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Working Paper

An overview of approaches to transition finance for hard-to-abate sectors

ADB Working Paper, No. 1423

Provided in Cooperation with:

Asian Development Bank Institute (ADBI), Tokyo

Suggested Citation: Shirai, Sayuri (2023) : An overview of approaches to transition finance for hard-to-abate sectors, ADB Working Paper, No. 1423, Asian Development Bank Institute (ADBI), Tokyo, <https://doi.org/10.56506/RIJR3972>

This Version is available at:

<https://hdl.handle.net/10419/296815>

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ADBI Working Paper Series

AN OVERVIEW OF APPROACHES TO TRANSITION FINANCE FOR HARD-TO-ABATE SECTORS

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No. 1423
December 2023

Asian Development Bank Institute

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Suggested citation:

Shirai, S. 2023. An Overview of Approaches to Transition Finance for Hard-to-Abate Sectors. ADBI Working Paper 1423. Tokyo: Asian Development Bank Institute. Available: <https://doi.org/10.56506/RIJR3972>

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Abstract

Climate finance has witnessed significant growth as a burgeoning field of long-term finance globally in recent years. However, it has yet to reach the necessary scale for mobilizing sufficient funds to support the decarbonization efforts of businesses. This shortfall is partly attributed to ongoing investors' concerns about greenwashing risk. Many global companies have made commitments to achieve the net-zero target by 2050, but without consistent short- and medium-term targets, comprehensive data and progress report, and detailed action plans. While the Task Force on Climate-Related Financial Disclosure (TCFD) recommendations have contributed to advancing disclosure frameworks, the standardization of corporate disclosures has not made substantial progress. Furthermore, a series of initiatives—such as the environmental, social, and governance (ESG) ratings offered by data providers, the certification of green or sustainability-linked bond labels through second-party opinions, as well as various taxonomies for green activities—have enhanced transparency to some extent but their divergent approaches have hampered climate finance from expanding further. The recent effort to standardize climate-related disclosures by the International Sustainability Standards Board (ISSB), which was established by the Trustees of the International Financial Reporting Standards (IFRS) Foundation, is a positive development, but broader initiatives are required to promote climate finance. In particular, transition finance in hard-to-abate sectors (such as steel, chemicals, cement) remains underdeveloped, despite the urgent need to financially support their emissions-reducing efforts. This paper provides an overview of various approaches toward transition finance intended to enhance credibility while addressing their challenges.

Keywords: transition finance, carbon budget, hard-to-abate sectors, ISSB Climate-Related Disclosures, taxonomy, traffic-light classification system

JEL Classification: G15, G32, Q01, Q54

Contents

1.	INTRODUCTION.....	1
1.1	What Hampers the Further Progress of Climate Finance?	1
1.2	ISSB Standards Promoting Standardization of Corporate Disclosure.....	3
1.3	Recent Growing Attentions to Transition Finance	3
1.4	Recent Initiatives to Enhance Transition Finance	5
2.	TRANSITION FINANCE AND LABELING APPROACHES IN CAPITAL MARKETS...	6
2.1	International Capital Markets Association (ICMA)'s Transition Finance Framework.....	6
2.2	Climate Bond Initiative (CBI)'s Transition Label and Certification	9
2.3	Green Equity Criteria and Classification Initiated by the World Federation of Exchanges.....	15
2.4	Challenges Related to Labeling Financial Instruments and Conclusions of Section 2	17
3.	PRACTICES TO PROMOTE CREDIBLE TRANSITION PLANS FOR EMISSIONS-INTENSIVE COMPANIES	19
3.1	Science-Based Target Initiative (SBTi) Certification	19
3.2	Developing Sectoral Decarbonization Approach (SDA)	21
3.3	Using Environmental Common Performance Thresholds Proposed by the IEA.....	26
3.4	Industry Technology Road Maps for Transition Finance Developed by Japan.....	27
3.5	Preventing Carbon-Intensive Lock-In and Stranded Assets.....	30
3.6	Challenges Related to Sector-Based Approaches and Conclusions of Section 3	31
4.	TAXONOMIES FOR TRANSITION ACTIVITIES IN HARD-TO-ABATE SECTORS ..	32
4.1	EU's Taxonomy and Transition Finance	32
4.2	Singapore's Taxonomy Proposal and Traffic-Light Classification System	38
4.3	ASEAN Taxonomy and a Traffic-Light System	47
4.4	Challenges Related to Transition Activities Under the Taxonomies and Conclusions of Section 4.....	52
5.	TRANSITION FINANCE FROM THE PERSPECTIVE OF FINANCIAL INSTITUTIONS	54
5.1	Defining Transition Finance and Segmentation of Portfolios	54
5.2	Attributes of Four Transition Financing Strategies	56
5.3	Promoting Decarbonization Contribution Calculation.....	60
5.4	Challenges Related to Decarbonizing Financed Emissions.....	62
6.	SUMMARIES AND CHALLENGES.....	63
	REFERENCES	69

1. INTRODUCTION

The global community needs to expedite the transition of the economy to align with the Paris Agreement goals, which aim to limit the increase in the global average temperature to well below 2°C or strive to achieve a limit of 1.5°C relative to pre-industrial levels. Achieving these goals necessitates government and companies to significantly intensify their efforts in reducing greenhouse gas (GHG) emissions. Meanwhile, it is important for investors and financial institutions to support these efforts by providing the necessary financing to support these endeavors. Climate finance is an emerging sector of long-term finance globally. It enables governments and companies to secure funding for the expansion of eco-friendly initiatives and projects through the issuance of green or sustainability-linked bonds (and loans). Green bonds represent debt instruments in which the proceeds are earmarked for green projects and activities, known as use-of-proceeds bonds. Sustainability-linked bonds with a green focus adjust financing terms contingent on the achievement of predefined performance indicators, such as reductions in GHG emissions.

Despite significant growth, climate finance has not reached its full potential to attract adequate investments for supporting global decarbonization and low-carbon corporate activities. Public and private finance flows for fossil fuels remain greater than those for climate adaptation and mitigation. The latter financial flows must expand substantially by a factor of three to six times greater than current levels in order to limit global warming to 2°C or 1.5°C (IPCC 2023). The primary obstacle for preventing further expansion of climate finance lies in limited corporate disclosure and associated investors' concerns about greenwashing risk. Greenwashing arises from corporate practices that exaggerate their green initiatives and projects without making meaningful emissions reductions.

1.1 What Hampers the Further Progress of Climate Finance?

Several factors have contributed to the underdevelopment of climate finance. First, many large companies have pledged to achieve net-zero emissions by 2050 or earlier, but without disclosing consistent short- and medium-term targets, which directly impact their ongoing business operations. Critical basic data, such as GHG emissions—including Scope 1 (direct emissions), Scope 2 (indirect emissions like purchased electricity), and Scope 3 (emissions from suppliers and users)—as well as progress toward long-term net-zero emission targets are often inadequate. Despite increasing calls from investors and other stakeholders, moreover, companies' disclosure regarding credible action plans encompassing operational and capital expenditures and supplier engagement, as well as the emissions reduction path toward net-zero emission targets, are insufficient.

Second, the recommendations for voluntary corporate disclosure made by the Task Force on Climate-Related Financial Disclosure (TCFD) in 2017 and its revised version in 2019 have partially contributed to promoting disclosure standardization. For instance, the TCFD recommendations have advocated for a framework based on four pillars: governance, strategy, risk management, and metrics and indicators. However, even with these four pillars in place, the disclosure of GHG emissions data, emission targets, and credible action plans remains significantly lacking. Consequently, there exists a wide variation in disclosure and reporting practices among companies, making cross-company comparisons extremely challenging. In addition, TCFD recommendations have not been adopted widely in some regions including Southeast Asia.

In addition to the TCFD recommendations, numerous influential climate-related voluntary disclosure and reporting guidelines and frameworks have been developed from various private sector organizations and initiatives—such as the Climate Disclosure Standards Board (CDSB)'s Framework for reporting environmental and climate change information, the Value Reporting Foundation's Integrated Reporting Framework, industry-specific Sustainability Accounting Standards Board (SASB) Standards, the World Economic Forum's Stakeholder Capitalism Metrics, and Global Reporting Initiative (GRI)'s Sustainability Reporting Standards. While these disclosure frameworks have intended to increase transparency for investors, their diverse approaches have further contributed to complexity and diverse disclosure practices. Companies tend to flexibly pick their preferred reporting frameworks and only disclose part of their reporting requirements.

Third, many investors rely on environment, social, and governance (ESG) ratings assigned to each, mostly large listed, company, which are provided by dozens of global data providers. Concerns remain among financial regulators due to the limited consistency among ESG ratings for the same company offered by different ESG data providers, and even within each segment of E, S, and G. This issue was raised by the International Organization of Securities Commissions (IOSCO) in 2021 (IOSCO 2021). Consequently, investors might make varying investment decisions depending on the data set purchased from a particular data provider. While large investors or asset management companies can address this issue by purchasing data from multiple providers, smaller investors are unable to do so due to the high data subscription costs. The substantial discrepancies among the ratings are primarily a result of selecting diverse indicators and allocating the varying weights to each indicator. Furthermore, ESG data providers often make estimates for missing data using various methodologies. As a result, divergences among these ratings tend to be more significant than the relatively consistent credit ratings provided to bond issuers by a few well-established rating agencies. The smaller differences in credit ratings can be attributed to the relative easiness of estimating creditworthiness, as past reliable credit data and information about default events on various companies are readily available. In contrast, for ESG ratings, data providers have more flexibility to select a wide range of indicators, partly because comprehensive, standardized corporate disclosure on climate accounting is lacking. Moreover, data on historical climate event remain limited, particularly since most climate risks (including physical and transition risks) are expected to intensify nonlinearly in the future.

Fourth, some investors place a premium on data reliability (such as GHG emissions data and other environmental indicators) verified by independent verifiers for company-disclosed data. However, due to the absence of standardized disclosure, data verification may not necessarily facilitate cross-company comparisons. Furthermore, many green, sustainability bonds, and sustainability-linked bonds are issued with second-party opinions certifying that issuers' disclosure and objectives adhere to specific guidelines and standards established by certain organizations, such as the International Capital Markets Association (ICMA) and the Climate Bond Initiative (CBI). However, their approaches are quite divergent in terms of disclosure requirements. Given that ICMA's guidelines are mostly based on recommendations rather than requirements, there may be some discretion among independent verifiers with regard to the extent of those recommendations being adequately taken into account in the process of producing second-party opinions. The divergent treatments on the disclosure of GHG emissions data, net-zero emissions target and 1.5°C pathway, and detailed action plans may lead to labeled bonds with different qualities. Moreover, the actual impact of such labeled bond issuances, such as actual emissions reduction, remains unclear due to limited corporate disclosure.

1.2 ISSB Standards Promoting Standardization of Corporate Disclosure

A significant and irreversible trend is the increasing momentum toward standardizing climate-related corporate disclosure, especially since the International Sustainability Standards Board (ISSB) was established by the Trustees of the International Financial Reporting Standards (IFRS) Foundation in 2021. The ISSB released the Climate-Related Disclosures (IFRS S2) in conjunction with the General Requirement for Disclosure of Sustainability-Related Financial Information (IFRS S1) in June 2023 (ISSB 2023a, 2023b). The IFRS S1 and S2 are scheduled to become effective for annual reporting periods beginning in January 2024, with reporting to commence in 2025. These standards were developed primarily by incorporating the TCFD recommendations and integrating them with the GHG Protocol, as well as some existing disclosure frameworks provided by organizations such as the CDSB, the Value Reporting Foundation, the SASB, and the World Economic Forum. The ISSB was established by the IFRS Foundation in 2021 in response to strong investor demand for the development of global standards that can serve as a baseline for comprehensive corporate sustainability disclosures, meeting the information needs of investors and other stakeholders, while ensuring compatibility with various existing disclosure and reporting frameworks. IFRS S2 play a crucial role in advancing carbon accounting, measuring GHG emissions with a focus on Scope 3 emissions, and setting emissions targets, essential for monitoring progress in emissions reduction and the effectiveness of corporate actions (Shirai 2023b).

Since ISSB disclosure frameworks received support from the G7, the G20, IOSCO, and the Financial Stability Board (FSB), many countries and regions are expected to mandate IFRS S1 and S2 within their jurisdictions. One notable issue related to IFRS S2, however, is the absence of a requirement for a long-term net-zero emission target. Given the critical importance of achieving net-zero emissions by around 2050 or earlier for countries and major companies, it is desirable for each country to mandate long-term net-zero targets, along with ISSB disclosure requirements, starting with large publicly listed companies in a phased manner. However, it is important to note that making IFRS S2 mandatory, while providing an essential step toward disclosure standardization, is not the sole solution for scaling up climate and sustainable finance.

1.3 Recent Growing Attentions to Transition Finance

In addition to driving corporate climate-related disclosure based on ISSB's IFRS S1 and S2 and promoting net-zero targets for all sectors and large companies, it is imperative to shed light on transition finance, which is one of the most challenging, but underdeveloped aspects of climate finance. In recent years, there has been a growing emphasis on increasing financing for companies operating in hard-to-abate sectors, such as iron and steel, cement, basic chemicals, and aviation (as well as electricity generation from fossil fuels), to support their transition efforts toward net zero. So far, transition finance has been lagging behind the relative popularity of green, sustainability, and sustainability-linked bonds globally. It has not provided sufficient finance in transitioning emissions-intensive companies towards the level required to achieve practical net-zero emissions. This reflects the fact that some investors associate transition finance with greenwashing finance. Other investors have been cautious about financing emissions-intensive companies due to the lack of clear definitions and criteria for determining financing decisions. The Organisation for Economic Co-operation and Development (OECD) Industry Survey on Transition

Finance revealed that more than 60% of investors were hesitant to provide transition finance, either in general or for specific regions, due to inadequate clarity on how to assess credible corporate alignment with a pathway that aligns with the Paris Agreement's goals (OECD 2022).

One primary reason for this caution is that transition bonds or sustainability-linked bonds issued by these companies may not necessarily result in substantial reductions in GHG emissions for the company as a whole or its entire value chain. This happens even if the company commits to a long-term net-zero target at the corporate level. If these debt instruments fund only a small portion of activities that drive significant improvements in energy efficiency, electrification, or low-carbon and decarbonization technologies, for instance, the company's emissions may remain high as long as it continues its existing emissions-intensive operations without abatement. Moreover, the hard-to-abate sectors require substantial investments and innovation to develop low-carbon or decarbonization technologies. For example, in the steel sector, some investments may involve shifting to electrification or retrofitting existing production facilities, which might be categorized as green activities. However, this sector necessitates new technologies to make substantial reductions in emissions, including the use of hydrogen, ammonia, and carbon capture utilization and storage (CCUS). Uncertainty is prevalent in terms of new technology, investment costs, operational expenses including the supply chains, and the pathway toward transitioning hard-to-abate sectors to achieve net-zero emissions. As a result, these companies' emissions-reducing approaches tend to be flexible, which in turn pose challenges for investors in comparing their climate transition plans within sectors and across borders.

It is important to scale up transition finance, given the projected increase in global demand for products from hard-to-abate sectors, which is essential for economic and social development. Due to the unique nature of these sectors, there is a growing consensus that they need to be treated somewhat differently from less emissions-intensive sectors to facilitate financing. The OECD has pointed out that transition finance is generally understood as a means to *decarbonize companies or economic activities that meet three specific criteria: (1) they are emissions-intensive, (2) they may not currently have economically viable or credible low- or zero-emissions alternatives, and (3) they play a crucial role in future socio-economic development* (OECD 2022).

Meanwhile, the Secretariat of the Glasgow Financial Alliance for Net Zero (GFANZ) provides a broader definition than the OECD. GFANZ is a global coalition of over 650 financial institutions across the sector with the goal of supporting the world's transition to net-zero emissions by 2050. The GFANZ Secretariat published a Technical Review Note, where transition finance refers to *investment, financing, insurance, and related products and services that are necessary to support an orderly real economy transition to net zero* (GFANZ 2022, 2023a, 2023b). Under transition finance, financial institutions could segment their portfolios into the four key financing strategies (Climate Solutions, Aligned, Aligning, and Managed Phaseout) which are essential for financing a comprehensive transition to a net-zero economy. Namely, GFANZ's concept of transition finance covers both all economic activities that could facilitate transition to net zero. In addition to OECD's definition, therefore, green finance, as well as financing enabling activities, nature-based solutions, and managed phase out of emissions-intensive assets (such as coal-fired power plants) are encompassed within the definition of transition finance.

1.4 Recent Initiatives to Enhance Transition Finance

Several developments are underway to promote credibility and transparency with regards to transition finance. As for the principles and standards related to bond instruments, ICMA enhanced recommendations on disclosure for hard-to-abate sectors including Scope 3 emissions using the existing principles applied to green bonds or sustainability-lined bonds (ICMA 2023). Meanwhile, the CBI has been developing new technical criteria and certification schemes for labeling “Aligned” (with 1.5°C pathway) and “Transition” in relation to debt financing instruments and entities (companies) in 2023 (CBI 2023a, 2023b). The concept of the 1.5°C pathway at the global level and sectoral level are based on the remaining carbon budget to limit global warming to 1.5°C with a 50% probability (about 500 gigatonnes [GT] of carbon dioxide [CO₂]) based on IPCC estimates (IPCC 2021). Annual CO₂ emissions globally are expected to be halved by around 2030 and reach net-zero by 2050. With this aggregate remaining carbon budget, sectoral 1.5°C pathways are developed for some emissions-intensive sectors. Using the carbon budget concept, the Science-Based Target Initiative (SBTi) issue science-based target certificates and developed the Sectoral Decarbonization Approaches. Meanwhile, Japan’s government has introduced unique Industry Technology Roadmaps for emissions-intensive sectors.

In addition, some countries and regions have incorporated transition activities into their taxonomies. Notable examples include the European Union (EU), Singapore, and the Association of South-East Asian Nations (ASEAN). The Singapore and ASEAN Taxonomies encompass a wide range of transition activities, utilizing a traffic-light classification system and addressing sunset requirements for transition activities and early-phase coal power plant retirements. Some investors are concerned about a potential temporary increase in financed emissions arising from financing hard-to-abate sectors. In response, GFANZ proposed that financed emissions can be estimated from expected emissions reduction relative to the business-as-usual scenario considering the forecasted impact of financing corporate counterparties (GFANZ 2023a).

While all these approaches share the common goal of advancing transition finance, there are notable disparities in their methodologies. These discrepancies encompass data prerequisites (including Scope 3 emissions data and targets), alignment or aligning with the net-zero or 1.5°C pathway, the presence of time-bound criteria or thresholds, as well as the utilization of science-based criteria and employing carbon budgets. It is important to consider the stages of economic and institutional development in developing and emerging economies, as well as the burden on companies. At the same time, it is essential to encourage discussions among governments and financial regulators to share information and experiences to foster convergence by establishing minimum standards and criteria or promoting interoperability among these approaches. This is vital to prevent fragmentation within the climate finance market and system. In the context of hard-to-abate sectors, investors wish to ensure that their financing activities will result in substantial emissions reductions of their corporate counterparties. In particular, dialogue in the Asia and Pacific region is crucial given the region’s heavy reliance on coal-fired electricity and hard-to-abate sectors.

This paper takes an overview of various existing practices aimed at enhancing the credibility and transparency of corporate disclosures. A particular focus was placed on emissions-intensive hard-to-abate sectors, while also addressing the challenges they face. Shirai (2023a, 2023b) concentrated on promoting corporate climate disclosure based on IFRS S2 prepared by ISSB, identifying climate-related risks and opportunities, developing credible climate transition plans, and formulating climate scenario analyses. Building on those works, this paper shifts its focus to transition finance and related

issues. Section 2 delves into the criteria and certifications primarily applicable to the issuance of debt financial instruments (developed by ICMA and the CBI) while some attention is also given to recent stock market initiative led by the World Federation Exchanges (WFE). Section 3 sheds light on various practices and measures designed to enhance the credibility and transparency of companies transitioning to net zero. This section covers topics like SBTi's certifications, Sectoral Decarbonization Pathway approaches, the use of global common thresholds developed by the International Energy Agency (IEA), Industry Technology Roadmaps developed by Japan, and the issue of avoiding an emissions-intensive lock-in. Section 4 provides an overview of selected taxonomies related to transition activities, as developed by the EU, ASEAN, and Singapore. Section 5 briefly explores the final paper released by the GFANZ Secretariat on promoting transition finance. Section 6 offers conclusions.

2. TRANSITION FINANCE AND LABELING APPROACHES IN CAPITAL MARKETS

In recent years, the global sustainable and green bond market has witnessed significant expansion and the development of various financial instruments, including green bonds, social bonds, sustainable bonds, and sustainability-linked bonds (along with associated loans). ICMA and the CBI play key roles in establishing principles (or handbooks) and standards, which provide a basis for certifying these labeled bonds. Labeled bonds with ICMA and/or CBI certifications are preferred by ESG investors due to the mandatory assessment process through independent reviews, and reporting requirements that precede issuance. Namely, companies seeking to issue labeled bonds must secure a second-party opinion from independent verifiers designated by these organizations. These verifiers assess whether the bonds meet the criteria set by ICMA or the CBI to qualify them as labeled bonds. While ICMA focused on additional recommendations for hard-to-abate sector within the existing green or other sustainable bond principles, the CBI introduced a transition label to its existing standards and classification scheme with a focus on the 1.5°C pathway. While not directly related to transition finance, a new initiative has emerged in stock markets by the WFE, involving the provision of green labels for listed equities based on equity principles.

2.1 International Capital Markets Association (ICMA)'s Transition Finance Framework

ICMA is a not-for-profit association with a membership of over 600 financial entities operating in all segments of the international debt capital markets across 66 jurisdictions worldwide. Its members include private and public sector issuers, banks, securities dealers, asset and fund managers, insurance companies, law firms, capital market infrastructure providers, and central banks. ICMA has issued a series of recommendations regarding disclosure for issuers in relation to the Green Bond Principles (GBP), the Sustainability Bond Guidance (SBG), Sustainability-Linked Bond Principles (SLBP), etc. GBP-aligned instruments allocate proceeds to contribute to an issuer's GHG emissions reduction or other environmental strategy. Eligible Green Project categories include renewable energy (comprising production, transmission, appliances, and products); energy efficiency (encompassing new and refurbished buildings, energy storage, district heating, smart grids, appliances, and products); pollution prevention and control (such as air emissions reduction, GHG control, soil remediation, waste prevention, waste reduction, and waste recycling); environmentally

sustainable management of natural resources and land use; clean transportation; circular economy; and climate adaptation (ICMA 2020, 2022). SBG-aligned bonds allocate proceeds to green, social, or other sustainable projects. SLBP-aligned debt instruments pertain to those with one or more Key Performance Indicators (KPIs) related to GHG emissions reduction indicators, either in terms of direct results (like absolute GHG emissions or intensity metrics) or supportive results (metrics influencing GHG emissions targets). These principles are widely utilized for the bond issuance globally. ICMA guidelines provide mostly recommended principles rather than requirements.

In the context of transition finance, ICMA introduced the Climate Transition Finance Handbook in 2020, along with the Climate Transition Finance Handbook Guidance for Issuers newly published in 2023. ICMA released the Climate Transition Finance Handbook for issuers, offering additional disclosure recommendations, particularly for issuers in hard-to-abate sectors whose debt instruments align with the GBP, SBP, and the SLBP (ICMA 2023). This handbook integrates transition finance within the existing GBP, SBG, and SLBP frameworks, without isolating transition finance (i.e., transition bonds) as a separate financial instrument (ICMA 2020). Transition finance focuses on hard-to-abate sectors with regards to issuers of Green Bond Principles or Sustainability Bond Guidelines aligned instruments to bolster credibility. Companies in hard-to-abate sectors that adhere to the existing frameworks, the Handbook outlines four key elements within the disclosure recommendations: (1) the issuer's climate transition plan and governance; (2) the environmental materiality of the business model; (3) the science-based nature of the climate transition plan and targets; and (4) transparency in implementation.

With regard to the first element, which pertains to the climate transition plan and governance, ICMA recommends that issuers disclose short-term, medium-term, and long-term science-based targets in alignment with the goals of the Paris Agreement. Companies are also recommended to provide a climate transition plan that includes a detailed capital spending plan and relevant technological implications, carbon pricing, and regulatory factors. It is crucial that the importance of implementing the plan is clearly understood and monitored properly at both the board and management levels, as illustrated in Table 2.1 (ICMA 2023). In addressing the second element on materiality, issuers are advised to examine the current and future impact of their core businesses on emissions and other environmental issues. Developing a materiality matrix related to these impacts is also desirable along with an assessment of the materiality of climate-related eligible projects and Key Performance Indicators (KPIs) on the issuer's overall emissions profile. When Scope 3 emissions are material, issuers are strongly recommended to disclose the data with a timeline for their reporting.

Concerning the third element, which centers on targets, ICMA strongly recommends that issuers provide short-, medium-, and long-term GHG emissions targets aligned with the Paris Agreement. In addition, companies are recommended to disclose detailed historical emissions data, including absolute emissions, encompassing Scope 1, Scope 2, Scope 3, and the most relevant subcategories (Table 2.1). It is important to highlight the baseline year, the scenario and methodology used, and emissions targets in either absolute or intensity terms. In the case of using emissions intensity terms, companies are advised to present projections on the future change to absolute emissions. Since Scope 3 data measurement is still evolving for certain sectors, estimates may be necessary based on a best-efforts basis in the interim. Additionally, it is highly advisable to disclose information about CCUS technology, high-quality carbon credits, and their relative contributions to GHG emissions reduction, in line with industry best practices from organizations such as the Science-Based Targets Initiative (SBTi), Voluntary Carbon Market Initiative (VCMI), and the Integrity Council for

Voluntary Carbon Markets (ICVCM). The use of carbon credits to achieve GHG emissions targets needs to be minimized and reserved mainly for abating residual emissions. Issuers should also explain the rationale for their use and provide details about their internal carbon credit procurement policy.

Table 2.1: ICMA's Recommended Disclosure for Transition Finance

Objective	Providing recommendations on disclosures to improve the use-of-proceeds or sustainability-linked instruments to finance transition of hard-to-abate sectors
Targets	<p>Hard-to-Abate Sectors:</p> <p>Issuers of Green Bond Principles or Sustainability Bond Guidelines aligned instruments; and Sustainability-Linked Bond Principles aligned instruments would be strengthened through alignment with the Handbook</p> <hr/> <p>Handbook Recommendations on the Four Key Elements:</p> <ol style="list-style-type: none"> 1. Issuer's climate transition strategy and governance 2. Business model environmental materiality 3. Climate transition strategy and targets to be science-based 4. Implementation transparency <hr/> <p>Of which, Strongly Recommended Information and Indicators:</p> <ul style="list-style-type: none"> • Short-, medium-, and long-term GHG emission targets aligned with the Paris Agreement • Historic emissions (including absolute emissions, where intensity metrics are the main indicator) • GHG emission objectives covering all scopes and most relevant sub-categories (Scopes 1, 2 and 3) • Targets can be absolute or intensity terms (projections on the change to absolute emissions necessary for the intensity terms)
Verification	Provided by approved verifier before certification

Source: Prepared by the author based on ICMA (2023).

