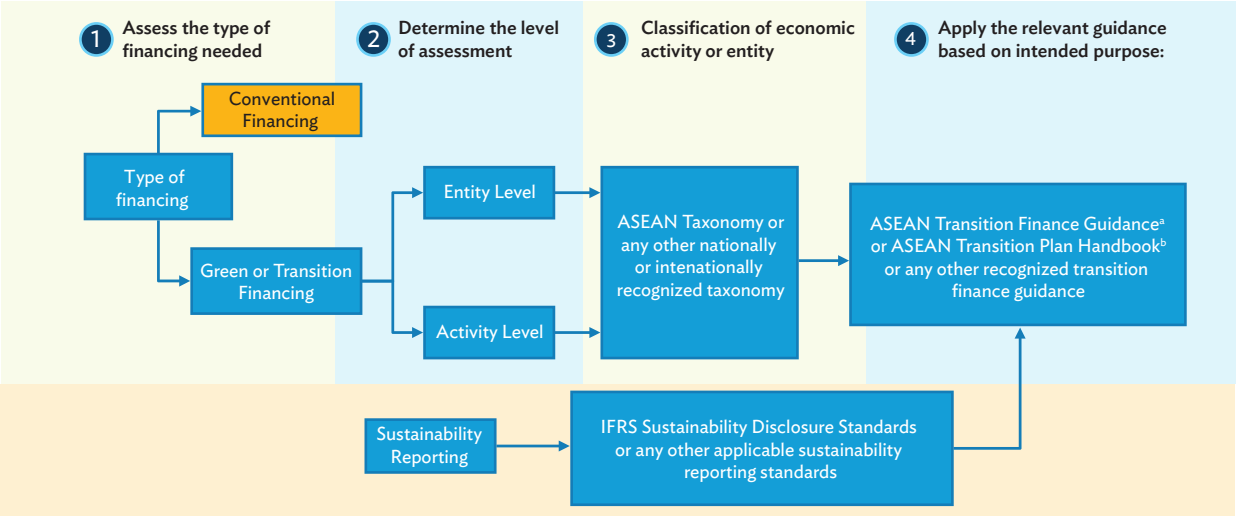
ASEAN = Association of Southeast Asian Nations, ATFG = ASEAN Transition Finance Guidance, GFANZ = Glasgow Financial Alliance for Net Zero, IFRS S2 = International Financial Reporting Standards S2, TPT = Transition Plan Taskforce.

Notes: Blue = Covered: The framework, standard, or guidance contains explicit requirements, guidance, or recommendations relating to the pillar. Light blue = Partially covered: The framework, standard, or guidance addresses certain elements of the pillar but does not provide comprehensive coverage. Grey = Not covered: The framework, standard, or guidance does not address the pillar.

Source: Asian Development Bank and PwC analysis.

Figure 2 illustrates how this Handbook, along with the ASEAN Taxonomy, ASEAN Transition Finance Guidance, and other recognized frameworks and guidance may be applied based on the intended use. It also highlights the relationship between the transition planning and sustainability disclosures prepared in accordance with the IFRS Sustainability Disclosure Standards or any other applicable sustainability reporting standards.

Figure 2: Applying This Handbook, ASEAN Taxonomy, ASEAN Transition Finance Guidance, and Other Recognized Frameworks and Guidance



[a] Assessment by financial institutions.
[b] Assessment by financial institutions and preparation by organizations.

ASEAN = Association of Southeast Asian Nations, IFRS = International Financial Reporting Standards.
Source: Asian Development Bank and PwC analysis.

2.3 Proportionate Guidance

The three pillars described in this chapter are intended to be applied on a proportionate and progressive basis, as introduced in Chapter 1. While the core pillars of a credible transition plan remain broadly consistent, the scope, level of detail, and form of disclosure will vary depending on an organization's circumstances and stage of maturity in transition planning and response. To support the application of this approach in practice, the Handbook uses three broad levels—base, intermediate, and advanced—to illustrate how transition plan disclosures may progressively develop and strengthen over time across each of the three pillars.

1. **Base.** The base is an entry point for organizations at an earlier stage of transition planning. At this level, the emphasis is on establishing the core elements of a transition plan such as an initial emissions baseline, high-level transition objectives, near-term priority actions, and fundamental governance arrangements. These elements enable organizations to understand their starting point, set a clear direction of travel, and progressively enhance their transition planning capabilities and disclosures. Base disclosures are intended to support organizations in getting started without undue cost or effort, while still providing enough information to demonstrate intent, direction, and accountability.
2. **Intermediate.** The intermediate stage is a more structured level of transition planning that would generally be expected of most organizations, subject to their circumstances and the reporting environment in which they operate. Climate targets are typically aligned with long-term decarbonization or net-zero ambitions aligned to relevant national climate commitments, sector pathways, or recognized frameworks, and supported by a defined transition strategy. At this level, transition plans are expected to show greater clarity, internal consistency, and operational detail across the three pillars. This may include more developed implementation measures; stronger links to financial planning; more structured stakeholder engagement; and clearer metrics, targets, and governance processes.
3. **Advanced.** This represents a more comprehensive and mature level of transition planning. Climate targets are typically aligned to internationally recognized pathways and supported by quantified transition roadmaps and interim milestones. At this level, organizations would typically be expected to demonstrate stronger integration of the transition plan into business strategy, risk management, financial decision-making, and external engagement. Advanced disclosures may also involve more granular data, more sophisticated scenario analysis, clearer treatment of dependencies and assumptions, more developed value chain engagement, and more robust assurance or internal control processes.

The proportionate guidance outlined in Chapters 3 and 4 is non-exhaustive and represents different maturity levels of a transition plan. These considerations were identified through a review of representative company disclosures within each sector together with national decarbonization commitments; regional frameworks; sustainability disclosure standards; transition planning frameworks and guidance, including the TPT Sector Summary (April 2024); and prevailing industry practice (**Box 3).**

Organizations may apply this to determine the appropriate level of detail and disclosure for their transition plans, while financial institutions may refer to conduct assessments of transition plans in a proportionate manner. In both cases, the appropriate maturity level may vary depending on factors such as organizational size, sector characteristics, resources and capabilities, and operating context—including local reporting regulations, national policies, and climate targets—as well as an organization's position and influence within the value chain. Organizations and financial institutions should therefore consider these and other factors relevant to their specific circumstances when determining the appropriate maturity level.

Starting with Practical and Achievable Actions

While transition plans may become more comprehensive and sophisticated over time, organizations are encouraged to begin with practical and achievable actions rather than waiting for future technological breakthroughs. In many cases, meaningful

progress can already be made through currently available measures such as energy efficiency improvements, operational optimization, and fuel switching. These actions can deliver emissions reductions while also generating business benefits, including cost savings and reduced operational risks. At the same time, organizations should ensure that near-term actions remain aligned with their longer-term transition pathway and avoid creating carbon lock-in risks. While emerging technologies and supporting infrastructure can play an important role in achieving deeper decarbonization over the longer term, their availability, timing, cost, and commercial viability may remain uncertain. Transition plans should therefore demonstrate how organizations intend to progress through feasible near-term actions while remaining positioned to take advantage of future transition opportunities as enabling conditions evolve.

Box 3: Distinguishing the Handbook's Proportionate Guidance Levels from ATFG's Transition Tiers

The base, intermediate and advanced levels used in this Handbook are intended to reflect the maturity or depth of an organization's transition plan, rather than a judgment on whether its transition itself is credible. A relatively simple plan at the base level may still be credible for an organization at an earlier stage of its journey, while a more detailed plan meeting advanced indicators is not automatically credible simply by virtue of its complexity or detail.

This distinction is particularly relevant when considering the ASEAN Transition Finance Guidance (ATFG) three tiers for transitioning entities (aligned and aligning: 1.5°C; aligned and aligning: well below 2°C; and progressing), which classify entities based on their climate ambition and robustness of ability to deliver on that ambition, for transition finance purposes. While both frameworks use a three-level structure, they serve different purposes: This Handbook's levels guide the appropriate depth and scope of transition plan disclosure, whereas the ATFG's tiers assess entity-level transition credibility. The two are assessed independently and do not correspond directly to one another.

Source: Asian Development Bank and PwC analysis.

3. Illustrative Transition Plan, Including Sector-Specific Initiatives

Construction was selected as the Handbook's illustrative sector due to its significant presence in most AMS, contributing materially to regional GDP and growing at 7.5% year-on-year in 2024, up from 4.1% in 2021.[16] Compared with sectors such as oil and gas and iron and steel, which are concentrated in a limited number of AMS, construction offers broader regional relevance.

The sector also provides a practical illustration of value chain decarbonization, encompassing upstream Scope 3 GHG emissions from hard-to-abate materials such as cement and steel, operational Scope 1 and Scope 2 GHG emissions, and downstream Scope 3 GHG emissions associated with the operational phase of completed assets. Its fragmented market structure, which is often dominated by small and medium-sized enterprises, also mirrors the profile of many ASEAN organizations that are beginning their transition-planning journey. At the same time, the wide variation in sector maturity across the region—ranging from advanced green-building regimes in some markets to nascent regulatory frameworks in others—allows this chapter to illustrate transition planning across a broad spectrum of organizational readiness levels.

Accordingly, this chapter outlines an illustrative transition plan for the construction sector and demonstrates how transition planning guidance can be applied and assessed in practice:

[16] ASEAN Secretariat. 2024. *ASEAN Statistical Brief–Vol 4 (January);* ASEANstats. 2024. ASEAN Gross Domestic Product Annual, Construction Growth Rate (%) in ASEAN. https://data.aseanstats.org/asean-gdp-annual.(14 October 2026 access date).

- **3.1. Illustrative Transition Plan for the Construction Sector.** This subchapter presents a sample transition plan for a fictional company for the financial year ended 31 December 2025. The transition plan demonstrates intermediate to advanced maturity levels across the three pillars outlined in Figure 1 of this Handbook.
- **3.2. Application of Proportionate Guidance to the Construction Sector.** This subchapter demonstrates how organizations can apply the guidance in a manner proportionate to their readiness and maturity level.

3.1 Illustrative Transition Plan for the Construction Sector

Southeast Build Solutions Limited (Southeast Build) is a regional engineering, procurement, and construction (EPC) general contractor headquartered in Malaysia with operations across Singapore, Thailand, and Viet Nam. They deliver construction and infrastructure projects across residential, commercial, and civil works segments for developers, government agencies, and corporate clients. They are responsible for construction execution and on-site operations. Beyond enterprise-wide initiatives, decarbonization is also driven through project-by-project execution by embedding sustainable practices and reducing emissions.

Their transition plan has been prepared for the financial year ended 31 December 2025 and outlines their decarbonization strategy, targets, and key initiatives in support of our net-zero commitments. As they are in the early stages of their decarbonization journey, 2023 has been established as the baseline year from which progress against their targets will be measured. In preparing their transition plan, the company referenced the ASEAN Transition Plan Handbook, which builds upon existing frameworks, standards, and guidance such as the Transition Plan Taskforce Disclosure Framework and the ASEAN Taxonomy.

Pillar 1.1: Strategic Ambition

Time Horizons

In alignment with our business strategy and planning horizon, we have established the following short-, medium-, and long-term horizons.

- Short term: 1 year (2026)
- Medium term: 2–5 years (2027–2030)
- Long term: beyond 5 years (beyond 2030)

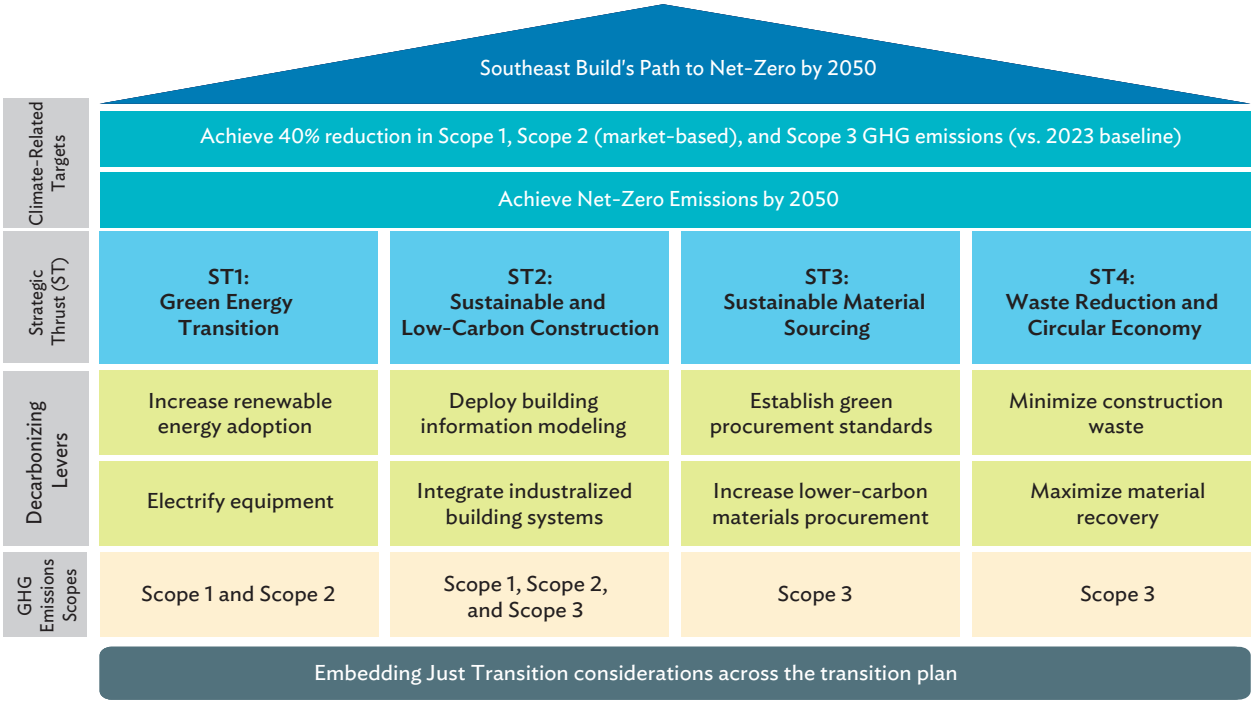
Our Climate Commitments

We are committed to achieving net-zero across Scope 1, Scope 2, and Scope 3 GHG emissions by 2050. Our commitments:

- are aligned with the Paris Agreement's goal of limiting global warming to 1.5°C;
- support the NDCs and net-zero ambitions of our core operating markets
- **Malaysia, Singapore, Thailand, and Viet Nam:** Aligned with their national targets to achieve net zero by 2050; and
- have been independently validated as science-based.

Our Net-Zero Transition Plan

Figure A: Southeast Build's Net-Zero Transition Plan



GHG = greenhouse gas.
Source: Asian Development Bank and PwC analysis.

Our transition plan addresses the following scopes of GHG emissions based on our level of control and influence (**Figure A**):

- **Scope 1 and Scope 2 GHG emissions (directly controlled and managed).** Operational emissions from machinery, equipment, site vehicles, and temporary facilities during construction driven by our operational practices and on-site management.
- **Scope 3 GHG emissions (influenced)**
  - **Embodied carbon in purchased materials (Category 1: purchased goods and services).** We have influence over the project's material procurement, construction methods, and building design through early contractor involvement, design-and-build delivery models, alternative technical proposals, and material substitutions (toward lower-carbon materials), subject to client approval.[17]
  - **Construction waste (Category 5: waste generated in operations).** We manage on-site waste through segregation and recovery practices.

Final design decisions rest with the project owners and design teams; post-handover operational emissions remain their responsibility.

As an EPC contractor, we prioritize Scope 1, Scope 2, and Scope 3 (Categories 1 and 5) emissions, where we have direct management, control, or material influence. We do not address post-handover operational emissions, as we do not retain operational responsibility.

[17] Throughout the chapter, we use the term "lower-carbon materials" to reflect materials with substantially reduced embodied carbon compared to conventional alternatives in the construction industry. While international frameworks reference "low-carbon" as an aspirational standard, we adopt "lower-carbon" to acknowledge the current technical reality of construction materials like cement, where full decarbonization pathways are still evolving.

Box 4: Guidance from Transition Plan Taskforce Disclosure Framework

"A transition plan should translate ambitious objectives and priorities into concrete steps to be taken in the short-, medium- and long-term. It should emphasize in its disclosure of a roadmap of planned actions that will contribute to meeting its Strategic Ambition."

Source: Transition Plan Taskforce Disclosure Framework.

Box 5: Guidance from ASEAN Transition Finance Guidance

"The ASEAN Transition Finance Guidance encourages all entities across all sectors to decarbonize at the earliest opportunity. Nevertheless, there may be instances in which deferring emission reduction is unavoidable due to factors such as technology readiness, national policy and regulations, and other reasons. Entities that consider it necessary to delay their decarbonization efforts are required to provide clear rationale and strong evidence as to why earlier decarbonization is not feasible. Without such substantiation, these entities' transition plans may be perceived as less credible, potentially leading to the entities not being able to qualify for higher tiers in the ASEAN Transition Finance Guidance."

Source: ASEAN Transition Finance Guidance.

Pillar 1.2: Business Model and Value Chain

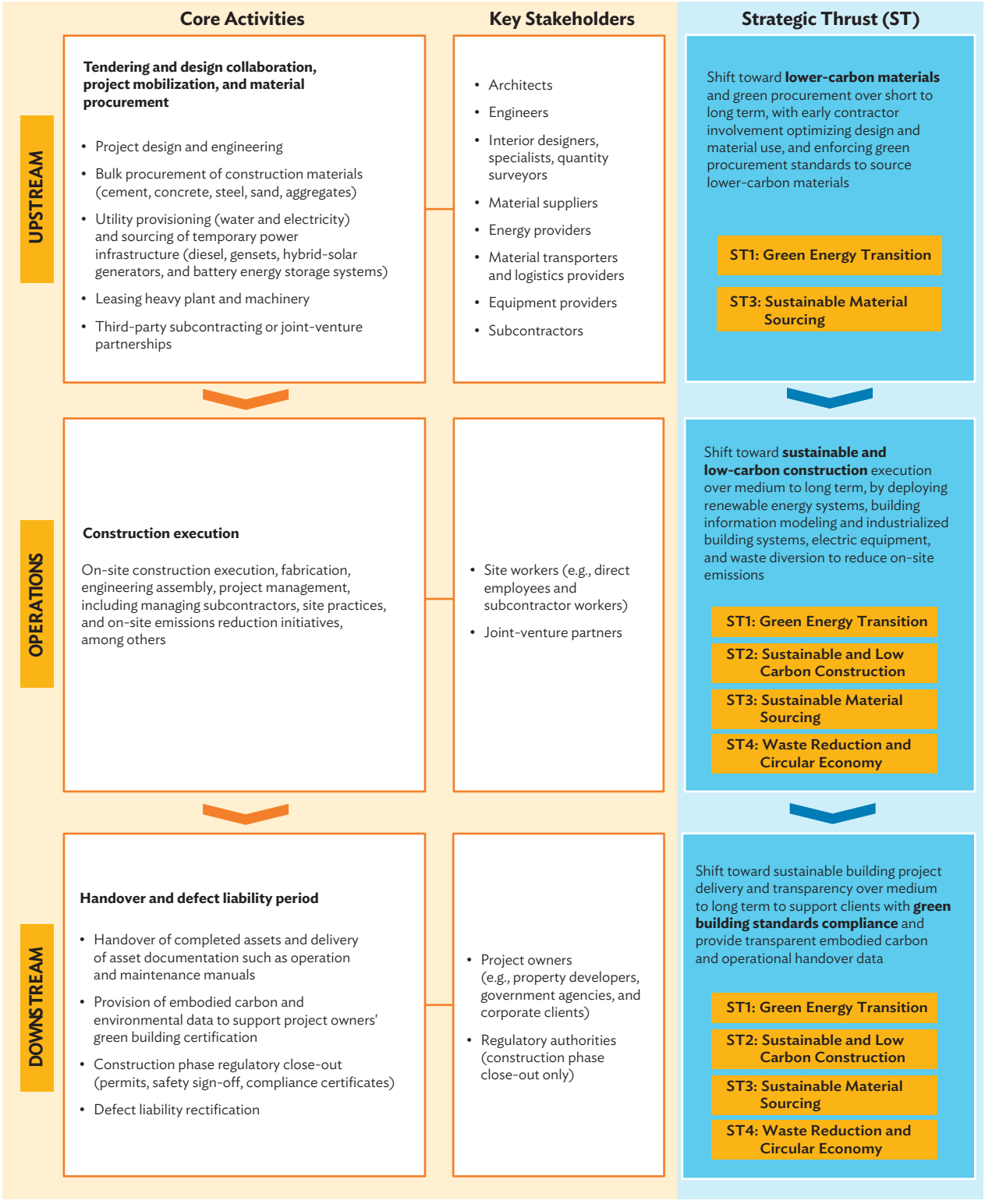
Value Chain

We operate an integrated EPC business model, delivering complex infrastructure, residential, and commercial projects across our operations (**Figure B**).

As we aim to achieve net zero by 2050, we have integrated transition-aligned objectives across all stages of construction, demanding active collaboration with stakeholders throughout the upstream, operations, and downstream value chain.