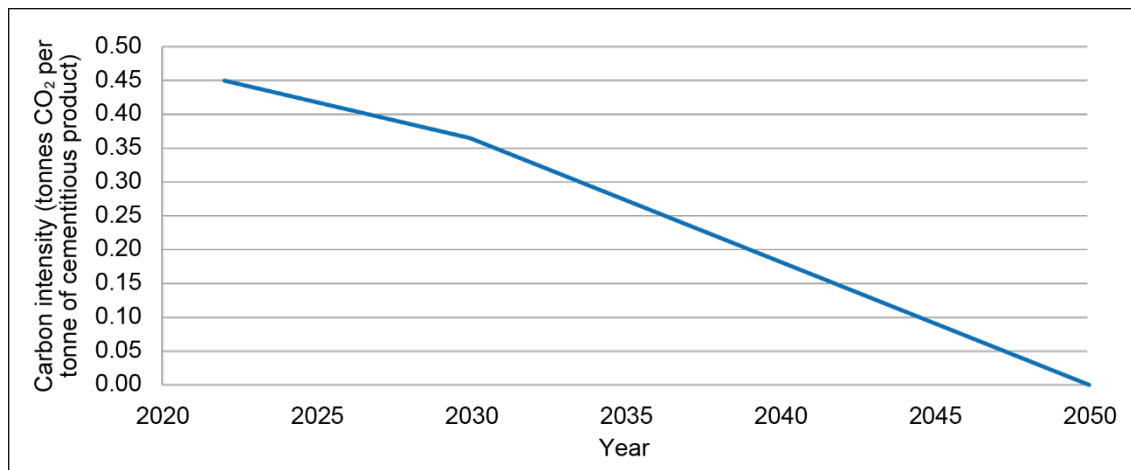
Regarding the fourth element, which involves implementation, issuers are recommended to disclose a capital spending rollout plan aligned with the climate transition plan. They should outline a phaseout plan for emissions-intensive activities and products that would be incompatible with the science-based emissions reduction path outlined in the transition plan. Furthermore, information about the percentage of assets, revenues, expenditures, and divestments related to various strategies should be included in the disclosure.

As such, ICMA's approach treats transition finance within the categories of existing green, sustainability, or sustainability-linked bonds. Transition finance is typically needed by companies that are actively formulating credible climate transition plans and decarbonization trajectories in hard-to-abate sectors. ICMA acknowledges that in specific jurisdictions, these green, sustainability, or sustainability-linked instruments may be referred to as transition bonds through the addition of a climate transition label (CBI 2023). This appears to refer to Japan and the People's Republic of China (PRC) as pointed out in Section 2.6. So far, the growth of use-of-proceeds transition bonds, as outlined in ICMA's *Climate Transition Finance Handbook*, has been limited and concentrated in these two countries. Meanwhile, ICMA's Sustainability-Linked Bond Principles have contributed to the proliferation of sustainability-linked bonds within the realm of transition finance to a certain degree. It is essential to note that the recommendations set forth by ICMA are not obligatory. Thus, there is room for discretion with regards to the extent of those recommendations being taken into account by verifiers.

2.2 Climate Bond Initiative (CBI)'s Transition Label and Certification

The CBI is an international not-for-profit organization operating in approximately 25 countries, dedicated to mobilizing global capital for climate actions. It has been playing a significant role in establishing standards and certification schemes for bonds and loans with the aim of preventing greenwashing practices. It is widely recognized that the CBI's standards complement those of ICMA. This means, ICMA standards provides a basis for all related bond issuers while more stringent standards are provided by the CBI as additional elements. The CBI defines transition finance as encompassing *bond financing activities that do not fall into the category of low- or zero-emissions (i.e., not green) but have a pivotal role, whether in the short or long term, in facilitating the decarbonization of an activity or supporting an issuer's transition toward alignment with the Paris Agreement* (CBI 2022a). In essence, transition finance is designed to expedite the by decarbonization of hard-to-abate sectors, which is essential for transitioning the economy to a 1.5°C decarbonization pathway (CBI 2023a). The CBI's approach differs from that of ICMA in the sense that it clearly distinguishes between green labeling and transition labeling. Through the use of a transition label, debt instruments could be more developed with greater transparency and reliability. By focusing on the 1.5°C decarbonization pathway, on the other hand, there is a concern that emerging and developing economies may find that the hurdles are too high, thus discouraging their efforts to reduce GHG emission.

CBI has also developed sector-specific technical screening criteria using emissions intensity thresholds over time until 2050 based on the 1.5°C science-based decarbonization pathways for several sectors. Those sectors include agriculture, renewable energy, cement, steel, basic chemicals, low-cost transport, shipping, and energy. The criteria are comprised of climate mitigation criteria, and climate adaption and resilience criteria. In the case of all cement production facilities, the emissions pathway for the facility-level emissions intensity thresholds over time (using climate mitigation criteria) is provided in Figure 2.1. In practice, a company could calculate its facility's correction factor-adjusted intensity to account for the cement grade being produced. Subsequently, this intensity can be compared with the relevant threshold (CBI 2023c). The corrected pathway depends partly on the term of CBI certification and partly on a company's preference. For example, suppose a company wishes to issue a 10-year bond starting in 2025. Based on Figure 2.1, the thresholds for 2025 and 2035 are 0.416 tCO₂/t and 0.271 tCO₂/t cementitious product, respectively—provided that the company does not need to apply a correction factor to their emissions intensity. The average threshold between 2025 and 2035 results in 0.344 tCO₂/t cement. If the company's plant emissions intensity in 2025 turns out to be 0.32 tCO₂/t, which is below both the 2025 threshold and the necessary averaged threshold, the plant meets the criterion and thus no further verification is required for meeting emissions intensity thresholds.

Figure 2.1: Emissions Pathway for All Cement Production Facilities

Source: CBI (2023c).

Also, criteria for other sectors (such as utility, grain and fuel production, specialty chemicals, rare metal, and other important materials, CCUS) will be scheduled to be developed by the CBI. Each Sector Criteria sets climate change benchmarks or thresholds for that sector that are used to screen assets and capital projects so that only those that have climate integrity, either through their contribution to climate mitigation, and/or to adaptation and resilience to climate change, will be certified. Where a bond encompasses a mixed portfolio of assets across several sectors, each subcategory of assets will be subject to the relevant Sector Criteria for those assets. Singapore's taxonomy proposal pointed out in Section 4 used the CBI's technical screening criteria, namely the emissions thresholds to classify activities for a Green classification for emissions-intensive sectors including basic chemicals, steel, cement, hydrogen, and aluminum.

2.2.1 Developing Green and Transition Labels for Activities and Entities

With regard to activities, the CBI makes a distinction between those that do not have a long-term role in a low-carbon economy due to their high emissions and those that do, despite their high emissions (CBI 2020). It upholds that the Green label should continue to be applied to eligible investments in activities or entities that have a long-term role to play, either already approaching net-zero emissions or following decarbonization pathways in line with halving global emissions by 2030 and reaching net zero by 2050. The Green label can also be used for investments in activities and entities that support such endeavors, like the manufacturing of triple-glazed windows crucial for near-zero activities. Meanwhile, the Transition label is suitable for eligible investments that fall into two categories: (1) making a substantial contribution to halving global emissions levels by 2030 and reaching net zero by 2050 but not destined for a long-term role; or (2) having an uncertain pathway to net-zero goals.

In terms of the use of Green and Transition labels, the CBI employs five categories to determine progress toward the net-zero target: "near-zero pathway," "pathway to zero," "no pathway to zero," "interim," and "stranded" (CBI 2020). The near-zero pathway applies to activities already at or close to net-zero emissions, needing further decarbonization but not requiring significant transition (such as wind power and solar power electricity generation). Pathways to zero activities extend beyond 2050 and have a clear 1.5°C decarbonization path. Conversely, no pathway to zero activities refers to those needed beyond 2050 but are currently lacking a clear 1.5°C decarbonization

pathway to 2050 (such as long-haul passenger aviation). Interim activities include those that are currently necessary but should be phased out by 2050 (such as energy production from municipal waste). Stranded activities involve those that cannot align with global warming targets and have alternative low-emissions substitutes (such as coal-fired electricity generation).

All activities within the near-zero pathway should be labeled as Green as they are aligned with the Paris Agreement. Activities in the pathway to zero category, such as steel production meeting decarbonization goals, may receive either a Green or Transition label. The no pathway to zero activities cover those that cannot align with the Paris Agreement goals but contribute significantly to reducing emissions in the short to medium term. Activities in the no pathway to zero category, like retrofitting airline fleets to operate with a maximum biofuel or synfuel mix or CCUS, may use the Transition label. Activities providing products or services needed in the interim until viable alternatives or substitutes emerge, such as the operation of a plastics recycling facility, fall into the interim category. Within the stranded category, the Transition label can be applied to activities if they help reduce emissions in the short to medium term without locking in high-carbon technology, such as capturing and utilizing carbon leakage from closed landfills and early decommissioning of a coal-fired power station. In essence, the CBI regards Green label can be applied to all near-zero pathway activities and some activities in the pathway to zero category. Meanwhile, Transition label can be offered to some activities in the pathway to zero, the no pathway to zero, interim, and stranded categories. The rationale behind maintaining flexibility in labeling activities within the pathway to zero category, either as Green or Transition, arises from the lack of consensus on appropriate, viable transition pathways for some activities at the present stage.

The Green or Transition label can also be applied to entities (such as companies). The Green label is applied to entities that are near zero, while the Green or Transition label is applicable for entities in the pathway to zero and interim categories. Thus, entities that fall into the pathway to zero category can receive either a Green or Transition label. For example, a coal company belongs to the pathway to zero category if it is transitioning to renewables at a pace aligned with the Paris Agreement. The interim entity label is assigned, for instance, to a company in the waste-to-energy sector if the company is swiftly shifting toward recycling operations. Companies in the no pathway to zero and stranded categories do not receive a Transition label.

2.2.2 Five Hallmarks of a Credible Transitioning Company

The CBI has been offering a voluntary labeling scheme for use-of-proceeds debt instruments, such as green bonds and loans, under the Climate Bonds Standards and Certification Scheme. They have been widely used by issuers and investors globally. This scheme is based on scientific criteria to ensure that bonds and loans align with the goal of maintaining the global average temperature at 1.5°C above the pre-industrial level. The scheme was developed to certify green bonds and loans, enhancing credibility and informing investors' decisions.

Although the need for expanding transition bonds is high, the size of the transition bond market remains small and most of such bonds are issued by hard-to-abate sectors in the form of sustainability-linked bonds. The CBI attributes this underperformance to investors' concerns about the reliability and ambition of transition pathways, which make it challenging to assess the impact and ambition of each bond, hindering the further growth of transition finance (CBI 2022b). This also reflects the difficulty of comparing a company's emissions targets with those of its peers or the Paris Agreement goals.

Without additional measures to enhance credibility and address concerns about greenwashing risk, the transition bond market may not grow as much as necessary.

In response to these concerns, the CBI has been working on developing guidelines to enhance the credibility of transition finance and attract more funding since 2021. A credibly transitioning company is defined as one whose transition is rapid and robust enough to align with the global goal of nearly halving emissions by 2030 and reaching net zero by 2050. This effort resulted in the publication of the proposal for the five hallmarks of a credibly transitioning company in 2022 (CBI 2022a, 2022b). These five hallmarks are as follows: (1) Paris-aligned targets; (2) robust plans; (3) implementation action; (4) internal monitoring; and (5) external reporting. These hallmarks will serve as the basis for assessing and certifying financial instruments—such as sustainability-linked bonds with their forward-looking, company-wide targets, as well as transition-labeled use-of-proceeds bonds, and for making overall assessments of a company's transition. The Paris-aligned targets and pathway not only need to align with net zero by 2050 and nearly halving emissions by 2030, but also must be science-based and do not count offsets.

To further support the market using these hallmarks as its foundation, the CBI has proposed expanding the existing Climate Bonds Standard and Certification Scheme to certify nonfinancial entities (such as companies), including emissions-intensive sectors, with two certification labels, and to include sustainability-linked bonds:

- The first certification label for companies already near zero (already closely aligned with the 1.5°C pathway, without the need for further deep transition).
- The second certification label for companies that are credibly transitioning to align with the 1.5°C pathway, including those already aligned and those who will align by 2030.
- Sustainability-linked bonds issued by companies that are already aligned with the 1.5°C pathway and credibly transitioning companies.

2.2.3 Standards and Certification Scheme Expanding to the Transition Label (Version 4.0)

Following these developments and the receipt of feedback through consultations, the CBI published Version 4.0 in 2023 to expand the coverage of the existing Standard and Certification to include general-purpose assets, nonfinancial companies, and sustainability-linked bonds and loans (CBI 2023a, 2023b). The certification process is assessed by a group of Climate Bonds Approved Verifiers, and the Scheme is overseen by the independent Climate Bonds Standard Board. The scheme provides two levels of certification, depending on when the Climate Mitigation Performance Targets align with the Sector Criteria: **Level 1 (Aligned)** and **Level 2 (Transitioning)**.

- Under Level 1 (1.5°C aligned), the Climate Mitigation Performance Targets align with the Sector Criteria at the time of certification and thereafter until the date the Climate Mitigation Performance Targets represent net-zero emissions or 2050, whichever comes sooner.
- Under Level 2, the Climate Mitigation Performance Targets do not align with the Sector Criteria at the time of certification but align by December 31, 2030, and thereafter until the date the Climate Mitigation Performance Targets represent net-zero emissions or 2050, whichever comes sooner. Public consultation is scheduled until early November 2023.

Climate Mitigation Performance Targets encompass Scope 1 and Scope 2 emissions for all companies, and Scope 3 emissions if the applicable Climate Bonds Standard Sector Criteria address those three emissions. These targets must also specify the date by which the activity aims to achieve net-zero emissions or 2050, whichever comes sooner. Additionally, they should include interim targets on a three-year basis for the first nine years following the date of certification and a five-year basis thereafter over the entire time horizon. Companies are required to develop an action plan to address Scope 1 and 2 emissions in order to meet their Climate Mitigation Performance Targets, and for companies in sectors covered by the Climate Bonds Standard Sector Criteria this also includes Scope 3 emissions.

Level 1 (Aligned) certification applies to (a) use-of-proceeds bonds, (b) nonfinancial entities (companies), (c) assets, and (d) sustainability-linked bonds and loans. Level 2 (Transitioning) certification is relevant to (e) companies transitioning to 1.5°C alignment and (f) sustainability-linked bonds and loans transitioning to 1.5°C alignment. Use-of-proceeds bonds and loans allocate proceeds to specific projects, assets, activities, or expenditures that conform to the Climate Bonds Sector Specific Criteria. The environmental credentials of specific debt instruments, assets, or a portfolio of assets are certified in accordance with the Climate Bonds Sector Specific Criteria. Companies are certified based on their ability to offer goods and services with ambitious Performance Targets that are already aligned with the Climate Bonds Sector Criteria or that will align by end-2030 with credible transition plans and compliance with disclosure requirements. General-purpose debt instruments issued by these companies can also receive certification.

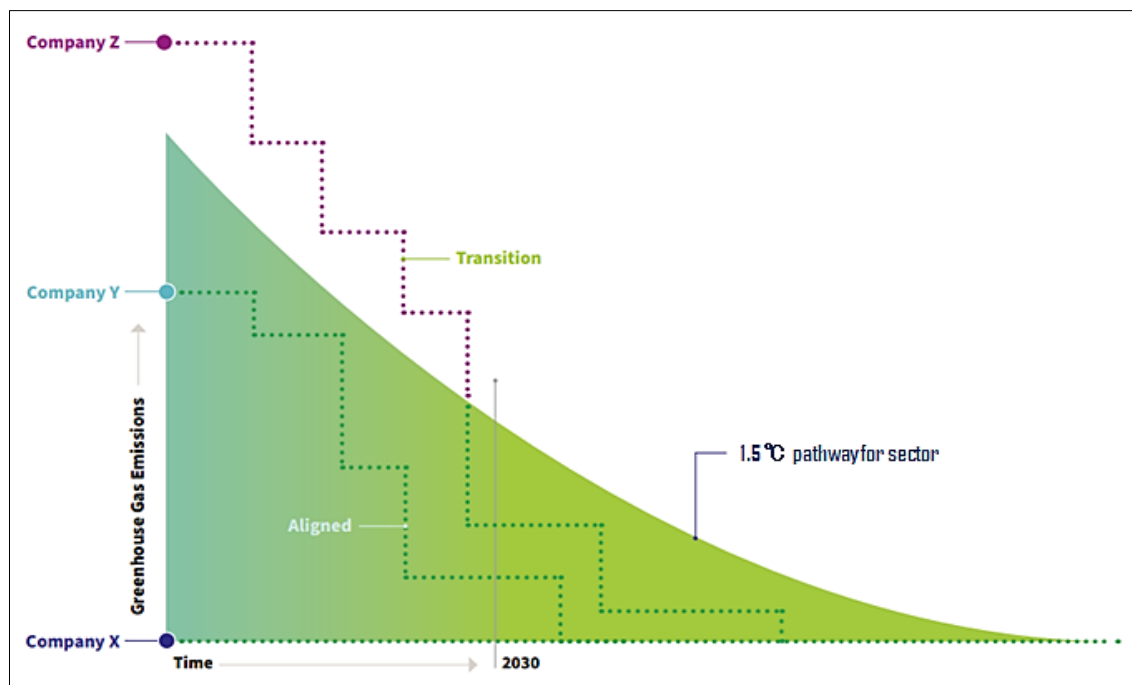
Table 2.2: CBI's Latest Standards and Certification Scheme

Objective	Voluntary labelling scheme for climate-related investments that are consistent with the goal of limiting global temperature rise to 1.5°C	
Science-based	Future targets are benchmarked against science-based, technologically feasible pathways, and not against peers	
Two Level of Certification		
Level 1 (Aligned)	The Climate Mitigation Performance Targets align with the Sector Criteria at the time of Certification and thereafter until the date the Climate Mitigation Performance Targets represent net zero emissions or 2050, whichever is sooner	Use-of-Precedes Bonds Assets Entity (non-financial) Sustainability-Linked Bonds
Level 2 (Transition)	The Climate Mitigation Performance Targets do not align with the Sector Criteria at the time of Certification but align by 31st December with the Sector Criteria at the time of Certification and thereafter until the date the Climate Mitigation Performance Targets represent net zero emissions or 2050, whichever is sooner	Entity (non-financial) Sustainability-Linked Bonds
Climate Mitigation Performance Targets	Include Scope 1 and Scope 2 emissions for all companies and Scope 3 emissions if the relevant Climate Bonds Standard Sector Criteria address Scope 3 emissions	
	Include the date the activity is intended to hit net zero, or 2050, whichever is sooner	
	Include interim targets on a three-yearly basis for the nine years following the date of certification and a five-yearly basis thereafter over the full-time horizon; benchmarked against the climate mitigation Sector Criteria and align with those Sector Criteria by end-2030 at the latest	
Verification	Provided by approved verifier before certification	

Source: Prepared by the author based on CBI (2023a, 2023b).

To obtain the Level 1 certification, companies, bonds, and assets need to demonstrate that they are already in alignment with the 1.5°C pathway and are categorized as “near zero.” This designation means that emissions remain higher than net zero but fall within the sector-specific 1.5°C pathway, and the companies’ transition plans are consistent with the 1.5°C target. On the other hand, companies in Level 2 certification are those whose targets are currently not in line with the 1.5°C target but are expected to align with it by end-2030 as their transition plans make progress. This certification also applies to sustainability-linked bonds issued by Level 1 and Level 2 companies. In essence, this new scheme offers certification for companies with already ambitious emissions targets under the Aligned category and companies with emissions targets set for end-2030 under the Transitioning category. As depicted in Figure 2.2, Company X and Company Y are eligible for the Aligned label because their Climate Mitigation Performance Targets are consistent with the 1.5°C pathway for their respective sectors. However, Company Z is not eligible for the Level 1 label but qualifies for the Transitioning label since its Climate Mitigation Performance Targets will align with the 1.5°C pathway by end-2030.

Figure 2.2: CBI’s Aligned and Transition Labels to Companies



Source: CBI (2023b).

Assessing and certifying companies and sustainability-linked bonds will be based not only on KPIs selected by companies, but also on corporate information disclosure, corporate visions for future activities, goods and services provided to achieve the targets, and associated risks. Governance—covering managerial responsibility over targets and transition plans, monitoring of progress relative to the targets and the plans, as well as management ability to take corrective actions when performance deteriorates—is also subject to assessment. In addition, the CBI emphasizes not only Scope 1, Scope 2, and Scope 3 emissions data but also consistency of financing and internal policies with the targets in the transition plans. Moreover, general-purpose bonds issued by these certified

companies, as well as sustainability-linked bonds, are now subject to the new certification scheme. The transition certification is expected to enhance credibility as it is based on the evaluation of ambitious performance targets and robust climate transition plans.

As for sector-specific criteria (such as emissions-intensity thresholds), the CBI has also begun to provide detailed criteria for Level 1 (Aligned) and Level 2 (Transitioning) labels. For example, the climate mitigation criteria for an entity to be Aligned in the cement sector must meet the following criteria at the time of certification (CBI 2023c):

- An entity's cement production facilities' average emissions intensity (with correction factors applied) meets the entity-level pathway threshold and their future Performance Targets to 2050 continue to meet those declining thresholds; and
- If the entity's production facilities use hydrogen, biomass, or alternative fuels and raw materials (including municipal solid waste) as a fuel, then those fuels meet the cross-cutting criteria set by the CBI; and
- If the entity's production facilities employ CCS (or CCUS), that CCS meets the criteria set by the CBI; and
- For any plant becoming operational post-certification date, that plant will meet the criteria set by the CBI from day 1 of commencing operation. Details of this should be provided in the entity's Transition Plan.

Regarding the criteria for Level 2 (Transitioning) label, an entity must meet the same criteria as for Level 1, except that the entity's cement production facilities' average emissions intensity (with correction factors applied) does not meet the entity-level pathway threshold at the time of certification, but the future Performance Targets align with those entity-level emissions thresholds by end-2030 and will continue to meet them after that date.

2.3 Green Equity Criteria and Classification Initiated by the World Federation of Exchanges

The WFE, which serves as the global industry association for exchanges and clearing houses, represents more than 250 global market infrastructure providers, including stock exchanges. This extensive network covers over 50,000 listed companies. Drawing inspiration from labeling practices in the bond market, the WFE introduced the Guidance Note on the WFE Green Equity Principles in 2023 (WFE 2023). These Principles are based on five core pillars: (1) the minimum percentage of a company's revenues or investments derived from green activities; (2) the use of a specified taxonomy; (3) governance measures, such as existing listing requirements; (4) annual assessments conducted by approved reviewers; and (5) disclosure pertaining to the processes and reviews related to the green classification. It is important to note that the Green Equity Principles are voluntary and do not introduce any new formal additional listing standards. Instead, they serve as a foundational framework with global applicability, which individual exchanges can utilize when implementing green offerings for listed equities, including those involved in initial public offerings (IPOs). Listed equities can achieve the WFE Green Equity Classification by meeting the specified minimum criteria. Each exchange has the flexibility to adopt and manage these Principles within their jurisdictions while considering existing legislative and regulatory requirements. Both the Guidance Note and the Principles are open for public comments until January 15, 2024.

Regarding the eligibility criteria for the first pillar, listed issuers are required to utilize revenue data. *The minimum threshold regarding the ratio of revenue from green activities to total revenue is set at 50%.* However, exchanges are at liberty to establish a higher minimum percentage. The revenue data, encompassing both total revenue and green revenue, should be based on the latest publicly available financial statement. The definition of revenue generated from green activities relies on the exchange's specific existing taxonomy or publicly stated definitions. For pre-revenue stage issuers, expected revenue or investment data can be employed. Exchanges can select from two criteria options: (1) Expected total annual revenues from green economy activities should be 100%; or (2) The ratio of green investments to total investments should exceed 50%. Expected revenue can be evaluated from available business plans, while the green investment ratio information should be based on the latest publicly available financial statement, subject to assessment by the reviewer. Exchanges are tasked with defining green activities and publishing information under their respective classifications while considering any relevant existing legislation, including mandatory taxonomies supplemented by criteria and definitions for activities where taxonomies are not yet available.

Regarding the second pillar, each exchange has the flexibility to determine the eligible taxonomy used for identifying green revenues or investments, and this information should be made publicly available. Any existing green taxonomy that is clear, objective, and transparent can be utilized as a reference. As for the third pillar on governance, issuers are required to adhere to the existing listing requirements and maintain compliance with the governance standards prescribed therein. The fourth pillar, concerning assessment, mandates that approved independent reviewers assess compliance with the classification standards annually. Exchanges can compile a list of approved reviewers or establish separate criteria to assess their suitability. Templates can be provided to assist reviewers in their evaluations. Additionally, exchanges are permitted to set criteria for situations where a reviewer may not be deemed necessary.

The fifth pillar on disclosure requires exchanges to make information publicly available, such as on their websites, regarding the green taxonomies used or the criteria and definitions that define activities, especially if a specific taxonomy is not available in their assessment reports. Consequently, issuers must disclose information that aligns with these taxonomies, criteria, and definitions to qualify for eligibility. Exchanges must also publish the criteria and methodology employed for assessments conducted by approved reviewers. They are also required to publish the outcomes of assessment reports for issuers that qualify for the green classification.

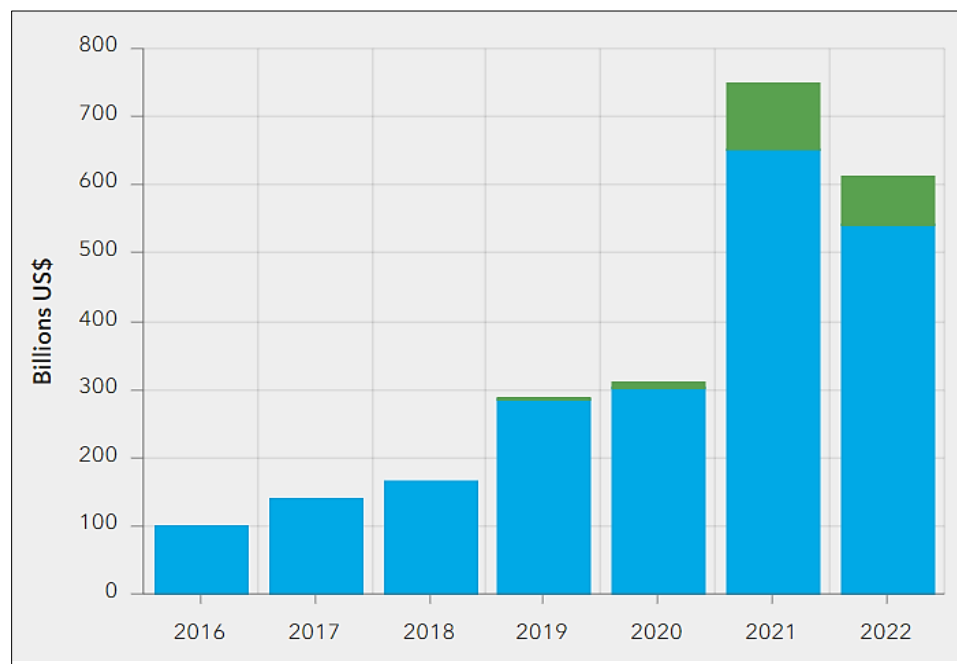
The WFE's approach is expected to play a significant role in standardizing climate-related disclosures in the equity market, thereby contributing to the growth of sustainable and green finance. Setting a 50% revenue threshold for existing issuers or a 100% revenue or 50% investment threshold for pre-revenue-stage issuers represents one of the most crucial aspects of this initiative. Currently, various stock exchanges have independently adopted Green equity criteria, resulting in diverse approaches. Furthermore, many financial assets use the Green label without clear criteria. The requirement for annual assessments by approved independent reviewers, not just during initial public offerings, and the use of transparent, clear taxonomies are likely to encourage exchanges to advance the sustainable and climate finance market while mitigating concerns about greenwashing. The provision of the Green label by the stock exchange association incentivizes exchanges seeking to establish green financial centers in their jurisdictions to enhance corporate disclosure and promote green activities. This also offers an opportunity for listed companies to enhance their reputation

and potentially attract more financing, business partners, clients, and employees. The provision of the Green label to listed equities marks the first step, potentially paving the way for addressing transition finance in the equity market in the near future.

2.4 Challenges Related to Labeling Financial Instruments and Conclusions of Section 2

The amount of green or sustainability-linked bonds issued has increased over time and especially in 2021–2022 (Figure 2.3). The size of outstanding green bonds issued reached about \$2 trillion in 2022. The PRC and Germany have been active issuers of green bonds, accounting for about 19% and 15% of total global green bonds issued in 2022 (about \$600 billion). While the size of such bonds remains small relative to the size of other general bonds, an increasing trend of issuance indicates growing investors' interest in climate finance and sustainable finance.

Figure 2.3: The Amount of Total Green Bonds and Sustainability-Linked Bond Issuances
(\$ billion)

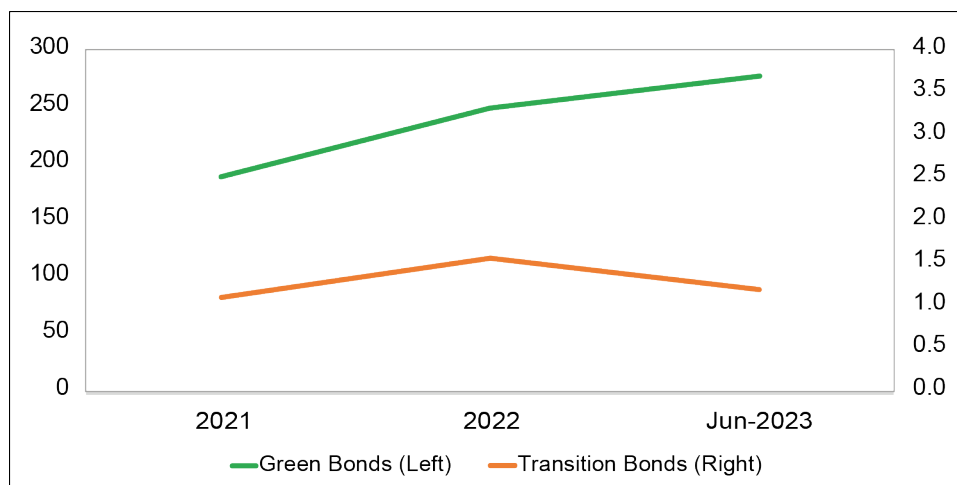


Source: IMF Climate Change Dashboard (<https://climatedata.imf.org/pages/fi-indicators#fr1>).

Meanwhile, the issuance of transition-labeled bonds has been limited compared to green bonds. So far transition bond issuers are concentrated mostly in the PRC and Japan. It is noticeable that the issuance of transition bonds has become less active in the PRC while a growing trend is observed in Japan due to the government's intensive efforts to promote transition finance as reported in the next section. Namely, the PRC issued transition bonds for about \$1.1 billion in 2021, \$0.5 billion in 2022, and \$0.3 billion, respectively, during the first half of 2023—while the issuance of green bonds reached \$81 billion, \$111 billion, and \$50 billion, respectively, over the same period. In Japan, meanwhile, the amount of transition bond issuance has been growing rapidly from about \$0.2 billion in 2021 to about \$2.3 billion in 2022 and to \$1 billion in the first half of 2023. This pace of issuance has been greater than that of green bonds in Japan, whose

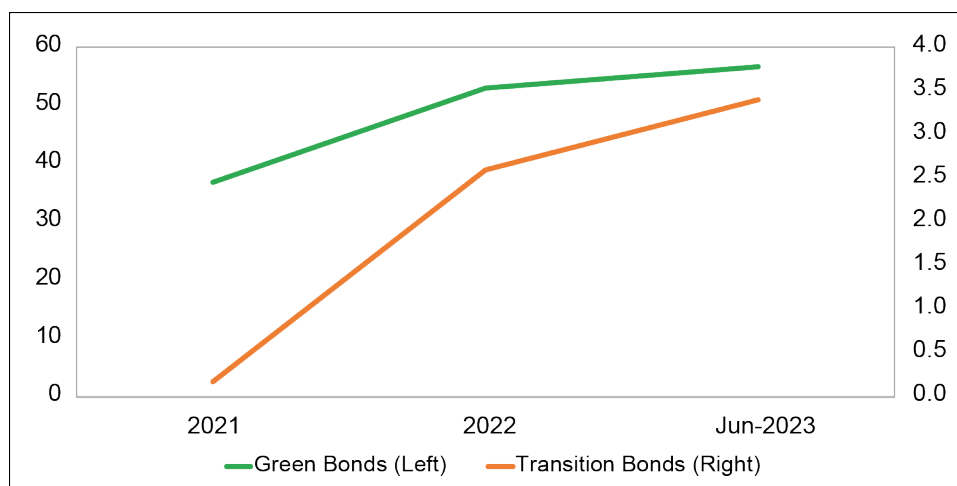
issuance amounted to \$16 billion in 2021, \$20 billion in 2022, and \$7.6 billion during the first half of 2023. As a result, the amount of transition bonds in Japan has exceeded that of the PRC. Figure 2.4 and Figure 2.5 exhibit the outstanding amount of green and transition bonds issued in PRC and Japan, respectively. The size of the green bond market in the PRC reached \$277 billion at end-June 2023 and has been much bigger than Japan (reaching \$3.4 billion). In contrast, the size of the transition bond market in Japan amounted to \$3.4 billion at end-June 2023, exceeding that of the PRC (\$1.2 billion).

Figure 2.4: The Size of the Green and Transition Bonds in the PRC (\$ billion)



Source: Prepared by the author based on AsianBondsOnline Portal database (<https://asianbondsonline.adb.org/data-portal/>).

Figure 2-5: The Size of the Green and Transition Bonds in Japan (\$ billion)



Source: Prepared by the author based on AsianBondsOnline Portal database (<https://asianbondsonline.adb.org/data-portal/>).

There is currently no consensus as to whether transition bonds (and loans) should be treated differently from the existing green, sustainability, or sustainability-linked bond (and loan) frameworks. It is possible that the transition label could be used for debt and other financial instruments more widely. However, the criteria for labeling certification vary among different guidelines and standards providers as well as among verifiers certifying compatibility with those guidelines and standards. With the ongoing global push to standardize climate-related disclosure under ISSB's IFRS S2, it may be beneficial for guidance providers and each country to establish minimum criteria for labeling bonds and loans based on information provided by IFRS S2 over time. The guidance providers could increase the number of requirements and decrease the number of recommendations. Many countries are likely to phase in ISSB-based disclosure requirements, taking into account the size of companies. Key elements of ISSB's IFRS S2 include detailed provisions related to Scope 3 coverage, absolute emissions data, emissions reduction targets, use of carbon credits, climate transition plans, and climate scenario analysis. Therefore, it may be advisable to consider incorporating them as minimum criteria for certifying existing debt financial instruments using the specific label, such as green bonds or sustainability-linked bonds, as well as for certifying transition-labeled bonds in the near future.

The recent labeling initiative for listed equities by the WEF, even though currently focusing on green equity, is an encouraging development. These initiatives, collectively, can promote corporate disclosure, thus alleviating concerns about greenwashing among investors and potentially attracting more funding for green and transition activities and projects. One challenge with this approach is the cost of verification borne by companies, which could pose difficulties for smaller companies unable to cover these expenses (OECD 2022). In this context, it would be advisable for financial regulators to make corporate disclosure mandatory and gradually extend it to a broader range of companies in a phased approach. Mandatory disclosure is generally perceived as more transparent and credible compared to voluntary disclosure.

3. PRACTICES TO PROMOTE CREDIBLE TRANSITION PLANS FOR EMISSIONS-INTENSIVE COMPANIES

In addition to the principles and standards used to label financial instruments discussed in the previous section, this section explores various approaches aimed at enhancing the credibility and transparency of companies' GHG emissions targets and their climate transition plans. These approaches encompass the certification of science-based targets, sector-specific pathways, the use of thresholds, technology road maps, and measures to prevent the entrenchment of carbon-intensive practices.

3.1 Science-Based Target Initiative (SBTi) Certification

As investors increasingly prioritize credible climate transition plans, the certification of science-based targets has gained significant recognition. Integrating certified science-based targets into the climate transition plan is likely to bolster credibility. For instance, the SBTi has progressively refined its criteria for certifying science-based targets, with a current focus on the Net-Zero Standard Criteria aimed at encouraging companies to adopt 1.5°C-aligned science-based emissions targets (SBTi 2023). SBTi is a partnership between the CDP, the United Nations Global Compact, World Resources Institute, and the World Wide Fund for Nature (WWF), aiming at promoting companies to adopt science-based targets for emissions reduction—namely, the emissions reduction targets aligned with the Paris Agreement goals. The SBTi sets the

requirements which must be met for companies' targets to be classified as SBTs. Over 6,300 companies globally have committed to setting such targets and submitting them to the SBTi for verification and endorsement. The time frame for these targets is divided into near-term SBTs (5–10 years) and long-term SBTs (net zero by 2050 or earlier) to guide companies towards a clear decarbonization pathway. Near-term targets encompass GHG emissions reduction objectives over a 5–10-year period, aligned with the 1.5°C pathways. These serve as milestones on the journey to achieving long-term science-based targets and encompass company-wide Scope 1 and Scope 2 emissions, with at least 95% coverage of all such emissions. Scope 3 emissions are to be included if they account for 40% or more of the total Scope 1, 2, and 3 emissions (see Table 3.1). Companies must establish 1.5°C-aligned Scope 1 and Scope 2 targets, to be accomplished within 5–10 years from the date of target submission to the SBTi, for validation. Achieving these near-term targets necessitates the implementation of actions that significantly reduce emissions by around 2030.

Table 3.1: SBTi's Near-Term and Long-Term Targets under the Net Zero Standards

	Types of Scopes	Temperature	Coverage	Target Setting Approaches
Near-Term Targets (5–10 Years)	Scope 1 and Scope 2	1.5°C alignment	At least 95% of Scope 1 and Scope 2 emissions	(1) Absolute construction approach: for all companies must reduce emissions at a minimum of 4.2% (for FLAG 3.03%) annually; (2) Sector-specific intensity convergence approach
	Scope 3	(a) No requirement for companies if Scope 3 is less than 40% of Scope 1, 2, 3 emissions (b) Well-below 2°C if Scope 3 is 40% or more of Scope 1, 2, 3 emissions	The coverage must be at least 67% in the case of (b)	(1) Absolute construction approach: for all companies must reduce emissions at a minimum of 4.2% (for FLAG 3.03%) annually; (2) Sector-specific intensity convergence approach: (3) Supplier or customer engagement (e.g. 80% of suppliers by emissions by 2025), etc.
Long-term Targets (2050 or sooner)	Scope 1 and Scope 2		At least 95% of Scope 1 and Scope 2 emissions	(1) Absolute contraction approach: 90% reduction for all companies (for FLAG 72%); (2) Sector-specific intensity convergence approach
	Scope 3		At least 90% of Scope 3 emissions	(1) Absolute contraction approach: 90% reduction for all companies (for FLAG 72%); (2) Sector-specific intensity convergence approach

Note: FLAG refers to forest, land, and agriculture.

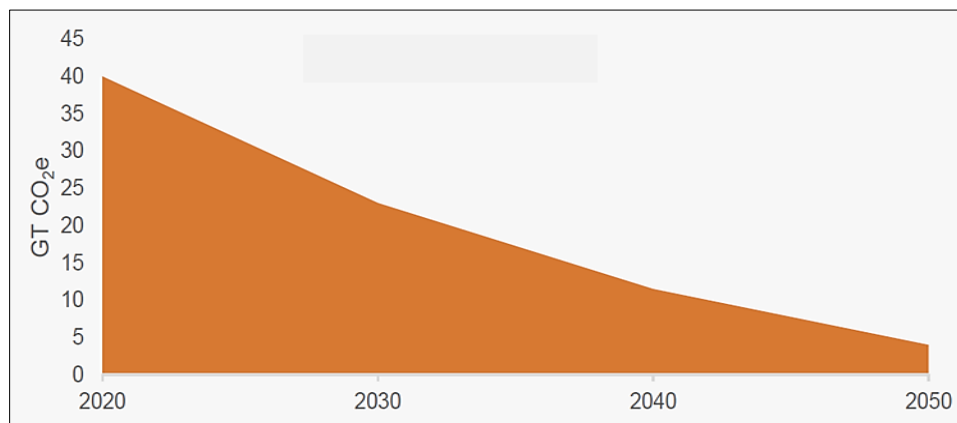
Source: Prepared by the author based on SBTi (2023).

Long-term targets encompass periods exceeding 10 years from the date of submission. They outline how companies must reduce emissions across their value chains to align with global or sector-level net-zero targets within eligible 1.5°C pathways by 2050 or sooner. All companies are required to include Scope 3 emissions from relevant categories in their long-term science-based targets, with at least 95% coverage for Scope 1 and 2 emissions and 90% for Scope 3 emissions. Offsets are not considered as emissions reduction measures, and companies must report them separately in their annual GHG inventories. Similarly, avoided emissions are not counted towards emissions reduction, and the SBTi mandates that companies exclude them from their GHG inventories. Long-term targets foster alignment across the entire economy and

facilitate long-term business planning in line with the emission reductions necessary to meet climate goals based on science.

With regards to establishing emissions targets, the SBTi offers two distinct approaches: the **cross-sector Absolute Contraction Approach (ACA)** and, for certain sectors, the **Sectoral Decarbonization Approach (SDA)**. In the aggregate, the SBTi's 1.5°C-aligned pathways adhere to the 500 GT carbon budget and achieve global net-zero CO₂ emissions by 2050, assuming a yearly removal of at least 1–4 gigatonnes (Gt) of CO₂ by 2050. The ACA, also known as the Absolute Reduction Approach, applies a consistent absolute emissions reduction rate across all sectors, aligning with global decarbonization trajectories. Consequently, all companies are tasked with reducing emissions at a fixed annual rate. This approach is adopted by many companies, particularly those without sector-specific guidance due to potential divergences in pathways. All companies, with the exception of those in forest and land use and agriculture (FLAG), power, and maritime transport which must adhere to sector-specific guidelines, are mandated to achieve a minimum annual reduction of 4.2%.

Figure 3.1: SBTi's Illustrative Cross-Sector Pathways Required for All Companies



Note: GT CO₂e refers to gigatons of carbon dioxide equivalent.

Source: SBTi (2023).

3.2 Developing Sectoral Decarbonization Approach (SDA)

3.2.1 SBTi's Sector-Specific Intensity Convergence Pathways

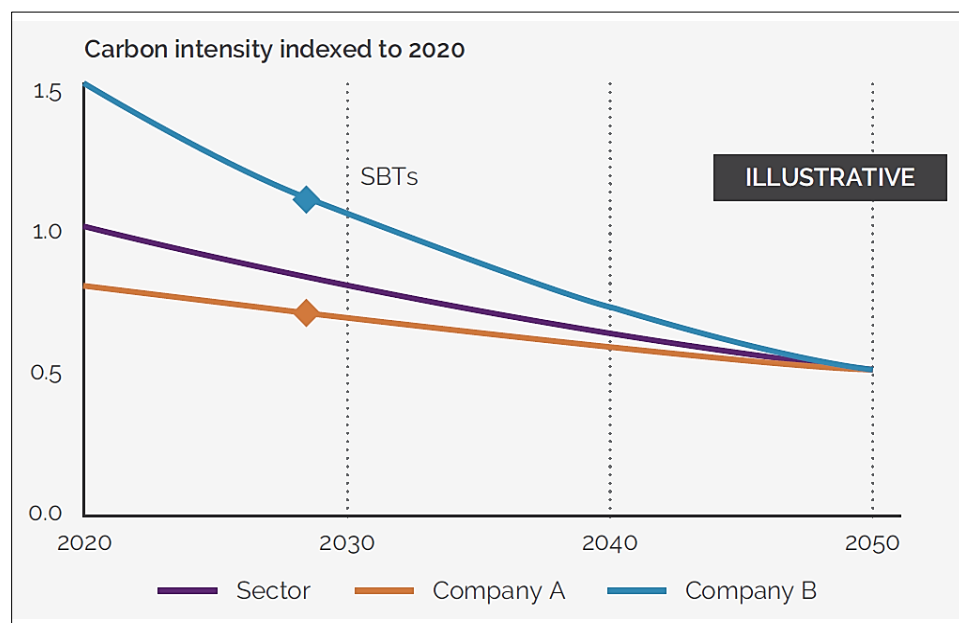
The SBTi also offers a second approach for establishing emissions targets, known as SDA. This approach is based on IEA's global sectoral scenarios that utilize both near- and long-term 1.5°C targets, specifically the net-zero by 2050 scenario (OECD 2022). Introducing sector pathways can be a crucial tool for enhancing credibility and transparency, especially in hard-to-decarbonize sectors where immediate or readily available net-zero solutions may not exist. Sector pathways can serve as a reference point for emissions reduction ambition and credibility.

The SBTi conducted an assessment on 1.5°C emissions scenarios for sectors by examining estimates of the remaining emissions budget, mitigation scenarios, and sector-specific studies to determine 1.5°C-aligned pathways at both the global and sectoral levels (SBTi 2022, 2023). Based on the carbon budget approach, the SBTi developed a cross-sector emissions corridor that encompasses CO₂, methane (CH₄),

and nitrous oxide (N₂O) emissions from carbon-intensive sectors, drawing from published studies and expert judgment.

Utilizing the convergence principle, annual emissions pathways are divided by projected industry activity to establish a carbon-intensity curve. The SDA posits that all companies within a specific sector will converge toward a common emissions intensity by 2050. In predominantly homogeneous sectors, a single 1.5°C pathway can be derived without disaggregating into subsectors. Consequently, the allocation to each sector depends partly on the available decarbonization strategies and their associated costs. Within each sector, companies can derive their emissions targets based on their relative contribution to the total sector activity and their carbon intensity compared to the sector's intensity in the base year (Figure 3.2). The SBTi's near-term targets for companies are established along their convergence trajectory, with the steepness of the curve determined by their relative intensity compared to the sector in the base year and the projected rate of company activity. Due to variations in pathways to net-zero across sectors, driven by factors such as technology development, costs, renewable energy availability, and policies, sector-based approaches are essential.

Figure 3.2: SBTi's Sectoral Illustrative Intensity Convergence Pathway



Source: SBTi (2022).

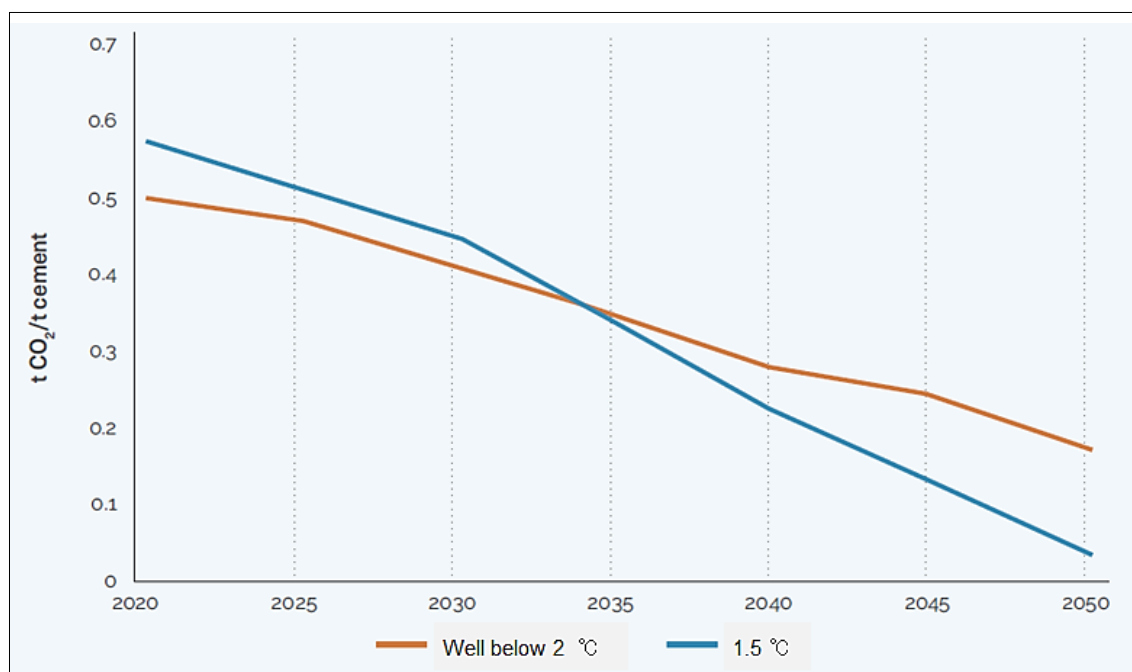
The SBTi offers specific requirements and guidance aligned with the 1.5°C pathway for emissions-intensive sectors—including aluminum; apparel and footwear; aviation; buildings; chemicals; cement; financial institutions; FLAG; information and communication technology (ICT); maritime; oil and gas power; steel; and transport. Requirements for many of these sectors are still under development. Among these sectors, the power generation, maritime transport, and FLAG sectors are required to use the sector-specific pathway to calculate their SBTs. In addition to these emissions-intensive sectors, other companies with Scope 3 emissions related to the activities of these sectors may use a combination of approaches to determine their emissions targets. For instance, a real estate developer may have substantial Scope 3 emissions associated with both the steel and cement sectors. In such cases, the developer can use a sector-specific pathway to establish intensity targets, provided that the pathway

considers both supply-side and demand-side mitigation aspects when setting targets that cover upstream Scope 3 emissions.

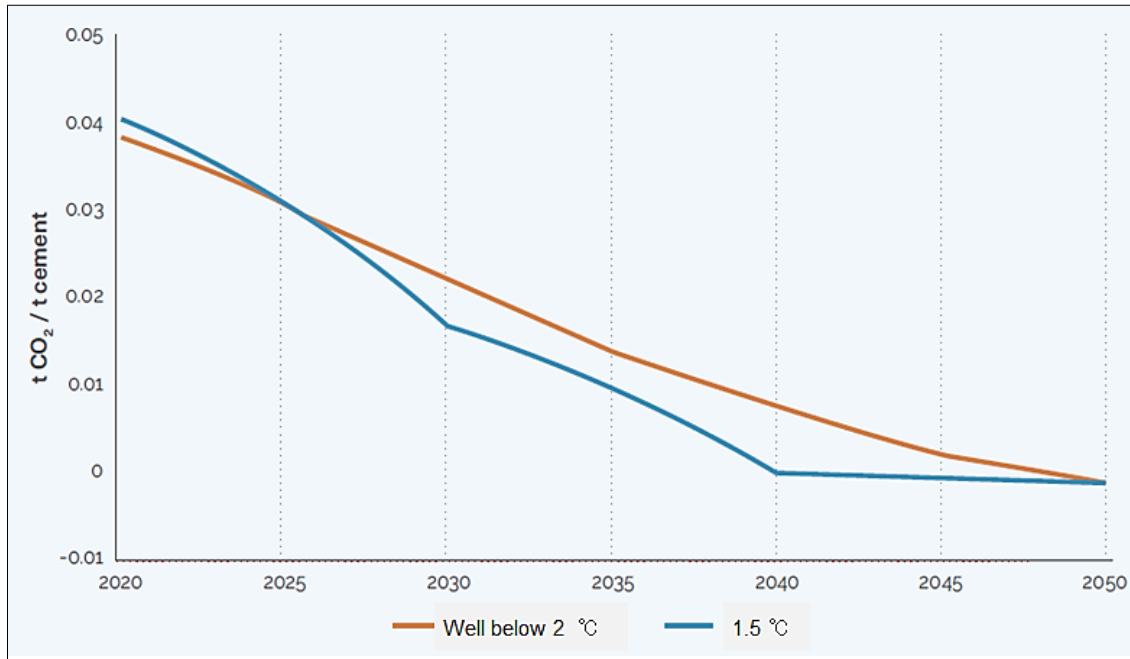
The cement sector, for example, is subject to additional requirements in addition to the fundamental criteria for the SBTi's near-term and long-term (net-zero) targets reported in Table 3.1. Notably, the near-term target for the cement sector must include a Scope 3 target that encompasses emissions from purchased cement and clinker (under Scope 3 Category 1, "purchased goods and services"), regardless of the share of these emissions relative to the total Scope 1, 2, and 3 emissions. The coverage of this target must extend to at least 95% of direct and electricity-related emissions from purchased cement and clinker. The target-setting method should follow the cement SDA, with an ambition level set at 1.5°C, and the denominator in the calculation is either purchased cement or clinker or the cross-sector absolute reduction method. This requirement has been introduced to ensure that the ambition level for bought clinker and cement matches that of the company's own production. It helps reduce the risk of "scope leakage," where a company that switches to buying more clinker or cement, rather than producing it, could see its Scope 1 emissions decrease without a corresponding increase in Scope 3 emissions covered by a target.

Figures 3.3 and 3.4 illustrate the SBTi's intensity convergence pathway based on Scope 1 and Scope 2 emissions for the cement sector, including both the new 1.5°C pathway and the previous well below 2°C pathways. The higher starting-year emissions intensity in the 1.5°C pathway is due to more recent data, but the steeper path indicates that the 1.5°C pathway results in greater emissions reduction for near- and long-term targets. Consequently, the 1.5°C pathway leads to lower residual emissions in 2050. The SBTi states that the chosen pathways align with the carbon budget for cement between 2020 and 2050 as of their development. If emissions fail to decrease in line with the pathway, a new, steeper path would be necessary to stay on track with the 1.5°C goal.