Figure B: Southeast Build's Value Chain

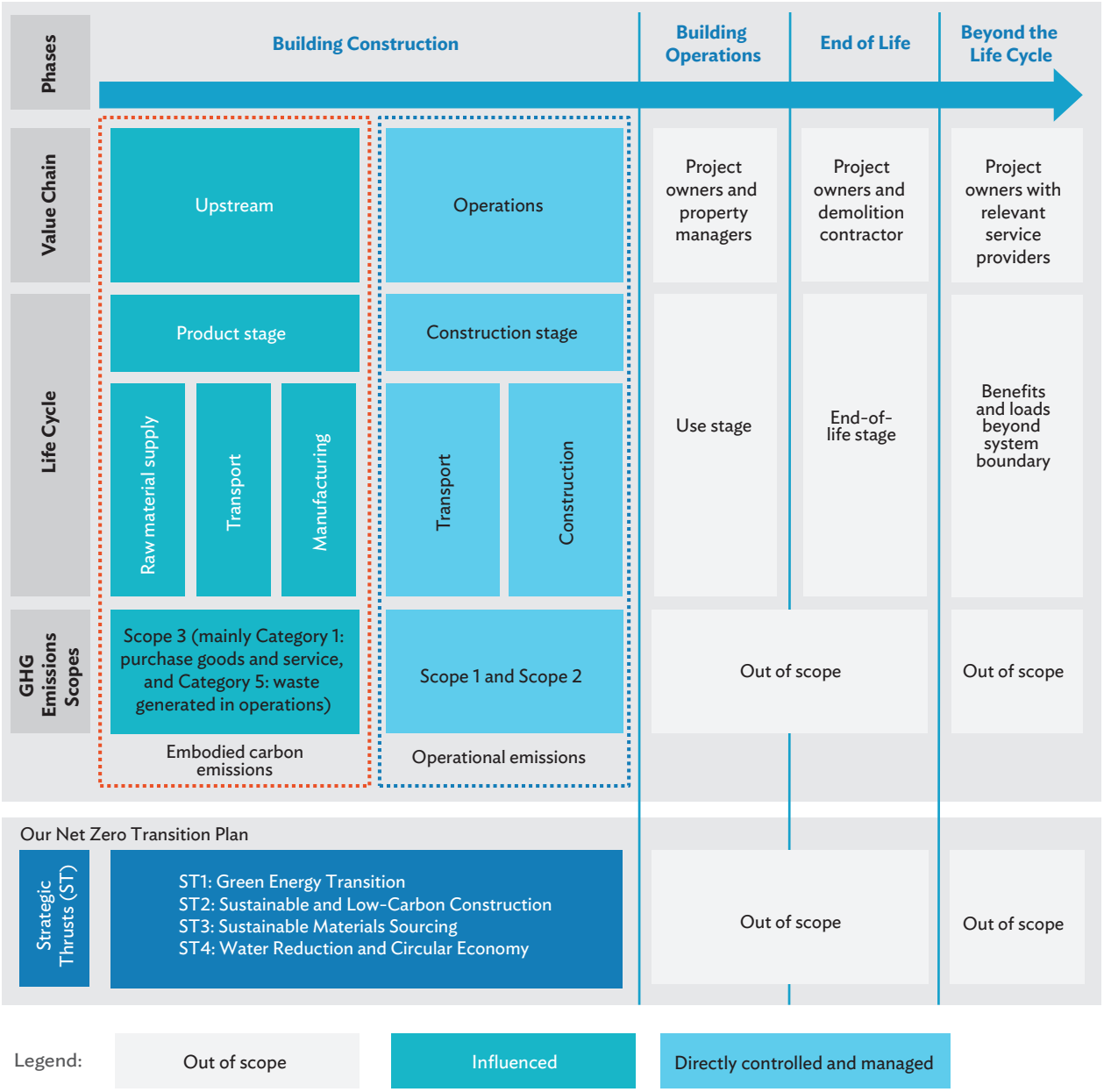


Source: Asian Development Bank and PwC analysis.

Our Role in Decarbonization

As an EPC contractor, we directly manage Scope 1 and Scope 2 GHG operational emissions and collaborate with our value chain to reduce Scope 3 GHG emissions (Categories 1 and 5). **Figure C** illustrates a building's life cycle and our decarbonization role during the construction phase, highlighting our interdependencies across the value chain.

Figure C: Southeast Build's Life-Cycle Stages



Note: As an engineering, procurement, and construction contractor, we do not address post-handover operational emissions as the responsibility for building operations transfers to the project owners upon handover.

Source: Asian Development Bank and PwC analysis based on European Committee for Standardization. 2011. Sustainability of Construction Works: Assessment of Environmental Performance of Buildings: Calculation Method.

Pillar 1.3: Key Assumptions and External Factors

Key Assumptions and External Factors of Our Net-Zero Transition Plan

Our Net-Zero Transition Plan is built on the following assumptions and external factors relevant to our operating environment (**Table A**):

Table A: Key Assumptions and External Factors

External Factor	Description
Policy and regulatory environment	• Increasingly stringent implementation of emissions regulations, including current and anticipated policy and regulatory shift toward mandatory carbon regulations in the form of a carbon tax, emissions trading schemes or carbon border adjustment mechanism, and energy efficiency building standards across ASEAN • Local and regional government support for renewable energy through incentives, grid expansion, and cross-border trading through the ASEAN Power Grid, enabling regional renewable energy procurement in supply-constrained markets • Development of national climate roadmaps and policies, such as Malaysia's National Energy Transition Roadmap, regional sustainability classification guidelines (e.g., ASEAN Taxonomy for Sustainable Finance), and mandatory sustainability disclosure requirements (e.g., IFRS Sustainability Disclosure Standards)
Technology and market trends	• Declining costs and improved availability of renewable energy and battery storage technologies • Growing supply of lower-carbon construction materials (e.g., lower-carbon cement, recycled aggregates, and recycled steel) • Increasing market demand from customers for low-carbon and sustainable buildings
Supply chain and economic factors	• Global volatility in energy prices due to geopolitical tensions and shifting trade policies posing risks of supply disruptions and cost volatility for low-carbon equipment (e.g., solar panels, batteries, and electric machinery) and related costs

ASEAN = Association of Southeast Asian Nations, IFRS = International Financial Reporting Standards.
Source: Asian Development Bank and PwC analysis.

Box 6: Guidance from Transition Plan Taskforce Disclosure Framework

The Transition Plan Taskforce Disclosure Recommendation under sub-element 1.1 Strategic Ambition states as follows:

An entity shall disclose whether and how it has identified, assessed and taken into account the impacts and dependencies of the transition plan on its stakeholders (e.g., its workforce, value chain counterparts, customers), society (e.g., local communities), the economy, and the natural environment, throughout its value chain, that may give rise to sustainability-related risks and opportunities.

Source: Transition Plan Taskforce Disclosure Framework.

Key Dependencies of Our Net-Zero Transition Plan

As our Scope 3 GHG emissions represent over 90% of our total GHG emissions, achieving our decarbonization targets requires systemic value chain transformation across multiple stakeholders in our value chain.

Shared Responsibility of Decarbonization

The decarbonization leverage is distributed across key stakeholders who each hold varying levels of influence:

- **Project owners.** They hold ultimate decision-making power, determining whether a project will pursue green building certifications (e.g., Leadership in Energy and Environmental Design [LEED], Building Research Establishment Environmental Assessment Method [BREEAM], Excellence in Design for Greater Efficiencies [EDGE], Green Building Index [GBI], Green Real Estate [GreenRE], Building and Construction Authority [BCA] Green Mark, Viet Nam's LOTUS

Rating System, Thailand's Rating of Energy and Environmental Sustainability [TREES], and more) and establishing the project's sustainability ambition, budget, and procurement frameworks.

- **Architects and engineers.** They specify structural designs and materials during the early stages, effectively locking in the majority (e.g., up to 80% or more) of an asset's lifetime embodied carbon before construction begins.
- **Material suppliers.** They control the direct production-phase carbon intensity of primary materials (e.g., cement, steel, and aggregates).
- **Contractors.** Like us, they execute procurement and construction. Although we do not unilaterally define material specifications, we can actively influence and drive decarbonization through early contractor involvement for pure construction projects. For design-and-build contracts, we can propose alternative technical proposals at the planning stage. However, our operational capacity to execute these material and design substitutions is strictly conditional upon final approval by the client.

Sector Ecosystem and Macro-Dependencies

Our Net-Zero Transition Plan depends on systemic shifts across five critical ecosystem factors:

- **Client demand and specifications.** Our ability to build sustainably relies on project owners such as property developers and government agencies specifying and accepting lower-carbon materials during project bidding phase.
- **Regulatory push and support for sustainable buildings and construction.** We depend on regulators to establish supportive policy environments such as updated green building codes, public procurement mandates, and embodied carbon caps. These measures help ensure a level playing field by making lower-carbon materials commercially viable and standard across the industry.
- **Supply chain maturity and subcontractor alignment.** Our Scope 3 GHG emissions reduction target is structurally tied to our upstream supply chain's ability to scale the production of lower-carbon materials (e.g., lower-carbon cement and recycled steel) and our subcontractors' readiness to adopt sustainable construction practices on site.
- **Grid decarbonization.** Our Scope 2 GHG emissions reduction target assumes that regional electricity grids will decarbonize in line with national utility targets and transition roadmaps in countries where we operate.
- **Technological innovation and supporting infrastructure.** We depend on continuous advancements in construction technologies and the development of related infrastructure. This includes the scaling of advanced building techniques, lower-carbon material manufacturing processes, and localized circular infrastructure such as construction and demolition waste processing facilities into high-quality recycled aggregates as an alternative to virgin resources and more.

We continuously monitor these external factors and assumptions as part of our annual strategic planning and enterprise risk management review cycles. These assumptions are formally reviewed and updated annually, or whenever material shifts in the operating environment occur—such as major regulatory changes (e.g., carbon pricing mechanisms), breakthroughs in low-carbon construction technologies, or updated climate scenario models—to ensure our transition plan remains robust and relevant.

Pillar 1.4: Metrics and Targets

Our GHG Emissions and Targets

Our GHG emissions are measured in accordance with the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard, 2004 (the GHG Protocol). We apply the GHG Protocol Corporate Value Chain (Scope 3) Standard, 2011 to categorize and disclose our Scope 3 GHG emissions across the 15 categories.

A summary of our GHG emissions progress is presented in (**Table B**).

Table B: Progress in Reducing Scope 1, Scope 2, and Scope 3 Greenhouse Gas Emissions

GHG emissions (tCO_2e)	2023 (Baseline)	2024	2025
Scope 1 GHG emissions	**35,895**	**32,681**	**30,543**
• The consolidated accounting group	35,895	32,681	30,543
• Other investees within the organizational boundary	—	—	—
Scope 2 (location-based) GHG emissions	**34,085**	**29,031**	**27,573**
• The consolidated accounting group	34,085	29,031	27,573
• Other investees within the organizational boundary	—	—	—
Scope 2 (market-based) GHG emissions[a]	—	**28,071**	**26,089**
• The consolidated accounting group	—	28,071	26,089
• Other investees within the organizational boundary	—	—	—
Scope 3 GHG emissions	**593,726**	**587,785**	**543,946**
• **Category 1:** Purchased goods and services	550,151	546,357	507,957
• **Category 4:** Upstream transportation and distribution	956	889	831
• **Category 5:** Waste generated in operations	31,955	29,732	25,787
• **Other categories**[b]	10,644	10,819	9,371
Total Scope 1, Scope 2 (location-based), and Scope 3 GHG emissions	**663,706**	**649,497**	**602,062**
Total Scope 1, Scope 2 (market-based), and Scope 3 GHG emissions	**663,706**	**648,537**	**600,578**

[a] Scope 2 market-based emissions are not applicable for financial year 2023, as we commenced acquiring renewable energy certificates from financial year 2024 onward.

[b] Emissions from other categories include Category 2: Capital goods; Category 3: Fuel and energy-related activities; Category 6: Business travels; Category 7: Employee commuting; and Category 8: Upstream leased assets. The remaining Scope 3 categories are currently excluded as they are immaterial and irrelevant to our business model, including Category 9: Downstream transport and distribution; Category 10: Processing of sold products; Category 11: Use of sold products; Category 12: End-of-life treatment of sold products; Category 13: Downstream leased assets; Category 14: Franchises; and Category 15: Investments.

GHG = greenhouse gas, tCO_2e = tons of carbon dioxide equivalent.
Note: Our Scope 1, Scope 2, and Scope 3 GHG emissions for financial year 2025 have been assured by an independent third-party assurance provider, ABC Assurance Ltd.

Source: Asian Development Bank and PwC analysis.

We account for our GHG emissions using the financial control approach. Consequently, emissions from joint-venture projects are accounted for under Scope 3 GHG emissions (Category 15: Investments) and are actively monitored and managed through project-level committees.

Total GHG emissions have been reduced by 7.4% and 9.5% from financial year 2024 and 2023 baselines, respectively. The reductions are mainly due to the following reasons:

- **Scope 1 GHG emissions** were reduced by 6.5% from the financial year 2024 level (representing a cumulative 14.9% reduction from the 2023 baseline), driven by our site-level transition from diesel generators to mobile solar-hybrid systems and equipment upgrades.
- **Scope 2 (market-based) GHG emissions** were reduced by 7.1% from financial year 2024, driven by the installation of solar panels at our facilities and sites, as well as procurement of renewable energy certificates (RECs), Green Electricity Tariffs in Malaysia, and green electricity in Singapore. During the year, we acquired and retired 1,484 tons of carbon dioxide equivalent (tCO_2e) of certified RECs.
- **Scope 3 GHG emissions** were reduced by 7.5% from financial year 2024 (representing a cumulative 8.4% reduction

from the 2023 baseline), driven by the early progress of our lower-carbon material procurement standards and collaborative vendor engagement on embodied carbon.

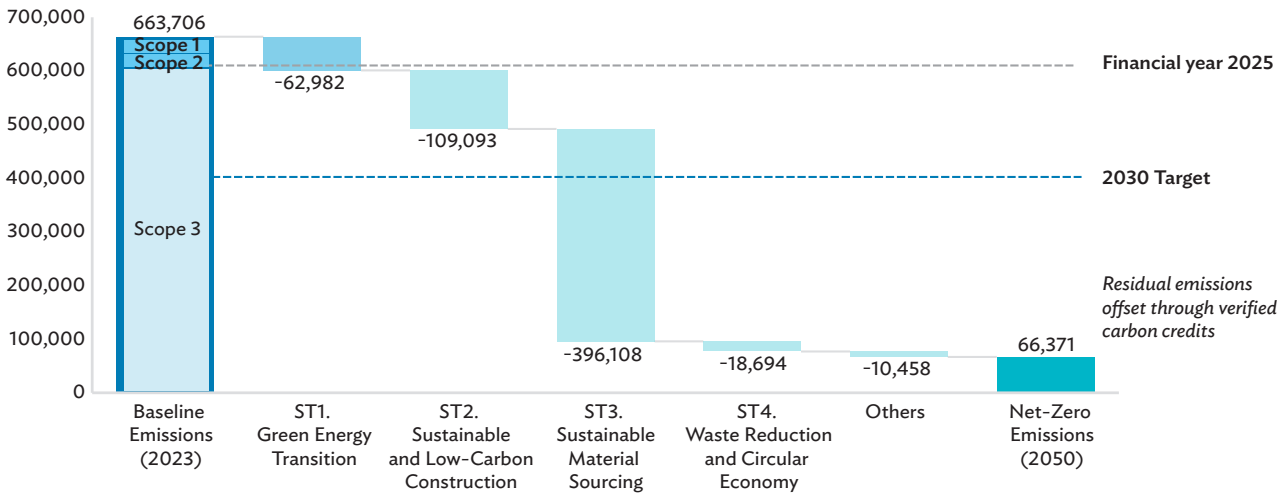
Box 7: Guidance from Transition Plan Taskforce Disclosure Framework

"An entity shall disclose information about the GHG emissions and removals metrics and targets that it uses in order to drive and monitor progress towards the Strategic Ambition of its transition plan, and report against these metrics and targets on at least an annual basis."

Source: Transition Plan Taskforce Disclosure Framework.

Our long-term decarbonization pathway for GHG emissions has been independently validated as science-based (**Figure D**).

Figure D: Southeast Build's Planned GHG Emissions Reduction, 2023–2050



GHG = greenhouse gas, ST = Strategic Thrust.
Source: Asian Development Bank and PwC analysis.

Based on the decarbonization pathway above, we prioritize reducing most of our emissions through operational and value chain decarbonization measures. To achieve net zero by 2050, we plan to purchase and retire carbon credits strictly to neutralize the remaining residual emissions:

- **Extent of reliance.** We will rely on carbon credits to address unavoidable residual emissions (approximately 10% of total emissions), such as heavy specialized machinery and remote logistics where low-carbon technologies are not yet commercially viable by 2050.
- **Credit types and removals focus.** We will transition our offset portfolio from emissions avoidance credits to permanent technological and nature-based carbon removal credits (e.g., bioenergy with carbon capture and storage, or afforestation).
- **Certification and verification standards.** We will purchase carbon credits certified by recognized third-party standards—such as the Verified Carbon Standard administered by Verra or the Gold Standard—and aligned with the Integrity Council for the Voluntary Carbon Market Core Carbon Principles. Where relevant, we will also explore the purchase of eligible credits through recognized registries and exchanges such as the Bursa Carbon Exchange.
- **Environmental and social safeguards.** To ensure the integrity of our carbon credit portfolio, we will conduct due diligence on the environmental and social impacts associated with carbon credit projects and prioritize projects that demonstrate strong protections for local communities, biodiversity, and human rights.



Box 8: Guidance from Transition Plan Taskforce Disclosure Framework

"Good practice transition plans should consider Scope 1, Scope 2, and Scope 3 emissions and should prioritize decarbonization through direct abatement over purchasing carbon credits."

Based on the Transition Plan Taskforce Disclosure Framework, an entity shall disclose information about the greenhouse gas emissions and removals metrics and targets that it uses to drive and monitor progress towards the Strategic Ambition of its transition plan, and report against these metrics and targets on at least an annual basis.

An entity shall also disclose information about how it uses or plans to use carbon credits to achieve the Strategic Ambition of its plan, and report on the use of carbon credits on at least an annual basis.

Source: Transition Plan Taskforce Disclosure Framework.

Box 9: Guidance from ASEAN Transition Finance Guidance Version 2

On the treatment of carbon credits or offsets, an entity may use high-quality carbon credits only as the last-mile measure to address residual emissions after they have fully engaged in all other meaningful and viable decarbonization activities. Where an entity uses offsets, it should report gross emissions performance as aligned with International Financial Reporting Standards Sustainability Disclosure Standards issued by the International Sustainability Standards Board.

Source: ASEAN Transition Finance Guidance.

Our Strategic Thrusts

Our targets are based on the 2023 baseline year and aligned with a science-based cross-sector pathway. Our Net-Zero Transition Plan is aligned with leading construction-sector decarbonization pathways, including the Global Alliance for Buildings and Construction Roadmap for Buildings and Construction, 2020–2050 and the World Green Building Council Net-Zero Carbon Buildings Framework, which emphasize renewable energy adoption, lower-carbon materials, resource-efficient design, circular construction practices, and supply chain decarbonization (**Table C**).

Table C: Strategic Thrusts

Strategic Thrust (ST)	Key Initiatives			Key Metrics	Progress	Targets		
	2023 (Baseline)	2030	2050		2025	Short term	Medium term	Long term
ST1: Green Energy Transition	Solar installation and renewable energy sourcing			Percentage of renewable energy share (%)	25.00	—	100.00	100.00
				Installed solar capacity (megawatt)	80	100	320	700
	Electrification of heavy site equipment and machinery			Percentage of high-use equipment converted to electric (%)	10.00	20.00	50.00	90.00
ST2: Sustainable and Low-Carbon Construction		Deployment of building information modeling (BIM)		Percentage of projects using BIM (%)	15.00	20.00	40.00	80.00
		Integration of industrialized building systems (IBS)		Percentage of projects built using IBS (%)	—	—	40.00	80.00
ST3: Sustainable Material Sourcing		Establishment and enforcement of green procurement standards		Percentage of top suppliers with carbon reduction targets (%)	10.00	15.00	50.00	90.00
		Sourcing of lower-carbon materials (e.g., lower-carbon cement, recycled steel, etc.)		Average material embodied carbon intensity (tCO_2e/t)	1.01	0.95	0.80	0.30
ST4: Waste Reduction and Circluar Economy	On-site waste sorting, direct material reuse, and landfill diversion			Percentage of waste diverted from landfill (%)	15.00	20.00	50.00	95.00
		Recycling and reprocesssing of construction and demolition waste (CDW)		Percentage of CDW recovered and reprocessed (%)	—	—	2.00	80.00

tCO_2e/t = tons of carbon dioxide equivalent per metric ton.
Source: Asian Development Bank and PwC analysis.

In addition to the metrics set out above, we also monitor the following metrics to be attained by 2025:[18]

- One commissioned project is certified to a third-party multi-attribute sustainability standard. The multi-attribute sustainability standard refers to green building certification schemes such as LEED, BREEAM, EDGE, GBI, GreenRE, BCA Green Mark, LOTUS, TREES, and other equivalent certification schemes.
- Two active projects are seeking such certifications.

There are currently no targets set across the short-, medium-, or long-term time horizons for the two metrics above.

> The three sub-pillars under Pillar 2: Business Adaptation, **Pillar 2.1: Business operations, Pillar 2.2: Products and services, and Pillar 2.3: Financial planning**, will be integrated across all strategic thrust disclosures.

[18] These metrics are adopted from the Sustainability Accounting Standards Board (SASB) Standards: Engineering and Construction Services.

ST1: Green Energy Transition

Focus Areas of ST1

ST1 seeks to reduce Scope 1 and Scope 2 GHG emissions through renewable energy adoption and equipment electrification, targeting key sources such as diesel generators, construction equipment, and temporary site facilities.

The key initiatives and metrics for ST1 are presented in (**Table D**).