Figure 3.3: Scope 1 Intensity Pathways for the Global Cement Industry



Source: SBTi (2022).

Figure 3.4: Scope 2 Intensity Pathways for the Global Cement Industry

Source: SBTi (2022).

3.2.2 Transition Pathway Initiative (TPI) Sector-Specific Pathways

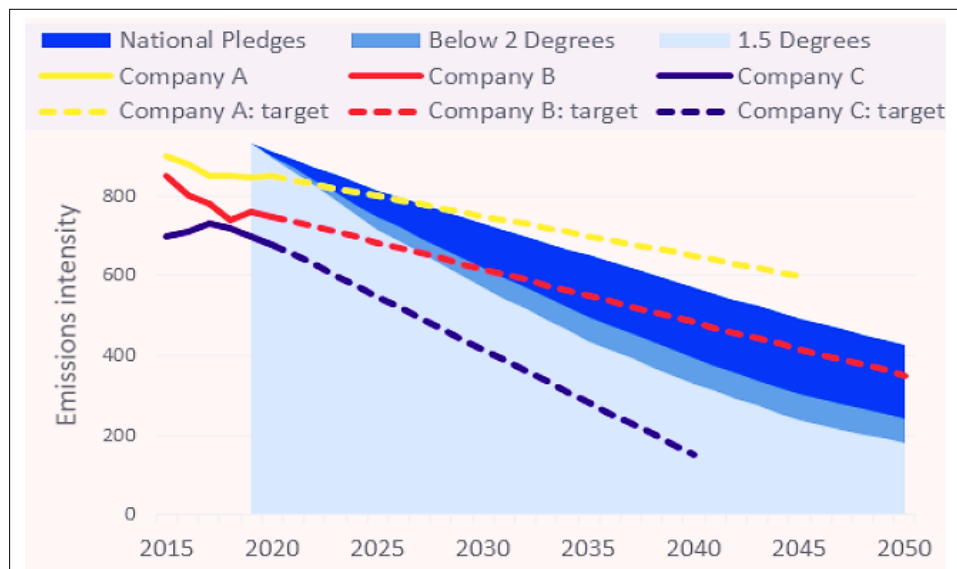
The TPI also offers a similar method using the SDA for emissions-intensive companies. The TPI is an initiative led by asset owners, provides an assessment tool for evaluating companies' readiness for a net-zero transition and offers benchmarks for corporate actions. Its primary goal is to assist companies in establishing and assessing climate transition plans that encourage the shift toward low-carbon pathways using sector-specific methodologies. The TPI's approach is referred to as the "Carbon Performance" assessment. This SDA translates GHG emissions targets committed to the United Nations Framework Convention on Climate Change (UNFCCC) into relevant benchmarks against which individual companies' performance can be measured, taking sectoral differences into account. The TPI focuses on ten emissions-intensive sectors, including electricity utilities, oil and gas production, aluminum, cement, diversified mining, paper, steel, airlines, shipping, and automobile manufacturing. These sectors face diverse challenges related to low-carbon transition, such as the concentration of emissions in the value chain and the cost of emission reduction.

In this approach, companies within each sector are compared against sector-specific benchmarks based on the performance of an average company aligned with international emissions targets (TPI 2021, 2022). The process involves three key steps: The first step is to establish a global carbon budget in line with international emissions targets under three scenarios (national pledge, below 2°C, and 1.5°C scenarios), using input from climate models (IEA, 2022b). The second step is to allocate the global carbon budget across different regions and industrial sectors over time using integrated economy-energy models. This allocation is determined by factors such as cost-effectiveness from economic and technical perspectives, subject to constraints like political and public preferences and capital availability. The third step is to measure sectoral emissions by emissions intensity (for example, using production or economic activity data) to enable comparisons among companies of different sizes and sectoral emissions. This results in a benchmark path for emissions intensity within each sector. Companies' recent and

current emissions intensity is then calculated, and their future emissions intensity is estimated based on the emissions targets they have set. These calculations establish emissions intensity paths for companies, which are compared with each other and with the relevant sectoral benchmark pathways.

For most emissions-intensive sectors, the TPI establishes three benchmarks based on the national pledges, below 2°C, and 1.5°C scenarios (Figure 3.5). However, some sectors have different benchmarks tailored to specific concepts and data. For instance, in the automobile manufacturing sector, different benchmarks are established to account for additional sources of uncertainty, such as shifting demand for various transport modes. These benchmarks include 2°C (High Efficiency), 2°C (Shift-Improve), and Paris Pledges, based on data provided by the International Council on Clean Transportation and the associated carbon budgets. The benchmarks may differ from those based on the IEA scenarios. In the case of airlines and shipping, the TPI uses an International Pledges benchmark instead of National Pledges because pledges in these sectors are primarily outlined by international bodies like the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO). For aluminum and paper, below 2°C, 2°C, and Paris Pledges benchmarks are established using the IEA's 2017 scenarios due to the limited sectoral coverage of its recent scenarios (IEA, 2017).

Figure 3.5: TPI's Illustrative Carbon Performance Assessment



Source: TPI (2021).

The TPI's Carbon Performance assessment categorizes 582 large companies in the ten emissions-intensive sectors into the following five scores: Green (1.5°C), Yellow (below 2°C), Orange (National Pledges), Red (Not Aligned), and Gray (Unsuitable Disclosure). The Green score is assigned to the 1.5°C category for the electricity, oil and gas, diversified mining, cement, steel, shipping, and aviation sectors; the below 2°C category for paper and aluminum sectors; and the 2°C (high efficiency) category for the automobile sector. The Yellow score is given to the below 2°C category for electricity, oil and gas, diversified mining, cement, steel, shipping, and aviation; the 2°C category for the paper and aluminum sectors; and the 2°C (shift-improve) category for the automobile sector. The Orange score corresponds to national pledges for the electricity, oil and gas, diversified mining, cement, steel, shipping, and aviation sectors;

the 2°C category for paper and aluminum; international pledges for the aviation and shipping sectors; and Paris Pledges for the automobile, paper, and aluminum sectors.

3.3 Using Environmental Common Performance Thresholds Proposed by the IEA

In response to concerns about greenwashing risk related to transition finance, the implementation of a common threshold or benchmark on emissions can help alleviate these issues, potentially attracting more investment. The IEA believes that defining emission level performance thresholds for low-emission products (referred to as “demand-push”) and establishing measurement protocols with definitions and standards are crucial to creating a unified direction for various technologies and sectors (known as “supply-push”). This is vital not only for stimulating demand for low-emission products and fuels but also for encouraging increased investment, innovation, and production in the supply sector. Having such thresholds is particularly essential for hard-to-decarbonize sectors to formulate effective policies (IEA, 2022a, 2022b, 2023a). IEA (2023a) emphasizes that these thresholds should remain stable, absolute, and sufficiently ambitious to align with the trajectory of achieving a net-zero emissions global energy system by 2050. Additionally, it is important to consider the unique characteristics of each sector, such as limited availability of certain inputs like scrap metal for recycling, as well as interim measures that significantly reduce emissions intensity but do not meet the desired high-performance thresholds.

At the request of the Germany G7 Presidency, the IEA conducted an examination of emissions thresholds for the steel and cement subsectors in 2022, as these are key components in the production of electric vehicles in the transport sector, heat pumps in the building sector, and solar and wind energy generation in the electricity sector. The focus of this investigation was to establish the emissions intensity level required to reduce emissions during the transition to a net-zero scenario. This is particularly important for measures aimed at creating robust markets for low-emission products (demand-pull) and guiding investment for deployment (supply-push). By adopting universally accepted definitions, both private and public sector stakeholders can commit to procuring low-emission steel and cement at a premium, thereby incentivizing industry to expand production. The IEA developed these common definitions for low-emission steel and cement production by incorporating input from various stakeholder groups. These common thresholds and definitions were subsequently proposed in the report “Achieving Net Zero Heavy Industry Sectors in G7 Members” (IEA, 2022a).

The thresholds or definitions for near-zero emissions must meet the criteria of stability, absoluteness, and ambition while aligning with the trajectory of a global energy system aiming to achieve net-zero emissions by 2050. The proposed common threshold for zero-emissions steel production stands at 400 kilograms CO₂-equivalent per ton (kg CO₂-eq/t) for crude steel and 50 kg CO₂-eq/t for the use of 100% scrap (IEA 2022a, 2022b). Consequently, the threshold ranges between 50 kg and 400 kg CO₂-eq/t, with the specific threshold depending on the degree of scrap utilization. The steel sector can be categorized into (primary) ore-based and (secondary) scrap-based steelmaking, involving significantly different processes and emissions. Although many of the products in these categories overlap, the production of various items may shift from using 0% to 100% scrap-based inputs. Since scrap-based production relies heavily on electricity, increasing the use of renewable energy sources plays a substantial role in decarbonization. Currently, the majority of steel production and emissions originate from ore-based steelmaking. Companies using this method are required to make costly transitions to shift away from coal-based processes. To ensure that ore-based

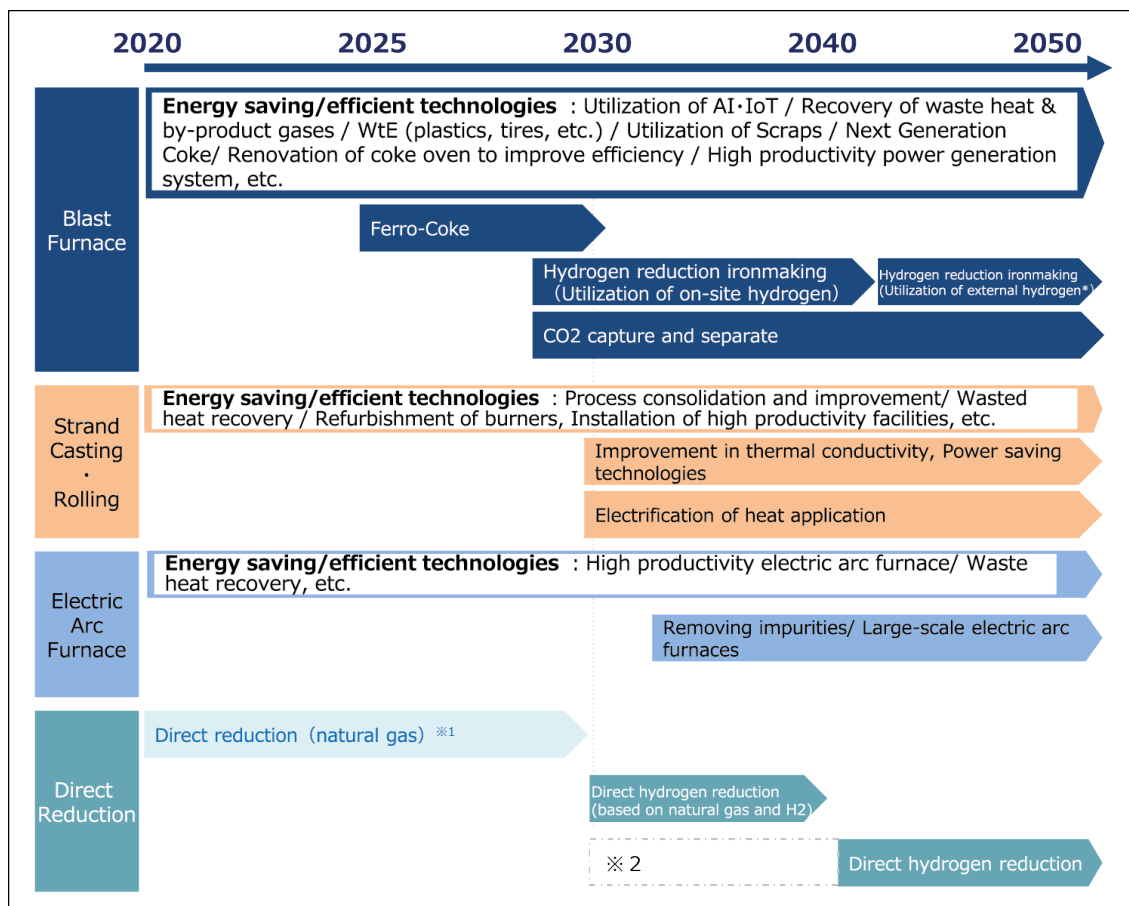
steelmaking aligns with a 1.5°C-consistent carbon budget, a faster decarbonization pace and higher thresholds are necessary compared to scrap-based steelmaking. The higher the proportion of scrap input in total metallic inputs, the lower the threshold becomes. Additionally, the IEA has set the threshold for zero-emissions cement production at 125 kg CO₂-eq/t for cement with 100% clinker usage and 40 kg CO₂-eq/t for full utilization of supplementary cementitious materials (SCMs). The threshold value for cement production varies from 40 to 125 kg CO₂-eq/t based on the clinker-to-cement ratio.

Various initiatives have developed different thresholds, some of which are far more challenging and stringent than the IEA thresholds. The IEA has raised concerns about the lack of consistency in these approaches, as the absence of coordination in common standards may lead to a proliferation of varying, stricter or more lenient standards and market fragmentation (IEA 2022c, 2023a). This inconsistency not only burdens companies administratively but also adversely affects their suppliers, customers, and investors. In response, the IEA has proposed the application of net-zero principles for emissions measurement methodologies in materials production when those initiatives revise existing methodologies—in order to promote convergence and interoperability in the medium term. Accounting rules for emissions credits and co-products should align with a net-zero emissions energy system.

The steel sector is currently exploring numerous technological options in its decarbonization efforts. This includes determining the optimal introduction of hydrogen into blast furnaces to reduce CO₂ emissions, researching the production of steel using only hydrogen without relying on blast furnaces, and exploring steel production through scrap recycling. Challenges also remain in producing high-quality steel from scrap due to the presence of impurities. Moreover, renewable and low-carbon hydrogen remains more expensive than hydrogen from unabated coal and gas fossil fuels. To increase green and low-carbon hydrogen, not only must renewable electricity cost and availability be improved, but also electrolyzer capital cost needs to be reduced over time (IEA 2023b). Therefore, efforts are needed to strike a balance across various technologies due to costly investment and research and development and technological uncertainties.

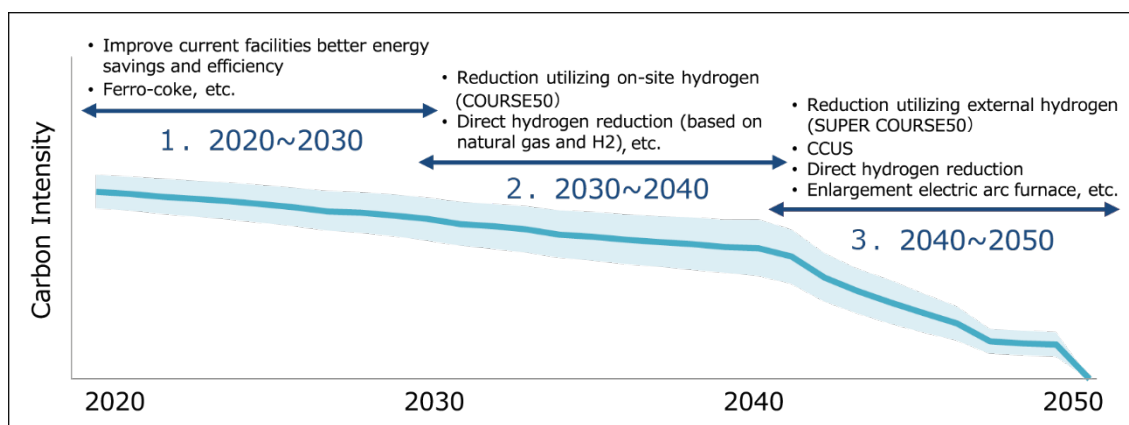
3.4 Industry Technology Road Maps for Transition Finance Developed by Japan

Under the guidance of the Ministry of Economy, Trade, and Industry (METI), the Japanese government has formulated pioneering Industry Technology Road Maps for transition finance, encompassing transition bonds and loans. This is a sector- and entity-based approach. These road maps delineate the transition and innovative technologies that are instrumental in achieving a net-zero trajectory by 2050 within eight emissions-intensive industrial sectors (cement, chemicals, iron and steel, power, gas, oil, pulp and paper, and automobiles), as well as international shipping, domestic marine transport, and aviation. The road maps provide insights into the technologies deemed essential in Japan to attain carbon neutrality in each emissions-intensive sector by 2050, along with approximate estimates of the expected commercialization timing until 2050. The government emphasizes that these road maps are founded on scientific principles, aligning them with the Paris Agreement and governmental policies. The feasibility of these road maps hinges on coordination with other sectors, such as the availability of decarbonized power sources, hydrogen supply, and CCUS for the hard-to-abate manufacturing sectors in Japan. Figure 3.6 illustrates the Technology Road Map for the iron and steel sector, while Figure 3.7 presents the assumed CO₂ reduction pathway for this sector.

Figure 3.6: Japan's Technology Road Map for the Iron and Steel Sector

Note: AI refers to artificial intelligence; IOT internet of things; and WtE waste to energy.

Source METI (2021).

Figure 3.7: Japan's CO₂ Reduction Pathway in the Iron and Steel Sector

Source METI (2021).

To mobilize finance for the aforementioned sectors, the Japanese government has been actively encouraging companies to issue transition bonds and loans by utilizing the Industry Technology Road Maps under the Basic Guidelines on Climate Transition Finance. These Basic Guidelines serve as a valuable reference for companies seeking

financial support through the issuance of transition bonds or loans. Transition finance refers to a financing means to promote long-term GHG emissions reduction initiatives that are taken by a company in emissions-intensive sectors considering tackling climate change for the achievement of a decarbonized society. The Guidelines are based on the *Climate Transition Finance Handbook*, as published by ICMA and reported in the preceding section. Specifically, the Guidelines revolve around four key elements related to disclosure: (1) the issuer's climate transition plan and governance; (2) the environmental materiality of the business model; (3) the alignment of the climate transition plan and targets with science-based criteria; and (4) the transparency in implementation. Consequently, Japan actively promotes the issuance of transition use-of-proceeds bonds and loans, certain sustainability-linked bonds and loans, and some green use-of-proceeds bonds that could be labeled as Transition if they adhere to the four specified transition elements. Prior to bond issuance, companies are required to secure certification from independent verifiers through second opinions, confirming their alignment with the Basic Guidelines

One of the notable advantages of these Industry Technology Road Maps is that companies operating within hard-to-abate sectors, where cost-effective emissions reduction technologies are not readily available, can use the information to prepare for their transition plans. These road maps offer valuable guidance on the potential timing for the adoption of specific technologies, which companies can incorporate into their climate transition plans. Moreover, these road maps take into account Japan's unique conditions and have the potential for broader applicability, particularly in other countries in Asia with significant dependence on fossil fuels. To facilitate their global adoption, meanwhile, a few supplementary elements could be beneficial. First, it may be desirable to refine or add additional information to the road maps by explicitly explaining how their assessment of innovative technological development for low emissions will be aligned with established carbon budget and associated sectoral decarbonization approaches, as well as common thresholds developed by IEA for the steel and cement sectors. Second, introducing minimum quantitative thresholds for emissions performance could be considered for each sector to enhance the road maps' credibility. Third, actively incorporating some of ICMA's recommendations outlined in the revised 2023 Handbook as requirements by updating the Basic Guidelines could be an effective strategy. A consideration of introducing some mandatory disclosure requirements aligned with some basic requirements reported in ISSB's IFRS 2 in the Basic Guidelines could also be investigated. These comprehensive efforts have the potential to significantly expand transition finance on a global scale by garnering increased support from international investors.

In pursuit of the national target to reduce emissions by 46% by 2030 compared to the 2013 level and to achieve net-zero emissions by 2050, the Japanese government plans to issue Green Transformation (GX) Economy Transition Bonds, totaling around ¥20 trillion, starting in 2023 over a 10-year period. This initiative aims to mobilize more than ¥150 trillion in total through public-private partnerships. Of this combined sum of ¥150 trillion, approximately ¥70 trillion is expected to be allocated to the energy supply side, encompassing areas such as (1) renewable energy, next-generation nuclear, hydrogen and ammonia (about ¥60 trillion in total), and (2) carbon capture and storage (CCS), carbon and resource recycling, and bio manufacturing (about ¥10 trillion in total). The remaining ¥80 trillion will be directed towards the energy demand side, including electrified vehicles and batteries, basic materials such as steel, cement, chemicals, and paper and pulp, zero-emission ships, buildings, and digital investments that promote decarbonization. The GX Economy Transition Bonds will be issued for approximately ¥1.6 trillion in the 2023 fiscal year (February 2024), following the acquisition of a second-party opinion about the consistency with the Basic Guidelines from nominated verifiers.

The selection of specific projects will be guided by principles that prioritize (a) investment activities that may be challenging to undertake solely with private-sector involvement and that concurrently enhance industrial competitiveness, economic growth, and emissions reduction; (b) sectors with substantial emission levels; (c) the utilization of sector-specific investment strategies designed to identify investment requirements for the next decade and to be prepared by the end of 2023; (d) analysis based on marginal emissions reduction costs and effects, as well as economic effects assessed through investment return analysis, taking into account market trends; and (e) the expertise of specialists in determining precise investment details at GX implementation meetings.

With regards to the government approach to promote credible transition finance, the CBI issued a report in October 2023 to provide a series of recommendations to the government (CBI 2023d). While endorsing the Industry Technology Road Maps and the GX plan, the CBI emphasized the necessity for the government to bolster the credibility of the Transition label, specifically by ensuring alignment with science-based 1.5°C scenarios. To achieve this alignment, the report recommended prioritizing established and proven technologies to drive decarbonization, such as energy efficiency, grid flexibility, demand management, and renewable energy. Additionally, it proposed setting a phaseout year for unabated coal, with a focus on all developed countries completely decarbonizing their power sectors by 2030 to achieve net-zero emissions. Other recommendations included reinforcing requirements for promoting low-carbon hydrogen and ammonia, introducing a mandatory emissions trading system (ETS) with a robust carbon price, mandating comprehensive disclosure of science-based transition plans by companies, and aligning the Climate Transition Finance Guidelines with science-based 1.5°C pathways. Furthermore, the report recommended aligning GX Economy Transition Bonds with the 1.5°C pathways to enhance their credibility.

3.5 Preventing Carbon-Intensive Lock-In and Stranded Assets

Given the widespread understanding that an increase in unabated fossil fuel energy and other infrastructure will result in the entrenchment of GHG emissions, every country is expected to prioritize abatement strategies that significantly reduce GHG emissions throughout the life cycle, utilizing technologies for both existing and new installations. The IPCC, for instance, has highlighted the potential for capturing 90% or more of emissions from power plants and achieving reductions of 50%–80% in fugitive methane emissions from energy supply (IPCC 2018). The OECD emphasizes that the deployment of emissions abatement technologies across existing infrastructure is essential in transition finance approaches aimed at averting carbon-intensive lock-in scenarios and the subsequent creation of stranded assets.

To prevent lock-in scenarios, three key approaches are under consideration (OECD 2022). The first approach involves requiring that newly constructed or retrofitted assets and infrastructure are equipped for the future utilization of near-zero and net-zero technologies. As an example, the EU taxonomy has integrated gas within its transition activities by establishing specific thresholds and conditions that promote low-carbon gases with a lifetime emissions limit, as pointed out in Section 4.

The second approach centers on promoting the transition of emissions-intensive assets and infrastructure to near-zero or net-zero technologies. Such technologies might include using ammonia and hydrogen co-firing in thermal power plants or developing extensive green hydrogen supply chain networks designed to facilitate emissions reduction from thermal power plants and support the future shift away from coal. However, it is important to acknowledge that substantial research and

development efforts are required, and there are no guarantees that new technologies will be commercially adopted, potentially resulting in significant emissions reductions (OECD 2022).

The third approach involves the introduction of sunset clauses and a gradual tightening of stringent criteria. This approach is incorporated in the EU Taxonomy, Singapore's Taxonomy, and the ASEAN Taxonomy, where an activity is categorized as a transition activity until a specific date, after which it must meet a more stringent set of criteria. In particular, Singapore's Taxonomy and ASEAN Taxonomy, as explained in Section 4, applies the sunset clause or sunset requirement so that transition activities covered in an Amber classification may be closed by a specific period either through being upgraded to a Green classification or downgraded to a Red classification. However, a challenge associated with this approach is the potential for promoting lock-in scenarios, as certain facility or infrastructure assets may be constructed before the sunset date, risking the enabling of these assets to continue operations unless they are stranded. Moreover, countries need to have a strong determination to close emissions-intensive facilities much earlier than the average operating period and replace them with clean energy. Therefore, setting appropriate sunset dates and criteria based on scientific evidence aligned with the goals of the Paris Agreement is of paramount importance with a strong national commitment and financial support to promote such early phaseout processes. Singapore's Taxonomy and ASEAN Taxonomy incorporate the early coal phaseout approach while GFANZ also proposed such a managed phaseout of emissions-intensive assets in its recent consultation paper.

3.6 Challenges Related to Sector-Based Approaches and Conclusions of Section 3

Regardless of whether companies belong to hard-to-abate sectors or other sectors, it is crucial for them to align with internationally-accepted climate disclosure frameworks such as ISSB's IFRS S2 to begin with. The ISSB Climate-Related Standards have recommended disclosing a range of information, including long-term net-zero targets, short- and medium-term science-based targets, absolute amounts of Scope 1, Scope 2, and Scope 3 emissions data, and progress relative to these targets. Additionally, companies are required to disclose their use of carbon credits to achieve net reduction targets. Given that many countries have officially endorsed the establishment of the ISSB and its disclosure frameworks, it is expected that financial regulators will progressively mandate such disclosures for large companies.

Furthermore, hard-to-abate sectors may need to enhance the credibility of their action plans by adopting existing approaches based on the carbon budget concept. For instance, certification by the SBTi can significantly bolster the credibility of a company's emissions targets, leading to increased investor confidence. In particular, the SBTi employs the SDA for certain sectors, facilitating comparisons across companies within the same sector. However, it is important to note that the SDA does not account for regional or country-specific conditions. While there are various initiatives available, such as those provided by the SBTi and the TPI, they differ in terms of alignment with the 1.5°C pathway. While the sectoral decarbonization approaches with the pathways aligned with the Paris Agreement goals have been developed by the SBTi, the TPI, and many other entities, one challenge is the lack of a standard agreed emissions reduction pathway. While these initiatives and efforts are welcome, the OECD points out that a broad sectoral scope and emissions coverage for economy-wide sectoral pathways is still lacking (OECD 2022).

Meanwhile, the IEA has examined common thresholds applicable to steel and cement sectors, which could be used by companies in those industries to create credible transition plans. Common thresholds may be beneficial because there are several thresholds developed by various initiatives, and the lack of coordination has resulted in divergent approaches. This divergence could not only burden companies but also affect their suppliers, customers, and investors. However, since sectors are actively exploring various technological possibilities in their transition to decarbonization, common thresholds might not always be suitable. Further discussions may be needed, involving various regions and companies.

Japan's sector-specific technology road maps, as applied to emissions-intensive sectors, are innovative in considering Japan's specific conditions. These road maps offer approximate timelines for the availability of decarbonization or low-carbonization technologies at a reasonable cost for companies to utilize in developing credible transition plans. To promote their adoption in other countries, adding a few additional elements could be beneficial—for example, describing the road maps' association with the carbon budget concept and associated sectoral decarbonization approaches developed by the SBTi and the TPI using the IEA's research analysis, or alternatively referencing the environmental performance common thresholds proposed by the IEA. Moreover, introducing quantitative thresholds for each specific sector may help enhance the credibility of these technology road maps and attract more global investors.

4. TAXONOMIES FOR TRANSITION ACTIVITIES IN HARD-TO-ABATE SECTORS

Since the EU developed the Taxonomy, which is a classification system to determine whether economic activities can be considered environmentally sustainable, an increasing number of countries and regions have initiated the development of their own taxonomies. Those taxonomies often refer to the EU Taxonomy as reference and incorporate country- or region-specific elements. Taxonomies are gaining recognition among investors as a crucial tool for mobilizing climate finance and combating greenwashing practices. In recent years, taxonomies have been extending to certain transition activities aimed at advancing transition finance in various regions and countries. The EU Taxonomy included natural gas and nuclear energy as transition activities in 2022. In addition, EU recently published recommendations to clarify its views on transition finance. Furthermore, the taxonomies developed by Singapore as well as the ASEAN as a group place significant emphasis on a broader range of transition activities than the EU. This section examines these taxonomies with a focus on transition activities.

4.1 EU's Taxonomy and Transition Finance

The EU has committed to achieving net-zero GHG emissions by 2050 and reducing emissions by 55% by 2030 compared to 1990 levels. In an effort to enhance transparency and address concerns about greenwashing risk among investors, the EU Taxonomy has been developed under the EU Taxonomy Regulation that came into effect in July 2020. The EU Taxonomy provides a green list for economic activities that align with six Environmental Objectives—including climate change mitigation; climate change adaptation; sustainable use and protection of water and marine resources; transition to a circular economy; pollution prevention and control; and protection and restoration of biodiversity and ecosystems. The EU Taxonomy is widely utilized within the EU and its

member states, particularly concerning financial products and corporate bonds issued by companies. It is integrated into the regulatory disclosure framework applicable to companies and financial participants.

4.1.1 Basic Structure of EU Taxonomy and Related Disclosure Requirement

To qualify as environmentally sustainable under the EU Taxonomy Regulation, economic activities must satisfy the following four key conditions:

- a) Activities should make a significant contribution to at least one of the six Environmental Objectives mentioned earlier,
- b) They must adhere to the **Do No Significant Harm (DNSH)** criteria, ensuring they do not cause significant harm to any of the other five Environmental Objectives.
- c) Compliance with minimal social and governance safeguards is required, aligning with international standards, such as the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights.
- d) Economic activities must meet the relevant science-based Technical Screening Criteria outlined in Delegated Acts and Complementary Delegated Acts.

The Climate Delegated Act, which provides detailed measures specified in the EU Taxonomy, was published in the Official Journal of the EU in 2021. The Act offers the Technical Screening Criteria for economic activities that substantially contribute to two Environmental Objectives: climate change mitigation and adaptation. It also ensures compliance with the DNSH criteria. The aim of the Climate Delegated Act is to expedite the transition from emissions-intensive energy sources, such as coal, to renewable energy and low-carbon gases (as mentioned below under transition activities). The Environmental Delegated Act, which pertains to the remaining four Environmental Objectives (sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and protection and restoration of biodiversity and ecosystems), was released by the European Commission in June 2023.

Economic activities that meet these Technical Screening Criteria are designated as environmentally sustainable, commonly referred to as **Taxonomy-aligned activities**. The EU emphasizes that economic activities not included in the EU Taxonomy are not necessarily environmentally harmful or unsustainable. This is because some of these activities have not yet been considered, or their environmental impact is considered negligible. The Technical Screening Criteria for activities can be updated as new scientific evidence becomes available, technological advancements occur, and climate and environmental policies evolve further. The EU's Technical Screening Criteria are used in part of Singapore's Taxonomy proposal and the Plus Standard of the ASEAN Taxonomy.

The EU's Sustainable Finance Framework is comprised of three important regulations: the EU Taxonomy, the Sustainable Finance Disclosure Regulation (SFDR), and the Corporate Sustainability Reporting Directive (CSRD). The Taxonomy's classification system for sustainable activities is integrated into both the SFDR and the CSRD. The SFDR requires financial market participants to disclose information about how their financial products are aligned with the EU Taxonomy. The CSRD requires companies to disclose information in line with the EU Taxonomy and replaced the previous NonFinancial Reporting Directive, by significantly expanding its coverage from

approximately 11,700 companies to 50,000 companies including small and medium-size companies and broadening the scope of disclosure requirements. The CSRD and SFDR are complementary regulations since both aim at enhancing transparency and accountability in climate and sustainability areas.

The SFDR mandates that financial market participants and financial advisors operating within the EU or intending to provide financial products and services to EU investors disclose information related to ESG financial products at both the entity and product levels. According to the SFDR, investment funds must be classified into three types based on their orientations regarding environmental objectives:

- a) Gray Funds, which neither prioritize nor promote environmental or social characteristics (as specified under Article 6).
- b) Light Green Funds (environmental and/or social characteristics), which promote environmental and social characteristics but may not have sustainability as their primary goal (as specified under Article 8).
- c) Dark Green Funds (environmental and/or social objectives), whose primary investment objective is sustainable investment (as specified under Article 9).

Since the SFDR was adopted in 2019, SFDR Level 1 has been in effect since March 2021. Fund and asset managers need to categorize their EU-domiciled sustainable funds into Articles 8 and 9. Subsequently, Level 2 came into force in January 2023, requiring fund and asset managers to justify their fund categorizations using a series of environmental and social principal adverse impact (PAI) disclosures. In addition, these managers are required to disclose whether and to what extent their funds or investments using Article 8- or 9-labeled products are aligned with the Technical Screening Criteria of the EU Taxonomy. The managers need to obtain information from companies about their sustainable activities to fulfill their SFDR disclosure requirement. Since large companies begin to disclose information from 2024 under the CSRD, it will take some time to improve their disclosure and thus improve the quality of SFDR-related information. The SFDR has required many fund managers to commit to net zero on their financed emissions by 2050 and thus begin to promote offering more climate funds. According to Morningstar (2023), the market shares of Article 8 funds and Article 9 funds accounted for about 50% (\$213 billion) and about 35% (\$157 billion), respectively, as of June 2023.

Under the CSRD, on the other hand, companies within the EU are mandated to disclose ESG-related information, encompassing their entire value chain, in a standardized manner. The accompanying European Sustainability Reporting Standards (ESRS) offer detailed performance indicators related to sales, capital spending, operational spending, and more. The coverage of the CSRD is much broader than that of ISSB's IFRS S1 and IFRS S2 due to disclosure requirements on various ESG data. While the ISSB essentially focuses on **single materiality** (i.e., the impact of climate change on a company's financial performance), moreover, the CSRD covers **double materiality** (i.e., the impact of climate change on a company's financial performance and the impact of their operations on environmental and social factors). Independent verification as well as digital disclosure are also required regarding ESG data. Companies subject to the CSRD are required to report the extent to which their activities align with the EU Taxonomy (referred to as **Taxonomy-eligibility**) and comply with the criteria outlined in the Taxonomy Delegated Acts (known as **Taxonomy-alignment**) in their annual reports. Nonfinancial and financial companies are also obliged to report Taxonomy-eligibility and Taxonomy-alignment under the Taxonomy Regulation. Beginning in January 2024, both nonfinancial and financial entities are required to report both Taxonomy-eligibility and Taxonomy-alignment for the previous calendar year. The full implementation of

disclosure under the CSRD commences in a phased manner, starting in January 2024. Companies not subject to the CSRD have the option to voluntarily disclose this information (European Commission 2023a).

4.1.2 EU's Transition Activities Included in EU Taxonomy

In addition to the environmentally sustainable activities, the EU Taxonomy has introduced two additional categories of environmentally sustainable activities that significantly contribute to the EU's climate and environmental objectives. The first category relates to **enabling activities**, defined as activities that (i) facilitate other activities in making substantial contributions to one or more of the six Environmental Objectives; (ii) do not result in the long-term lock-in of assets that undermine environmental goals, considering the economic lifespan of those assets; and (iii) exhibit substantial positive environmental impacts based on life-cycle considerations. For instance, the installation of energy-efficient windows qualifies as an enabling activity, as it enhances the energy efficiency of existing buildings. However, activities involving power generation from fossil fuels are not eligible.

The second category pertains to **transition activities**, which are activities for which no technologically and economically feasible low-carbon alternatives currently exist but which support the transition towards achieving net-zero emissions. Transition activities primarily contribute to the Environmental Objective of climate change mitigation and are placed as a subtype of activities that substantially support this objective. The EU classifies certain economic activities as environmentally sustainable transition activities under the EU Taxonomy provided that they meet the following conditions:

- Activities' GHG emission levels correspond to the best performance in the sector or industry.
- Activities must not hamper the development and deployment of low-carbon alternatives.
- Activities must not lead to a lock-in in carbon-intensive assets considering the economic lifetime of those assets.
- The Technical Screening Criteria for these activities will need to ensure that these transition activities have a credible net-zero pathway. The Technical Screening Criteria should be adjusted at regular intervals.

After extensive discussions among EU member countries, the EU has made the decision to incorporate nuclear and natural gas energy as environmentally sustainable activities in specific and restricted circumstances, subject to stringent conditions outlined in the EU Taxonomy. Detailed requirements related to nuclear and gas energy are specified in the Complementary Delegated Act published in 2022 (European Commission 2023a). Both nuclear and natural gas energy are expected to contribute to the transition towards climate neutrality, aligning with the European Green Deal's objectives.

For nuclear energy, it is essential to meet strict safety and environmental standards, including waste disposal considerations, under the DNSH criteria. Even though nuclear power is low carbon, the Technical Screening Criteria for nuclear energy mandates that operational disposal facilities for low-level waste must be in place, and EU member countries should have a comprehensive plan for a high-level radioactive waste disposal facility, with operations commencing by 2050. Some EU member countries are actively engaged in advanced projects for the long-term disposal of nuclear waste. The inclusion of nuclear energy in the EU Taxonomy partly reflects an expectation that the

development of solutions for final waste disposal could be accelerated within the EU. The Technical Screening Criteria also explicitly prohibits the export of radioactive waste for disposal in third countries.

In the case of natural gas energy, facilities are required to make a full transition to renewable or low-carbon gases by the end of 2035, contributing to the shift from coal to renewables. Unlike nuclear power, natural gas emits CO₂ when converted into electricity or heat. To deliver environmental benefits, the Technical Screening Criteria clarifies that any new gas-based power or heat plant must either remain below the technology-neutral threshold of 100 grams (g) CO₂ equivalent (e) per kilowatt-hour (kWh) (100g CO₂e/kWh) in life-cycle emissions (e.g., by utilizing CCS technologies) or satisfy a series of stringent conditions and secure a construction permit by 2030. Natural gas is intended to replace facilities running on more polluting solid and liquid fossil fuels like coal. Concerning combined heat and power generation, as well as heating and cooling activities, the Technical Screening Criteria stipulate that for every new natural gas-fired plant built, an equivalent coal-fired plant must be retired. Essentially, natural gas is recognized as a transitional fuel in the decarbonization process. According to the European Commission's modeling for Paris-aligned pathways, natural gas is projected to account for 22% of gross inland energy consumption in 2030, reducing to 9% in 2050. Any natural gas usage in 2050 will be subject to emissions reduction measures.

The EU emphasized that the incorporation of these two conventional energy activities is a relatively minor, albeit essential, aspect of the comprehensive EU Taxonomy (European Commission 2022). With the EU's primary emphasis being on renewable energies, environmentally responsible investors and green financial products will continue to maintain their emphasis on renewables. It is worth noting that the Technical Screening Criteria for transition activities will undergo a mandatory review every three years to accommodate emerging technologies and evolving scientific evidence.

4.1.3 European Commission's Recommendations on Transition Finance

With the growing importance of transition finance, the European Commission released recommendations on transition finance for the transition to a sustainable economy in June 2023 (European Commission 2023b). Although the EU's legal framework does not provide a specific definition of transition finance, these recommendations were issued to clarify its views on the concept. The European Commission defines transition finance as *financing private investments aimed at reducing current high GHG emissions or generating other environmentally positive impacts, as well as facilitating the transition to a climate-neutral and sustainable economy in alignment with the EU's climate and environmental goals*. Transition finance should be compatible with and contributing to the transition that avoids lock-ins. Transition finance encompasses two key components: (1) *investments in environmentally friendly production methods* and (2) *efforts to minimize emissions where green technologies are not yet available*.

All these recommendations, along with the use of transition finance by the private sector, are intended to be adopted on a voluntary basis. To facilitate transition finance, it is recommended that companies establish transition targets, including short-, medium-, and long-term objectives and initiatives that align with the transition towards a climate-neutral and sustainable economy. To achieve these targets and ensure transparent, credible execution, companies could disclose the resources that have been allocated and the resources that are needed at company level and activity level. Furthermore, it is advised that companies publish a climate transition plan to minimize the strategic and financial risks associated with the transition, identify potential business opportunities, and

offer clarity on their business strategies to attract new investors and business partners. Companies are also encouraged to *adopt publicly available cross-sectoral or sector-specific decarbonization scenarios and science-based pathways consistent with the Paris Agreement, such as the 1.5°C scenarios presented by the IEA or IPCC with minimal or no overshoot*. Science-based transition targets can also be promoted.

The EU Taxonomy serves not only as a means to disclose Taxonomy-aligned activities and capital spending but can also function as a forward-looking tool for a company's transition process, using the taxonomy's criteria as reference points for setting targets. The European Commission emphasized that the taxonomy is increasingly adopted by companies for the purpose of transition finance, particularly in emissions-intensive sectors. It is noted that *investments aimed at achieving Taxonomy alignment within 5 years (10 years under certain circumstances) are recognized as capital spending fully in line with the EU Taxonomy when accompanied by a capital spending plan*. Investments in the transitional activities covered under the EU Taxonomy, as mentioned earlier, represent *investments in the best available technologies and are deemed Taxonomy-aligned, as long as they do not result in long-term emissions-intensive lock-ins or hinder the development of greener technologies*. These are economic activities where no alternative technology is currently available, but their performance is on the path to future climate neutrality.

With regard to financing instruments used to facilitate transition finance, the EU's recommendations refer to sustainability-linked bonds and loans, green bonds and loans, as well as other sustainability bonds or loans for specific purposes (European Commission 2023b). Namely, it is also suggested that companies can *issue use-of-proceeds green bonds for transition purposes using the European Green Bond Standard*. *These financial instruments promote financing economic activities that are expected to become Taxonomy-aligned within 5 years (with an exception of 10 years)*. Additionally, companies can issue sustainability-linked bonds to raise capital for enhancing their sustainability performance, either at a company level or an activity level. *The sustainability-linked bonds can be tied to well-defined sustainability performance targets, such as Taxonomy key performance indicators, and a time frame aligned with the transition*. Furthermore, companies have the option to issue equity instruments or specialized lending solutions linked to sustainability performance targets at a company, project, or economic activity level. In essence, the EU does not introduce specific transition-labeled bonds and loans, although the issuance of sustainability-linked bonds is encouraged for both green and transition activities.

4.2 Singapore's Taxonomy Proposal and Traffic-Light Classification System

The Green Finance Industry Taskforce (GFIT), convened by the Monetary Authority of Singapore (MAS), worked intensively on developing Singapore's Taxonomy proposal from 2021 to 2023. This taxonomy is intended for use by financial institutions in Singapore to categorize activities as either "green" or in "transition." The GFIT comprised a diverse group of members, including financial institutions, companies, nongovernmental organizations, and financial industry associations. The taxonomy was drafted based on activities within Singapore that have made substantial contributions to the creation of the ASEAN Taxonomy. Singapore's Taxonomy encompasses five Environmental Objectives: climate change mitigation; climate change adaptation; protection of healthy ecosystems and biodiversity; promotion of resource resilience and circular economy; and pollution prevention and control. The GFIT Taskforce released a series of consultation papers: the first in 2021; the second in 2022; the third in February 2023; and the fourth and final paper in June 2023. Following the review of these papers and consultations, MAS has released the Singapore-Asia Taxonomy for Sustainable Finance: 2023 Edition in December 2023 (MAS 2023).

4.2.1 Structures and Features of Singapore's Taxonomy

Singapore's Taxonomy is primarily focused on eight sectors, which collectively contribute to approximately 90% of the ASEAN's GHG emissions. These sectors include agriculture and forestry/land use; real estate; transportation; energy; industry; information and communications technology; waste and circular economy; and carbon capture and sequestration. With reference to the EU Taxonomy, Singapore's Taxonomy incorporates the DNSH criteria, stipulating that, to be eligible for Taxonomy categories, activities making a substantial contribution to one Environmental Objective must not result in significant adverse impacts on the other four Environmental Objectives. For instance, the construction of a hydropower generation facility may meet the thresholds and criteria for a Green category with regards to climate change mitigation (the first Environmental Objective). However, it must also ensure that it does not generate significant adverse impacts on the environmental ecosystem (the third Environmental Objective) in its vicinity. To achieve this, for example, the owner of the hydropower generation facility needs to demonstrate the practical measures that will be implemented to mitigate any adverse impact.

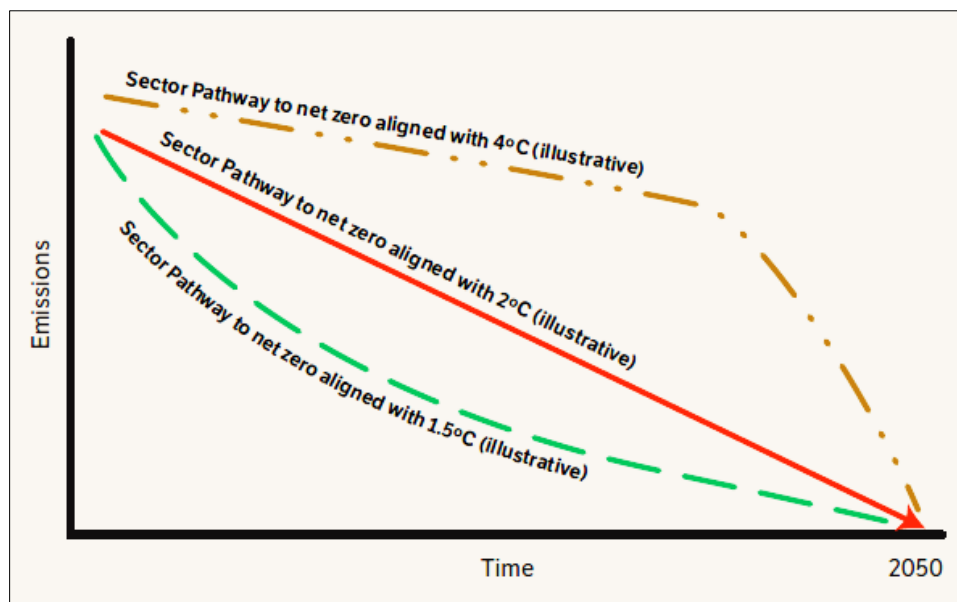
One of the unique features of Singapore's Taxonomy exhibits is its employment of a traffic-light system for classifying economic activities as **Green**, **Amber**, or **Ineligible** (Red was used in the GFIT papers). This classification is determined by their contribution to at least one of the Taxonomy's five Environmental Objectives, while concurrently avoiding any substantial harm to the other four:

- Green category designates activities that make substantial contributions to climate change mitigation, either by operating at net zero emissions, or are on a 1.5°C-aligned pathway (Figure 4.1). Namely, this classification encompasses both activities are already near zero and those that are not near zero but are aligned with the 1.5°C pathway. The pathway and associated thresholds are based on climate science and are consistent with the approach used in EU Taxonomy.

- Amber category relates to transition, encompassing activities that are not on the 1.5°C pathway currently, but either in the process of transitioning to Green within a defined time frame or facilitating significant emissions reductions in the short term with a prescribed **sunset date** (generally, 2030).
- Ineligible activities category pertains to activities that are incompatible with a net-zero trajectory.

Green category is defined based on a science-based 1.5°C pathway to net zero following the carbon budget allowed for a specific sector to reach 1.5°C. Singapore's Taxonomy stresses that 1.5°C-aligned pathway is not the same as a pathway to net zero by 2050 since focusing merely on 2050 as the end goal misses the steepness of the curve. Figure 4.1 illustrates three types of 2050 transition pathways aligned with a net-zero 2050 end point: each aligned with 4°C, 2°C, and 1.5°C pathway. Green criteria is consistent with 1.5°C pathway. In general, any new activities (such as new power plant, new building) have to meet the Green criteria. This reflects the need for transformational changes for all new infrastructure to meet a 1.5°C pathway, as well as the requirement to prevent the lock in of emissions-intensive carbon activities, assets and infrastructure long into the future.

Figure 4.1: Illustrative 2050 Pathways Aligned with a Range of Temperatures

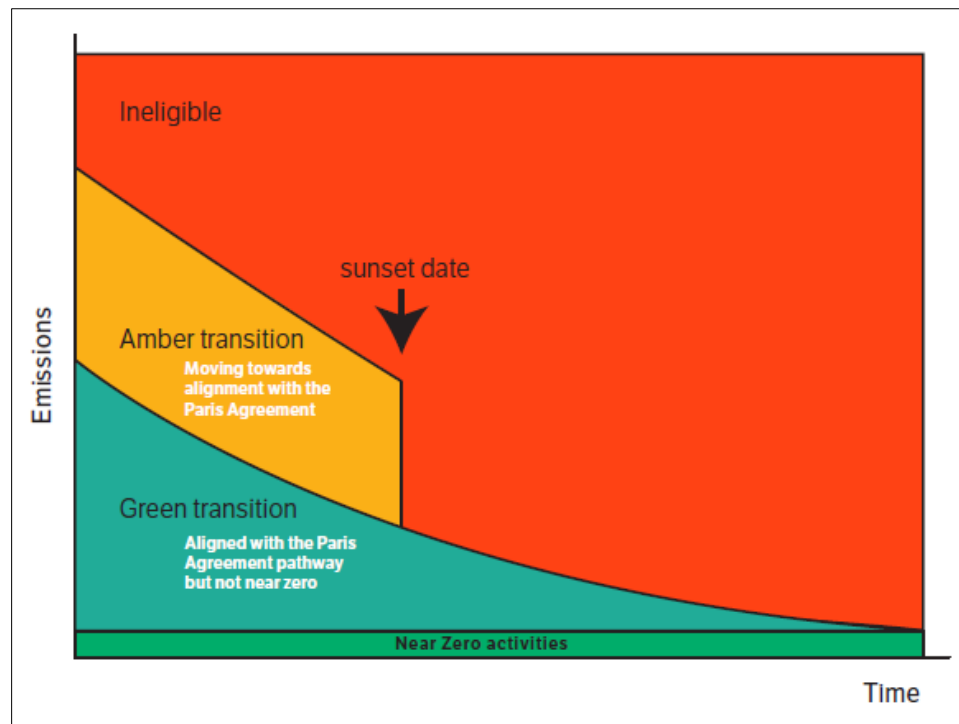


Source: MAS (2023).

Amber activities are not on the 1.5°C pathway illustrated in Figure 4.1 even if they have a downwards trajectory towards 2050. Amber category is primarily relevant for transitioning existing infrastructure and activities and does not apply to new projects. The transition period is considered temporary since activities should be on an identified pathway to reach net zero by a predetermined sunset date. Following the sunset date, there will no longer be an Amber category; the activity will either align with a Green category, transition to a Paris Agreement pathway, or be downgraded to an Ineligible activities category. Generally, the sunset date is assumed to be around 2030, and all Amber activities are anticipated to vanish after the sunset date unless otherwise specified in the criteria (Figure 4.2). For some activities where the technological options

to operate in line with the Paris Agreement are sufficiently developed and available at reasonable cost, the Amber category is nonexistent.

Figure 4.2: Graphical Illustration of Sunset Date for Amber Thresholds



Source: MAS (2023).

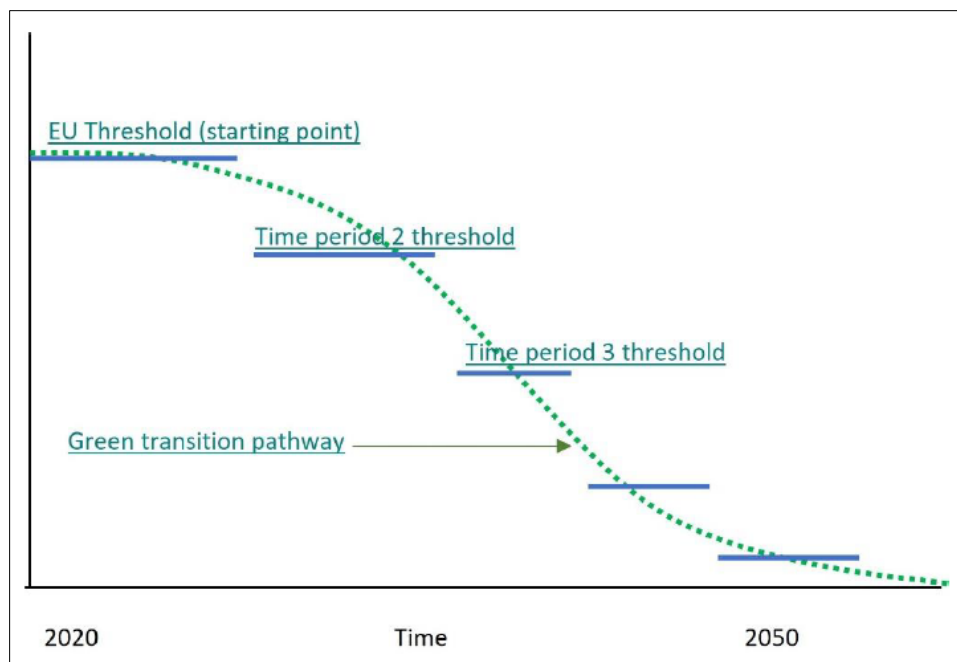
The Ineligible activities category covers activities that are not currently compatible with a net-zero trajectory so that they should be *phased out if GHG emissions (including Scope 3) cannot be reduced* (e.g., most fossil fuels) or *cannot be reduced in line with a green transition pathway* (e.g., high-carbon cement producer). Activities that do not comply with a Green or Amber categories are included in the Ineligible activities category. These activities are deemed as significant harm and thus are not eligible for transition finance. Compared to the EU Taxonomy, therefore, Singapore's taxonomy covers a wide range of transition activities that allow for a progressive shift towards greater sustainability while considering diverse starting positions and supporting inclusive economic and social development. Namely, Singapore's priority is to take a credible approach to promote transition finance for activities under the Amber category that will be required beyond 2050 but will require substantial decarbonization efforts to achieve net-zero emissions.