Table D: Key Initiatives and Metrics for ST1: Green Energy Transition

Key initiative	Metric	2023 (baseline)	2024	2025
On-site solar installation. Deploy mobile solar photovoltaic (solar PV), battery storage, and solar-powered charging stations at project sites	Installed solar capacity (megawatt)	38	55	80
Renewable power sourcing. Source off-site renewable energy through power purchase agreements and renewable energy certificates, where available	Percentage of renewable energy share (%)	6	13	25
Electrification of heavy site equipment and machinery. Transition high-use equipment (e.g., forklifts, concrete pumps, and mobile cranes) to electric-powered equipment	Percentage of high-use equipment converted to electric (%)	2	6	10

ST1 = Strategic Thrust 1.
Source: Asian Development Bank and PwC analysis.

To operationalize these key initiatives, we implement the following measures:

- **Mandatory solar assessments.** All new project sites with active duration exceeding 18 months are required to undergo mandatory pre-construction assessments of the technical feasibility, commercial viability, and payback period of on-site solar installations.
- **Solar-powered site infrastructure.** Solar solution providers are partnered with to deploy mobile solar PV, battery storage, and solar-powered charging stations to support site offices, worker accommodations, perimeter security, and site lighting, displacing traditional diesel generators, especially on all new long-duration projects (more than 18 months). Solar generation and consumption will be regularly monitored to optimize energy use.
- **Electrification of equipment and machinery.** High-use equipment (e.g., forklifts, concrete pumps, and mobile cranes) is transitioned to electric-powered models and the procurement of more energy-efficient equipment is prioritized, supported by digital energy management systems to continuously track and optimize consumption.

Additionally, in some operating markets, Southeast Build may be subject to a carbon tax (e.g., Malaysia and Singapore). To prepare for this, we are establishing an internal carbon price mechanism and policy to incorporate carbon pricing into our business planning and investment decisions.

We plan to fund these initiatives through a combination of internal funding and external financing:

- **On-site solar installation.** We allocate $0.60 million per annum in the short to medium term to install rooftop solar photovoltaic systems at offices, warehouses, and project sites to accommodate renewable energy generation and implement monitoring systems to optimize energy performance and reduce grid electricity consumption.
- **Renewable power sourcing.** We allocate $0.10 million per annum in the short to medium term to secure renewable electricity through green tariffs, RECs, and power purchase agreements, while strengthening internal energy management capabilities and supporting the transition to lower-carbon operations across our facilities and construction sites.

- **Equipment electrification.** We allocate $1 million per annum in the short to medium term to replace diesel-powered equipment and vehicles with electric or hybrid alternatives, develop charging infrastructure at key project locations, and train operational teams on the efficient use and maintenance of electrified equipment.

We have not provided quantitative information for the long term because the level of measurement uncertainty is so high that the resulting data is not useful. Funding is secured through a combination of operational cash flows and sustainability-linked loans (SLLs).

Box 10: Additional Guidance on Financial Planning

The key focus of financial planning is to disclose the anticipated financial effects of the transition plan on the organization's financial position, financial performance, and cash flows over short, medium, and long term. This is aligned with the Transition Plan Taskforce Disclosure Framework.

Source: Asian Development Bank and PwC Analysis.

Box 11: Additional Guidance on Evaluating Transition Projects or Initiatives

Organizations may use assessment tools, such as the marginal abatement cost curve (MACC), to evaluate and prioritize transition projects or initiatives. An MACC is used to evaluate the emission reduction options against the abatement costs of specific technology and potential for a set of mitigation measures, helping organizations identify projects or initiatives that are feasible, cost-effective, and aligned with their transition objectives.

For example, an organization may compare energy efficiency improvements, renewable energy procurement, and fuel-switching initiatives to determine which measures can deliver the greatest emission reductions within available resources.

The use of an MACC or other suitable assessment tools is not a requirement. Organizations may adopt approaches that are appropriate to their size, sector, transition maturity, data availability, and resources. The use of assessment tools and the underlying evaluations do not necessarily need to be publicly disclosed but may help support the rationale for selecting transition measures.

Source: Asian Development Bank and PwC analysis.

ST2: Sustainable and Low-Carbon Construction

Focus Areas of ST2

Reduce Scope 1 and Scope 2 GHG emissions, Scope 3 embodied carbon, and construction waste through early-stage design engagement, digital execution, and industrialized prefabrication.

The key initiatives and metrics for ST2 are presented in (**Table E**).

Table E: Key Initiatives and Metrics for ST2: Sustainable and Low-Carbon Construction

Key Initiative	Metric	2023 (baseline)	2024	2025
Deployment of building information modeling (BIM). Deploy BIM platforms to optimize material consumption and minimize waste during project planning and design	Percentage of projects using BIM (%)	0	5	15
Integration of industrialized building systems (IBS). Actively promote IBS and prefabrication solutions for suitable projects during the tender phase	Percentage of projects built using IBS (%)	-	-	-

ST2 = Strategic Thrust 2.
Note: The IBS manufacturing facility is currently under construction.
Source: Asian Development Bank and PwC analysis.

Our digitalization and prefabrication strategies, including deployment of building information modeling (BIM) and integration of industrialized building systems (IBS), are aligned with regional regulatory initiatives, such as the Construction Industry Development Board (CIDB), Malaysia's roadmap, and Thailand's national initiative for modular construction.

To operationalize sustainable construction across our business model, we focus on the following:

- **Digital material optimization.** We deploy BIM software during the planning phase to create a precise "virtual 3D model" of each major project. This allows our engineering teams to detect design clashes before breaking ground, eliminating material over-ordering and high-emission rework. The software also estimates the up-front construction-phase carbon emissions of our materials and processes. This optimizes material usage and minimizes waste, lowering Scope 1 and Scope 2 operational emissions, as well as Scope 3 embodied carbon and waste-related emissions.
- **Early-stage value engineering through IBS.**[19] We engage our clients and designers early in the tender phases to substitute traditional, high-carbon wet-concrete methods with precast concrete systems, including prefabricated IBS elements such as columns, beams, and lightweight wall panels. These efficient techniques shorten construction timelines, reduce manual labor dependency, and increase quality. Factory-controlled production lowers energy and material consumption, resulting in less waste and reduced operational and embodied carbon emissions.
- **Digital on-site project management controls.** We integrate real-time digital monitoring into on-site project management systems to track construction efficiency, energy consumption, and waste generation across project sites.

We plan to fund these initiatives through a combination of internal funding and external financing:

- **BIM and digital on-site project management investment.** We are investing $1.00 million per annum in financial years 2026 and 2027 from our internal working capital to enhance and scale our BIM and related systems. This capital will integrate advanced functionalities, including carbon accounting and life-cycle assessment (LCA) plugins, directly into our 3D project models. Additionally, it will expand our real-time digital site-monitoring capabilities through on-site project management system integrations while funding workforce upskilling. From financial year 2028 onward, we will allocate $0.30 million annually for software maintenance, regular updates, and continuous workforce training, funded through operational cash flow.
- **IBS capital expenditure.** We are investing $15 million per annum in financial years 2026 and 2027 in our IBS manufacturing facility, targeting full operation by 2027, with an additional $25 million per annum planned for phase 2 expansion over the long term. Both phases will be funded through SLLs.

ST3: Sustainable Material Sourcing

Focus Areas of ST3

Influence the reduction of Scope 3 embodied carbon (Category 1: Purchased Goods and Services) by implementing green procurement standards, engaging suppliers, and substituting traditional materials with low-carbon alternatives that are subject to project owner, engineer, and regulatory approval.

The key initiatives and metrics for ST3 are presented in (**Table F**).

[19] According to CIDB Malaysia, industrialized building systems is a system or method of building construction in which the components are produced in controlled conditions (in a factory or on a construction site), transported and installed during construction with the minimal use of workers on site.

Table F: Key Initiatives and Metrics for ST3: Sustainable Material Sourcing

Key Initiative	Metric	2023 (baseline)	2024	2025
Establishment and enforcement of green procurement standards. Establish and enforce carbon transparency and emissions disclosure across our material supply chain and supplier selection process	Percentage of suppliers with carbon reduction targets (%)	4.00	7.00	10.00
Sourcing of lower-carbon material. Actively promote and source green materials (e.g., lower-clinker cement, recycled steel, and recycled concrete aggregates) during the design and bidding phases of design-and-build contracts	Average material embodied carbon intensity (tCO_2e/t)	1.08	1.04	1.01

ST3 = Strategic Thrust 3, tCO_2e/t = tons of carbon dioxide equivalent per metric ton.
Source: Asian Development Bank and PwC analysis.

To achieve sustainable material sourcing, we are enhancing our supplier selection processes and substituting traditional materials with lower-carbon alternatives across four key areas:

- **Establishing and enforcing green procurement standards.** Integrate sustainable requirements into supplier selection process, including carbon emissions disclosure, carbon reduction targets, and the supply of lower-carbon materials. Recognizing that some suppliers are small and medium-sized enterprises with limited resources and technical capacity, we will also support key suppliers in developing GHG emissions baselines; improving emissions data collection and reporting; and identifying practical emissions reduction opportunities through training, technical assistance, standardized reporting templates, and supplier engagement programs.
- **Tender-stage life-cycle carbon assessments.** To qualify for green procurement and meet the requirements of sustainability rating systems across ASEAN—including Singapore's BCA Green Mark, Malaysia's CIDB MYCREST, Thailand's TREES, and Viet Nam's LOTUS—we leverage BIM-integrated LCA tools during the tender phase. Assessing material emissions early enables us to reduce carbon emissions before construction begins and to enhance our competitiveness for sustainability-rated contracts.
- **Sourcing lower-carbon cement and foundations.** We propose replacing traditional high-emission concrete and foundation piles with lower-carbon alternatives sourced from regional suppliers. Transitioning to lower-carbon cement (including lower-clinker cement) reduces concrete-related carbon emissions by up to 30%–40% compared to standard mixes, which significantly lowers overall embodied carbon as cement is one of our highest emission sources.
- **Prioritizing recycled and circular materials.** We prioritize and source materials with high recycled content to support a circular economy and reduced embodied carbon. While basic items like rebar in ASEAN are commonly made from 100% recycled scrap metal, our larger projects are required to use a mix of virgin and recycled steel to meet strict structural safety and grading standards. We also replace newly quarried stone with recycled concrete aggregate (RCA), crushed from construction and demolition waste, where engineering standards permit to reduce embodied carbon emissions.

We plan to fund these initiatives through internal funding:

- **Establishment and enforcement of green procurement standards.** We allocate $0.3 million per annum in the short term to establish supplier emission tracking systems, upskill procurement teams, and develop internal governance processes. For the medium to long term, we will allocate $0.1 million per annum to maintain and execute these procurement standards through continuous training and system updates. These expenditures will be funded through operational cash flow.
- **Engagement with suppliers for lower-carbon material sourcing.** We allocate $0.4 million–$0.8 million per annum over the short and medium term to establish strategic partnerships with lower-carbon material suppliers and producers,

conduct collaborative research and development for lower-carbon materials, and provide technical training to our engineering and procurement teams. For the long term, we plan to continue supplier engagement and allocate $0.5 million–$1.0 million annually for ongoing sourcing of lower-carbon, recycled, and circular materials. These expenditures will be funded through operational cash flow.

Box 12: Guidance from ASEAN Taxonomy for Sustainable Finance Version 4

The ASEAN Taxonomy Sustainable Finance Version 4 (ASEAN Taxonomy) provides guidance on technical screening criteria (TSC) by environmental objective. **Table B12** illustrates the bases for TSC setting for the construction and real estate sector by environmental objective.

Table B12: Technical Screening Criteria by Environmental Objective

Environmental Objective (EO)	Description
EO1: Climate Change Mitigation	**Tier 1 (Green)** 1. Aimed at achieving an advanced level of certification in credible, national, or international green building certification schemes; or 2. Aimed at specified proxies relevant to emissions intensity from energy usage and consumption to identify the level of greenness in some activities: it has been assessed that the measure of energy usage intensity demonstrates the most comprehensive measure for assessing greenness of the activities. **Tier 2 (Amber T2)** 1. Activity supports a transition toward a green pathway within a defined time frame; and a) results in a contribution to the EO that is at least as good as the lowest-carbon-emitting technology currently that is technologically feasible for widespread use in ASEAN; or b) results in achieving the best reduction in energy usage intensity from a building construction and implementation plan.
EO2: Climate Change Adaptation	**Tier 1 (Green)** 1. Activity where measures have been implemented to ensure own resilience to climate change and thereby contribute to overall local, national, or regional resilience; or 2. Activity supports other Activities to increase resilience to climate change.
EO4: Resource Resilience and the Transition to a Circular Economy	**Tier 1 (Green)** 1. Activity optimizes waste management, including the management and reduction of waste from the construction and demolition of buildings: it has been assessed as meeting the base minimum criteria of maintaining existing structural materials, as defined under credible, international GBC schemes. **Tier 2 (Amber T2)** 1. Activity supports a transition toward a green pathway within a defined time frame; and a) results in a contribution to the EO that is at least as good as the technology that results in the lowest possible waste production, which is currently technologically and economically feasible for widespread use in ASEAN; or b) results in achieving the best reduction in energy usage Intensity from a building construction and implementation plan.

In this example, the company has commissioned a project certified under a third-party multi-attribute sustainability. This has been classified as green under the climate change mitigation environmental objectives in accordance with the ASEAN Taxonomy.

When referring to the taxonomy, organizations should not focus solely on the sector in which they operate. As the ASEAN Taxonomy is activity-based, organizations may also refer to the criteria applicable to other sectors where these are relevant to their business activities. In this case, when procuring low carbon materials, organizations may refer to the manufacturing sector (ASEAN Taxonomy), under which the production of construction material falls. It sets out performance thresholds and technical criteria for determining whether an activity qualifies for a green or amber classification.

Source: ASEAN Taxonomy for Sustainable Finance Version 4.

ST4: Waste Reduction and Circular Economy

Focus Areas of ST4

Reduce Scope 3 GHG emissions (Category 5: Waste Generated in Operations) by minimizing construction and demolition waste and maximizing material recovery, recycling, and reuse.

The key initiatives and metrics for ST4 are presented in the (**Table G**).

Table G: Key Initiatives and Metrics for ST4: Waste Reduction and Circular Economy

Key initiative	Metric	2023 (baseline)	2024	2025
On-site waste segregation, direct material reuse, and landfill diversion. Implement mandatory on-site waste segregation protocols to construction waste at the source	Percentage of waste diverted from landfill (%)	7.00	9.00	15.00
Recycling and reprocessing construction waste. Partner with industry recyclers and invest in processing facility to crush and reprocess construction and demolition waste (CDW) into usable aggregates	Percentage of CDW recovered and reprocessed (%)	-	-	

ST4 = Strategic Thrust 4.
Note: The recycled concrete aggregate processing facility is currently under construction.
Source: Asian Development Bank and PwC analysis.

We focus our operations on three primary initiatives:

- **Mandatory on-site waste segregation and direct reuse.** We are implementing structured waste segregation protocols across all major project sites, beginning with new long-duration projects (i.e., exceeding 18 months). By segregating materials such as concrete, steel, timber, glass, and packaging at source, we maximize direct, unprocessed on-site reuse (e.g., timber reuse) and subsequent recycling of the waste materials, diverting usable materials from landfills.
- **Construction waste reprocessing.** We establish strategic partnerships and co-invest in building the infrastructure in Malaysia to reprocess construction waste such as concrete into RCA, which will be utilized as construction materials for road sub-bases and non-structural uses, reducing our construction waste emissions and use of virgin materials**.**
- **Planning-stage waste prevention.** We utilize BIM during our design and pre-construction planning phases, particularly for major projects. BIM enables optimized material cut-lists and improved design specifications, reducing unnecessary material procurement and excess usage. By preventing material waste before construction begins, we could achieve waste reductions of approximately 4%–15% or more up front.

We plan to fund these initiatives through a combination of internal funding and external financing.

- **Waste segregation protocol implementation spending.** We will allocate $1.50 million per annum in the short term to roll out waste segregation policies, project upskilling, and digital integration of waste management systems. In the medium to long term, we will continue these policies and site practices through an annual operational budget of $0.75 million. The expenditures will be funded through operational cash flow.
- **Investment in RCA processing facility.** We are co-funding the construction of an RCA processing facility with industry partners, with a committed capital expenditure of $5 million per annum in financial years 2026 and 2027. The facility is underway and targeted for full operationalization by 2027 to secure our local supply of recycled aggregates. In the long term, we plan to expand processing capacity and capabilities, which will require a total of additional $5 million investment. Both the initial construction and expansion phases will be funded through SLLs.

Pillar 2.4(a): Engagement with the Value Chain

Engagement with Our Value Chain Stakeholders

Our transition to low-carbon construction requires engagement across our value chain. We work with upstream suppliers and designers to specify and source lower-carbon materials, implement operational practices and renewable energy on project sites, and support project owners and facility operators in delivering and maintaining sustainable building performance. This section outlines our key stakeholders, engagement priorities, and methods across the upstream, operations, and downstream within our value chain, as shown in (**Table H**).

Table H: Value Chain Engagement

Value Chain	Strategic Thrust	Key Engagement Focus	Engagement Method	Key Stakeholder
Upstream Value Chain				
Transportation	ST1: Green Energy Transition	Transition to low-carbon transport (e.g., electric vehicles, consolidated logistics)	• Direct contract negotions on vehicle emissions • Industry engagement forums	• Material transporters and logistics providers
Energy and equipment	ST1: Green Energy Transition	Transition to renewable energy, energy-efficient equipment, and low-emission vehicles	• Direct contract negotions on long-term PPAs • Industry engagement forums	• Energy providers • Equipment providers
Design and pricing	ST2: Sustainable and Low-Carbon Construction ST3: Sustainable Material Sourcing	Specify lower-carbon materials and sustainable design	• ECI workshops • Technical briefings on low-carbon construction	• Architects • Engineers • Interior designers • Specialists • Quality surveyors
Material sourcing	ST3: Sustainable Material Sourcing	Source lower-carbon and recycled content materials, and ensure labor compliance	• Green procurement standards policy • Supplier audits • Collaborative R&D	• Material suppliers (e.g., cement, steel, and aggregates)
Operations				
On-site labor	ST2: Sustainable and Low-Carbon Construction	Build green skills and ensure safe, sustainable work practices	• Green skills training program, and health and safety guidelines • Labor practice assessments	• Site workers (direct employees)
On-site services	ST4: Waste Reduction and Circular Economy	Implement energy efficiency, waste segregation, and occupational health and safety compliance	• Subcontractor code of conduct • Mandatory training on waste segregation and site efficiency practices	• Site workers (subcontractors, on-site service providers)[a] • JV partners
Downstream Value Chain				
Project owners	ST2: Sustainable and Low Carbon Construction ST3: Sustainable Material Sourcing	Deliver green building certifications and embodied carbon data	• ECI to advise on low-carbon design • Transporting carbon data sharing	• Poverty developers • Government agencies • Corporate clients

ECI = early contractor involvement, JV = joint venture, PPA = power purchase agreement, R&D = research and development, ST = Strategic Thrust.

[a] Subcontractors and on-site service providers are part of our upstream value chain, who are also heavily involved in our operations at site.
Source: Asian Development Bank and PwC analysis.

Escalation and Monitoring Mechanism Across the Value Chain

Our engagement activities aim to drive material decarbonization across our value chain. To monitor progress and intervene where necessary, we have established escalation processes to ensure accountability across our stakeholder base:

- **Supplier due diligence and compliance.** Key construction material suppliers that do not meet our sustainable procurement standards and decarbonization targets (e.g., lower-carbon concrete and steel, recycled material content) will be rated lower in supplier evaluations. Failure to achieve the required standards within 18 months may result in supplier replacement, reduced business allocation, or revised contract terms.
- **Site-level performance and compliance.** On-site subcontractors not meeting waste segregation, energy efficiency, or safety key performance indicators are required to implement corrective action plans. Continued noncompliance may result in exclusion from future tenders for 12 months.
- **Renewable energy generation.** If renewable energy penetration on-site falls short of site targets (e.g., <30% in 2026), we conduct root cause analysis and adjust procurement strategy, grid contracts, or on-site generation capacity.

These escalation mechanisms ensure our engagement strategy remains adaptive and accountable to our value chain stakeholders in pursuit of our decarbonization and net-zero ambitions.

Pillar 2.4(b): Engagement with Industry

Industry Association Participation and Policy Advocacy

We participate in industry bodies across our operating markets to advance sector-wide decarbonization through policy dialogue and practical guidance. Our memberships include

- Malaysia: Master Builders Association Malaysia and CIDB Malaysia,
- Singapore: Singapore Contractors Association Limited,
- Thailand: Thai Contractors Association, and
- Viet Nam: Vietnam Association of Construction Contractors.

Our engagement focus is described in (**Table I**).

Table I: Industry Partnerships

Strategic Thrust	Key Engagement Focus	Engagement Method
ST1: Green Energy Transition	Establish renewable electricity standards for construction sites to increase renewable energy penetration	• Partner with MBAM, SCAL, and TCA on renewable energy procurement guidance
ST2: Sustainable and Low-Carbon Construction	Accelerate BIM and IBS adoption within ASEAN to reduce embodied carbon and on-site material waste	• Support MBAM, CIDB, and SCAL in developing BIM and IBS standards
ST3: Sustainable Material Sourcing	Establish green procurement standards for concrete, steel, and other construction materials to reduce embodied carbon	• Copublish industry-wide green procurement standards with MBAM and CIDB • Collaborate MBAM, CIDB, TCA, and SCAL in R&D of lower-carbon materials
ST4: Waste Reduction and Circular Economy	Advance R&D and commercialization of CDW recovery infrastructure to reduce waste-to-landfill emissions and increase RCA utilization	• Partner in CDW recovery R&D • Co-invest in RCA facilities across ASEAN markets

ASEAN = Association of Southeast Asian Nations, BIM = building information modeling, CDW = construction and demolition waste, CIDB = Construction Industry Development Board, IBS = industrialized building systems, MBAM = Master Builders Association Malaysia, R&D = research & development, RCA = recycled concrete aggregate, SCAL = Singapore Contractors Association Limited, TCA = Thai Contractors Association.

Source: Asian Development Bank and PwC analysis.

Our chief sustainability officer conducts an annual review of industry bodies in which we hold membership to assess their alignment with our 2030 emissions reduction pathway. In the event of any conflict, we will engage the relevant industry body within 60 days to discuss opportunities for greater alignment. If the issue remains unresolved after 6 months, it will be escalated to the Board Sustainability Committee for further review and guidance. We may reassess our membership or level of participation where an industry body's position diverges significantly from our commitments.

Pillar 2.4(c): Engagement with Government, the Public Sector, Communities, and Civil Society

Policy Engagement and Government Relations

We engage with national and local governments to shape decarbonization policies and incentive structures. We focus on policy areas that directly enable our four strategic thrusts while prioritizing markets with regulatory momentum such as Singapore and Viet Nam, and partner with industry associations to push for industry-wide decarbonization, as shown in the (**Table J**).

Table J: National and Local Government Partnerships

Policy Area	Key Engagement Focus	Strategic Thrust (ST)
Carbon pricing	Participate in government consultations on emissions trading frameworks and carbon tax alignment (Malaysia and Viet Nam)	• ST1: Green Energy Transition
Building codes	Support development of green building standards and lower-carbon material specifications (Singapore and Thailand)	• ST2: Sustainable and Low-Carbon Construction • ST3: Sustainable Material Sourcing
Renewable energy	Advocate for power purchase agreement frameworks and grid-connected renewable incentives to increase on-site renewable energy access (Malaysia and Viet Nam)	• ST1: Green Energy Transition
Waste management	Engage on enhancing construction waste management standards and policies and CDW recovery infrastructure incentives (Malaysia, Singapore, Thailand, and Viet Nam)	• ST4: Waste Reduction and Circular Economy
Green procurement	Support green procurement frameworks in government tenders to drive lower-carbon material adoption (Malaysia and Singapore)	• ST3: Sustainable Material Sourcing

CDW = construction and demolition waste.
Source: Asian Development Bank and PwC analysis.

Local Community Engagement and Economic Empowerment

We prioritize local economic participation by targeting at least 80% procurement spend with local suppliers and service providers across our operating markets, where commercially and technically feasible. In Malaysia, Viet Nam, and Thailand, we establish region-specific local supplier partnerships with approximately 15–20 local material vendors and 50 logistics organizations per market. These partnerships have generated more than 85% local supplier engagement in Malaysia and Viet Nam, contributing to sustainable long-term community economic development.

Skills Development and Just Transition

We invest in workforce upskilling for emerging technologies (e.g., BIM, IBS, and renewable energy systems). Our flagship Green Construction Academy partnership with polytechnics in Malaysia, Singapore, and Viet Nam trains 500 workers annually on BIM, renewable energy maintenance, and waste segregation to ensure workers who are potentially displaced by automation are reskilled and equipped with relevant green competencies.

Human Rights

We are guided by our Human Rights Policy, which commits us to respecting internationally recognized human rights standards, including the rights of Indigenous Peoples, freedom of association, and fair labor practices.

Consultation and Engagement with Indigenous Peoples

For projects near indigenous lands, we conduct free, prior, and informed consent consultations before commencement. On our East Malaysia Sarawak infrastructure project, we partnered with Iban and Orang Ulu communities and the Sarawak Indigenous Leaders Business Club to establish

- 30% of construction jobs reserved for Indigenous workers with priority support;
- revenue sharing from project-adjacent economic activities (e.g., local procurement, hospitality);
- indigenous-led environmental monitoring committees for biodiversity oversight; and
- long-term skills training in equipment operation and green construction practices.

Grievance mechanisms use culturally appropriate dispute resolution through community elders. The number of community grievances received and resolved within 30 days is tracked and reported quarterly.

Biodiversity and Environmental Stewardship

We are guided by our Biodiversity Policy, which commits us to protecting and restoring natural ecosystems, minimizing impacts on endangered species, and supporting nature-based solutions aligned with international conservation standards.

For projects near high-conservation areas (e.g., wetlands, reserved forests), we conduct environmental impact assessments and apply the Task Force on Nature-related Financial Disclosures locate, evaluate, assess, and prepare approach to systematically assess biodiversity impacts.

Our existing nature-based solutions offset construction impacts:

- reforestation initiatives on project margins and nearby degraded lands;
- wetland restoration in water-sensitive project areas, partnering with local environmental organizations;
- habitat creation for endangered species in high-conservation zones; and
- green infrastructure (e.g., living walls, bioswales, permeable surfaces) integrated into project design.

All projects are aligned with local and international green building standards such as BREEAM, LEED, and EDGE, to demonstrate environmental commitment beyond regulatory compliance.

Biodiversity Protection Through Wetland Restoration

Our Ho Chi Minh City residential project incorporated wetland restoration and native tree planting in partnership with Viet Nam and local environmental authorities, creating a biodiversity buffer for migratory birds and supporting the Mekong Delta's climate adaptation. The progress of the restoration is monitored regularly through collaboration with ecologists and local authorities. The key metrics—such as area of wetlands protected and restored, number of native trees planted, and biodiversity key performance indicators—are tracked and reported quarterly to the Sustainability Committee and biannually to Board Sustainability Committee.

Pillar 3: Governance and Accountability

> The three sub-pillars under Pillar 3: Governance and Accountability, **Pillar 3.1: Board oversight and reporting, Pillar 3.2: Management roles, responsibility and accountability, and Pillar 3.3: Incentives and remuneration**, will be integrated under "Governance oversight."

Governance Oversight

Our board of directors has ultimate oversight of the transition plan and reviews progress against the transition plan and related performance metrics on a quarterly basis, based on updates provided by the Board Sustainability Committee and Sustainability Committee on a quarterly basis.

Management, comprising representatives from various business units and departments, is responsible for implementing the transition plan and monitoring its progress.

Our remuneration framework incorporates a approach. During 2025, 15% of senior management's total remuneration was linked to the achievement of our net-zero targets and its key initiatives in decarbonization.

3.2 Application of Proportionate Guidance to the Construction Sector

Several transition plan pillars—such as financial planning, stakeholder engagement, governance and accountability—are broadly applicable across high-emitting sectors and are addressed in Chapter 4 on a cross-sectoral basis.

This section focuses on the components that warrant differentiated treatment for the construction sector: Strategic Ambition and metrics and targets. The proposed tiers take into account key sector characteristics, including its project-based delivery model, embodied and operational carbon profile, and materials and procurement-driven emissions. The construction sector also benefits from a relatively well-developed ecosystem of sector-specific roadmaps, certification frameworks, and target-setting initiatives, which provide a useful basis for assessing transition plan ambition and maturity (**Table K and Table L**).

Table K: Strategic Ambition

Base	Intermediate	Advanced
• Aligned with home-country nationally determined contributions and/or the Paris Agreement's temperature goals, with no sector-specific pathway referenced	• Long-term decarbonization or net-zero ambition aligned with a recognized sector-specific pathway (e.g., a national or regional low-carbon buildings and construction roadmap), supported by the company's own defined transition strategy • Company-level, time-bound net-zero commitment with a stated scope and supporting transition roadmap • References a recognized third-party target-setting methodology, or expresses an intention to pursue formal target setting or validation, without formal commitment or validation	• Targets formally committed or validated through a recognized third-party target-setting initiative or sector-specific commitment mechanism (e.g., SBTi, WorldGBC Net-Zero Carbon Buildings Commitment, CRREM, or other equivalent initiatives) • Quantified decarbonization roadmap with defined levers and interim milestones, integrated into corporate strategy, capital allocation, risk management, and decision-making processes

CRREM = Carbon Risk Real Estate Monitor, SBTi = Science-Based Targets initiative, WorldGBC = World Green Building Council.
Source: Asian Development Bank and PwC analysis.

Table L: Metrics and Targets

Category	Base	Intermediate	Advanced
Greenhouse gas (GHG) emissions	• Discloses annual Scope 1 and Scope 2 GHG emissions (tCO_2e) • Material Scope 3 categories listed but not quantified	• Sets a dated, self-determined GHG target with baseline year • Tracks Scope 1 and Scope 2 intensity (e.g., tCO_2e/revenue) • Quantifies material Scope 3 categories with boundary rationale	• Adopts an absolute GHG target validated through a recognized third-party target-setting initiative (near- and long-term) • Reports independently assured Scope 1 and Scope 2 data • Discloses a Scope 3 inventory using primary or activity-based data where feasible, split by operational vs. embodied carbon
Renewable energy on sites; fleet decarbonization	• Discloses total energy and electricity consumption (MWh), with only a qualitative statement on reducing fossil fuel use	• Sets a dated renewable electricity or fleet electrification target • Tracks total energy by source (e.g., grid, fossil, renewable) • Discloses % of fleet electrified or using alternative fuels	• Integrates renewable energy or alternative fuel targets into net-zero roadmap • Tracks fleet electrification against a defined trajectory • Discloses purchased renewable electricity % with procurement method named (e.g., supply contract, certificate purchase)
Construction and Demolition Waste	• Discloses total waste generated (metric tons), without a diversion or recycling rate	• Sets a dated landfill diversion target • Discloses diversion rate (%) by recovery or disposal type for major projects	• Integrates a zero-waste-to-landfill or circularity target into project delivery • Discloses a full waste inventory by hazard or treatment type • Reports % non-recycled and design-for-deconstruction metrics
Raw material consumption	• Estimates material use as % of spend for a single year, explicitly not physically measured	• Discloses physically measured material tonnage by type for a single year or region, without a forward efficiency target	• Tracks a material efficiency or intensity target (e.g., metric ton per project value) • Discloses physical tonnage by type across multiple years and regions
Green building and sustainable design	• References green building council membership or green building certifications qualitatively, without disclosing certification scheme, achievement level or portfolio coverage	• Sets a dated certification target naming a specific tier • Discloses named certifications by scheme and tier for a subset of projects	• Sets a portfolio-wide certification target approaching full coverage • Discloses portfolio-wide certified coverage (e.g., % of floor area, project count, or revenue), broken down by tier achieved across the portfolio
Recycled and secondary material content	• States a general policy of using recycled materials where feasible, without quantification	• Sets a dated recycled-content target for one material stream (e.g., steel, aggregates) and discloses % or tonnage for that stream	• Sets a company-wide recycled-content target across material streams tied to a roadmap • Discloses the % of recycled or secondary material used, broken down by material category
Lower-carbon materials	• References lower-carbon material types qualitatively (e.g., mass timber, lower-carbon concrete), without a quantified substitution rate	• Sets a dated substitution target for one material or product line (e.g., 90% lower-carbon concrete by 2030) • Discloses specific lower-carbon material types in use and the number of projects adopting them	• Embeds a company-wide substitution target • Discloses company-wide % by volume, by category, supported by supplier environmental documentation where feasible
Embodied carbon	• References embodied carbon or whole-life carbon considerations qualitatively, without quantification	• Conducts embodied carbon assessments for selected projects • Discloses embodied carbon metrics for key materials or projects (e.g., clinker factor, concrete embodied carbon, steel emissions factor)	• Tracks embodied carbon performance across projects or material categories using supplier-specific or primary data where feasible • Sets embodied carbon reduction targets

MWh = megawatt-hour, tCO_2e = tons of carbon dioxide equivalent.
Source: Asian Development Bank and PwC analysis.



4. High-Emitting Sectors Considerations

4.1 Application of Proportionate Guidance

As described in Chapter 2.3, this Handbook adopts proportionate guidance in disclosing a credible transition plan. While the core pillars and sub-pillars of a transition plan remain broadly consistent and applicable across organizations, the scope and the level of details may vary depending on the organizations' circumstances and maturity in transitioning.

To support the practical application of the proportionate guidance, **Table 5** illustrates how organizations may apply the base, intermediate, and advanced maturity levels across the pillars and sub-pillars of this Handbook. These maturity levels are intended to demonstrate the progressive development of transition planning practices and disclosures, and to acknowledge the data limitations that organizations may encounter as their capabilities evolve. They should not be interpreted as prescriptive requirements.

Table 5: Applying Base, Intermediate, and Advanced Maturity Levels Across Pillars

Sub-pillar	Base	Intermediate	Advanced
Pillar 1: Strategy and Targets			
Strategic Ambition	Establishes initial transition objectives and a direction of travel, supported by near-term priorities and foundational governance arrangements	Defines a clearer transition ambition that is integrated into business planning and supported by structured implementation actions	Fully embeds the transition ambition into business strategy, decision-making, risk management, capital allocation, and value chain engagement
Business model and value chain	Identifies key business activities, value chain, and areas potentially affected by the transition	Assesses material transition-related risks and opportunities across the value chain and identifies actions to address them	Demonstrates how transition considerations are integrated into business model, value chain resilience, and strategic decision-making
Key assumptions and external factors	Discloses key assumptions and external dependencies underpinning the transition plan	Discloses details regarding the assumptions, uncertainties, and external factors that may influence implementation of the transition plan	Discloses robust assessment of assumptions, scenario analysis, dependencies, and potential implications for achieving transition objectives
Metrics and targets	Establishes an emissions baseline and discloses a limited set of operational and transition-related metrics and targets	Establishes clearly defined metrics and targets across key transition areas, supported by regular monitoring and performance management processes	Utilizes comprehensive metrics and targets aligned with long-term transition objectives and integrated into strategic decision-making, capital allocation, and performance oversight
Pillar 2: Business and Adaptation			
Business operations	Identifies operational activities that may be affected by transition risks and opportunities and outlines initial adaptation measures	Implements operational initiatives and monitors progress against transition objectives	Fully integrates transition considerations into operational planning, resource allocation, and performance management processes
Products and services	Identifies products and services that may be impacted by the transition and explores potential opportunities	Develops products and services that support transition objectives and respond to evolving customer and market expectations	Aligns product and service portfolios with long-term transition objectives and emerging low-carbon market opportunities

Continued on next page

Table 5 continued

Sub-pillar	Base	Intermediate	Advanced
Financial planning	Provides a qualitative discussion of anticipated financial implications and resource requirements associated with the transition	Incorporates transition-related investments, expenditure, and financial implications into planning processes	Demonstrates integration of transition considerations into financial strategy, capital allocation, and investment decision-making
Engagement strategy	Identifies key stakeholders relevant to transition planning and implementation	Establishes structured stakeholder engagement processes and incorporates feedback into transition initiatives	Demonstrates ongoing engagement that informs strategic decisions, supports implementation, and enhances transition outcomes
Pillar 3: Governance and Accountability			
Board oversight and reporting	Identifies board responsibility for overseeing transition planning and related disclosures	Establishes formal board reporting processes and periodic review of transition progress	Demonstrates active board oversight of transition performance, strategic decisions, and long-term transition outcomes
Management roles, responsibilities, and accountability	Assigns responsibility for transition planning activities to relevant management functions	Defines clear accountability structures, responsibilities, and reporting lines across the organization	Fully embeds transition-related accountability within management structures, decision-making processes, and performance management systems
Incentives and remuneration	Considers transition objectives within management performance discussions where relevant	Links selected transition-related objectives to management performance evaluation processes	Integrates material transition-related performance indicators into remuneration and incentive frameworks where appropriate

Source: Asian Development Bank and PwC analysis.

4.2 Sector-Specific Considerations for High-Emitting Sectors

Organizations in high-emitting sectors are expected to play a critical role in ASEAN's transition to a low-carbon economy. However, the decarbonization pathways may differ significantly across sectors due to variations in emissions sources, available technologies, business models, investment requirements, and regulatory developments.

As a result, organizations in different sectors may pursue different transition priorities, decarbonization levers, and implementation pathways. Although emission profiles vary across ASEAN region, the following sectors are widely recognized as high-emitting sectors due to their emissions footprint, transition challenges, and economic significance:

- construction (refer to Chapter 3.2),
- agriculture,
- iron and steel,
- oil and gas,
- power generation, and
- transportation.

To further support the sectors in preparing the transition plan, the additional sector-specific considerations are provided for the following sub-pillars under Pillar 1: Strategy and Targets:

- Strategic Ambition, and
- metrics and targets.

These sub-pillars are closely linked to sector-specific decarbonization pathways and transition priorities, influencing how organizations define their transition objectives and measure progress toward them. In addition, these sub-pillars typically require tailored considerations to reflect sector-specific circumstances, whereas other elements of a transition plan are generally applicable across industries. These considerations were identified through a review of representative company disclosures within each sector, together with national decarbonization commitments; regional frameworks; sustainability disclosure standards; transition planning frameworks and guidance, including the TPT Sector Summary (April 2024); and prevailing industry practice.

To support the application of these considerations, Chapter 4.2 provides illustrative examples of Strategic Ambition and metrics and targets across the selected high-emitting sectors. The chapter also highlights key sector-specific decarbonization levers that organizations may consider when developing and implementing their transition plans. These examples are intended to supplement the proportionate guidance described in Chapter 4.1 and should not be interpreted as exhaustive or prescriptive.

Box 13: Guidance from the ASEAN Taxonomy for Sustainable Finance Version 4

Under the ASEAN Taxonomy Plus Standard, technical screening criteria (TSC) have been established for a range of economic activities to assess and classify them as green or amber based on their contributions to environmental objectives. The TSC provide technical benchmarks for identifying what constitutes green and transitional activities.

Comparing an activity's current performance against the relevant TSC can help an organization identify transition gaps and determine changes required for improvement. Where applicable, the TSC can also support the establishment of measurable targets that contribute to an organization's overall pathway and inform investment decisions. In this way, the taxonomy can help demonstrate where organization is starting from and how it intends to progress toward its transition objectives.

Organizations may refer to the non-exhaustive list of activities and their associated TSC set out in Annex 1 of the ASEAN Taxonomy for Sustainable Finance Version 4, taking into account the activities relevant to the sector. Organizations and financial institutions may also refer to this list as part of the proportionate guidance.

Source: ASEAN Taxonomy for Sustainable Finance.

4.2.1 Agriculture

Sector Overview

Agriculture is a cornerstone of the ASEAN economy, underpinning food security, rural livelihoods, employment, and export earnings across the region. The sector contributed approximately $332.3 billion to the regional economy in 2024, spanning around 140 million hectares of agricultural land.[20] Key commodities include rice, palm oil, rubber, and livestock, with ASEAN accounting for roughly 30% of global rice production and more than 80% of global palm oil output, underscoring the region's significant role in global agricultural trade and food systems.[21] At the same time, agriculture is among the sectors most exposed to climate-related risks. Rising temperatures, shifting precipitation patterns, droughts, floods, and other extreme weather events increasingly threaten agricultural productivity, rural incomes, and food security across the region. The sector therefore faces a dual challenge: adapting to a changing climate while reducing its own contribution to GHG emissions.

Agriculture is estimated to account for around 15% of ASEAN's total GHG emissions and is structurally distinct from many other high-emitting sectors where carbon dioxide dominates the emissions profile.[22] Instead, emissions are spread across three major GHGs: methane (CH_4), nitrous oxide (N_2O), and carbon dioxide (CO_2). Methane—generated from livestock

[20] Food and Agriculture Organization of the United Nations (FAOSTAT). Value of Agricultural Production (accessed 21 August 2026); World Bank.
[21] International Rice Research Institute. 2025. *Southeast Asia Tackles Methane Emissions with New Low-Emission Rice Production Project;* US Department of Agriculture, Foreign Agricultural Service. 2026. *Palm Oil Production.* https://www.fas.usda.gov/data/production/4243000.
[22] ASEAN Secretariat. 2023. *Study on Decarbonising the ASEAN Agriculture and Forestry Sector.*

enteric fermentation, manure management, and flooded rice cultivation—has a warming effect approximately 28–30 times greater than CO_2 over a 100-year period and around 80 times greater over 20 years.[23] N_2O, emitted primarily through fertilizer application and soil management practices, has a global warming potential around 273 times that of CO_2 and remains in the atmosphere for more than a century. CO_2 emissions stem predominantly from land-use change, particularly the conversion of forests and peatlands to cropland, pastures, and plantations.

Rice cultivation, livestock production, and fertilizer use are the principal sources of agricultural emissions in ASEAN. Rice cultivation is a major source of methane emissions, reflecting the region's position as one of the world's leading rice-producing regions, while livestock production contributes methane through enteric fermentation and manure management. Fertilizer application remains the primary source of N_2O emissions. Beyond direct production emissions, agricultural expansion continues to be a significant driver of deforestation and peatland degradation, with oil palm plantations alone estimated to account for approximately 29% of deforestation across South Asia and Southeast Asia.[24] Together, agricultural production and associated land-use change make the sector one of the region's largest sources of GHG emissions.

These emissions have risen steadily over recent decades, driven by population growth, changing dietary preferences, agricultural intensification, and rising demand for food and agricultural commodities. As ASEAN seeks to balance food security, economic development, and climate objectives, reducing emissions from agricultural production and land-use change will be critical to building a more sustainable and climate-resilient food system.