4.2.2 Amber Categories and Measures-Based Approach for Hard-to-Abate Sectors

Singapore's Taxonomy also sheds light on activities in the hard-to-abate industrial sectors (such as basic chemicals, steel, cement, hydrogen, aluminum). To be qualified for Green category, activities should meet the Technical Screening Criteria based on emissions thresholds in line with the 1.5°C science-based decarbonization pathways—following an approach adapted from the CBI criteria (GFIT 2023a). The EU Taxonomy thresholds are used as a starting point for a pathway and the science-based Sectoral Decarbonization Pathway has been transposed to this starting point to reach net zero by 2050 at the activity level. The Sectoral Decarbonization Pathway referred

to the approaches adopted by the SBTi for cement, and the IEA net-zero emissions for iron and steel, and aluminum, etc. As far as possible, the thresholds have been projected into the future so that investors and other users can see how the thresholds will change over time as they ratchet down towards 2050 (Figure 4.3). This approach was extended from the EU Taxonomy since the EU thresholds are placed for the current period and the threshold will be expected to be reviewed and potentially revised every 3 years as new technologies become available. The reference to the EU Taxonomy was made to provide greater certainty for investors and other users to see how activities need to be decarbonized to remain Green.

Figure 4.3: Hypothetical Example of Creating Thresholds Are Put Forward Based on Transition



Source: GFIT (2023a), MAS (2023).

When it comes to the Amber category, hard-to-abate sectors encounter notable challenges in their decarbonization efforts due to uncertainties related to low-carbon alternatives, both technologically and cost-wise. While establishing a distinction between Amber and Ineligible activities categories is reasonable in most sectors, this demarcation can be problematic in hard-to-abate sectors for several reasons. First, there is currently no credible or science-based data available to draw this line, making the boundary between Ineligible activities and Amber somewhat arbitrary. Second, all facilities are expected to transition to a green pathway within a specified time frame, even though performance at the activity level (or within the same industry) can vary significantly. Therefore, the starting point is less significant compared to the progress made toward a greener outcome over time. Third, these activities are inherently transitional, and activity thresholds alone are insufficient to capture the evolving nature of change.

In some sectors, Amber (measures) have been proposed to provide additional options for users. To identify and classify activities that are in a state of transition and evolving over time, two approaches can be employed:

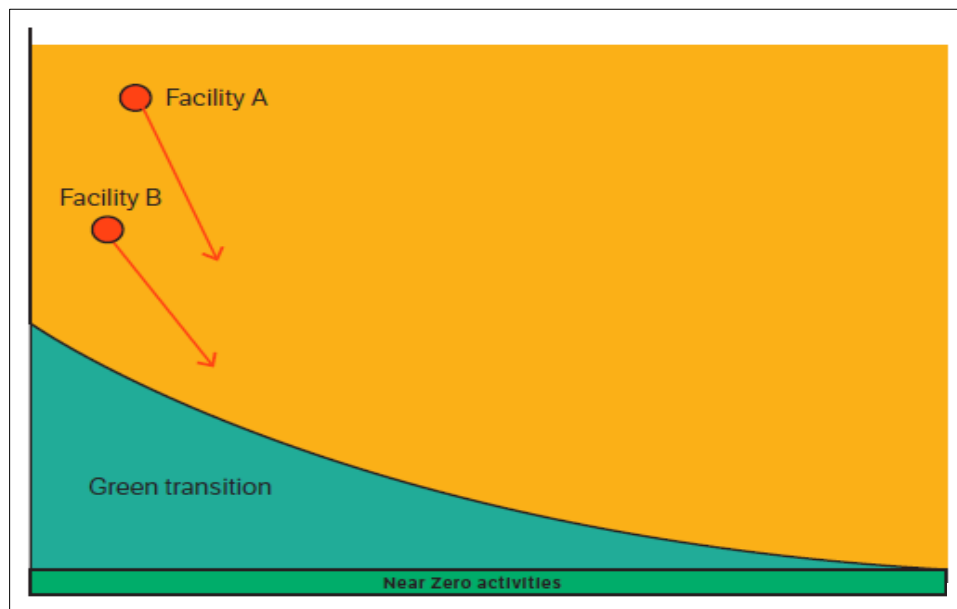
- a) **Climate transition plans** that outline planned actions at the company level toward achieving net-zero goals; and
- b) **Measures-Based Approach**, which entails a list of eligible technologies or Green transition measures that significantly contribute to short-term emissions reduction.

Measures-based approach is an innovative approach adopted for the industrial sector (one of the eight sectors). Compared to the seven other sectors, the industrial sector, which includes hard-to-abate sectors, categorized under the Amber category faces a high degree of uncertainty with regards to the technological solutions to achieve net-zero emissions. GFIT views that it is challenging to determine science-based metrics and thresholds based on the emissions performance of the activity. Also, relying solely on corporate climate transition plans may be inadequate, as it can be challenging to evaluate the feasibility of achieving these plans at a specific point in time. Thus, measures-based approach does not focus on selected specific activities deemed as harmful (ineligible). Rather the approach focuses on criteria that would positively reinforce decarbonization efforts through the establishment of Green category for facilities that meet certain thresholds as well as Amber category for measures that support emissions reduction.

At the same time, the 1.5°C-aligned transition plan is required to promote “movement towards green” of these facilities that do not yet meet the Green criteria, and to ensure that investments in measures are not just a one-off initiative. Such transition plan is necessary as part of strategic planning focused on alignment of the activity with the decarbonization pathway (MAS 2023). The Amber (measures) category identifies and provides a list of decarbonization measures or retrofitting plans, which should be put in place to support better energy efficiency outcomes. Namely, the measures-based approach attempts to reduce GHG emissions through decarbonization and the implementation of the retrofit, electrification, non-fossil-based inputs, use of hydrogen for heat applications, and CCUS (or CCS).

The measures-based approach is designed to acknowledge changes occurring over time, regardless of the initial starting point, as illustrated below. This implies that individual measures or sets of measures are eligible for all facilities and activities, regardless of their starting conditions. For instance, in Figure 4.4, both Facility A and Facility B are currently in Amber category. Both Facility A and Facility B have the opportunity to implement decarbonization measures specified in the taxonomy that will propel them towards Green category. These measures are considered eligible on their own, irrespective of the emissions level at the facility’s outset.

A measures-based approach can be applied to capital spending in hard-to-abate sectors. A capital spending is eligible for a Green activity if a given activity currently meets the Green category, and the measures will help to keep the future Green category. By contrast, a capital spending is eligible for an Amber facility if a given activity currently meets the Amber criteria, and the measure will help to achieve a Green category. Also, specific measures can be eligible for Amber measures.

Figure 4.4: Amber Category for Hard-to-Abate Sectors

Source: MAS (2023).

4.2.3 Early Phaseout of Coal-Fired Power Plants

A unique and important feature of Singapore's Taxonomy is its detailed focus on thresholds and criteria for the early phaseout of coal-fired power plants, as proposed in the fourth consultation paper (GFIT 2023b). According to the IEA (2021), to align with a 1.5°C or net-zero scenario, it is necessary to halt the construction of new coal-fired plants and manage the decline in emissions from existing assets. Around 100 GW of coal-fired plants need to be phased out during the period of 2021–2030, both in developed and emerging economies. GFANZ (2022) has also suggested the Managed Phaseout approach as an emerging area of transition finance, as described in the next section. This approach allows financing high-emitting assets under the condition that there are plans to cease their operation within a time frame consistent with the net-zero transition. In other words, these assets may be operable while low- or zero-carbon alternatives are being developed, as long as the retirement date aligns with a 1.5°C target or occurs earlier.

GFIT emphasizes that there is currently no net-zero-aligned, science-based category system available for defining investments eligible as climate finance under coal transition schemes. Taxonomies are primarily designed for classifying sustainable activities and focus on transition activities based on companies' credible transition plans leading to net-zero-aligned transformation. When it comes to phasing out carbon-intensive assets, GFIT underscores the need to develop guidance on acceptable ambition levels for the transition of coal assets, beyond the traffic-light category system. This might include the creation of Technical Screening Criteria for the potential decommissioning and closure of assets that lack technological possibilities for transitioning away from significantly harmful performance levels. Additionally, the formulation of country- or region-specific pathways could be essential in determining appropriate timelines for phasing out coal-fired power plants.

Taking into account these considerations and the increasing demand from investors to reduce financing for coal-fired energy sources, Singapore's Taxonomy has developed three sets of criteria to address various issues and ensure a credible and just transition away from coal. These criteria include:

- **Facility Level Criteria:** These criteria are used to assess coal plant eligibility, focusing on whether it is credible to provide transition finance for a specific coal plant from a climate perspective.
- **Entity and System Level Criteria:** These criteria are employed to evaluate coal transition pathways, specifically whether the proposed phaseout process aligns with the 1.5°C goal.
- **Social Protection:** examining whether the phaseout strategy addresses social consequences and potential economic opportunities for affected communities and stakeholders.

The objective of these early coal phaseout criteria is to put the “transition away” approach into practice by effectively managing and accelerating the reduction of emissions-intensive activities with viable alternatives. Consequently, *early coal phaseout activities will not be categorized using the traffic light system* within Singapore's Taxonomy. Instead, they will be treated separately under the Taxonomy, while remaining eligible for transition finance. It is worth noting that these criteria may be subject to regular revisions as new approaches are developed, making the current criteria applicable for a limited period, such as until 2025.

The alignment of a coal-fired power plant with this guidance and its potential suitability for a managed coal phaseout process depend on meeting all of the Facility Level Criteria and all of the Entity and System Level Criteria. The key points are outlined below:

A. The Main Features of the Facility Level Criteria:

- (1) **Timing of Financial Close:** The financial close or final investment decision for the coal plant must have occurred before December 2021.
- (2) **Positive Fair Value:** The coal plant should have a positive fair value at the time of the proposed coal transition.
- (3) **Emissions Savings:** The early coal phaseout should result in verified, positive absolute emissions savings over the expected total lifetime of the coal plant when compared to a scenario without early phaseout.
- (4) **Alignment with Phase-Out Deadlines:** The phaseout of unabated coal combustion in the coal plant aligns with or occurs earlier than 1.5°C-aligned coal phaseout deadlines. Specifically, the coal plant retires *no later than 2030 in developed economies and 2040* in other countries in accordance with the IEA net-zero pathway.
- (5) **Operation Duration:** The coal plant's operational duration from its commercial operation date is *limited to 25 years* and complies with the phaseout requirements described in point (4).
- (6) **No Extension of Lifetime:** Investments made as part of the early coal phaseout process should not extend the expected lifetime for coal combustion, ensuring the cessation of fossil fuel-based activities in line with the timeline specified in points (4) and (5).

- (7) **1-for-1 Replacement:** Generation from the coal plant should be replaced on a 1-for-1 basis with a portfolio of clean resources that offer equivalent electricity services within the electricity system. These clean resources must meet specific criteria, including a *life-cycle emissions intensity of 100 g CO₂e per kilowatt-hour (kWh) or less*, and they should also qualify for the Green category.

The 100 g CO₂/kWh criteria is consistent with the EU threshold applied to gas energy to qualify for transition activities. Meeting all these Facility Level Criteria is essential for considering a coal-fired power plant's alignment with the guidance and potential inclusion in a managed coal phaseout process.

B. Main Features of the Entity and System Level Criteria:

- (i) **Entity Level Criteria 1:** The coal plant owner must commit at the entity level to refrain from developing or procuring new coal-fired power plants on a global scale, except for plants that have reached financial close or received a final investment decision before December 2021.
- (ii) **Entity Level Criteria 2:** The entity is required to establish a transition plan aligned with the 1.5°C target and conforming to the principles of transition finance as defined by the International Platform on Sustainable Finance. Entities are expected to outline their approach for *achieving this alignment by 2030 at the latest*.
- (iii) **Power Plant Level Criteria:** If the coal plant is not retired and replaced with a portfolio of clean resources providing equivalent electricity services (Facility Level Criteria (7) pointed out above), the entity must demonstrate long-term emissions savings. This demonstration should be based on power-sector-level decarbonization commitments and plans that align with the 1.5°C target, supported at the national or subnational level. The boundary for these commitments should encompass the entire power system within which the entity operates. These commitments should facilitate a ratcheting process, working toward achieving the 1.5°C ambition over time and by no later than 2030.

4.2.4 Review of Existing Coal Transition Financing Mechanisms

GFIT places a strong emphasis on innovative coal transition financing mechanisms that can expedite the transition to green energy. These mechanisms are vital for the timely phasing out of coal plants, accelerating climate change mitigation, and ensuring a just transition. For instance, GFIT points out the Asian Development Bank has established a blended coal reduction fund aimed at acquiring and expediting the retirement of coal assets.

Additionally, recent multilateral initiatives like the Just Energy Transition Partnerships (JETPs)—for South Africa in 2021 (\$8.5 billion), Indonesia in 2022 (\$20 billion), Vietnam in 2022 (\$15.5 billion), and Senegal in 2023 (€2.5 billion)—are pointed out as promising steps to promote a just and sustainable energy transition, including coal power early retirement or promoting renewable energy. The aforementioned financing amounts are pledged financing amounts comprising of investment and loans from some developed countries and private sector over the next 3–5 years. At this stage, it is not certain whether these pledged amounts will be collected from both public and private sector sources given deteriorating global financing conditions. JETPs are a blended finance scheme mobilizing public funds from developed countries and private sector in collaboration with the GFANZ Working Group, which is comprised of banks and institutional investors (Shirai 2022). The initiatives are normally a 3- to

5-year program. Recipient countries must have the JETP political declaration, establish a steering committee, preparing and approve an action plan, form a secretariat with specialized working groups, as well as provide a detailed road map to reduce GHG emissions by eliminating coal power production and developing renewable energy hubs over time. In addition, the legal framework needs to be improved to expand public and private investment from abroad.

However, GFIT admits that these mechanisms are still in their infancy and face challenges related to credibility and acceptance within the financial industry, among investors, and other stakeholders. To facilitate the rapid implementation of coal phaseout mechanisms, there is a pressing need for clear guidance on the credible utilization of climate finance to support coal transition in the power sector. This is why the early coal phaseout processes have been developed and included in Singapore's Taxonomy and the ASEAN Taxonomy.

4.2.5 Avoidance Carbon Credit (Transition Credit) to Finance Early Coal Phaseout

Recently, the idea of using carbon credits to obtain revenues and finance the JETPs and other projects aimed at promoting energy transition projects in coal-dependent developing has been under the spotlight. If the market of such carbon credits arising from the avoidance of GHG emissions can be developed, more private sector finance can be raised. This idea was brought up in 2022 by John Kerry, the US special envoy on climate, at the United Nations Climate Change Conference (COP27) held in Sharm el-Sheikh, Egypt. There are some criticisms of this idea due to the fear of it encouraging companies to fulfill their net-zero targets by purchasing carbon credits from third parties without making own efforts to reduce emissions. At the same time, support for using carbon credits is growing since issuing and selling carbon credits can generate revenues. Given that little finance and funds have been allocated to transition activities in emerging and developing countries despite the urgent need to scale up investment, developing carbon credit for avoided emissions could be an option to be pursued.

Reflecting this view, the Coal to Clean Credit Initiative, a consortium of global experts, has announced a plan to develop a world-first carbon credit methodology to obtain revenue from selling "coal-to-clean" credits in June 2023. The initiative is a partnership between the Global Energy Alliance for People and Planet (GEAPP) and the Rockefeller Foundation (IEA 2023b). The detailed methodology will be announced at COP 28 held in Dubai and will be used to promote just transition activities of many coal-fired power plants in emerging and developing countries with the objective of avoiding the planned release of millions of tons of GHG emissions into the atmosphere. The initiative has conducted a consultative process to develop the methodology and establish a global benchmark or standard for carbon credit financed coal transition projects. Initial transactions might take place as soon as 2024. The revenues could also be allocated to the JETPs to make up for a shortfall of private finance.

In September 2023, moreover, MAS and McKinsey & Company published an innovative detailed concept involving the *use of avoidance carbon credits as a means of financing the early retirement of coal-fired power plants*. As an example, the report highlights a hypothetical 1-gigawatt (GW) power plant that would face an economic gap of US\$70 million per gigawatt if it were to retire five years ahead of schedule (MAS and McKinsey & Company 2023). This economic gap is roughly equivalent to a nominal price of US\$11–12 per ton of CO₂e, which could potentially be financed through the sale of carbon credits. These newly proposed carbon avoidance credits, known as "*transition credits*," *could be generated by retiring a coal-fired power plant ahead of schedule and*

replacing it with renewable energy sources. To be considered high-quality transition credits, they must align with the Core Carbon Principles established by the Integrity Council for the Voluntary Carbon Markets (ICVCM). Transition credits are expected to meet essential Core Carbon Principles such as “additionality” (indicating that the early retirement would not have occurred without the revenue generated from the sale of carbon credits) and “performance” (ensuring that adequate safeguards prevent any reversal of the projected carbon emissions due to the complete dismantling of the plant). These high-quality transition credits are likely to be purchased by companies seeking to offset their emissions, or governments aiming to promote domestic decarbonization in alignment with the goals of the Paris Agreement.

Based on the paper, MAS announced in December 2023 to launch the Transition Credits Coalition (TRACTION) and two pilot projects to test the use of high-integrity transition credits in transactions for the early retirement of coal-fired power plants. TRACTION will examine the challenges and propose solutions to scale the early retirement of the plants in Asia through high-integrity carbon credits. Pilot projects will be separately undertaken to test the feasibility of integrating transition credits for early coal-fired power plants. The pilot projects will be in collaboration with ACEN Corporation and Coal to Clean Credit Initiative, to accelerate the retirement of the South Luzon Thermal Energy Corporation coal plant in Philippines. Climate Smart Ventures, an advisory firm focused on energy transition, will be coordinating the project; and the Asian Development Bank, which is advising the Government of Philippines over the retirement of a coal plant in Mindanao under its Energy Transition Mechanism. High-integrity carbon credit must be in line with globally recognized standards such as Core Carbon Principles (CCPs) set out by ICVCM, and other Article 6 integrity requirements, as mandated by United Nations.

4.3 ASEAN Taxonomy and a Traffic-Light System

Following the initiative of the ASEAN Capital Market Forum to jointly develop the ASEAN Green Bond Standard in collaboration with the ICMA Green Bond Principles, the ASEAN established the ASEAN Taxonomy Board in 2021. This board is comprised of the representatives from all ASEAN member countries and key ASEAN entities, including the ASEAN Capital Markets Forum, the ASEAN Insurance Regulators Meeting, the ASEAN Senior Level Committee on Financial Integration, and the ASEAN Working Committee on Capital Market Development. With a shared commitment to achieving net-zero GHG emissions, ideally by the latter half of the 21st century, in alignment with each member country’s Nationally Determined Contributions (NDCs), the ASEAN Taxonomy Board has been actively developing a regional taxonomy. Thus, the taxonomy has been developed under the auspices of the ASEAN Finance Ministers and Central Bank Governors to promote sustainable finance. The ASEAN Taxonomy for sustainable finance employs a hybrid, multilayered, and phased approach. It consists of a principles-based layer, complemented by subsequent layers, which include a traffic-light system (**Green**, **Amber**, and **Red**). This approach integrates various methodologies adopted by ASEAN member countries, drawing inspiration from systems like Singapore’s traffic-light model and Malaysia’s principles-based taxonomy.

4.3.1 Basic Structures and Features of the ASEAN Taxonomy

The ASEAN Taxonomy has undergone two versions, with the first released in 2021 and the second in 2023 (ASEAN Taxonomy Board 2023). This taxonomy is built upon the following five fundamental principles:

- Aiming to establish a common language that complements national sustainability initiatives.
- Taking into account widely recognized taxonomies from other regions and countries, and providing inclusive benefits to all member countries.
- Being inclusive and beneficial to all member countries.
- Providing a credible framework including definitions and, where appropriate, being science-based.
- Being aligned with the sustainability initiatives taken by the capital market, banking, and insurance sectors.

In contrast to the uniform region-wide approach of the EU Taxonomy, the ASEAN Taxonomy follows its unique path, drawing a lot of features from the EU Taxonomy and stressing four core Environmental Objectives. These objectives are as follows: climate change mitigation; climate change adaptation; protection of healthy ecosystems and biodiversity; and resource resilience in the transition to a circular economy. Unlike Singapore, the objective of pollution prevention and control was removed. To earn a classification within the ASEAN Taxonomy, an activity must demonstrate that it contributes to at least one of these four Environmental Objectives while ensuring it does not adversely affect the other Environmental Objectives. This is in line with the so-called DNSH criteria.

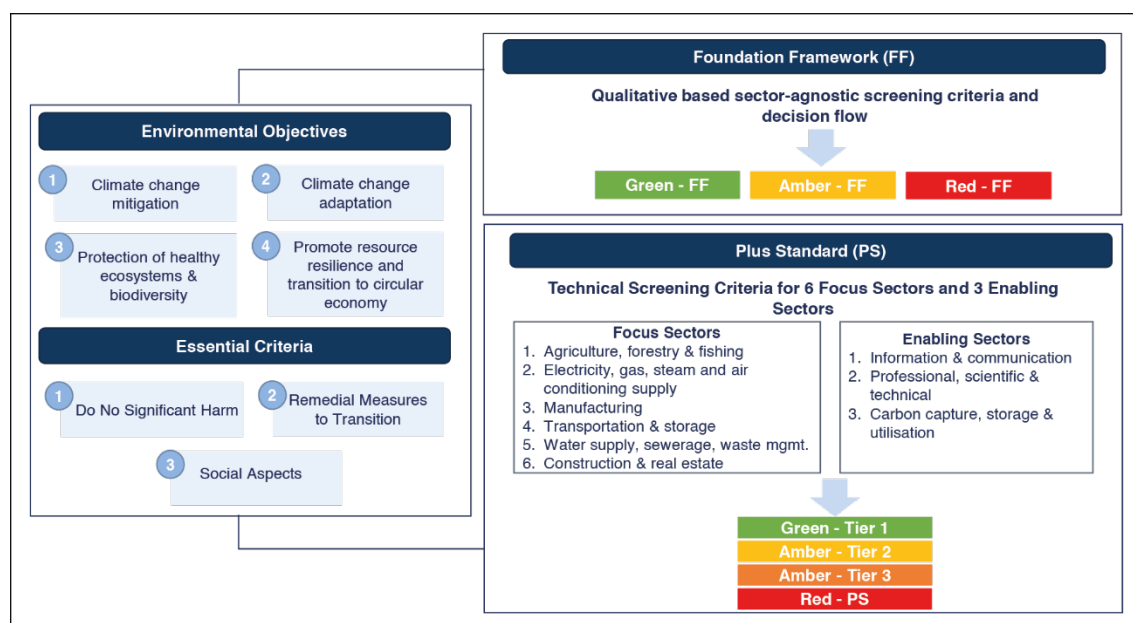
Furthermore, any activity seeking classification must adhere to the **Remedial Measures** to Transition objective, ensuring that any substantial harm is either eliminated or significantly reduced. Additionally, it must address **Social Aspects**, including human rights, the prevention of forced labor, the protection of children's rights, and the impact on individuals residing near the investments, which could be adversely affected by the activity. Thus, the three **Essential Criteria** for classification consist of the DNSH objective, the Remedial Measures to Transition objective, and all Social Aspects criteria. Essentially, the classification methodology assesses whether the activity aligns with at least one of the four Environmental Objectives and meets the three Essential Criteria.

Within the ASEAN Taxonomy, two distinct assessment approaches have been developed: **the Foundation Framework (FF)** and **the Plus Standard (PS)**. FF is a principles-based assessment approach that classifies activities using qualitative guiding questions. This framework is designed as *an introductory assessment method* for ASEAN member countries. On the other hand, the Plus Standard is *a more advanced and robust assessment approach* that combines both threshold-based (quantitative) and process- or practice-based (qualitative) Technical Screening Criteria. This two-tier system reflects divergent economic and social stages of development within the region. While FF is treated as an initial, transitory approach, the taxonomy does not specify the process of member countries choosing FF will be upgraded to PS.

Under the ASEAN Taxonomy, “classification” refers to an activity’s contribution to an Environmental Objective and “Tier” refers to the different levels of development and varied economic activities under the Technical Screening Criteria. FF classifications are comprised of Green-FF, Amber-FF, and Red-FF. PS classifications consist of Green Tier 1, Amber Tier 2, Amber Tier 3, and Red-PS. For both FF and PS, the Red category refers to an activity that is not aligned with the ASEAN Taxonomy (Figure 4.5). The Amber category is related to transition and Amber-labeled finance could be transition finance. PS provides Technical Screening Criteria for six focus sectors (agriculture, forestry and fishing; electricity, gas, steam and air conditioning supply [i.e., energy sector]; manufacturing; transportation and storage; water supply, sewerage, waste management; and construction and real estate) as well as three enabling sectors (information and communication; professional, scientific and technical; CCUS).

FF and PS approaches can be chosen freely by each ASEAN member country based on country-level preference or by large multilateral financial institutions and other stakeholders in the region. Both Environmental Objectives and Essential Criteria are applicable to the FF and PS approaches. However, PS, which is based on Singapore’s Taxonomy, is more focused on ensuring interoperability with the leading EU Taxonomy. Other taxonomies such as those developed by Australia, Canada, and South Africa, all of which use similar Environmental Objectives, were also used as reference. Future versions of the ASEAN Taxonomy will expand the coverage of activities in all focus sectors and provide more qualitative process and/or practice-based criteria. Companies are required to provide evidence on whether the Environmental Objectives and the Essential Criteria, if applicable, are met under the Plus Standard. The ASEAN Taxonomy Board plans to finalize the Technical Screening Criteria for the energy sector in early 2024 in the next version. The Technical Screening Criteria for all six priority sectors will be finalized in a phased manner by 2025.

Figure 4.5: Structure of the ASEAN Taxonomy



Source: ASEAN Taxonomy Board (2023).

4.3.2 Thresholds Applied to Green and Amber Activities for the Energy Sector

The sector-agnostic FF layer introduced decision trees, guiding questions and use cases for all Environmental Objectives and Essential Criteria. The PS layer, meanwhile, provided the Technical Screening Criteria for the electricity, gas, steam and air conditioning supply (namely, energy) for all Environmental Objectives and the DNSH criteria. In addition, the Technical Screening Criteria for the use of the CCUS enabling sector was also provided. With regards to the Plus Standard in the case of the energy sector, the thresholds for labeling Green or Amber activities in the case of the first Environment Objective (climate change mitigation) are provided.

A Green activity in line with limiting global average temperature rise to no more than 1.5°C by 2050 for power generation is required to *fulfill a threshold of 100 g CO₂e/kWh (lifecycle GHG emissions from the generation of electricity by the entire facility)*. This is consistent with the EU threshold applied to gas energy to be eligible for transition activities (also adopted by Singapore). Thus, an activity must limit GHG emissions to below the thresholds. The threshold may be adjusted after the first Technical Screening Period scheduled to conclude at end-2030. The Taxonomy does not necessarily preclude fossil fuels as a Green activity, as long as fossil fuels meet the Technical Screening Criteria aimed at achieving GHG emissions levels based on the reference credible 1.5°C-aligned science-based pathways.