Key Challenges

Biological Emissions

The transition and decarbonization of ASEAN's agriculture sector is complicated by the need to balance climate objectives with food security, rural livelihoods, and economic development. Unlike other sectors, agricultural emissions are largely derived from biological processes (e.g., enteric fermentation, rice cultivation, and manure management) that are difficult to eliminate entirely, with mitigation efforts involving inherent trade-offs rather than straightforward reductions. As a result, achieving deep emissions reductions while maintaining agricultural productivity presents a significant challenge for the sector.[25]

Food Demand Pressures

Population growth, urbanization, and changing consumption patterns are driving the continued growth in food demand, particularly livestock products, placing upward pressure on agricultural production and potentially offsetting emission reduction gains. The sector therefore faces the dual challenge of increasing output to meet food security needs while simultaneously reducing its emissions intensity.[26]

Structural Constraints

The adoption of low-emission agricultural technologies and practices is further constrained by the structural characteristics of the sector. Agriculture in many ASEAN countries is dominated by smallholder farmers, who often face limited access to financing, technology, technical knowledge, and infrastructure. The up-front costs associated with sustainable farming practices, renewable energy deployment, and improved land management can create barriers to adoption, particularly where financial incentives or support mechanisms are limited. These structural constraints contribute to substantial financing gaps, for example, smallholder financing needs for climate-smart agriculture, such as drought-resistant seeds, across South Asia and Southeast Asia are estimated at approximately $100 billion annually, with current financial resources covering less than one-third of this requirement.[27]

[23] Intergovernmental Panel on Climate Change. 2023. *IPCC Sixth Assessment Report, 2021–2023.*
[24] World Resources Institute. 2026. *Deforestation Linked to Agriculture.*
[25] Refer to footnote 24.
[26] ADB Institute. 2022. *Contribution of Agriculture to Climate Change and Low-Emission Agricultural Development in Asia and the Pacific.*
[27] United Nations Thailand Portal. 2025. Southeast Asian Countries Advance Climate-Smart Agriculture through Regional Cooperation. 24 January.

Market Adoption and Pricing Challenges

The adoption of low-carbon practices across the agriculture sector may increase production costs, which can translate into higher prices for low-carbon agricultural products. Consumer willingness to pay a premium for sustainable products varies across markets and customer segments, limiting the ability of producers to recover transition costs. This creates uncertainty around the business case for decarbonization investments and could slow the sector's transition to lower-emission production methods.

Application of Proportionate Guidance

Table 6 and **Table 7** illustrate how organizations in the agriculture sector may progressively strengthen their transition planning practices across Strategic Ambition and metrics and targets. Organizations may apply these examples in a manner that reflects their specific circumstances, transition objectives, and stage of transition planning.

Table 6: Strategic Ambition—Agriculture Sector

Base	Intermediate	Advanced
• Aligned with home-country nationally determined contributions and/or the Paris Agreement's temperature goals, with no sector-specific pathway referenced	• Long-term decarbonization or net-zero ambition aligned with a recognized sector-specific pathway (e.g., a national or regional agricultural roadmap), supported by the company's own defined transition strategy • Company-level, time-bound net-zero commitment with a stated scope and supporting transition roadmap • References a recognized third-party target-setting methodology, or expresses an intention to pursue formal target setting or validation, without formal commitment or validation	• Targets formally committed or validated through a recognized third-party target-setting initiative or sector-specific commitment mechanism (e.g., SBTi's FLAG Guidance) • Quantified decarbonization roadmap with defined levers and interim milestones, integrated into corporate strategy, capital allocation, risk management, and decision-making processes

FLAG = forest, land, and agriculture; SBTi = Science-Based Targets initiative.
Source: Asian Development Bank and PwC analysis.



Table 7: Metrics and Targets—Agriculture Sector

Category	Base	Intermediate	Advanced
GHG emissions	Discloses Scope 1 and Scope 2 GHG emissions and establishes an operational emissions baseline	Establishes medium-term emissions reduction targets across operations and land emissions management	Adopts science-based emissions reduction targets aligned with a net-zero pathway and tracks progress against interim and long-term milestones across Scope 1, Scope 2, and relevant Scope 3 emissions; any intended use of carbon offsets is transparently disclosed, justified, and limited to residual emissions, with the majority of reductions achieved through operational decarbonization measures
	Examples: • Scope 1 and Scope 2 GHG emissions (tCO_2e) • Scope 2 GHG emissions (tCO_2e)	Examples: • Scope 1, Scope 2, and material Scope 3 GHG emissions • Emissions intensity performance against reduction target • Land-related emissions (land-use change and land management emissions)	Examples: • SBTi-aligned targets (GHG emissions and removals covered in the FLAG pathways) • Scope 1, Scope 2 and material Scope 3 GHG emissions • Emissions intensity performance against reduction target • Progress against decarbonization roadmap • Disclosure of intended use of carbon credits or carbon markets and contribution toward net-zero targets
Land use and deforestation	Identifies and reports sourcing and/or production footprint information for relevant commodities and operations	Sets a dated deforestation-free target and discloses traceability systems to monitor progress	Demonstrates implementation of a deforestation-free and responsible land-use strategy through independently verified traceability systems, quantified land-use outcomes, and transparent reporting of progress against targets and commitments
	Examples: • Key agricultural commodities sourced (e.g., palm oil, soy, cattle, cocoa, coffee, timber) • Volume or % of raw material sourced by origin or region • Area of owned, managed or cultivated land (hectares)	Examples: • Target date for 100% deforestation-free sourcing and/or production • % of raw material volume traceable to processing facility or first point of aggregation (e.g., to mill or plantation for palm oil, to first point of aggregation for grain and rice) • % or hectares of own land assessed against a land-use or conversion-risk classification (e.g., high conservation value or high carbon stock–equivalent assessment)	Examples: • % volume of land independently verified by a named third-party assurance provider • Defined methodology for what qualifies as "traceable" (e.g., facility name, location, GPS coordinates, certification status) • Stated % or volume not yet traceable, with reasons and gap treatment disclosed • Land-use-change emissions disclosed in tCO_2e as a distinct, named GHG inventory line item

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Table 7 continued

Category	Base	Intermediate	Advanced
Carbon removal and sequestration	No sequestration figure disclosed, or only an activity count, without a corresponding carbon removal estimate	Quantifies carbon removals and/or sequestration associated with specific initiatives	Separately discloses gross emissions and removals with methodology, and/or tracks outcomes
	Examples: • Number of trees or seedlings planted • Description of restoration or conservation initiatives	Examples: • Estimated carbon removals or sequestration associated with specific initiatives (e.g., agroforestry, mangrove reforestation)	Examples: • Gross emissions and carbon removals or sequestration disclosed separately within the formal GHG inventory, including methodology and assumptions used (e.g., mitigation from regenerative practices such as cover cropping, reduced tillage, and agroforestry, where counted toward a validated FLAG target) • Quantified carbon removals or sequestration outcomes tracked over multiple years and/or subject to external verification
Soil health	Identifies and reports soil management practices and/or soil-related inputs across operations and begins monitoring key soil health indicators	Implements a soil health management and monitoring programme with defined assessment intervals and deploys practices aimed at improving soil function, fertility and resilience	Demonstrates measurable improvements in soil health through quantified outcomes and integrates soil health performance into broader climate, sustainability, and land management objectives
	Examples: • Description of circular fertilizer or manure by-product use • Total fertilizer application (metric tons) • Share of organic vs. inorganic fertilizer use	Examples: • Soil testing and monitoring program with defined assessment frequency • Area under soil health practices (cover cropping, reduced tillage, crop rotation, organic fertilization or erosion-control measures) (hectares) • Percentage reduction in synthetic fertilizer, pesticide, or herbicide use	Examples: • Measured improvement in soil organic matter (%) • Measured increase in soil organic carbon stocks (tC/hectare or tCO_2e) • Reduction in soil erosion rates or improvement in soil retention indicators

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Table 7 continued

Category	Base	Intermediate	Advanced
Energy management	Discloses energy consumption across operations and energy use within agricultural activities, facilities and fleets	Establishes targets and initiatives to increase renewable energy use and/or electrification and tracks performance across key energy-consuming operations and equipment	Implements a renewable energy and electrification strategy with measurable progress against targets, transparent reporting of energy sources, and demonstrated reduction in reliance on fossil fuel energy
	Examples: • Total energy consumption (MWh or GJ) • Energy consumption by facilities and operations	Examples: • States an electrification ambition or target for fleet or machinery • % of renewable energy against total energy consumption • Source type of fuel or generation mix (e.g. solar, biogas, grid electricity), including installed capacity for at least one renewable source	Examples: • Installed renewable energy capacity by source (MW) • Renewable energy generated and consumed from own operations (MWh) • Progress against renewable energy and electrification targets • Discloses the current % of fleet or machinery electrified, tracked over multiple years, with a dated target

FLAG = forest, land, and agriculture; GHG = greenhouse gas; GJ = gigajoule; MW = megawatt; MWh = megawatt-hour; SBTi = Science-Based Targets initiative; tCO_2e = tons of carbon dioxide equivalent.

Note: SBTi-aligned targets refer to SBTi. 2026. Forest, Land and Agriculture Science-Based Target-Setting Guidance (March).

Source: Asian Development Bank and PwC analysis.

Box 14: Guidance from GHG Protocol Land Sector and Removals Standard (Version 1.1)

The GHG Protocol's Land Sector and Removals Standard (LSRS) will reshape how organizations measure and report emissions and removals from land-based activities, bringing greater rigor, transparency, and comparability to one of the most complex areas of greenhouse gas accounting. Effective 1 January 2027, organizations with significant land sector activities in their operations or value chain seeking continued alignment with the GHG Protocol will be expected to apply the new standard.

Notably, the LSRS introduces comprehensive requirements for accounting emissions from land-use change, agricultural production, and land management activities, while providing a framework for the transparent reporting of carbon removals. By enhancing data quality, traceability, and reporting integrity, the standard is expected to strengthen the credibility and consistency of corporate climate disclosures and improve comparability across organizations and sectors.

Key LSRS categories organizations should assess include the following:

- Land-use change (LUC) emissions are mandatory and include deforestation and other land conversion. They are calculated using direct LUC or statistical LUC approaches with linear amortization applied over the LUC assessment period.
- Land management emissions are mandatory and split into net biogenic carbon dioxide (CO_2) emissions from carbon stock losses and production emissions such as methane and nitrous oxide from ongoing agricultural activity.
- Land management CO_2 removals are optional but require physical traceability and ongoing monitoring, with reversals reported if stored carbon is later lost.
- Traceability is demonstrated through identity preservation, segregation, controlled blending, or mass balance approaches. Book-and-claim approaches are excluded.

Source: GHG Protocol Land Sector and Removals Standard.

Decarbonization Levers

Table 8 illustrates the decarbonization levers that organizations in the agriculture sector can implement in their transition planning.

Table 8: Decarbonization Levers in the Agriculture Sector

Category	Examples of initiative (Non-Exhaustive)
Reduce on-farm and operational emissions	• Adopt methane-reducing feed additives for livestock (e.g., 3-NOP, seaweed-based compounds) • Improve manure and effluent management (e.g., covered lagoons, anaerobic digestion) to capture methane • Apply nitrification inhibitors and precision fertilizer techniques to reduce nitrogen losses and N_2O emissions • Apply alternate wetting and drying and improved water management in rice cultivation
Improve soil health and water-use efficiency	• Apply biochar and organic mulch to enhance soil carbon, retain moisture, and improve soil health • Deploy smart and precision irrigation systems across plantation and cropping systems to optimize water use • Adopt regenerative practices (e.g., cover cropping, reduced tillage, agroforestry) to build soil carbon
Decarbonize existing operations	• Capture methane from palm oil mill effluent and other organic waste streams for energy use • Deploy on-farm renewable energy (e.g., solar, biomass boilers using crop residues). • Improve machinery, irrigation, and processing energy efficiency • Improve yields and asset productivity to reduce emissions intensity per unit of output
Eliminate land-use change and enhance carbon sinks	• Adopt regenerative practices such as no-tillage farming • Deforestation-free sourcing • Restore and conserve high-carbon-stock and peatland areas
Develop lower-carbon products and value chains	• Pursue certification for low-carbon, sustainable production (e.g., Roundtable on Sustainable Palm Oil, product carbon footprint labels)

3-NOP = 3-Nitrooxypropanol, N_2O = nitrous oxide.
Source: Asian Development Bank and PwC analysis.

Box 15: Technical Screening Criteria Outlined in the ASEAN Taxonomy for Sustainable Finance

Entities undertaking activities within the agriculture sector covered by this Handbook may refer to the Focus Sector: D. Agriculture, Forestry and Fishing in the ASEAN Taxonomy for Sustainable Finance, which sets out the relevant technical screening criteria within the sector.

Source: ASEAN Taxonomy for Sustainable Finance.

4.2.2 Iron and Steel

Sector Overview

ASEAN's five largest steel-producing and -consuming markets—Viet Nam, Indonesia, Malaysia, Thailand, and the Philippines, who are collectively referred to as ASEAN-5—account for the vast majority of ASEAN's steel demand, production, and sector emissions. Steel demand across ASEAN-5 is forecast to reach approximately 197 million metric tons by 2050, representing a 138% increase from 2024, driven by continued population growth, rapid urbanization, and economic expansion across the region, with construction accounting for 63% of regional steel consumption, compared with a global average of 52%.[28]

The steel sector is one of Southeast Asia's largest industrial sources of GHG emissions. Under a business-as-usual scenario, sectoral emissions across ASEAN-5 steel-producing markets are projected to rise sharply, from approximately 125 million

[28] Rocky Mountain Institute. 2026. *ASEAN-5 Steel Sector Decarbonization and Green Demand.*

metric tons of CO_2 in 2023 to around 300 million metric tons by 2030, reflecting both rising output and the continued dominance of coal-based production.[29] This risk is reinforced by the region's capacity pipeline, where blast furnace–basic oxygen furnace (BF-BOF) capacity stood at approximately 31 million metric tons in 2024, roughly on par with electric arc furnace (EAF) capacity, yet an additional 72 million metric tons of BF–BOF capacity has since been announced, accounting for approximately 58% of the region's total capacity pipeline and around 49% of announced projects overall.[30] Indonesia, Viet Nam, and Malaysia are seeing the most significant BF–BOF expansion linked to integrated industrial development, while Thailand remains the only ASEAN-5 market operating on a pure EAF basis, and the Philippines has BF–BOF capacity currently under construction.[31] This reflects differences in feedstock quality, fuel mix, grid emissions factors, and plant efficiency. The challenge is further compounded by the carbon intensity of the region's electricity grid, meaning that a shift toward electricity-based EAF production delivers a smaller emissions benefit in ASEAN than it would elsewhere.[32]

Key Challenges

Carbon Lock-In

Unlike mature steel-producing regions, where ageing BF-BOF assets are approaching retirement and increasingly being replaced by lower-carbon alternatives such as EAFs, ASEAN's steel sector is moving in the opposite direction. The region has experienced a rapid expansion of BF-BOF capacity, with its share of installed steelmaking capacity increasing from around 6% in 2011 to approximately 45% by 2023.[33] Across Viet Nam, Indonesia, and Malaysia, a significant pipeline of new steelmaking investments is underway, with announced projects expected to double ASEAN's steel production capacity by 2030.[34] This expansion risks creating a substantial carbon lock-in challenge. New steel assets are expected to remain operational for several decades, yet the current investment pipeline is overwhelmingly weighted toward the more emissions-intensive BF–BOF route rather than lower-carbon EAF technology. In some countries, the investment pipeline even represents a reversal of previous decarbonization progress. In Indonesia, EAFs account for 42.5% of existing steelmaking capacity, yet only 5.4% of announced expansion projects use EAF technology.[35] Similarly, Malaysia's current steel fleet is 60.8% EAF-based, but only 2.2% of planned new capacity adopts EAFs.[36]

Costly Lower-Carbon Routes

Mature lower-carbon steelmaking routes, including scrap-based EAFs, natural-gas-based direct-reduced-iron EAF (DRI-EAF) and hydrogen-ready DRI-EAF, are all commercially proven and available to ASEAN producers today.[37] However, their deployment remains constrained by economics. Across much of the region, BF–BOF production continues to be the lowest-cost steelmaking route, supported by relatively low coal prices and the significantly higher cost of alternative reductants.[38] Green hydrogen, in particular, remains two to five times more expensive than fossil-based alternatives, and while costs are expected to decline through the 2030s as renewable electricity and electrolyzer costs fall, the cost differential is expected to narrow progressively rather than close in the near term.[39] Without carbon pricing, capital cost subsidies, or demand-side mechanisms to help offset this premium, the underlying economics continue to favor BF–BOF investments across the region.

[29] Agora Industry & Agora Energiewende. 2025. *Decarbonising Steel in Southeast Asia: Pathways, Opportunities and Enablers.*
[30] Refer to footnote 29.
[31] Refer to footnote 28, p.48.
[32] Refer to footnote 29.
[33] Refer to footnote 29.
[34] South East Asia Iron & Steel Institute. 2025. *Regional Decarbonisation Roadmap: ASEAN-6.*
[35] LSE Grantham Research Institute. 2026. *Asia's Steel Expansion Is Creating Carbon Lock-In.*
[36] Refer to footnote 35.
[37] Refer to footnote 29.
[38] Ramboll. 2025. *Decarbonising Steel Industry in Southeast Asia: Balancing Short-Term Wins and Long-Term Strategies.*
[39] Organisation for Economic Co-operation and Development. 2025. *Hydrogen in Steel: Addressing Emissions and Dealing with Overcapacity.*

Scrap and Raw Material Constraints

Scrap-based EAFs are currently the least emissions-intensive steelmaking route available at commercial scale, with the substitution of scrap for virgin iron ore estimated to reduce CO_2 emissions by around 58%.[40] However, scrap availability is closely linked to a country's industrialization history. While mature economies benefit from large volumes of end-of-life steel available for recycling, most ASEAN countries are still relatively early in this cycle and therefore have a more limited domestic scrap base. As a result, scrap shortages in the region may constrain the expansion of EAF-based production and limit the range of commercially viable low-carbon technology options.[41] This challenge is compounded by ASEAN's reliance on imported scrap. As more countries pursue steel decarbonization, ferrous scrap is increasingly being treated as a strategic raw material, with export restrictions now in place across 42 countries to safeguard domestic supply.[42] At the same time, growing steel demand and existing EAF capacity are expected to increase scrap requirements across the region, with Southeast Asia's ferrous scrap demand forecast to rise 50% over the next decade.[43]

Dependency on Power Sector Decarbonization

Carbon-intensive power grids present a challenge that extends well beyond EAF adoption alone, as grid dependency is a feature of nearly all deep-decarbonization pathways available to the steel sector. Scrap-EAF, natural gas-based direct reduced iron-electric arc furnace (NG-DRI-EAF), and green hydrogen-based direct reduced iron-electric arc furnace (H2-DRI-EAF) all draw meaningfully more electricity than unabated BF–BOF, meaning the shift toward lower-carbon routes generally increases reliance on the grid, making decarbonization of ASEAN's iron and steel sector fundamentally dependent on the pace of grid decarbonization. This dynamic is already visible in the Philippines, where the steel sector is entirely EAF-based with no blast furnace capacity at all, yet grid electricity still accounts for two-thirds of the sector's total emissions.[44]

Application of Proportionate Guidance

Table 9 illustrates how organizations in the iron and steel sector may progressively strengthen their transition planning practices across Strategic Ambition and metrics and targets. Organizations may apply these examples in a manner that reflects their specific circumstances, transition objectives, and stage of transition planning.

Table 9: Strategic Ambition—Iron and Steel Sector

Base	Intermediate	Advanced
• Corporate-level emissions reduction commitment aligned with relevant national climate objectives and nationally determined contributions	• Long-term decarbonization or net-zero ambition aligned with a recognized sector-specific pathway (e.g., a national or regional low-carbon steel roadmap), supported by the company's own defined transition strategy • Leverages recognized science-based targets framework in development of targets across short, medium, and long term	• Targets formally committed or validated through a recognised third-party target-setting initiative or sector-specific commitment mechanism (e.g., SBTi's Steel Guidance or Global Steel Climate Council's Steel Climate Standard)

SBTi = Science-Based Targets initiative.
Source: Asian Development Bank and PwC analysis.

[40] Refer to footnote 35, p.49.
[41] Refer to footnote 35, p.49.
[42] Organisation for Economic Co-operation and Development. 2026. *OECD Steel Outlook 2026.*
[43] Fastmarkets. 2022. *Southeast Asia's Blast Furnace Capacity Set for 25% Growth.*
[44] Global Efficiency Intelligence. 2026. *Net-Zero Roadmap for the ASEAN Steel Industry: Pathways for Viet Nam, Indonesia, Malaysia, Thailand, the Philippines, and Singapore.*

Box 16: Understanding the Two Steel Sector Target-Setting Frameworks

There are currently two main science-based target-setting approaches available to steel companies: (i) **the Science-Based Targets initiative (SBTi) Steel Guidance** and (ii) **the Global Steel Climate Council (GSCC) Steel Climate Standard**. Both aim to align corporate emissions trajectories with a 1.5°C pathway to 2050, and both require third-party verification and exclude carbon offsets and insets from target achievement. However, they were developed by different types of organizations and address one core methodological question in fundamentally different ways—how to treat differences in production route between ore-based and scrap-based steelmaking.

SBTi uses a **scrap-input-dependent pathway** under its sectoral decarbonization approach, whereby a company's glidepath is a weighted average between a 100% ore-based and a 100% scrap-based 1.5°C trajectory, recalculated as its scrap ratio changes over time. This means an ore-based producer (using the Blast Furnance-Basic Oxygen Furnace route) and a scrap-based producer (using the Electric Arc Furnace route) will be assigned different trajectories, reflecting their different starting points and decarbonization challenges. This does not simply reward higher scrap use, since primary producers are still required to decarbonize their ore-based production.

On the contrary, GSCC applies a **single, process-agnostic glidepath** to all producers regardless of production route. Companies calculate a baseline company average steel emissions intensity and must converge toward the same benchmark by 2040, with alignment through 2050. In practice, this means scrap-based producers, already closer to the benchmark, face comparatively smaller reductions. Ore-based producers, particularly in markets with limited scrap availability, face a steeper decarbonization curve to reach the same target.

In practical terms, the choice of approach can materially affect how ambitious a company's near-term target looks on paper, independent of its actual physical decarbonization effort. This makes it important for companies to understand both methodologies and disclose clearly why a particular framework was chosen.

Source: Asian Development Bank and PwC analysis.

Table 10: Metrics and Targets—Iron and Steel Sector

Category	Base	Intermediate	Advanced
Greenhouse gas (GHG) emissions	Discloses Scope 1 and Scope 2 GHG emissions and establishes an operational emissions baseline	Establishes medium-term emissions reduction targets across operations and land emissions management	• Adopts science-based emissions reduction targets aligned with a net-zero pathway and tracks progress against interim and long-term milestones across Scope 1, Scope 2, and relevant Scope 3 GHG emissions • Any intended use of carbon offsets is transparently disclosed, justified, and limited to residual emissions, with most reductions achieved through operational decarbonization measures
	Examples: • Scope 1 GHG emissions (tCO_2e) • Scope 2 GHG emissions (tCO_2e)	Examples: • Scope 1, Scope 2, and material Scope 3 GHG emissions (e.g., purchased raw materials such as iron ore, scrap, coal, ferroalloys, and pig iron) • Emissions intensity performance against reduction target	Examples: • SBTi-aligned targets (GHG emissions and removals covered in the steel pathways) • Scope 1, Scope 2, and material Scope 3 GHG emissions • Emissions intensity performance against reduction target • Progress against decarbonization roadmap • Disclosure of intended use of carbon credits and carbon markets, and their contribution toward net-zero targets

Continued on next page

Table 10 continued

Category	Base	Intermediate	Advanced
Energy management	Discloses Scope 1 and Scope 2 GHG emissions and establishes an operational emissions baseline	Establishes targets to improve energy intensity and tracks the energy mix by source	Sets targets for renewable energy and intensity reduction, including purchased-power arrangements and the energy transition plan
	Examples: • Total energy consumption (GJ) or single-year energy intensity (GJ/t steel) • Primary energy source identified (e.g., coal, electricity)	Examples: • Energy intensity (GJ/t steel), tracked over multiple years • % mix of energy used by source or fuel type (e.g., coal, natural gas, electricity), tracked over multiple years • % renewable or self-generated energy, tracked over multiple years, without a dated target	Examples: • Dated renewable energy or energy-intensity reduction target with baseline year • Renewable and purchased-power target (e.g., power purchase agreements, renewable energy certificates) integrated into roadmap • Energy-source transition plan with interim milestones and levers (e.g., phased coal-to-gas-to-hydrogen pathway)
Material efficiency	Discloses raw material and scrap volumes	Establishes targets for material efficiency and recycled content	Monitors material efficiency and recycled content against targets, including substitution programs and internal scrap recovery
	Examples: • Raw material and/or scrap consumption (metric tons) • Scrap produced (metric tons)	Examples: • Dated target for raw material efficiency, yield improvement, recycled content, and/or scrap ratio, with baseline year • Tonnage by material type and/or scrap ratio, tracked over multiple years	Examples: • Quantified reductions in raw-material intensity, recycled content, and/or yield • Lower-carbon material-substitution programs with quantified emissions impact • Recovery or reuse rate of internally generated scrap
Air emissions	No monitoring disclosed, or disclosed only as a general compliance statement	Discloses specific pollutants monitored and the monitoring method or location	Reports pollutant concentrations and intensity against historical performance, including emissions reduction measures
	Statement of compliance with air emissions regulations	Examples: • Specific pollutants (e.g., nitrogen oxides [NOx], sulfur oxides [SOx], particulate matter) • Monitoring method or location	Examples: • Quantified concentrations and/or emissions intensity for specific pollutants (e.g., NOx, SOx, particulate matter), with multi-year trend • Emissions reduction measures and/or demonstrated improvement in emissions performance
Waste management	Discloses total waste generated as a single aggregate	Tracks a recycling or diversion rate and classifies waste by type	Sets waste reduction and diversion targets, tracked against performance, including by-product streams recovered from disposal
	Examples: • Total waste generated (metric tons)	Examples: • Recycling or diversion rate with baseline and trend • Waste split by hazardous vs. non-hazardous or disposal vs. valorization route	Examples: • Dated waste reduction or diversion target with baseline year, tracked against actual performance over time • Specific by-product and co-product stream (e.g., slag, mill scale, dust) diverted from disposal

SBTi = Science-Based Targets initiative, tCO_2e = tons of carbon dioxide equivalent.
Note: SBTi-aligned targets refer to SBTi. 2023. Steel Science-Based Target-Setting Guidance (July).
Source: Asian Development Bank and PwC analysis.

Decarbonization Levers

Table 11 illustrates the decarbonization levers organizations in the iron and steel sector may implement in their transition planning.

Table 11: Decarbonization Levers in the Iron and Steel Sector

Category	Examples of initiative (Non-Exhaustive)
Reduce demand and scale circularity	• Improve material efficiency in design, fabrication, and construction to reduce yield losses and over-specification • Improve internal scrap recovery and recycling across own production and downstream processing
Maximize EAF steelmaking	• Invest in EAF capacity (scrap, DRI/HBI, or blend) • Build or invest in scrap collection, sorting, and quality-grading capabilities • Secure long-term scrap supply/offtake contracts with suppliers • Participate in industry scrap-quality certification initiatives to improve input reliability
Deploy transitional or bridging iron-making technology	• Where domestic gas access exists, invest in natural-gas-based DRI-EAF rather than BF-BOF for new iron-making capacity • Design new DRI plants to be "hydrogen-ready" to allow phased blending as hydrogen supply matures • Pilot small-scale hydrogen blending (e.g., 10%–30%) in existing or new gas-DRI reducing gas as a low-risk first step
Avoid carbon lock-in in capital decisions	• Treat each new capacity or blast furnace reline decision as a formal go/no-go checkpoint against low-carbon alternatives • Direct new capital expenditure toward EAF-compatible or hydrogen-ready routes rather than unabated BF-BOF

BF-BOF = blast furnace–basic oxygen furnace, DRI = direct reduced iron, EAF = electric arc furnace, HBI = hot briquetted iron.
Source: Asian Development Bank and PwC analysis.

Box 17: Technical Screening Criteria Outlined in the ASEAN Taxonomy for Sustainable Finance

Entities undertaking activities within the iron and steel sector covered by this Handbook may refer to the Focus Sector: E. Manufacturing in the ASEAN Taxonomy for Sustainable Finance, which sets out the relevant technical screening criteria within the sector.

Source: ASEAN Taxonomy for Sustainable Finance.

4.2.3 Oil and Gas

Sector Overview

The oil and gas sector remains integral to ASEAN's economy and energy system. Oil continues to play a critical role in transportation and petrochemical value chains, while natural gas is widely used in industrial processes and power generation. The sector also contributes significantly to export earnings and energy security across several countries in the ASEAN region.

Despite accelerating efforts to transition toward lower-carbon energy sources, demand for oil and gas continues to grow across the ASEAN region. Between 2023 and 2024, oil consumption in ASEAN increased by 1.93%, while natural gas consumption grew by 8.28%, reflecting the continued reliance on hydrocarbons to support population growth and energy security.[45] Within the region, fossil fuels continue to dominate the energy mix, with natural gas playing an increasingly important role in supporting power generation and industrial production and is often viewed as a transition fuel due to its lower emissions intensity relative to coal, particularly as several countries pursue coal phase-down strategies and greater renewable energy deployment.

[45] ASEAN Centre for Energy. 2026. *ASEAN Energy in 2026.*

While the sector remains critical in meeting the region's needs, the sector is among the largest contributors to GHG emissions globally. Emissions arise throughout the value chain, including exploration, production, processing, transportation, and refining activities, as well as from the combustion of oil and gas products by end users. A significant proportion of the sector's emissions therefore occurs beyond organizations' direct control, creating additional challenges in managing and reducing emissions across the value chain.

As the countries in the ASEAN region pursue their decarbonization ambitions, organizations are increasingly expected to reduce emissions while maintaining reliable supply. This has led organizations to consider a broader range of decarbonization pathways, including operational efficiency improvements; carbon capture, utilization, and storage (CCUS); and investments in lower-carbon energy solutions. In addition, many oil and gas companies in the region are state-owned with varying degrees of national strategic importance which may require them to balance decarbonization objectives with broader energy security and economic development considerations. These competing considerations create a unique set of transition challenges that may influence how organizations develop and implement credible transition plans.

Key Challenges

Managing operational and value chain emissions. Organizations in the oil and gas sector are increasingly expected to manage emissions not only from their own operations but also from the products they supply to customers. While operational emissions can be reduced through measures such as CCUS, flaring reduction, and energy efficiency improvements, downstream emissions may be more difficult to influence directly. As a result, organizations may face challenges in determining the scope, pace, and approach of their transition efforts while balancing stakeholder expectations, climate objectives, and business considerations. This may lead organizations to pursue different transition pathways, with varying emphasis on measures such as operational emissions reductions, methane abatement, CCUS, or product portfolio diversification, depending on their business models, regulatory environments, and ability to influence downstream emissions.

Long-lived assets and investment decisions. Oil and gas assets such as offshore platforms, pipelines, and refineries typically have long operating life cycles and require significant up-front investment. As climate policies evolve and lower-carbon alternatives become more widespread, organizations may struggle to ensure these assets remain commercially viable throughout their intended operating lives. This may require organizations to carefully consider the asset life cycles, reinvestment decisions, repurposing opportunities, and decommissioning requirements.

Scaling emerging low-carbon technologies. Many of the technologies expected to support decarbonization in the oil and gas sector—including CCUS, hydrogen, and low-carbon fuels—are still developing and may require supporting infrastructure, market demand, and enabling policy frameworks to be deployed at scale. In some cases, organizations' transition pathways may depend on future technological breakthroughs and the successful commercialization of these solutions, particularly CCUS. The pace of technological development therefore introduces additional uncertainty into transition planning and investment decisions.

Portfolio transformation and business resilience. As market, policy, and technology developments reshape the energy sector, many oil and gas organizations are seeking to diversify their portfolios beyond traditional hydrocarbon activities. This may require balancing continued investment in existing operations with the development of lower-carbon businesses and technologies. The ability to navigate this transition while maintaining financial performance and meeting stakeholder expectations may be a key determinant of long-term resilience and competitiveness.

Application of Proportionate Guidance

Table 12 illustrates how organizations in the oil and gas sector may progressively strengthen their transition planning practices across Strategic Ambition and metrics and targets. Organizations may apply these examples in a manner that reflects their specific circumstances, transition objectives, and stage of transition planning.

Table 12: Strategic Ambition—Oil and Gas Sector

Base	Intermediate	Advanced
Corporate-level emissions reduction commitment aligned with relevant national climate objectives and nationally determined contributions	Long-term decarbonization or net-zero ambition aligned with relevant national energy transition plans and supported by a defined transition strategy	Science-based transition ambition aligned with a 1.5°C pathway, integrated into corporate strategy, capital allocation, risk management, and decision-making processes

Source: Asian Development Bank and PwC analysis.

Table 13: Metrics and Targets—Oil and Gas Sector

Category	Base	Intermediate	Advanced
Greenhouse gas (GHG) emissions and methane management	Discloses Scope 1 and Scope 2 GHG emissions and establishes an operational emissions baseline	Establishes medium-term emissions reduction targets and methane reduction targets across operations	Adopts science-based emissions reduction metrics aligned with a net-zero pathway and tracks progress against interim and long-term milestones across Scope 1, Scope 2, and relevant Scope 3 emissions Any intended use of carbon offsets is transparently disclosed, justified, and limited to residual emissions, with the majority of reductions achieved through operational decarbonization measures.
	Examples: Scope 1 GHG emissions (tCO_2e) Scope 2 GHG emissions (tCO_2e) Scope 1 and Scope 2 GHG emissions intensity	Examples: Scope 1 and Scope 2 GHG emissions reduction targets Scope 1 and Scope 2 GHG emissions intensity Methane reduction targets Methane intensity	Examples: SBTi-aligned metrics (emissions based) Scope 1, Scope 2, and material Scope 3 GHG emissions Emissions intensity performance against reduction target Progress against decarbonization roadmap Disclosure of intended use of carbon credits or carbon markets and contribution toward net-zero targets
Flaring and operational efficiency	Disclose flaring volumes and flaring intensity	Establish targets to reduce routine flaring	Implements time-bound pathways, initiatives, and progress to achieve World Bank Group's Zero Routine Flaring by 2030
	Examples: • Flaring volume • Flaring intensity	Examples: • Routine-flaring reduction target	Examples: • Progress against zero-routine-flaring commitments
Energy management	Disclose operational energy consumption	Establishes targets to improve energy efficiency	Reports progress of energy efficiency and transition against targets, including changes in generation mix and electrification initiatives
	Examples: • Energy consumption • Energy intensity	Examples: • Energy efficiency improvement target	Examples: • Energy intensity improvement against targets • Generation mix transition against targets (e.g., higher renewable share, lower fossil fuel share)

Continued on next page

Table 13 continued

Category	Base	Intermediate	Advanced
Portfolio transition and low-carbon businesses	Tracks investments and activities related to low-carbon technologies and businesses	Establishes targets for low-carbon investments and monitors deployment of transition technologies	Monitors progress toward a lower-carbon business mix, long-term resilience and adopts science-based emissions reduction metrics.
	Examples: • Renewable energy projects under assessment • CCUS feasibility studies • Hydrogen projects under assessment	Examples: • Renewable energy capacity installed (MW) • CCUS capacity under development	Examples: • SBTi-aligned metrics (non-emissions based) • CO_2 captured and stored via CCUS • Progress against low-carbon investment targets • Capital allocation aligned to transition objectives

CCUS = carbon capture, utilization, and storage; MW = megawatts; SBTi = Science-Based Targets initiative, tCO_2e = tons of carbon dioxide equivalent.
Note: SBTi-aligned targets refer to SBTi. 2026. Science-Based Target Setting for the Oil and Gas Sector (February).
Source: Asian Development Bank and PwC analysis.

Decarbonization Levers

Table 14 illustrates the decarbonization levers organizations in the oil and gas sector may implement in their transition planning.

Table 14: Decarbonization Levers in the Oil and Gas Sector

Category	Examples of Initiative (Non-Exhaustive)
Reduce operational emissions	• Improve energy efficiency through process optimization, digitalization, and equipment upgrades • Reduce methane emissions through leak detection and repair, with continuous monitoring and equipment replacement • Minimize venting and implement flared gas recovery systems • Electrify facilities and operations where technically and economically feasible
Decarbonize existing operations	• Deploy renewable electricity and lower-emission energy sources within operations • Implement carbon capture, utilization, and storage, where feasible • Explore low-carbon fuels and alternative energy sources to support facility operations • Improve asset reliability and operational performance to reduce emissions intensity
Develop lower-carbon products and solutions	• Invest in renewable energy projects and associated infrastructure • Develop low-carbon hydrogen and ammonia value chains • Expand sustainable fuels and biofuels offerings
Strengthen portfolio resilience	• Incorporate climate-related considerations into investment decisions and capital allocation processes • Apply climate scenario analysis and internal carbon pricing where appropriate • Repurpose, retrofit, or optimize existing assets where feasible • Diversify business activities and revenue streams to support long-term resilience in a lower-carbon economy

Source: Asian Development Bank and PwC analysis.

4.2.4 Power Generation

Sector Overview

Reliable electricity supply is fundamental to economic growth, industrial development, and energy security. Electricity demand is increasing globally as industries, transport systems, and digital infrastructure become increasingly electrified. In 2024, global electricity demand increased by 4.3%, significantly outpacing overall energy demand growth.[46] The increase reflected rising cooling needs associated with higher temperatures, growing industrial activity, and increasing electricity consumption from data centers and artificial intelligence applications. In Southeast Asia, energy demand is expected to continue rising over the coming decades, with the region's overall energy demand projected to increase 2.6 times by 2050, driven by population and economic growth.[47]

Despite the growing deployment of clean energy technologies, decarbonizing electricity generation remains a significant challenge globally. Across the ASEAN region, coal remains a significant source of electricity generation and continues to play an important role in supporting growing electricity demand. While many countries are pursuing efforts to reduce reliance on coal-fired generation, coal consumption in Southeast Asia increased by 8%, while global coal-related emissions increased by 0.9% (135 million tons of carbon dioxide), highlighting the challenges associated with reducing reliance on coal.[48]

At the same time, natural gas also plays a prominent role in the power generation sector and is often viewed as a transition fuel due to its lower emissions intensity relative to coal and its ability to support power system reliability and renewable energy integration. In 2024, natural gas demand in developing economies in Asia increased by 6%, contributing to around 40% of incremental global gas demand.[49]

These trends reflect the complex realities of the transition of power generation sector, where decarbonization objectives must be balanced against growing electricity demand, energy security, and system reliability. These dynamics give rise to several common challenges that may influence transition efforts across the ASEAN region.

Key Challenges

Coal Reliance and Asset Transition

Coal-fired generation remains a significant component of the electricity mix in several countries across the ASEAN region. While efforts to accelerate renewable energy deployment continue to gain momentum, transitioning away from coal-fired generation may be constrained by substantial existing infrastructure investments, long asset lifespans, and the need to maintain reliable electricity supply. At the same time, several countries in the region have pledged to phase out coal around 2040–2050 as part of its broader pathway to achieve net-zero emissions by 2050. Organizations may face challenges in managing the retirement, repurposing, or replacement of coal-fired assets, particularly in markets where coal-fired generation remains a significant source in generating baseload power.

Grid Fragmentation and Renewable Energy Integration

Electricity systems across the ASEAN region vary in terms of transmission capacity, grid flexibility, and cross-border interconnections. These differences can limit the integration of variable renewable energy sources and constrain opportunities to optimize electricity flows across the markets. Continued investment in transmission infrastructure, storage solutions, and regional initiatives such as the ASEAN Power Grid will be important to improve system resilience and support cross-border electricity trade.[50]

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46 International Energy Agency. 2025. *Global Energy Review 2025.*

47 ASEAN Centre for Energy. 2025. *Energy Security in Transition: ASEAN's Path to Strategic Resilience.*

48 Refer to footnote 46.

49 Refer to footnote 46.

50 The ASEAN Power Grid is a regional power grid initiative driving ASEAN's energy cooperation to enhance regional energy security and connectivity, through infrastructure development, advancing market frameworks, and a coordinated regional cooperation framework.

Capital Requirements and Financing Gaps

Capital availability remains one of the most significant determinants of transition progress. Across the ASEAN region, financial institutions are increasingly integrating climate-related considerations into lending and investment decisions. Several banks have started to introduce restrictions on financing new coal-fired generation projects and established timelines to reduce thermal coal exposure. For example, major Singapore-based banks such as DBS, OCBC, and UOB have ceased financing new greenfield coal-fired generation projects, while certain Malaysian banks have announced coal phase-out commitments extending to 2040. As a result, organizations with coal-dependent generation portfolios may face challenges to secure financing and need to reassess asset portfolios, investment priorities, and transition pathways, including options for retrofitting existing assets while demonstrating credible transition plans and emissions reduction commitments to maintain access to capital.

Organizations in the power generation sector are often required to invest in renewable energy projects and grid expansion while responding to growing electricity demand. Balancing these competing investment needs can present challenges, particularly where access to affordable long-term financing and sustainable finance solutions is limited.

Policy Uncertainty

The pace of power sector decarbonization across the ASEAN region may be influenced by evolving energy policies, regulatory frameworks, and market mechanisms. Unclear policy direction, evolving regulatory requirements, and uncertainty around the implementation of energy transition measures can create uncertainty and hinder the pace of power sector decarbonization. Organizations often face challenges in identifying viable transition pathways and allocating capital efficiently where policy direction and regulatory expectations remain unclear or subject to change.

Application of Proportionate Guidance

Table 15 illustrates how organizations in the power generation sector can progressively strengthen their transition planning practices across Strategic Ambition and metrics and targets. Organizations may apply these examples in a manner that reflects their specific circumstances, transition objectives, and stage of transition planning.

Table 15: Strategic Ambition—Power Generation Sector

Base	Intermediate	Advanced
Corporate-level emissions reduction commitment aligned with relevant national climate objectives and nationally determined contributions	Long-term decarbonization or net-zero ambition aligned with relevant national energy transition plans and supported by a defined transition strategy	• Targets formally committed or validated through a recognized third-party target-setting initiative or sector-specific commitment mechanism (e.g., SBTi's Power Sector Net-Zero Standard) • Quantified decarbonization roadmap with defined levers and interim milestones, integrated into corporate strategy, capital allocation, risk management, and decision-making processes

SBTi = Science-Based Targets initiative.
Source: Asian Development Bank and PwC analysis.