Meanwhile, Amber Tier 2 activities are defined as those that support a transition towards a Green pathway within a defined time frame; AND that (a) results in a contribution to the Environmental Objective (climate change mitigation) that is at least as good as the lowest carbon-emitting technology currently technically and economically feasible for widespread use in the ASEAN, with a prescribed sunset date; OR that (b) enables or promotes the implementation of a Green activity in the context of this Environment Objective. The *threshold for life-cycle GHG emissions from the generation of electricity by the entire facility is set at 425 gCO₂e/kWh*.

Furthermore, the Amber Tier 3 classification refers to (i) an activity in line with supporting the meeting of NDC emissions reduction targets of ASEAN member countries that do not have a net-zero 2050 timeline; OR (ii) an activity meeting the Technical Screening Criteria of Amber Tier 2 or Green, but has been assessed that it will do some level of significant harm to other Environment Objectives which will be remediated within 5 years. The *threshold for lifecycle GHG emissions from the generation of electricity by the entire facility was set at 510 gCO₂e/kWh*.

With regards to the Technical Screening Criteria for electricity, the Green Technical Screening Criteria were determined in line with other international taxonomies, such as the EU Taxonomy. The Technical Screening Criteria for Amber Tiers were determined against future emissions projections for all power generation in Southeast Asia based on the Sustainable Development Scenario (SDS) developed by the IEA, which reflects projected emissions intensity for Southeast Asia in 2030 for Amber Tier 2 and in 2027 for Amber Tier 3. The Technical Screening Criteria were set by taking into account the lowest carbon-emitting technology currently technically and economically feasible, for widespread use in the ASEAN. The criteria were set through a review of publicly available technology comparisons and through consultation with regional stakeholders. Electricity generation from fossil gas includes power generation as part of cogeneration and excludes unabated power generation from coal or fuels derived from coal, as well as co-firing of fossil fuels with fuels derived from renewable sources.

4.3.3 Early Phaseout of Coal-Fired Power Plants Under the ASEAN Taxonomy

Like Singapore, the ASEAN Taxonomy focuses on the coal power phased out issue. Namely, it is an activity whereby processes involving the combustion of coal, such as the coal-powered generation of electricity, will be shut down over time in line with aims to reduce GHG emissions. In 2023, about 40% of existing power stations that generate electricity from the combustion of coal in the ASEAN are less than 8 years old, and close to 90% of them will be less than 35 years old. The power stations normally have an operating life of about 40 years, which can be extended for much longer with refurbishment. The treatment of coal power plans under the Green and Amber labels might be needed to be consistent with the ongoing JETP initiatives for the case of Indonesia and Viet Nam and increase credibility and transparency for global investors and financial institutions. The ASEAN Taxonomy decided to use specific calendar dates and ages of power plants rather than using emissions calculations for two reasons. First, age may be seen as a proxy for the emissions factor since older and less-advanced power stations tend to be heavier emitters than younger power stations. Second, calendar dates provide a hard deadline for the operation of all power stations and do not allow operations to carry on indefinitely.

To be eligible for a Green activity, an activity should be aligned with a 1.5°C outcome and is consistent with the Net-Zero Emissions Pathway prepared by the IEA for the power sector to achieve net-zero emissions by 2050. Specific conditions include: (a) *coal phaseout by 2040*; (b) coal plants built after 31 December 2022 will not qualify; (c) *operation duration of the coal plant from commercial operation date is capped at 35 years*; (d) coal plants must demonstrate the adoption of best-in-class technology; and (e) coal plants must demonstrate substantial absolute positive emissions savings over their expected lifetime with verification provided by independent entities as compared to a case without a transition mechanism.

As for the Amber Tier 2 activities, an activity should be aligned with a 1.5°C outcome for a coal phaseout that is derived from regional- or country-specific pathways that are consistent with science-based pathways. Specific conditions include: (a) *coal phaseout by 2050*; (b) *coal plants built after 31 December 2022 will not qualify*; (c) *operation duration of the coal plant from commercial operation date is capped at 35 years*. Meanwhile, the Amber Tier 3 activities should meet: (a) *operation duration of the coal plant from commercial operation date is capped at 35 years*; and (b) coal plants that are built after 31 December 2022 will not qualify, except for coal plants that are built from 1 January 2023 up till 31 December 2027; and (c) adopt best-in-class technology, provided that these technologies are affordable, accessible, reliable and can be implemented within a reasonable time frame.

4.3.4 Sunseting Requirement Applied to Transition (Amber) Activities

The ASEAN Taxonomy has introduced the sunseting requirement—the process of phasing out a Tier for an activity—toward activities categorized as Amber Tier 2 and Amber Tier 3 under the Plus Standard. These activities will be gradually phased out over time toward the Tier 1 (i.e., Green) classification. The decision to sunset a Tier must be approved, adopted, and published by the ASEAN Taxonomy Board. Sunseting of an activity Tier does not necessarily mean that all Tiers for that activity must be sunset (for example, sunseting Tier 3 for an activity does not necessarily mean that Tier 2 will be sunset at the same time). In addition, sunseting of a Tier for one activity does not necessarily have an impact on the same Tier for a different activity (for example, sunseting of a Tier 3 for a power generation activity does not mean that Tier 3 could not

exist for a transportation activity). The sunset period is not specified under the ASEAN Taxonomy, while Singapore's Taxonomy is proposed to be set around 2030.

4.4 Challenges Related to Transition Activities Under the Taxonomies and Conclusions of Section 4

Following the EU Taxonomy, the ASEAN region has been actively developing the ASEAN Taxonomy for Sustainable Finance. While the EU Taxonomy focuses on six Environmental Objectives, the ASEAN Taxonomy primarily incorporates four of these objectives: climate change mitigation; climate change adaptation; transition to a circular economy; and protection and restoration of biodiversity and ecosystems. Notably, the Environmental Objectives related to the sustainable use and protection of water and marine resources, as well as pollution prevention and control, have not been included in the ASEAN Taxonomy. Both the EU and ASEAN Taxonomies employ a set of three criteria for evaluating the eligibility of activities. These criteria consist of: (1) demonstrating a significant contribution to one of the Environmental Objectives while meeting the associated Technical Screening Criteria; (2) adhering to the DNSH criteria applied to the other Environmental Objectives and fulfilling the relevant Technical Screening Criteria; and (3) compliance with minimum social safeguards. The ASEAN Taxonomy retains these three criteria, introducing regional-specific features to align with the distinctive needs of the ASEAN member countries.

The ASEAN claims that the ASEAN Taxonomy is interoperable with the EU Taxonomy. The Green category appears consistent with the net zero pathway and the EU thresholds. The main difference arises from a traffic-light system used for classifying activities with Green (environmentally sustainable activities), Amber (transition activities), and Red (harmful activities) categories. The ASEAN places a stronger emphasis on transition activities, especially those without readily available low-carbon alternatives, as compared to the EU. Given the increasing recognition of transition finance within the climate finance landscape globally, the ASEAN's approach is a welcome step. Furthermore, both the ASEAN and Singapore Taxonomies highlight the significance of CCUS as an enabling sector for sustainable activities. The ASEAN Taxonomy features a hybrid classification system that combines the Foundation Framework and the Plus Standard. This approach acknowledges the diverse stages of economic and social development within the ASEAN and is considered appropriate at this stage. It still contributes to clarifying sustainable and decarbonization activities for various stakeholders, including investors, governments, and companies, by promoting the use of a common language and terminology within the region.

In the future, meanwhile, the ASEAN could consider providing more detailed information on whether member countries plan to replace their current national approach with the ASEAN Taxonomy as the core pillar of their national taxonomies. Besides Singapore's Taxonomy, Indonesia, the Philippines, and Thailand have already published their national taxonomies while Malaysia has issued a Climate Change and Principle-based Taxonomy implemented by its central bank (Bank Negara Malaysia) for the financial sector. Viet Nam is under the preparatory and development process. Currently, these approaches intend to design their own taxonomies rather than completely follow the ASEAN Taxonomy. These divergent approaches reflect country-specific and geographical features, diverse economic and social conditions, the sophistication of the domestic financial sector, levels of emission reduction targets, national priorities, etc. Thus, it is not clear at this stage whether the ASEAN Taxonomy will constitute a central pillar of each country's taxonomy and only add more country-specific details as an extension of the ASEAN Taxonomy. In the future, the ASEAN will

benefit from further discussions along this line with clear timelines for implementation. Moreover, it might be desirable for at least middle-income ASEAN countries to consider the detailed steps leading to a shift from the Foundation Framework to the Plus Standard for each member country. This is not only useful for investors but also important to ensure that the emergence of a fragmentation in the regional sustainable finance market and system will be avoided.

Furthermore, it is crucial to consider how the ASEAN Taxonomy will be applied in practical settings in the region, taking experiences from the EU's utilization of the EU Taxonomy for corporate disclosure under the Corporate Sustainability Reporting Directive (CSRD), various financial funds created under the Sustainable Finance Disclosure Regulation (SFDR), and the development of ESG benchmarks. The ASEAN Taxonomy Board has indicated that the Taxonomy can serve multiple stakeholders, including governments, financial regulators, companies, banks, asset managers, and rating agencies. Its applications may encompass issuing green bonds and loans, developing ESG benchmarks, and enhancing sustainability reporting. To foster climate finance and sustainable finance markets, the ASEAN may benefit from jointly exploring strategies for widespread adoption of the Taxonomy within the region, thereby increasing its credibility and transparency, as well as expanding the scale of funds from global investors and financial institutions.

Two other distinctive features of the ASEAN Taxonomy include an introduction of a sunset date for activities classified under Amber and the early coal phaseout approach. Similarly to Singapore's approach, the ASEAN clarifies that transition activities in the Amber classification are transitional and are only applicable to existing activities, as these activities will eventually be upgraded to either the Green or Red classification. Given the region's heavy reliance on energy sources from coal-fired power plants, the ASEAN's efforts to address early coal phaseout are likely to enhance transparency among investors and other stakeholders. The ASEAN Taxonomy regards the phaseout of coal-fired power plants as sustainable if the maximum operating period for the plant is 35 years, which is considerably shorter than the typical operating period of 40–60 years. This is why investments in the early retirement of coal assets can fall under either the Green or Amber classification. In contrast, under the Singapore Taxonomy, the operation duration of coal plants from the commercial operation date is capped at 25 years, representing a more stringent requirement than that set by the ASEAN Taxonomy. Looking ahead, the region could enhance its credibility by developing credible implementation plans in alignment with the Taxonomy for each member country. In other words, the actual implementation and enforcement mechanisms are likely to be key factors for the success of this approach.

While the Plus Standard shares a lot of similarities with Singapore's Taxonomy, the latter framework is notably more stringent. For instance, Singapore's Taxonomy clarifies a sunset date for activities classified under Amber (i.e., 2030). Additionally, it introduces the 1.5°C pathways based on the EU Taxonomy thresholds and the CBI criteria, specifically for activities falling under the Green classification in hard-to-abate-sectors. The framework also sets a shorter timeline for the decommissioning of coal-fired power plants and a reduced operation duration. It will be interesting to observe how Singapore will leverage these two taxonomies to foster the development of climate finance market within the country and ASEAN region.

Moreover, Singapore's Taxonomy introduced a Measures-Based Approach specifically designed for the challenging hard-to-abate industrial sectors to advance decarbonization efforts in the face of considerable technological and cost uncertainties. GFIT's perspective is that in these sectors, an entity-level corporate disclosure of transition plans may not be sufficient for investors and other stakeholders. This is because taxonomies are more granular in nature and focus on activity-level criteria, which can be used to inform and enhance entity-level transition plans. Furthermore, taxonomies primarily rely on current performance to establish eligibility rather than future performance. Even though transition plans offer insights into future performance, it is challenging to assess their feasibility, particularly for industries characterized by high technological and cost uncertainties. Hence, Singapore's Taxonomy has put forth the Measures-Based Approach for Amber classification, which identifies and promotes the implementation of a set of technologies or measures aimed at decarbonization and efficiency-enhancing retrofitting. These technologies and measures are recognized for their potential contributions to emissions reduction, in contrast to the Taxonomy's traditional focus on specific activities (Allen and Gledhill 2023)

5. TRANSITION FINANCE FROM THE PERSPECTIVE OF FINANCIAL INSTITUTIONS

Recognizing the need for uniform definitions and methodologies to measure the impact of financing activities and strategies on emissions reduction, GFANZ was formed in 2021 as a coalition of eight existing independent net-zero financial alliances, whose members have committed to support the transition to net zero by 2050 through financing activities. Since then, GFANZ has achieved a reputation globally as a network striving to establish a common framework for transition finance from the perspective of financial institutions. These financial institutions are committed to net zero, mostly arising from finance emissions—defined in Scope 3 (Category 15) emissions under the GHG Protocol, as well as insurance-related emissions. The GFANZ Secretariat collectively treats transition finance as a means to support four key financing strategies essential for financing a comprehensive transition to a net-zero economy, as described in detail below (GFANZ 2022, 2023a, 2023b).

5.1 Defining Transition Finance and Segmentation of Portfolios

The GFANZ approach aims to mobilize funds to achieve net zero by encompassing a wide range of sectors, companies, activities, and assets that could support an orderly real economy transition to net zero. Thus, it covers the whole-economy level including both emissions-intensive hard-to-abate and no or low-emitting assets and entities. GFANZ define transition finance as areas of financing and support needed to transition at the whole-economy level. Thus, transition finance is applicable across all financial subsectors rather than being specific to a particular asset class or product and service. Reflecting global trends on transition finance, the GFANZ Secretariat initiated a consultation in September 2023 on Transition Finance Strategies and Measuring Their Impact on Emissions and published a final paper in the form of Technical Note in December 2023 (GFANZ 2023a, 2023b). The objective is to refine the definitions of transition finance strategies and provide financial institutions with tools to forecast the emissions-reducing impact of these strategies. GFANZ, in its attempt to promote a comprehensive transition toward a net-zero economy and to secure substantial financing for achieving this goal, has outlined transition finance through four key **Transition Financing Strategies** (GFANZ 2022, 2023a, 2023b):

1. **Climate Solutions Strategy:** Climate Solution Strategies are comprised of three types: (a) solutions that directly reduce or remove emissions, (b) enablers that contribute indirectly; and (c) nature-based solutions that mitigate climate impacts. Climate Solution Strategies refers to financing the development and scaling of climate mitigation solutions—including technologies, services, tools, and social and behavioral changes that directly contribute to the elimination, removal, or reduction of real economy GHG emissions or that directly support the expansion of these solutions.
 - **Solutions:** Financing assets and entities that directly remove or reduce real economy's GHG emissions (e.g., project financing for a renewable energy solutions provider or financing an energy company's project to increase the use of CCUS).
 - **Enablers:** Financing assets and entities that indirectly contribute to, but are necessary for, emissions reductions by facilitating the deployment and scaling of Solutions or supporting the decarbonization of other actors' operations (e.g., financial support for a battery maker for an electric vehicle manufacturer or development of new or smart grid infrastructure).
 - **Nature-Based Solutions:** Financing actions to protect, sustainably manage, and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits. Nature-based climate solutions are those that use natural systems to reduce emissions and store carbon (e.g., local communities restoring forests or an international hotel operator restoring mangrove forests on one of its properties).
2. **Aligned Strategy:** Aligned Strategy pertains to financing or enabling entities that are already aligned with a 1.5°C pathways (net zero pathways). This strategy supports climate leaders and signals that the financial sector is seeking transition alignment behavior from the real-economy companies with which it does business.
 - Financing entities that are well on track or have successfully transformed or repositioned their operations to be aligned with net zero (e.g., financing a power company that has demonstrated emissions reduction performance through a consistent track record of meeting its targets and tracking on the pathway to delivering low carbon power with a robust and detailed transition plan that is being implemented as planned and validated by an independent verifier).
3. **Aligning Strategy:** Aligning Strategy concerns financing or enabling entities committed to transitioning in line with 1.5°C aligned pathways. Entities are currently fall short of full alignment with net-zero target. However, they are developing a transition plan and are converging toward net-zero. They have not yet demonstrated alignment to 1.5°C aligned pathways, but is expected to meet the interim targets set.
 - Financing investment in a large emissions-intensive company that has made a net-zero commitment and has a transition plan that is converging toward a 1.5°C pathway (although not aligned to the 1.5°C pathway currently).
 - Financing a medium-sized company that has made a net-zero commitment with targets and a robust transition plan to achieve the targets.

4. **Managed Phaseout Strategy:** Managed Phaseout Strategy addresses the accelerated managed phaseout of high-emitting physical assets, such as coal-fired power plants (GFANZ 2022). The Managed Phaseout strategy is related to financing and enabling of emissions-intensive assets to facilitate their early retirement ahead of the end of their designed lifespan, while managing service continuity and community interests (e.g., financing a fossil fuel power plant designated for phaseout to complete or support the phaseout). The Managed Phaseout Strategy does not necessarily encompass the alternative asset that might be constructed or deployed to replace the service provided by the high-emitting asset.
 - If the power plant is being replaced by clean power assets, financing for the construction or operation of such assets may be identified as Climate Solutions financing.
 - If there is a parent corporate entity that owns both the fossil fuel power plant and the new clean power assets as part of larger operations, general financing to such an entity (such as taking equity shares or general proceeds loan), may be identified as Aligned or Aligning financing.

The four key transition financing strategies were developed to support assessment of the nature of the activities and output of an asset, project, or entity. GFANZ's definition of Transition Finance is not intended to operate as a formal taxonomy. The four key transition financing strategies and the Attributes are principles-based and intended to be applicable globally. They are not restricted to specific industry sectors and activities. A financial institution's transition finance portfolio can be segmented into the four financing strategies by identifying companies, assets, and projects that support the financial institution's own priorities: If a financial institution plans to prioritize financial support or establish funds—for example, for Aligning companies—it can identify related companies, assets, or projects by segmenting from its portfolio. It then concentrates its financial resources on these segmented assets and conduct intensive engagement with the companies.

5.2 Attributes of Four Transition Financing Strategies

The GFANZ approach is a principles-based method and operates on a voluntary basis, offering a framework to categorize portfolios held by financial institutions based on the four key strategies. It also sheds light on potential methods for assessing the associated impact on decarbonization contributions. The GFANZ Technical Note is divided into two parts: Part I covering transition finance and Part II introducing the concept of Expected Emissions Reduction (EER) as a forward-looking metric that estimates potential emissions reduction of exposures (GFANZ 2023b).

The first part of the paper (transition finance section) outlines a set of Attributes that allow the analysis of financing and/or enabling initiatives for applicability to each of the four key transition financing strategies (Figure 5.1). Attributes can be used to identify opportunities, portfolio holdings, and clients under each strategy. The definition of transition finance and Attributes are pan-sector and applicable across asset classes. The technical information can be useful to inform net-zero transition planning within financial institutions, especially the Implementation and Engagement Strategies.

Figure 5.1: Main Attributes Across the Four Transition Financing Strategies

CLIMATE SOLUTIONS	
<ul style="list-style-type: none"> Solutions Enablers Nature-based solutions 	<p>A. Real-economy emission reduction</p> <p>i. Includes both direct and/or indirect real-economy emissions reductions ii. Not leading to lifetime emissions expansion of phaseout assets</p> <p>B. Expectations of net-zero alignment</p> <p>Includes considerations of near- and medium-term timelines and pathways</p>

ALIGNED & ALIGNING	
A. Established net-zero commitment/ambition	Commitment/ambition to reach net zero
B. Established net-zero targets (set to a plan)	Appropriate KPIs to monitor progress (Emissions, Transition -based)
C. Net-zero transition plan (or phaseout plan)	<p>Aligned only: established and being implemented</p> <p>Aligning only: developing</p> <p>Managed Phaseout only: phaseout plan</p>

MANAGED PHASEOUT	
D. Additional KPIs (where applicable)	Any other KPIs relevant for decarbonization/transition progress
E. Performance	<p>Aligned only: actual performance against targets – two years continuous</p> <p>Aligning only: increasingly meaningful progress towards targets</p> <p>Managed Phaseout only: actual performance regarding asset phaseout</p>

Source: GFANZ (2023b).

Climate Solutions has two Attributes:

- A. **Real-economy emissions reduction:** Direct or indirect net contribution to emissions reductions should be significant and should not lead to the extension (beyond net-zero pathway) of the lifetime emissions of assets identified for phaseout.
- B. **Expectations of net-zero alignment:** The Climate Solution's own emissions should be reasonably expected to progress toward net-zero over time. Reasonable efforts need to be planned or being made to address emissions reductions in the near and medium-term, and can be expected to align to a science-based pathway over time in a net-zero economy.

Aligned and Aligning Strategies apply to consecutive stages in an entity's transition toward net zero, delineating the entity's level of commitment and progress toward operations consistent with a net-zero pathway. There are five Attributes for Aligned and Aligning entities:

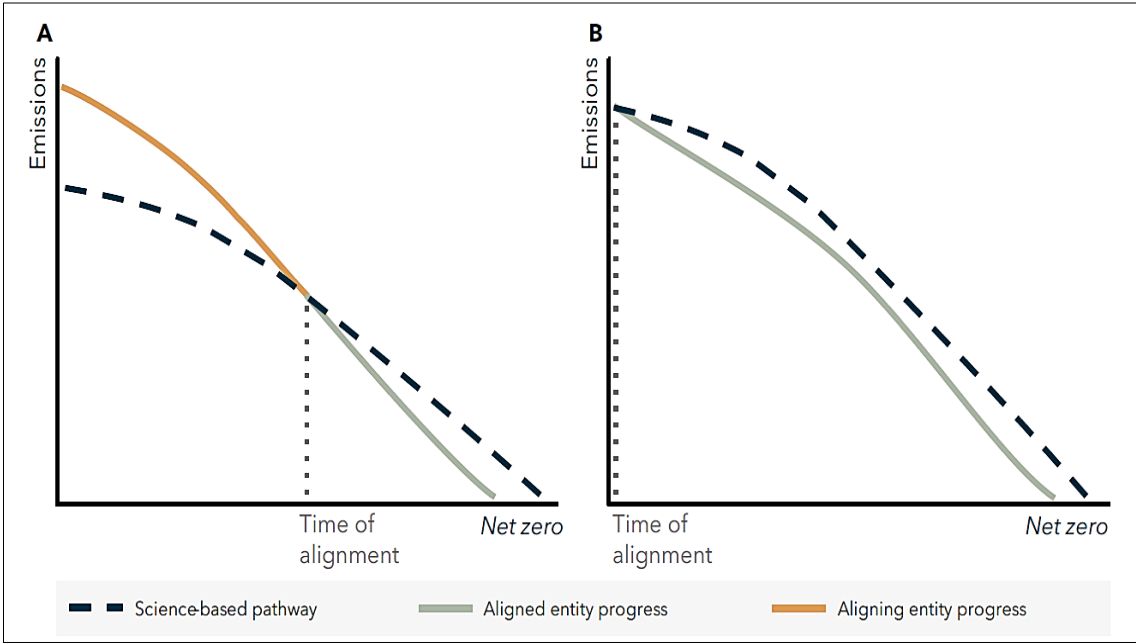
- A. **Established net-zero commitment/ambition:** A commitment or stated ambition to reach net zero with pathways or benchmarks specified. A commitment signals intent and support from the Board of Directors. Public commitments provide added credibility and help to distinguish between emissions reductions that may be a result of exogenous factors (e.g., an economic downturn) and a strategic plan of action.
- B. **Established net-zero targets** (set to pathway): A net-zero commitment should be underpinned by specific short-, medium-, and long-term targets that illustrate the projected trajectory of the entity. Targets should consider Scope 1, 2 and—where material—Scope 3 and may follow industry target-setting guidance as relevant to the sector, region, or other initiatives.

- C. **Net-zero transition plan:** For Aligned entities, a net-zero transition plan should be established and implemented. For Aligning entities, it should be under development. A credible transition plan comprises five themes—Foundations (objectives and priorities), Implementation Strategy (products and services, activities and decision-making, policies), Engagement Strategy (clients and portfolio companies, industry, government and public sector), Metrics and Targets (including Scopes 1, 2, and 3 [if material]), and Governance (roles, responsibilities, remuneration, skills and culture).
- D. **Additional KPIs** (where applicable): Suggestions for additional KPIs that may be considered in the identification of Aligned and Aligning entities (such as low-carbon revenues or low-carbon capital expenditure). These KPIs are able to demonstrate how the transition and alignment is embedded within a business model. Through these KPIs, an entity can provide details on the robustness of its alignment and its continued ability to meet future targets.
- E. **Performance with regards to the targets and additional KPIs:** The performance should be demonstrated over time, taking into account factors such as the length of the financial relationship, historical and projected cumulative emissions, contribution to the remaining global carbon budget, etc. Aligned entities are expected to show alignment to pathways and actual performance against their targets for two continuous years. Aligning entities may be at a lower maturity level but may still demonstrate increasingly meaningful progress towards its targets and convergence towards its pathways. For example, an entity can demonstrate that it is on track and expected to meet its short to medium interim targets (e.g., 2030, 2035 interim targets).

Figures 5.2 exhibits two hypothetical cases illustrating potential alignment pathways for Aligned and Aligning entities. To simplify and offer an intuitive understanding of the performance attribute, the figures do not capture carbon budgets, regional, or sector specific considerations. Figure 5.2-A illustrates that an entity is identified as Aligning at the beginning of engagement by a financial institution since the entity's emissions is above the science-based pathway. However, its pace of emissions reduction points to convergence towards the pathway and interim targets thus the entity is progressing from Aligning status into Aligned status. The entity could be identified as Aligning if it meets the other attributes or as Aligned if it meets all of the other Attributes for the Aligned entity. Figure 5.2-B shows that an entity is viewed as Aligned at the start of engagement since it tracks on a net-zero pathway and if it meets the other Attributes. The entity remains Aligned for the entire time horizon.