Box 18: Net-Zero by 2050: A Roadmap for the Global Energy Sector

The International Energy Agency has issued *Net-Zero by 2050: A Roadmap for the Global Energy Sector,* which provides a globally recognized pathway for achieving net-zero emissions by 2050. It outlines the key milestones in transforming global electricity generation by category (**Table B18**):

Table B18: Key Milestones in the International Energy Agency's Energy Sector Roadmap

Category	Key Milestones
Decarbonization of electricity sector	• Advanced economies in aggregate: 2035. • Emerging markets and developing economies: 2040.
Hydrogen-based fuels	• Start retrofitting coal-fired power plants to co-fire with ammonia, and gas turbines to co-fire with hydrogen by 2025.
Unabated fossil fuel	• Phase out all subcritical coal-fired power plants by 2030 (870 GW existing plants and 14 GW under construction) • Phase out all unabated coal-fired plants by 2040. • Phase out large oil-fired power plants in the 2030s. • Unabated natural-gas-fired generation peaks by 2030 and 90% lower by 2040

GW = gigawatt.
Source: International Energy Agency.

Box 19: Guidance from the Science-Based Targets Initiative's Power Sector Net-Zero Standard (Version 1.0)

The Science-Based Targets Initiative (SBTi) has issued consultation draft on its dedicated Power Sector Net-Zero Standard, providing additional criteria that establish an ambitious and actionable approach to set and achieve near-term and net-zero targets for organizations in the power sector. The SBTi Power Sector Net-Zero Standard addresses target-setting guidance for these activities in the power sector, where applicable:

- production, transmission, and distribution of energy carriers other than electricity (e.g., natural gas, hydrogen, stand-alone heat);
- manufacture of equipment for use in the power sector (e.g., manufacture of renewable power generation technologies, manufacture of electricity transmission and distribution assets);
- activities related to the use of electricity, such as provision of energy efficiency services;
- trade of electricity such as activities of brokers or agents that arrange the sale of electricity via power distribution systems operated by others; and
- activities that involve the use of electricity to produce other goods or other energy carriers, such as hydrogen production.

Source: SBTi.

Table 16: Metrics and Targets—Power Generation Sector

Category	Base	Intermediate	Advanced
Greenhouse gas (GHG) emissions	Discloses Scope 1 and Scope 2 GHG emissions from power generation operations and establishes an emissions baseline	Discloses Scope 1, Scope 2, and relevant Scope 3 GHG emissions as well as sets medium-term emissions reduction targets and monitors emissions intensity across generation assets	Adopts science-based emissions reduction targets aligned with a net-zero pathway and tracks progress against interim and long-term milestones across Scope 1, Scope 2, and relevant 3 GHG emissions Any intended use of carbon offsets is transparently disclosed, justified, and limited to residual emissions, with the majority of reductions achieved through operational decarbonization measures.
	Examples: • Scope 1 and Scope 2 GHG emissions (tCO_2e) • Scope 1 and Scope 2 GHG emissions intensity • GHG emissions avoided from renewable energy projects	Examples: • Emissions intensity reduction target (e.g., % reduction by 2030) • Scope 1, Scope 2, and material Scope 3 emissions • Emissions intensity by sources (coal, gas, renewables)	Examples: • SBTi-aligned targets (e.g., Scope 1 emissions intensity reduction and asset transition targets) • Scope 1, Scope 2, and material Scope 3 emissions • Emissions intensity performance against reduction target • Progress against decarbonization roadmap • Disclosure of intended use of carbon credits or carbon markets and contribution toward net-zero targets
Coal usage	Discloses coal-fired generation capacity, coal generation share, and coal-related emissions	Establishes targets and implementation plans to reduce emissions from coal-fired assets through retirement, repurposing, fuel-switching, efficiency improvements, or reduced utilization	Implements a time-bound coal phase-down or phase-out pathway aligned with long-term decarbonization objectives and reports progress against retirement or emissions reduction milestones
	Examples: • Coal-fired capacity (MW) • Coal generation share (%) • Coal-related emissions • Coal consumption (tons/year)	Examples: • Coal capacity scheduled for retirement (MW) • Coal utilization rate (%) • Coal emissions intensity reduction target • Coal phase-out targets (e.g., ASEAN Taxonomy's coal phase-out by 2040)	Examples: • Coal capacity retired (MW) • Progress against coal phase-down roadmap • Reduction in coal consumption (%)

Continued on next page

Table 16 continued

Category	Base	Intermediate	Advanced
Natural gas	Discloses natural gas generation capacity, generation share, and associated emissions	Establishes targets to improve operational efficiency and reduce emissions intensity from gas-fired generation assets while supporting renewable energy integration	Sets long-term targets to decarbonize natural gas generation through carbon capture technologies and/or progressive reduction of unabated gas generation while supporting renewable energy integration
	Examples: • Gas-fired capacity (MW) • Gas generation share (%) • Natural gas consumption	Examples: • Efficiency improvement targets for combined-cycle gas turbines • Natural gas emissions intensity reduction target	Examples: • Hydrogen or ammonia co-firing share (%) • CO_2 captured through CCUS
Renewable energy and grid integration	Tracks renewable energy installed capacity, renewable generation, and key renewable energy projects under development	Establishes renewable energy deployment targets and monitors supporting investments in transmission infrastructure, grid modernization, and energy storage systems	Uses integrated metrics to monitor progress toward a low-carbon power portfolio, including renewable energy penetration, grid flexibility, energy storage deployment, and interconnection capabilities
	Examples: • Renewable energy capacity (MW) • Renewable generation share (%) • Renewable electricity generated (MWh) • Number or value of renewable projects under development	Examples: • Renewable capacity addition targets (MW) • Capital expenditure allocated to grid modernization (%) • Renewable capacity under development (MW) • Transmission network expansion (km)	Examples: • Renewable energy penetration rate (%) • Renewable generation share (%) progress against targets • Cross-border interconnection capacity and storage (MW)

CCUS = carbon capture, utilization, and storage; km = kilometer; MW = megawatt; MWh = megawatt-hour; SBTi = Science-Based Targets initiative; tCO_2e = tons of carbon dioxide equivalent.

Note: SBTi-aligned targets refer to SBTi. 2026. Science-Based Target Setting for the Power Sector (July).

Source: Asian Development Bank and PwC analysis.

Decarbonization levers

Table 17 illustrates the decarbonization levers that organizations in the power generation sector can choose to implement in their transition planning.

Table 17: Decarbonization Levers in the Power Generation Sector

Category	Examples of Initiative (Non-Exhaustive)
Optimize existing generation assets	• Improve thermal plant efficiency through heat-rate optimization, digital monitoring, and maintenance. • Reduce emissions through fuel efficiency improvements and transmission-loss reduction initiatives. • Enhance operational flexibility of conventional plants to support higher renewable energy penetration and system reliability.
Expand renewable and low-carbon generation	• Increase renewable energy capacity through utility-scale solar, hydropower, wind, geothermal, hybrid renewable, and energy storage projects. • Diversify the generation portfolio toward lower-carbon technologies, including high-efficiency gas generation where required for transition and energy security. • Prioritize scalable and locally viable renewable resources to support long-term emissions reduction and energy resilience.
Enhance grid and system flexibility	• Modernize transmission and distribution networks to accommodate growing shares of variable renewable energy. • Deploy enabling technologies such as battery energy storage systems, pumped hydro storage, and smart-grid solutions. • Strengthen system balancing capabilities through demand response, digitalization, and flexible generation resources.
Develop and scale emerging low-carbon technologies	• Assess the technical and economic viability of emerging decarbonization technologies across the generation portfolio. • Pilot and progressively deploy technologies such as carbon capture, utilization, and storage and hydrogen or ammonia co-firing. • Establish partnerships to accelerate technology development, infrastructure readiness, and capability building.
Enable electrification and demand-side decarbonization	• Support electrification of transport, industry, and buildings through enabling infrastructure and customer solutions. • Expand distributed energy resources such as rooftop solar and community solar. • Promote energy efficiency and demand-side management programs to reduce overall system emissions and improve network utilization.
Transition high-emitting assets	• Evaluate retirement, repowering, or fuel-switching opportunities for high-emitting generation assets in line with energy security requirements. • Implement phased transition pathways that balance emissions reduction, affordability, and reliability considerations. • Explore asset conversion opportunities, including biomass co-firing, gas conversion, or integration with carbon capture technologies where feasible.

Source: Asian Development Bank and PwC analysis.

Box 20: Technical Screening Criteria Outlined in the ASEAN Taxonomy for Sustainable Finance

Entities undertaking activities within the power generation sector covered by this Handbook may refer to the Focus Sector: A. Electricity, Gas, Steam and Air Conditioning Supply in the ASEAN Taxonomy for Sustainable Finance, which sets out the relevant technical screening criteria within the sector.

Source: ASEAN Taxonomy for Sustainable Finance.

4.2.5 Transportation

Sector Overview

ASEAN is home to one of the world's fastest-growing populations and economies, with a population set to exceed 790 million by 2050.[51] Transport is central to sustaining this growth, moving goods, people, and capital across the region. This growth carries a significant climate cost, driven in large part by the sector's overwhelming dependence on fossil fuels, with oil projected to supply around 91% of transport energy demand by 2050 across the region and consumption increasing by an average rate of 4.4% in the absence of stronger policy intervention.[52]

The transportation sector accounts for roughly 25% of ASEAN's total CO_2 emissions, a share that likely understates its true footprint given limited data capture of informal transport and rural connectivity.[53] Ranking among the top three emitting sectors alongside power and industry, transport represents one of the region's most urgent decarbonization priorities, particularly as rising demand threatens to further entrench, rather than reduce, its emissions footprint. Road transport dominates this footprint, accounting for approximately 93.8% of the sector's final energy use and emissions through private vehicles, motorcycles, buses, and trucks that carry the bulk of passenger and freight movement.[54] Aviation represents the next largest contributor, followed by maritime and inland waterway transport, with rail contributing less than 1%.[55]

The region's dependence on road transport differs from that of many other regions and is largely structural rather than incidental, reflecting decades of infrastructure development that have generally favored road networks over rail systems. Since 2000, regional road networks have expanded at an average rate of 1.8% annually compared to 1.3% for railways.[56] This has left Southeast Asia with only 35 kilometers of heavy rail per million people, which is well below the average for Asia and the Pacific of 99 kilometers.[57] Consequently, rail remains a limited alternative for large-scale modal shift in most ASEAN member states (AMS), leaving road transport as the default mode by necessity rather than preference, reinforced by lower initial capital costs and flexible connectivity across fragmented geographies.

The composition of this road-dominated fleet also sets ASEAN apart. Motorcycles and other two-wheeled vehicles account for a disproportionately large share of vehicles in many AMS, reflecting local mobility patterns and affordability considerations that are largely absent from car-centric transport systems elsewhere. Maritime transport plays a comparably vital role as well, particularly in archipelagic economies such as Indonesia and the Philippines where sea transport underpins not only international trade but also inter-island connectivity.

Key Challenges

Decarbonization in the ASEAN transportion sector is strongly shaped by factors outside any individual organization's control, including government policy, infrastructure availability, power grid composition, harmonized technical standards, and access to affordable financing. Company-level action is therefore necessary but often not sufficient on its own. Firms can lead through fleet, operations, and investment decisions, but large-scale transition depends on these wider enabling conditions materializing at the pace required.

[51] ASEAN Centre for Energy. 2022. *The 7th ASEAN Energy Outlook 2020–2050.*
[52] Refer to footnote 51.
[53] ASEAN Centre for Energy. 2020. *The 6th ASEAN Energy Outlook 2017–2040.*
[54] Refer to footnote 51.
[55] Refer to footnote 51.
[56] Asian Transport Observatory. 2025. *State of Play: Railways in the ASEAN Region.*
[57] ASEAN Secretariat. 2026. *Strategic Plan on Enhancing Railway Interoperability Among ASEAN Member States.*

Lack of Infrastructure

A major challenge in decarbonizing ASEAN transport is inadequate enabling infrastructure. In road transport, charging networks remain sparse and unevenly distributed, concentrated in major cities rather than along highways, secondary urban centers, and cross-border freight corridors.[58] This limits practicality for both private users and commercial fleets, and fuels ongoing concerns about range and reliability.[59] Even where charging points exist, they are largely limited to slower, lower-power alternating current (AC) charging. High-power direct current (DC) fast charging, which is essential for long-distance highway travels and time-sensitive commercial fleet operations, lags well behind what is needed, with the region estimated to require around 40,000 DC fast-charging points by 2030 to meet projected electric vehicle (EV) growth.[60] The gap is even starker for two- and three-wheelers, which represent around 80% of ASEAN's total vehicle stock, but depend on fundamentally different infrastructure types, particularly dedicated AC charging facilities and battery-swapping networks, which remain significantly underdeveloped and largely confined to selected urban centers across the ASEAN-6 markets (footnote 60).

Another key challenge for transport electrification in ASEAN is the limited readiness of electricity networks to support large-scale charging demand. Grid readiness varies significantly across the region, with power supply comparatively stable in markets such as Malaysia, the Philippines, and Thailand, while outages remain common in others such as Cambodia, the Lao People's Democratic Republic, and Myanmar.[61] Beyond existing reliability issues, expanding electrified transport will require sufficient grid capacity to accommodate higher and more concentrated electricity loads, particularly from fast-charging stations, fleet depots, and high-usage commercial corridors. The need is becoming increasingly urgent as EV adoption rises across the region, with a growing demand for faster and more reliable charging.[62] As a result, gaps in grid readiness can delay infrastructure rollout and limit the broader adoption of electric transport technologies.

Dependency on Power Sector Decarbonization

The decarbonization benefits of transport electrification in ASEAN depend heavily on the cleanliness of each country's power system and therefore vary significantly according to national generation mixes. In markets where grids remain highly dependent on fossil fuels, electrification may deliver only limited emissions reductions, whereas cleaner grids substantially enhance its decarbonization potential. For example, widespread EV adoption would reduce emissions by only 2% in Indonesia under a business-as-usual scenario in which fossil fuels continue to provide around 90% of the country's electricity through 2040, compared to a 17% reduction if Indonesia achieves its renewable energy targets.[63] This dynamic is also reflected in the relative performance of different vehicle technologies. In several ASEAN markets, hybrid EVs currently emit less than battery EVs, while the latter are only expected to emerge as the lowest-emitting option as power grids decarbonize further.[64] These indicate that transport decarbonization in ASEAN cannot be treated separately from power-sector transition, as shifting transport energy demand from fuel to electricity without cleaner electricity will not deliver the full emissions reductions required.

Subsidized Fuel Prices

One of the most significant barriers to transport electrification in ASEAN is the persistence of retail fuel subsidies, which keep the cost of operating internal combustion engine vehicles artificially low and weaken the primary financial incentive for switching to EVs. The business case for EV adoption typically rests on lower running costs, as electricity is generally cheaper than petrol or diesel on a per-kilometer basis. However, where governments subsidize fuel prices, such as in Malaysia where RON95 remains heavily subsidized and among the cheapest globally, narrows the operational savings that would

[58] US–ASEAN Business Council. 2025. *US–ABC Recommendation Paper: The Electric Vehicle Ecosystem in ASEAN.*
[59] Lin et al. 2025. *Barriers to Electric Vehicle Adoption in ASEAN Emerging Economies: Comparative Analysis of Cambodia, Myanmar, and the Philippines.*
[60] ASEAN Secretariat. 2024. *ASEAN Guidelines on Light Electric Vehicles.*
[61] Refer to footnote 60.
[62] PwC. 2025. *ASEAN-6 eReadiness 2025 Report.*
[63] ERIA. 2018. *An Analysis of Alternative Vehicles' Potential and Implications for Energy Supply Industries in Indonesia.*
[64] ERIA. 2022. *Study on Policies and Infrastructure Development for the Wider Penetration of Electrified Vehicles in ASEAN Countries.*

otherwise make EVs attractive to price-sensitive buyers.[65] The contrast in adoption outcomes is stark. Thailand, where fuel is comparatively unsubsidized and priced closer to market rates, saw EVs account for roughly 25% of new vehicle sales in 2025, compared with just 7% in Malaysia, reflecting how subsidized petrol reduces the cost competitiveness of EVs relative to internal combustion engine vehicles.[66] Subsidy reforms, alongside EV incentives, are therefore crucial in making EVs cost-competitive across the region, particularly for high-mileage commercial fleets such as buses and trucks where fuel consumption, and therefore the subsidy benefit, is largest. However, as fuel subsidy reforms are often politically sensitive and implemented gradually, this distortion is likely to remain a persistent, market-specific constraint on fleet electrification in parts of the region.

Neglect of Non-road Transport

A critical blind spot in ASEAN's transport decarbonization strategy is the disproportionate policy focus on road transport at the expense of other subsectors, particularly maritime shipping and aviation. Given the region's role as both an archipelagic trade network and a global shipping hub, these subsectors account for a substantial and rapidly growing share of transport-related emissions. ASEAN-linked shipping alone emits an estimated 112 million metric tons of CO_2 annually, which is roughly 14% of global ship emissions, while regional air traffic is projected to triple by 2033.[67] Unlike passenger cars, however, aviation and long-distance shipping face a severe lack of commercially mature and scalable zero-emission alternatives as direct battery electrification is technically unfeasible due to energy density constraints, and is only practical for shorter routes such as ferries and inland waterways. As a result, both subsectors are expected to rely on alternative low-carbon fuels such as sustainable aviation fuels (SAF) for planes and green ammonia or e-methanol for ships, as there is currently no other viable path to zero emissions at long range.

However, these fuels remain economically uncompetitive, with SAF typically costing 2–5 times more than conventional jet fuel, while green ammonia and methanol cost roughly 3.5 times more than standard marine fuel.[68] The issue is further compounded by limited feedstock availability, insufficient production capacity, and a lack of dedicated refueling and bunkering infrastructure across the region. Compounding this, both subsectors currently rely more on voluntary commitments and bilateral pilot projects than on binding regional mandates, with Singapore's phased SAF uplift target and Thailand's 2026 blending mandate being notable exceptions, leaving ASEAN's hard-to-abate transport emissions largely unaddressed by the policy frameworks that have concentrated almost exclusively on road electrification.

Table 18 illustrates how organizations in the transportation sector may progressively strengthen their transition planning practices across Strategic Ambition and metrics and targets. Organizations may apply these examples in a manner that reflects their specific circumstances, transition objectives, and stage of transition planning.

[65] ISEAS - Yusof Ishak Institute. 2025. *Floating Prices, Fearing Backlash: Economics and Politics of Malaysia's Petrol Subsidy Reform.*

[66] International Energy Agency. 2026. *Global EV Outlook 2026: Growing sales amid an energy crisis.*

[67] DNV GL. 2018. *Air Emissions from Shipping in the ASEAN Region.* Journal of Applied and Physical Sciences. 2017. *NOX and CO2 Emissions from Current Air Traffic in ASEAN Region and Benefits of Free Route Airspace Implementation.*

[68] International Air Transport Association. 2024. *SAF Handbook*. S&P Global Commodity Insights. 2025. *Methanol Holds Edge over Ammonia as Green Marine Fuel Alternative in Near Term: Proman.*

Table 18: Strategic Ambition—Transportation Sector

Base	Intermediate	Advanced
Corporate-level emissions reduction commitment aligned with relevant national climate objectives and nationally determined contributions	Long-term decarbonization or net-zero ambition aligned with relevant national energy transition plans and supported by a defined transition strategy	• Targets formally committed or validated through a recognized third-party target-setting initiative or sector-specific commitment mechanism (e.g., Science-based Target Setting for the Aviation Sector, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), and SBTi's Automotive Sector Net-Zero Standard)[a,b] • Quantified decarbonization roadmap with defined levers and interim milestones, integrated into corporate strategy, capital allocation, risk management, and decision-making processes

[a] SBTi. 2021. Science-Based Target Setting for the Aviation Sector August 2021.
[b] SBTi. 2026. SBTi Automotive Sector Net-Zero Standard Second Public Consultation Draft February 2026.
SBTi = Science-Based Targets initiative.
Source: Asian Development Bank and PwC analysis.

Box 21: Guidance from the Science-Based Target Initiative for the Aviation Sector (Version 1.0)

The Science-Based Targets initiative (SBTi) has issued a guidance that helps companies in the aviation sector to understand how much and how fast they must reduce the greenhouse gas (GHG) emissions to limit global warming to well below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C. The guidance can be used to set targets for:

- GHG Scope 3 category 4 "upstream transportation and distribution" (e.g., contracted freight),
- GHG Scope 3 category 9 "downstream transportation and distribution," and
- GHG Scope 3 category 6 "business travel" emissions.

Source: SBTi.

Box 22: Guidance from the Science-Based Target Initiative for the Automotive Sector (Version 1.0)

The Science-Based Targets initiative (SBTi) has issued consultation draft on its dedicated Automotive Sector Net-Zero Standard, providing a set of additional criteria that establish an ambitious and actionable approach to set and achieve near-term and net-zero targets for organizations in the automotive sector. It addresses target-setting guidance for these activities in the automotive sector, where applicable:

- automakers,
- auto parts manufacturers,
- powertrain suppliers,
- companies producing both vehicles and auto parts, and
- automakers offering financial services.

Source: SBTi.

Box 23: Guidance from the Carbon Offsetting and Reduction Scheme for International Aviation

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is the first global market-based scheme that applies to a sector. It complements other aviation in-sector emissions reductions efforts such as technological innovations, operational improvements, and sustainable aviation fuels to meet the International Civil Aviation Organization aspirational goal of carbon-neutral growth.

Organizations may refer to CORSIA when developing transition plans relating to

- management of residual emissions from international aviation activities,
- carbon offsetting and carbon removal approaches, and
- sustainable aviation fuel adoption and other aviation decarbonization measures.

Source: CORSIA.

Table 19: Metrics and Targets—Transportation Sector

Category	Base	Intermediate	Advanced
Greenhouse gas (GHG) emissions	Discloses Scope 1 and Scope 2 GHG emissions and establishes an operational emissions baseline	Discloses Scope 1, Scope 2, and relevant Scope 3 GHG emissions as well as sets medium-term emissions reduction targets and monitors emissions intensity across generation assets	Adopts science-based emissions reduction targets aligned with a net-zero pathway and tracks progress against interim and long-term milestones across Scope 1, Scope 2, and relevant Scope 3 GHG emissions Any intended use of carbon offsets is transparently disclosed, justified, and limited to residual emissions, with the majority of reductions achieved through operational decarbonization measures.
	Examples: • Scope 1 and Scope 2 GHG emissions (tCO_2e) • Scope 1 and Scope 2 GHG emissions intensity • GHG emissions avoided from renewable energy strategies	Examples: • Emissions intensity reduction target (e.g., % reduction by 2030) • Scope 1, Scope 2, and material Scope 3 emissions • Emissions intensity by sources (fuel, gas, renewables)	Examples: • Science-based emissions reduction targets (e.g. CORSIA) • Scope 1, Scope 2, and material Scope 3 emissions • Emissions intensity performance against reduction target • Progress against decarbonization roadmap • Disclosure of intended use of carbon credits or carbon markets and contribution toward net-zero targets
Energy management	Discloses operational energy consumption	Establishes targets to improve energy efficiency	Reports progress of energy efficiency and transition against targets, including changes in generation mix and electrification initiatives
	Examples: • Energy consumption • Energy intensity	Examples: • Energy efficiency improvement target	Examples: • Energy intensity improvement against targets • Generation mix transition against targets (e.g., usage of sustainable aviation fuel)
Waste management	Discloses total waste generated as a single aggregate	Tracks a recycling or diversion rate and classifies waste by type	Sets waste reduction and diversion targets, tracked against performance, including by-product streams recovered from disposal
	Examples: • Total waste generated (metric tons)	Examples: • Recycling or diversion rate with baseline and trend • Waste split by hazardous vs. non-hazardous or disposal vs. valorization route	Examples: • Dated waste reduction or diversion target with baseline year, tracked against actual performance • Specific by-product or co-product stream diverted from disposal
Aviation: Fleet modernization	Discloses fleet composition, average fleet age and fuel efficiency performance.	Establishes targets to improve energy efficiency	Reports progress of energy efficiency and transition against targets, including changes in generation mix and electrification initiatives
	Examples: • Energy consumption • Energy intensity	Examples: • Energy efficiency improvement target	Examples: • Energy intensity improvement against targets • Generation mix transition against targets (e.g., usage of sustainable aviation fuel)

Continued on next page

Table 19 continued

Category	Base	Intermediate	Advanced
Aviation: sustainable aviation fuel (SAF)	Discloses SAF consumption and assesses opportunities for SAF adoption.	Sets SAF adoption targets and monitors SAF usage relative to total fuel consumption.	Demonstrates progress toward scaling SAF use through long-term procurement arrangements and reports associated with life-cycle emissions reductions.
	Examples: • SAF consumption relative to total fuel use	Examples: • SAF adoption target (e.g., % SAF by 2030) • SAF consumption relative to total fuel use • Long-term SAF procurement commitments	Examples: • Progress against SAF adoption targets • Life-cycle emissions reductions from SAF use • Percentage of total fuel demand met by SAF
Automobile and road transport: Fleet electrification and product mix	Discloses xEV unit sales and production volumes as a proportion of total fleet	Establishes portfolio electrification targets and monitor progress	Reports progress against portfolio electrification targets, including breakdown by country or region, alignment with regulatory pathways, and product-level decarbonization outcomes
	Examples: • xEV sales volume and % of total sales • Total units produced or sold	Examples: • Electrification target (e.g., % of battery EV sales by year) • Cumulative xEV sales tracked	Examples: • Progress against electrification target, by market
Automobile and road transport: Materials and resource efficiency	Discloses use of virgin vs. recycled or secondary materials in production	Sets targets for secondary material content in new production (e.g., recycled steel or aluminum %)	Reports progress against secondary-material targets and discloses battery-specific circularity performance
	Examples: • % recycled content in raw materials	Examples: • Recycled steel/aluminum % • Secondary or recycled material content target (e.g., 25% by 2030)	Examples: • Progress against fleet renewal targets • Reduction in fuel consumption and emissions from fleet modernization
Maritime: Vessel transition and alternative fuel adoption	Discloses fleet composition and fuel-type consumption breakdown	Establishes targets and implementation plans to increase the use of lower-carbon fuels through fuel switching, fleet retrofits, and vessel renewal	Reports progress against fleet transition targets, including dated intensity targets
	Examples: • Fuel consumption by % and type (e.g., VLSFO, MGO, LNG, biofuel) • Total fleet size and vessel-type composition (e.g., vessels capable of using alternative fuels)	Examples: • Alternative fuel uptake targets in % • Share of fuel consumption from lower-carbon fuel • Number of vessels retrofitted or ordered with alternative-fuel capability	Examples: • Actual % of operating time or energy from lower-carbon fuels, with methodology disclosed • Retrofit measures disclosed with quantified % fuel savings or emissions reduction • Phased retirement of legacy vessel types disclosed with baseline year

CORSIA = Carbon Offsetting and Reduction Scheme for International Aviation, LNG = liquefied natural gas, MGO = Marine Gas Oil, tCO_2e = tons of carbon dioxide equivalent, xEV = Electrified Vehicle, VLSFO = Very Low Sulphur Fuel Oil, SBTi = Science-Based Targets initiative.

Note: SBTi-aligned targets refer to SBTi. 2024. Land Transport Science-Based Target-Setting Guidance (October); SBTi. 2021. Science-Based Target Setting for the Aviation Sector (August); SBTi. 2023. Science-Based Target Setting for the Maritime Transportation Sector (May).

Source: Asian Development Bank and PwC analysis.

Decarbonization Levers

The levers in **Table 20** are limited to company-level initiatives within an organization's direct control that can be planned, resourced, and tracked through its transition plan. They do not include broader policy, market, or system-level enablers—such as charging infrastructure, grid decarbonization, port infrastructure, SAF supply, or regulatory frameworks—which shape transition feasibility but are outside the control of any single company. These enabling factors are important context for assessing sector readiness but are not treated as actionable items within an individual organization's transition plan.

Table 20: Decarbonization Levers in the Transportation Sector

Category	Examples of Initiative (Non-Exhaustive)
Aviation	**Fleet modernization** • Replacement of older aircraft with new-generation fuel-efficient aircraft • Aircraft fleet renewal programs • Retirement of high-emitting aircraft and investment in lower-emission technologies **Sustainable aviation fuel (SAF)** • Procurement and use of SAF • Long-term SAF supply agreements and strategic partnerships • Scaling SAF blending rates and supporting SAF ecosystem development **Operational efficiency** • Flight route and airspace optimization • Aircraft weight reduction and fuel management initiatives
Automobile and road transport	**Original equipment and vehicle manufacturers** • Gradually phase out ICE vehicles through product portfolio electrification by focusing product design, R&D, and investment in BEVs and EVs, thereby shifting new vehicle sales toward zero-emission powertrains • Improve energy efficiency via initiatives such as installation of energy management systems, efficient lighting, variable frequency drives, and heat recovery • Electrification of process heat by replacing fossil fuel boilers, furnaces, and process equipment with electric (or hydrogen-based) alternatives where feasible such as electric paint ovens, industrial heat pumps, and electric furnaces • Use of renewable energy in plants through renewable energy contracts, on-site solar • Procure low-carbon and recycled materials (e.g., green steel, low-carbon/recycled aluminum, sustainable battery sourcing) through offtake agreements, supplier contractual requirements, and equity partnerships with producers • Establish take-back and recycling programs to recover critical materials (e.g., lithium, cobalt, nickel) for reuse in production **Fleet operators and logistics and trucking companies** • Use of drop-in biofuels blends in existing diesel fleets • Fleet procurement and renewal toward zero and low-emission vehicles • Implement structured eco-driving training and real-time driver feedback and coaching to reinforce fuel-efficient driving habits • Deploy telematics systems to monitor driving behavior (harsh acceleration and braking, idling, speeding) and identify fuel-inefficient patterns • Route optimization with the use of digital tools or software • Consolidate loads and reduce empty running (backhaul matching) to maximize vehicle capacity utilization per trip • Right-size vehicles to shipment requirements through dynamic dispatch and scheduling systems

Continued on next page

Table 20 continued

Category	Examples of Initiative (Non-Exhaustive)
Maritime	**Technical measures** • Adoption of newbuild vessels with multi-fuel engines or energy-saving technologies such as hull and bow optimization, waste heat recovery, and advanced propeller and rudder integration • Retrofit technologies that can be fitted to existing vessels (e.g., air lubrication systems, wind-assisted propulsion systems, shore power connectivity, and onboard carbon-capture) **Alternative fuels** • Use of short-term bridge fuels such as biofuels and liquefied natural gas, or more advanced zero or low-carbon alternatives in methanol, ammonia, and hydrogen **Operational efficiency** • Slow steaming by operating below maximum speeds • Just-in-time arrival to reduce or eliminate idle times • Voyage and route optimization with the use of digital tools or software • Improved cargo and capacity utilization (e.g., reducing ballast voyages, vessel pooling, and backhaul cargo optimization).

BEV = battery electric vehicle, EV = electric vehicle, ICE = internal combustion engine, R&D = research and development.
Source: Asian Development Bank and PwC analysis.

Box 24: Technical Screening Criteria Outlined in the ASEAN Taxonomy for Sustainable Finance

Entities undertaking activities within the transportation sector covered by this Handbook may refer to the Focus Sector: C. Transportation and Storage in the ASEAN Taxonomy for Sustainable Finance, which sets out the relevant technical screening criteria within the sector.

Source: ASEAN Taxonomy for Sustainable Finance.

5. Implementation Strategies and Addressing Challenges

Broader adoption of transition planning across ASEAN will require organizations to translate transition ambitions into practical and actionable measures. While challenges may vary across organizational size, sector, resources, capabilities, and operating context, proportionate guidance can help organizations focus on the actions most relevant to their circumstances. The implementation strategies outlined in **Table 21** can support the development and execution of credible transition plans.



Table 21: Implementation Strategies to Address Transition Challenges

No	Key Challenge in Adoption and/or Implementation of Transition Planning	Implementation Strategies
1	Lack of climate-related Strategic Ambition and targets	• Consider aligning the organization's Strategic Ambition with relevant national targets (e.g., NDCs, net-zero commitments, or national roadmaps), sectoral pathways, and voluntary commitments, where appropriate. • Establish short-, medium-, and long-term targets that are aligned with the organization's transition objectives. • Develop actionable transition initiatives and implementation plans to achieve these targets. • Periodically review and update targets, action plans, and performance metrics to reflect evolving business circumstances, technological, and climate-related policy and regulatory developments.
2	Challenges in integrating transition planning into business strategy and decision-making	• Embed transition planning considerations into strategic planning, risk management, and capital allocation processes. • Align the organization's transition plan objectives with broader business strategy. • Identify and engage with relevant stakeholders, including suppliers, business partners, and financial institutions, to communicate the organization's transition objectives and transition plan, and inform updates to the plan as circumstances evolve, where appropriate. • Periodically review and update targets and action plans, and performance metrics to reflect evolving business circumstances, technological, and climate-related policy and regulatory developments.
3	Limited availability of GHG emissions data	• Identify sources of GHG emissions across operations and the value chain. • Prioritize measurement of Scope 1 and Scope 2 GHG emissions, followed by material categories under the Scope 3 GHG emissions. • Establish a baseline year and track emissions performance. • Enhance data collection and governance processes to improve data quality and reliability.
4	Unclear accountability and oversight for transition planning	• Establish governance structure to oversee the development and implementation of the transition plan. • Clearly define roles, responsibilities, and reporting lines across the governance structure. • Consider linking remuneration to transition plan objectives and climate-related targets to strengthen accountability and support implementation. • Consider obtaining independent verification or assurance of transition plan to enhance reliability and stakeholder confidence.

GHG = greenhouse gas, NDC = nationally determined contribution.
Source: Asian Development Bank and PwC analysis.

Box 25: Additional Guidance on IFRS Sustainability Disclosure Standards

Some of the transition planning implementation strategies described in Table 21 are also reflected in the requirements of the International Financial Reporting Standards (IFRS) Sustainability Disclosure Standards requirements. For example, entities shall disclose.

- Scope 1, Scope 2, and Scope 3 GHG emissions (IFRS S2 Paragraph 29(a));
- information about the governance body(s) or individual(s) responsible for oversight of sustainability- and climate-related risks and opportunities (IFRS S1 Paragraph 27(a) and IFRS S2 Paragraph 6(a)); and
- description of whether and how climate-related considerations are factored into executive remuneration and the percentage of executive management remuneration in the current period that is linked to climate-related considerations (IFRS S2 Paragraph 29[g]).

Entities may refer to IFRS Sustainability Disclosure Standards (IFRS S1 and S2) for further details on the disclosure requirements.

Source: IFRS Sustainability Disclosure Standards.



Box 26: Assessing the Credibility of a Transition Plan

Financial institutions assessing the credibility of an organization's transition plan for financing decisions may refer to the ASEAN Transition Finance Guidance (ATFG), which defines transition credibility through the following two elements:

Element 1: Climate Ambition

This element considers whether an organization has:

- established a **current state assessment** identifying and reporting greenhouse gas emissions from environmentally material parts of the business (Scope 1, Scope 2, and Scope 3 where material), with justified emissions metrics and disclosure of any carbon credit use;
- selected a reference **transition pathway**, ideally science-based, aligned with the Paris Agreement (1.5°C, or at least well below 2°C), which may be region-specific or augmented to reflect business nuances; and
- set near-, medium-, and long-term **transition targets** that demonstrate how the organization will transition from its current state to align with the selected pathway, assessed relative to that pathway rather than business-as-usual performance.

Element 2: Robustness of Ability to Deliver

This element considers whether an organization has

- an **implementation strategy** comprising an action plan, capital allocation plan, risk assessment and mitigation approach, ongoing monitoring processes, and governance arrangements to execute and oversee the transition;
- **disclosure** of progress against climate ambition and implementation strategy, reported at least annually or upon material change;
- **independent third-party verification** of the organization's transition credibility, including its metrics, targets, and implementation strategy; and
- **Just Transition considerations**, reflected in the assessment and disclosure of environmental and social impacts arising from the transition.

Organizations that demonstrate these elements to varying degrees may be differentiated accordingly through the **three tiers** proposed by ATFG, reflecting differences in climate ambition and/or ability to deliver (aligned and aligning: 1.5°C; aligned and aligning: well below 2°C; and progressing) to support a consistent basis for financing decisions. The full set of criteria, detailed checklists, and guidance on applying these tiers in practice are set out in the ATFG.

Source: ASEAN Transition Finance Guidance.



The implementation strategies outlined in Chapter 4 can support the development and execution of credible transition plans. Rather than starting from scratch, organizations may leverage the existing processes, governance structures, and data. The following checklist in **Table 22** highlights examples of foundational inputs, organized around the three core pillars and the Just Transition principles outlined in the Handbook, that may already be available within an organization.

Table 22: Foundational Inputs for a Just Transition

Pillars	Purpose	Examples of Existing Inputs That May Already Be Available
Strategy and Targets	Establish where the organization is seeking to go and the climate-related outcomes it aims to achieve	• Existing climate commitments and targets • Existing sustainability strategy, ESG policies, and materiality assessments • GHG inventory and baseline for Scope 1, Scope 2, and material Scope 3
Business Adaptation	Explain how operations, products, services, financing, and value chain will need to change	• Capital expenditure plans and investment pipelines • Financial commitments for decarbonization, energy efficiency, technology deployment, or climate resilience measures to protect business operations and assets • Procurement and supplier engagement processes
Governance and Accountability	Clarify who is responsible for overseeing climate response in the organization, making decisions, monitoring progress, and ensuring accountability	• Board and management governance structures for climate issues • Risk management frameworks covering climate and transition risks • Internal controls and data assurance processes for sustainability reporting • Existing roles, committees, or terms of reference covering sustainability or ESG oversight
Just Transition	Address the people and social dimensions, including impacts on workers and communities	• Workforce planning and skills development plans • Existing health, safety, and human resources policies relevant to workforce transition • Community engagement and stakeholder dialogue mechanisms • Social impact assessments

ESG = environmental, social, and governance; GHG = greenhouse gas.
Source: Asian Development Bank and PwC analysis.

Appendixes

Appendix I: ASEAN Climate Commitments and Sustainability Disclosure Landscape

Table A2 provides a country-by-country overview of climate commitments and sustainability disclosure developments across Association of Southeast Asian Nations (ASEAN) member states, covering national net-zero commitments, sectors covered under nationally determined contributions, IFRS Sustainability Disclosure Standards adoption status, and related assurance requirements for Scope 1 and Scope 2 greenhouse gas emissions, as of 21 September 2026.

Table A2: Climate Commitments and Sustainability Disclosure Developments Across ASEAN Member States

No	Country	Climate Commitment	Sectors Covered in NDC	IFRS S1 and S2 Adoption Status	Assurance Requirements
1	Brunei Darussalam	Net-Zero by 2050	• Energy • Forestry • Land transport • Waste	No announcement on adoption status	No announcement on assurance requirements
2	Cambodia	Carbon neutrality and Net-Zero by 2050	• Agriculture • Energy (including transport and manufacturing and construction) • Forestry and other land use (FOLU) • Industrial processes and product use (IPPU) • Waste	No announcement on adoption status	No announcement on assurance requirements
3	Indonesia	Net-Zero by 2060 or sooner	• Agriculture • Energy • FOLU • IPPU • Waste	To adopt beginning on/after 1 January 2027 with a phased implementation	Organizations must disclose formal transition plans and obtain third-party independent assurance (subject to ongoing regulatory developments)
4	Lao People's Democratic Republic	Net-Zero by 2050	• Agriculture • Energy • Industrial processes • Land-use change and forestry • Waste	No announcement on adoption status	No announcement on assurance requirements
5	Malaysia	Net-Zero by 2050	• Agriculture • Energy • IPPU • Waste • Land use, land-use change and forestry (LULUCF)	Adopted beginning on/after 1 January 2025 with a phased implementation	Mandatory reasonable assurance on Scope 1 and Scope 2 GHG emissions beginning on/after 1 January 2028 with a phased implementation

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Table A2 continued

No	Country	Climate Commitment	Sectors Covered in NDC	IFRS S1 and S2 Adoption Status	Assurance Requirements
6	Myanmar	Net-zero emissions from FOLU by 2040	• Energy • Agriculture, Forestry and other Land Use	No announcement on adoption status	No announcement on assurance requirements
7	Philippines	Net emissions reduction and/or avoidance target (including FOLU) of 75% for the period of 2025-2035 against projected business-as-usual cumulative emissions	• Agriculture • Energy • FOLU • IPPU • Transport • Waste	To adopt beginning on/after 1 January 2026 with a phased implementation	Mandatory external limited assurance on Scope 1 and Scope 2 GHG emissions beginning on/after 1 January 2028 with a phased implementation
8	Singapore	Net-Zero by 2050	• Agriculture • Energy • IPPU • LULUCF • Waste	Adopted beginning on/after 1 January 2025 with a phased implementation	Mandatory limited assurance for Scope 1 and Scope 2 GHG emissions beginning/on 1 January 2029 with a phased implementation
9	Thailand	Net-Zero by 2050	• Agriculture • Energy • IPPU • LULUCF • Waste	To adopt beginning on/after 1 January 2027 with a phased implementation	Mandatory limited assurance for Scope 1 and Scope 2 GHG emissions on/after 1 January 2027 with a phased implementation
10	Timor-Leste	Does not have net-zero commitments	• Agriculture • Energy • FOLU • Waste	No announcement on adoption status	No announcement on assurance requirements
11	Viet Nam	Net-Zero by 2050	• Agriculture • Energy • Industrial Processes • LULUCF • Waste	No announcement on adoption status	No announcement on assurance requirements

IFRS = International Financial Reporting Standards, NDC = nationally determined contribution.
Source: Asian Development Bank and PwC analysis.

Appendix II: Key Pillars and Sub-pillars Content Index for Chapter 3

Key Pillar and Sub-pillars	Sub-section	Page
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1.4 Metrics and targets	• Our GHG Emissions and Targets • Our Strategic Thrusts	Page 22 Page 25
2. Business Adaptation		
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2.4(c) Engagement with government, public sector, communities and civil society	• Policy Engagement and Government Relations • Local Community Engagement and Economic Empowerment • Skills Development and Just Transition • Human Rights	Page 35 Page 35 Page 35 Page 36
	• Consultation and Engagement with Indigenous Peoples • Biodiversity and Environmental Stewardship • Biodiversity Protection Through Wetland Restoration	Page 36
3. Governance and Accountability		
3.1 Board oversight and reporting 3.2 Management roles, responsibility and accountability 3.3 Incentives and remuneration	• Governance oversight	Page 37

ASEAN Transition Plan Handbook

A Practical Guide for Enterprises and Financial Institutions

The *ASEAN Transition Plan Handbook: A Practical Guide for Enterprises and Financial Institutions* (the Handbook) provides practical guidance to assist entities in developing and financial institutions in assessing transition plans that are proportionate to the entities' circumstances and aligned with the Association of Southeast Asian Nations (ASEAN) context. By combining international good practices with regional perspectives, the Handbook aims to support organizations at different stages of transition readiness and encourage a more consistent and credible approach to transition planning across the region.

The Handbook is a resource of the Asia Green Transformation Consortium, a collaborative platform established to advance sustainable finance and support the region's transition toward a low-carbon and sustainable future.

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