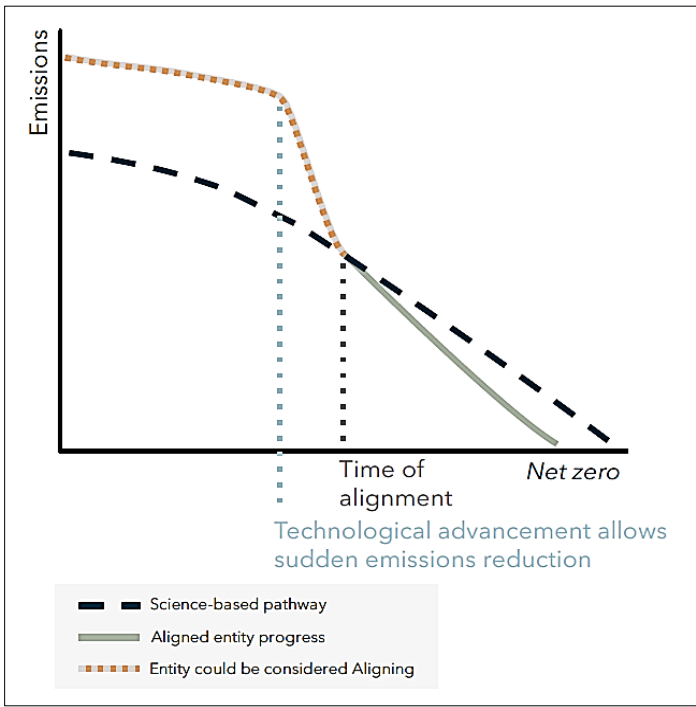
The process of transitioning from an Aligning state to an Aligned state may occur in a non-linear manner. For instance, an entity may not make significant emissions reduction initially due to technological constraints in hard-to-abate sectors. Nevertheless, an entity may exhibit a strong ambition and commitment to reaching net zero and is projected to substantially reduce its emissions drastically, contingent upon a specific external lever or innovation. The entity's ambition and projections are comprehensively outlined with the detailed underlying assumptions in its transition plan. In such instances, a financial institution may decide to finance the Aligning entity, provided that they are convinced that the entity is genuinely on a credible pathway to becoming Aligned and fulfills the remaining Attributes. Considerations for financing decisions may hinge on factors like the degree of divergence from the net-zero pathway and the nature of the transition plan for alignment. The assessment may encompass the likelihood of projected developments, taking into account technological feasibility among other factors. Figure 5.3 provides hypothetical illustrations depicting cases where an entity undergoes an abrupt transformation from Aligning to Aligned.

Figure 5.2: Hypothetical Illustrations of the Cases of Aligned and Aligning Performance



Source: GFANZ (2023b).

Figure 5.3: Hypothetical Illustrations of a Non-Linear Progression from Aligning to Aligned



Source: GFANZ (2023b).

Managed Phaseout Strategy has five Attributes, which mirror those for Aligned and Aligning Strategies:

- A. **Established net-zero commitment/ambition:** A clear commitment to phase out the asset early before the expected economic life. The commitment could be based on the planned remaining operating life, emissions avoided by shortening the operating life, emissions avoided by shortening the operating life, relevant sector pathway, etc.
- B. **Established net-zero targets (set to pathway):** Requires specific targets to track phaseout progress. Targets can be set against the pathway or benchmark established as part of the phaseout commitment to track phaseout progress (e.g., early retirement year; interim targets along the phaseout GHG emissions profile).
- C. **Net-zero transition plan (or phaseout plan):** A phaseout plan either specific to the asset or captured as part of financial institution or owner/operator phaseout strategy. The phaseout plan may include estimates of capital expenditure and operational spending requirements. Planned capital and operational spending may be used as a KPI since the indicator could indicate part of progress toward phaseout.
- D. **Additional KPIs** (where applicable): Suggestions for additional KPIs that may be considered in the specific case of Managed Phaseout. Operational KPIs include decommissioning provisions, retraining of staff, plans in place for alternative (e.g., clean energy) supply, independent validation, phaseout financing structure; just transition considerations.
- E. **Performance:** Demonstrated actual performance against established targets or KPIs for phaseout assets against the specific pathway or benchmark.

5.3 Promoting Decarbonization Contribution Calculation

The second part of the Technical Note focuses on developing a foundation for *quantifying the decarbonization impact across the four key financing strategies*. Following the concept of the expected return of a financing decision, **Expected Emissions Reduction (EER)** is quantified to exhibit the emissions return of a financing activity. Expected Emissions Reduction is developed to address challenges associated with the current approach to financed emissions. The existing widely used approach tends to be backward-looking (focusing on current finance emissions) and focuses on the downward trajectory required to attain long-term net-zero emissions target (for instance, annual percentage reductions). While this trajectory is useful in illustrating the net-zero emissions pathway, it fails to account for future anticipated emissions reductions.

In the case of hard-to-abate sectors, moreover, financed emissions *may experience a temporary increase before leading to substantial reductions*. Partly because of this concern, the conventional backward-looking approach faces the risk of discouraging some financial institutions from providing transition finance to the emissions-intensive sectors and companies. There are concerns that the initial rise in financed emissions might be criticized by investors and other stakeholders. In calculating financed emissions, many financial institutions presently rely on allocation methods that focus on allocating the amount of current emissions to financial institutions based on a financial metric (e.g., share of equity or enterprise value). For example, suppose there is a financial institution that is considering providing transition finance newly to high-emission company A, which needs substantial investment to reduce emissions. An

increase in finance to company A will result in increasing the financial institution's relative ownership of company A's stocks, bonds, or loans. This in turn will lead to a significant increase in the financial institution's financed emissions. Investors and other stakeholders looking at the financial institution's emissions data may interpret it as a sign of financing fossil fuel-based economic activities rather than financing transition efforts in hard-to-abate sectors.

Acknowledging these challenges, the GFANZ Secretariat presented key considerations, which is to *compare a projected emissions profile to a business-as-usual benchmark scenario* (namely, what would have happened if no efforts to transition were made).

For the **Climate Solutions Strategy**, the business-as-usual benchmark scenarios can be expressed as an emissions factor that is related to the emissions associated with the current technology. For example, for a financial institution wishing to finance a company transitioning from a gas-powered system to heat pumps, the baseline emissions factor should be the emissions factor of the gas being replaced. Thus, Climate Solutions Strategy is related to financing an alternative to emissions-intensive technology or activity (which becomes the business-as-usual benchmark), namely the avoided emissions. GFANZ stresses that considering Scopes 1, 2, and 3 emissions may not be sufficient to reflect the true emissions reduction potential of the solutions. Thus, life-cycle assessment methodology is used for assessing the impact on emissions at all stages of the life cycle of a commercial product, process, or service. This methodology could be beneficial in quantifying potential emissions savings beyond the value chain. In the case of a manufactured product, impacts on emissions are assessed from raw material extraction and processing, through to the product's manufacture, distribution, and use to the recycling or final disposal.

The EERs may vary significantly depending on each country or region where Climate Solutions are deployed. The life-cycle emissions of electric vehicles, for instance, are heavily influenced by grid emission factors specific to each country or region and thus it is desirable for the life-cycle assessment to consider local environmental and energy conditions, regulations, and available energy resources. Several other factors, such as technological advancements, changes in the energy mix, shifts in climate policies, adoption of more stringent industry standards, and variations in demand, are also likely to impact both the baseline business-as-usual benchmark as well as Climate Solutions. Further works and efforts are necessary to establish consensus on how these complex factors are incorporated into the EER calculations. In deriving the EER, the time horizon used for the baseline should align with the projected emissions of the Climate Solution and the production curve assumed in the calculation assumption.

For the case of transition financing related to **Aligned and Aligning strategies**, a projected emissions profile is compared against a sector-specific pathway by taking into account a company's specific emissions reduction (i.e., Sectoral Decarbonization Approaches). Aligned and Aligning companies are expected to prepare a net-zero transition plan including long-run net-zero targets and an interim target (such as 2030) in line with the appropriate sector-specific science-based pathway. To quantify Expected Emissions Reduction, the projected emissions profile to net zero can be compared with the benchmark business-as-usual pathway. To enhance credibility, the business-as-usual pathway should be chosen carefully by a financial institution. For example, the business-as-usual pathway could be based on emissions factors of specific steel industry intensity coupled with planned production capacities in the case where a steel manufacturing company's emissions are mainly from Scope 1 emissions. Another example is the case of operating a toll road, where the business-as-usual pathway may be based on societal behaviors, such as driving habits and uptake of low-emissions vehicle technology. If a company has a net -zero transition plan, a

forward-looking net-zero emissions profile can be calculated using the company's emissions reduction target and historical data. A financial institution can set the weighting approach by adding a credibility or risk factor.

With regards to **Managed Phaseout Strategy**, the source of the emissions reductions derives from a high-emitting asset's operations (Scopes 1, 2, and 3). Business-as-usual benchmark could be based on current emissions data of a coal-fired power plant including current absolute emissions and intensities of the plant, as well as the past emissions data of the plant. Moreover, business forecasts will be useful to gauge the plant's future energy production by using information such as generation capacity, utilization rate, energy efficiency, power purchasing agreements that are in place.

The second consideration pertains to the *allocation of Expected Emission Reduction, once Expected Emissions Reduction is calculated*. Namely, the share that a financial institution may claim at a point in time needs to be determined by examining the allocation of the share of Expected Emissions Reduction to financial institutions. Some guidance is needed to help financial institutions to attribute a credible percentage of Expected Emissions Reduction to their portfolio and to aggregate Expected Emissions Reductions at the portfolio level. Expected Emissions Reduction can be allocated by a financial institution in a manner similar to the current allocation approach. For example, the Global GHG Accounting & Reporting Standards for the Financial Industry developed by the Partnership for Carbon Accounting Financials (PCAF) provides this form of allocation based on the proportion of the equity share or the company value share held by the financial institution (PCAF 2022). Accordingly, Expected Emissions Reduction can be allocated based by equating the share of the Expected Emissions Reduction with the equity share held by the financial institution.

5.4 Challenges Related to Decarbonizing Financed Emissions

The GFANZ Secretariat has been actively working to promote the decarbonization of financed missions—namely, reducing emissions within the portfolios of large global financial institutions toward net zero by around 2050. The initiative's approach is essentially based on the carbon budget concept and associated sectoral decarbonization approaches. GFANZ's approaches and perspectives are voluntary and non-binding. Nevertheless, their reports and papers present innovative, forward-looking strategies that may guide leading large financial institutions in taking a leadership role and stimulating other financial institutions.

Particularly, the commendable efforts to support these financial institutions in forming credible net-zero transition plans by introducing the key four transition financing strategies, are noteworthy. The strategies may assist them in segmenting their portfolios with the objective of promoting the global economy to engage in transition to net zero in an orderly manner. The strategies may support the development of financial assets, such as labeled funds, with a focus on one or a combination of the four strategies. One issue that warrants further discussion might be the alignment of these strategies with existing taxonomies developed in the EU, Singapore, ASEAN, and other countries. It remains unclear whether the Aligned strategy, for example, is consistent with the Technical Screening Criteria used in EU Taxonomy and the Green classification in Singapore's Taxonomy. Moreover, GFANZ's Attributes outlined for the Aligned and Aligning entities appear less stringent than the criteria used to certify Aligned (Level 1) entities and Aligning or Transitioning (Level 2) entities defined by the CBI. GFANZ has been making efforts to encourage financial institutions in emerging and developing economies to decarbonize their portfolios, it is crucial that their approaches allow for greater flexibility in implementation by financial institutions. At the same time, the

development of various financial assets may lead to divergent approaches, potentially causing confusion among investors.

Another innovative approach outlined in GFANZ's Technical Review Note addresses an approach to calculate expected emissions reduction (EER). This approach was presented in response to concerns raised by some financial institutions regarding the possibility of transition finance leading to an increase in finance emissions at the initial stage. There is apprehension that the increase might be misinterpreted as an increase in financing emission-intensive entities lacking net zero commitments and credible transition strategies, potentially exacerbating climate-related issues. To address their concerns, GFANZ's Technical Review Note suggests that financial institutions can employ the four key transition financing strategies, their associated attributes, and life-cycle assessment for calculating EERs in preparing their transition plans. The EER approach is forward-looking, in contrast to the prevailing backward-looking approach that primarily focuses on current finance emissions. The conventional approach emphasizes the downward trajectory necessary to achieve a long-term net-zero emissions target (e.g., annual percentage reductions). While this retrospective trajectory is valuable for illustrating the net-zero emissions pathway, it overlooks anticipated future emissions reductions. Despite many challenges associated with developing business-as-usual benchmarks and underlying assumptions used in calculating EER, the Technical Review Note is anticipated to foster insightful and constructive discussions in the near future.

6. SUMMARIES AND CHALLENGES

This paper focused on key approaches aimed at enhancing transparency regarding decarbonization and low-carbon activities, particularly within hard-to-abate sectors. Transition activities are an integral and crucial part of the efforts to reduce GHG emissions to zero, with a primary focus on sectors that are emissions-intensive and challenging to decarbonize. Some of the current activities in these sectors, such as changing to electrification, or retrofitting existing production facilities, may be considered greener. Given that demand for products in hard-to-abate sectors is expected to grow further globally due to direct linkages with economic and social development, however, these sectors require a substantial amount of investment and innovation to make emissions reduction. Given the high degree of technological uncertainty and the high investment cost and risk involved, it is crucial to pay special attention to these sectors. Global investors remain wary of greenwashing practices, and some mistakenly associate transition finance with greenwashing finance due to the lack of clear definitions and criteria when making financing decisions in the presence of technological and cost uncertainties. To scale up transition finance, therefore, additional disclosure or measures appear to be necessary to enhance transparency and credibility.

Given this background, this paper took an overview of several approaches related to transition finance and examines their benefits and challenges (Table 6-1). First, certain technical criteria and certification scheme providers, such as ICMA and the CBI, have provided some additional recommendations or certification schemes for transition finance especially for debt financing instruments. ICMA does not treat transition finance as a distinct financial instrument but provides additional disclosure recommendations for hard-to-abate sectors to enhance credibility. Japan and the PRC have been encouraging transition bonds (and loans) as separate labels—for example, using the ICMA handbook. Meanwhile, the latest version of the CBI has expanded the coverage of the existing Standard and Certification to include transition criteria, offering Level 1 (Aligned) and

Level 2 (Transition) classifications. Level 1 indicates that emissions remain greater than net zero but are in line with the sector-specific 1.5°C pathway, while Level 2 refers to emissions whose targets are not currently aligned with the 1.5°C pathway but can be projected to align with it by 2030 as their transition plans make progress.

Second, science-based target certificates issued by the SBTi and the Sectoral Decarbonization Approach developed, for example, by the SBTi and TPI based on carbon budget concept are used for some, mostly emissions-intensive, sectors. The approach is widely used across the globe. Meanwhile, Japan developed Industry Technology Road Maps for emissions-intensive sectors to promote transition finance and to help hard-to-abate companies to develop credible transition plans. The IEA attempted to provide common emission level performance thresholds to promote lower-emissions products in hard-to-abate sectors, such as steel and cement. Some of these approaches focus on alignment or aligning with a 1.5°C pathway.

Third, taxonomies are becoming popular as a tool to increase credibility and transparency for investors and other stakeholders. Led by the EU, green taxonomies that classify environmentally sustainable activities have been developed by a number of countries. In light of developing transition finance, Singapore and the ASEAN extended the EU Taxonomy and others to encompass a broader range of transition activities compared with transition activities and enabling activities covered under the EU Taxonomy. Those taxonomies use Technical Screening Criteria and sunseting requirements in the Amber category (transition activities). Transition activities will be eventually upgraded to a Green classification if the criteria are met, or alternatively downgraded to a Red classification if the Green criteria are not met. This approach demonstrates the intention to avoid locking in unabated fossil fuel energy and other emissions-intensive assets and thus prevent the emergence of stranded assets.

Fourth, GFANZ proposed the definition and criteria of transition finance from the perspective of financial institutions. The proposal focuses on segmenting transition finance portfolios based on the four strategies (Climate Solutions, Aligned, Aligning, Managed Phaseout). This approach includes both hard-to-abate sectors and lower-emissions sectors, which currently have presented 1.5°C aligned emissions reduction pathways or have committed to transitioning in accordance with 1.5°C aligned pathways. It also covers various technologies, services, tools, or social and behavioral changes that directly contribute to the elimination, removal, or reduction of real economy GHG emissions or that directly support the expansion of these solutions. An approach to calculate Expected Emissions Reduction and its allocation to financial institutions (required to estimate financed emissions) is also presented to scale up transition finance.

All of these aforementioned approaches share the goal of increasing transparency and credibility among investors to develop the transition finance market. However, they differ significantly in terms of the definition of transition finance; data and target disclosure requirements (such as Scope 3 emissions data and targets); alignment or aligning with the 1.5°C pathways; the use of time-bound criteria and thresholds; requirement of science-based criteria; and sectoral decarbonization approaches. It appears that there is a growing consensus that companies transitioning to net zero should make efforts to make their emission reduction path aligned with the 1.5°C pathway much earlier than 2050. Following the ISSB's IFRS S2 and other suggestions, companies are expected to disclose Scope 1, 2, and 3 emissions data. Thus, it is important to begin to reflect the disclosure requirements covered by the ISSB standards in the aforementioned approaches. It is likely to take time to improve the coverage of Scope 3 emissions or the quality of information about Scope 3. Due to limited data available from their suppliers, companies need to make estimates on Scope 3 data

based on various sources. Nevertheless, understanding all upstream and downstream emissions is essential for companies and thus financial institutions. Once many companies begin to disclose those emissions data, targets, and action plans globally, companies will be able to obtain emissions data directly from their suppliers and thus the quality of Scope 3 data will improve over time.

Table 6.1: Main Approaches to Transition Finance

1. 1.5°C Aligned Pathway	SBT Initiative, Climate Bond Initiative (CBI), etc.
2. Global Common Threshold (e.g., steel and cement)	International Energy Agency
3. Technology Roadmap	Japan
4. Classifying Transition Activities Under the Taxonomies	
Gas and Nuclear Power subject to stringent time-bound criteria	European Union (EU)
Using Amber label under the Traffic Light Classification System	Singapore, ASEAN
5. ICMA and CBI Certified Bond Principles (or Handbook) and Standards	
Recommending Scope 3 emissions data and other disclosure in 2023	International Capital Markets Association (ICMA)
Labelling "Aligned" and "Transitioning" based on alignment with 1.5°C pathway	CBI
6. Transition Finance from the Financial Sector Perspectives	
Estimating Expected emissions Reduction based on 1.5°C Pathway and benchmarks	Glasgow Financial Alliance for Net Zero (GFANZ) Secretariat
7. Early Coal Power Phaseout	Singapore, ASEAN, GFANZ Secretariat

Source: Prepared by the author.

While the issuance of transition bonds (and loans) has been on the rise, the size of the transition bond market remains limited in comparison to green bonds, sustainable bonds, or sustainability-linked bonds. The majority of transition bonds are issued mainly in Japan and the PRC, with emissions-intensive companies being the main issuers. These transition bonds support companies in financing investments to reduce GHG emissions by promoting energy efficiency and investments in new production or decarbonization technologies. Unlike green bonds, which require the allocation of proceeds to green or environmentally sustainable projects, transition bonds do not mandate that companies' current operations be environmentally sustainable. Instead, they expect companies to reduce GHG emissions toward net zero by around 2050 through transitioning their business operations. This transition can involve retrofitting existing assets, developing new production technologies (utilizing hydrogen and ammonia), and investing in CCUS technology. Given the considerable uncertainties regarding technological development and the high costs associated with investment, along with the necessity to establish new supply chain networks, it is unclear at this stage which technological solutions will become commercially viable. Thus, increasing financing for companies to explore various options and technologies is essential.

It remains uncertain whether the world economy will collectively pursue the development of a transition bond (and loans) market with a dedicated "Transition" label, which will be treated differently from the existing green bonds, sustainable bonds, and sustainability-linked bonds—following the precedents set by Japan and the PRC. Alternatively, it is possible that financial institutions and investors could pursue disclosing transition finance based on the four key transition financing strategies developed by GFANZ on their portfolios without specifying the types of financial instruments (bonds, loans, equity, etc.) and targeted sectors. The former approach primarily concentrates on developing

financing instruments tailored for hard-to-abate sectors. In contrast, the latter approach encompasses a broader spectrum of sectors and entities. Its goal is to channel more funds toward all activities and entities contributing to the transition of the economy to a net-zero status.

At this stage, there is a high degree of uncertainties regarding which approach will become more dominant over time for two reasons. One reason is due to the existence of various definitions related to transition finance (Table 6.2, Table 6.3). For instance, the OECD defined transitional finance as financing the decarbonization of emissions-intensive companies and economic activities that may not currently have cost-effective low- or zero-emissions alternatives but are essential for future socio-economic development. In contrast, GFANZ provides a more comprehensive definition of transition finance by including both high- and low-emitting companies, including technologies and tools that result in emissions reduction, as well as extending to managed phaseout or early phaseout of unabated coal-fired power plants. The EU, on the other hand, defines transition finance as investment in green production methods and efforts to reduce emissions as much as possible, particularly in cases where green technologies are not yet available.

Table 6.2: Various Definitions of Transition Finance

OECD (2022)	Transition finance is generally understood as a means to decarbonize companies or economic activities that meet three specific criteria: (1) they are emissions-intensive, (2) they may not currently have economically viable or credible low- or zero-emissions alternatives, and (3) they play a crucial role in future socio-economic development
GFANZ (2023)	Transition finance is defined as investment, financing, insurance, and related products and services that are necessary to support an orderly real economy transition to net zero. Transition finance is a means to support four key financing strategies essential for financing a comprehensive transition to a net-zero economy. Adopting a principles-based approach, these four strategies (Climate Solutions; Aligned; Aligning; and Managed Phaseout).
ICMA (2020, 2023)	Transition finance focuses on hard-to-abate sectors for issuers of Green Bond Principles or Sustainability Bond Guidelines aligned instruments
CBI (2022a, 2023a)	Transition finance is defined as encompassing bond financing activities that do not fall into the category of low- or zero-emissions (i.e., not green) but have a pivotal role, whether in the short or long term, in facilitating the decarbonization of an activity or supporting an issuer's transition toward alignment with the Paris Agreement. Transition finance is designed to expedite the decarbonization of hard-to-abate sectors, which is essential for transitioning the economy to a 1.5°C pathway.
Japan (METI 2021)	Transition finance refers to a financing means to promote long-term GHG emissions reduction initiatives that are taken by a company in emissions-intensive sectors considering to tackle climate change for the achievement of a decarbonized society

Source: Prepared by the author.

The second reason reflects that it is uncertain whether bond principles and standards setters, such as ICMA and the CBI, will actively work on establishing separate Transition-labeled use-of-proceeds bonds. The CBI proposed the Transition label to entities (companies) and sustainability-linked bonds (and loans). The CBI certification may be used to develop other labeled assets such as equity or funds. The EU appears to categorize transition finance under existing green bonds or sustainability-linked bonds, which may hamper a wider deployment of the Transition-labeled bonds. Singapore's Taxonomy did not explicitly outline how it would be adopted. Nonetheless, according to MAS (2023), there is a suggestion that it could be used to classify capital expenditures or assets investments through green bonds and loans (i.e., the Taxonomy in the PRC) or disclosure of green revenues (i.e., EU Taxonomy) or both. It remains unclear whether Singapore intends to explore the development of Amber-labeled bonds and loans or

funds. While the ASEAN Taxonomy Board has emphasized transition finance, it has not explicitly stated its intent to develop a separate transition-label financial market. Singapore's Taxonomy admitted that there was no detail available presently as to how the Taxonomy would be applied and used. GFANZ focuses on transition finance, which comprises the four key financing strategies and thus cover green finance as well.

Table 6.3: Various Definitions of Transition Finance

EU Taxonomy (European Commission 2023a)	Transition activities refer to activities for which no technologically and economically feasible low-carbon alternatives currently exist but support the transition towards achieving net-zero emissions
	Companies are expected to adopt cross-sectoral or sector-specific decarbonization scenarios and science-based pathways consistent with the 1.5°C scenarios
	* Investments aimed at achieving the EU Taxonomy alignment within 5 years (10 years under certain circumstances) are recognized as capital spending fully in line with the Taxonomy
	* Issuing use-of-proceeds green bonds for transition purposes using the European Green Bond Standard promote financing economic activities expected to become Taxonomy-aligned within 5 years (with an exception of 10 years)
	* Sustainability-linked bonds can be tied to Taxonomy key performance indicators and a timeframe aligned with the transition
Singapore (GFIT 2023a)	Amber (Transition) label encompasses activities under the Traffic Light Classification System that are either in the process of transitioning to Green within a specific timeframe or facilitating significant short-term emissions reductions
	* To identify and classify transition activities evolving over time, two approaches can be employed: (a) climate transition plans that outline planned actions at the company level toward achieving net-zero goals, and (b) a Measures-Based Approach, which entails a list of eligible technologies or Green and Transition
	* Early coal phase-out activities will Not be categorized using the traffic light system. The phase-out of unabated coal combustion in the coal plant aligns with or occurs earlier than 1.5°C-aligned coal phase-out deadlines (retiring no later than 2030 in developed economies and 2040 in other countries in accordance with the IEA Net Zero pathway). The coal plant's operational duration is limited to 25 years.
ASEAN Taxonomy (ASEAN Taxonomy Board 2023)	Plus Standard include Amber Tier 2 and Tier 3 as transition activities:
	Amber Tier 2 activities refer to those that support a transition towards a Green pathway within a defined timeframe; AND that (a) results in a contribution to climate change mitigation with the lowest carbon emitting technology and a prescribed sunset date; OR that (b) enables or promotes the implementation of a Green activity. Minimum threshold is applied for lifecycles emissions.
	Amber Tier 3 activities refer to (i) an activity supporting the meeting of NDC emissions targets of ASEAN member countries that do not have a net zero 2050 timeline; OR (ii) an activity meeting the Technical Screening Criteria of Amber Tier 2 or Green, but assessed that it will do some level of significant harm to other Environment Objectives (will be remediated within 5 years)
	* Coal power plants are classified under the Green, Amber Tier 2 and Amber Tier 3 activities. The conditions for Green label include (1) phasing out coal plants by 2040, (2) coal plants built before 2023, and (3) operation period capped at 35 years, etc.
	* Amber T2 category is applied if phasing out coal plants by 2050, (2) coal plants build before 2023, and (3) operation period capped at 35 years. Amber T3 category is applied if operation period capped at 35 years, coal plants build during 2023–2027, and adopt best-in-class technology.

Source: Prepared by the author.

The approach to transition finance has gained significant momentum in recent years, particularly in the Asia and the Pacific region. This region relies heavily on coal-fired power generation, often with shorter operating lifespans compared to those in the United States and Europe. Consequently, there is a growing need to explore early phaseout possibilities while simultaneously driving decarbonization through the development of new technologies, including CCUS, ammonia, and hydrogen. Concurrently, the region is expected to remain a key hub for global economic development and manufacturing, resulting in increased demand for products from coal-fired power and hard-to-abate sectors. Therefore, it would be advantageous for governments and financial regulators in the region to initiate more information sharing and informal discussions regarding individual approaches related to corporate disclosure and supervisory approaches, as well as approaches related to transition finance. A deeper understanding of each other's approach and some efforts to promote interoperability and standardization could ultimately contribute to the expansion of transition finance.

Lastly, an essential aspect not covered in this paper is the importance of fostering product markets for hard-to-abate sectors. Companies operating in these sectors must make substantial investments in research and development to reduce production-related emissions through the exploration of various options. This process involves considerable risks and costs. When these companies make significant investments in producing cleaner products, which often come with higher production costs and associated risks, it is important to acknowledge that these cleaner products may be sold at higher prices compared to traditional ones. Despite their higher costs, these cleaner products play a critical role in the global economy. Therefore, it is essential to address the development of product markets and the corresponding supply chain networks. Even if new technologies become available, these sectors will struggle to achieve substantial GHG emissions reductions without well-established product markets and supply chain networks.

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