CLIMATE POLICY INITIATIVE

TECHNICAL BRIEF

Financing Transitional Activities in the Iron and Steel Sector

Transition finance, core enablers, and financing instruments

December 2025

AUTHORS

Saarthak Khurana
saarthak.khurana@cpiglobal.org

Tariq Habib
tariq.habib@cpiglobal.org

Zeya Farhan
zeya.farhan@cpiglobal.org

ACKNOWLEDGEMENTS

We acknowledge the brief's lead authors and contributors, and extend our special thanks to our advisors—Kalpesh Gada, Neha Khanna, Sanjoy Banerjee, and Vikram Widge for their invaluable guidance and contributions. We are also grateful to Kavya Hari from Intellecap for her insights into carbon markets.

We also acknowledge the contributions from the members of the India Green Steel Network's (IGSN) Sustainable Finance and Green Industrial Policy Working Group. Special thanks to Neha Kumar from the Climate Bonds Initiative, Shantanu Shrivastava from the Institute for Energy Economics and Financial Analysis, Hemant Mallya from Council on Energy, Environment, and Water, Sangeeth Selvaraju from the Grantham Research Institute on Climate Change and the Environment for their inputs during IGSN working group meetings. We also acknowledge the authors of the chapter "Long–Duration Deep-Discount Bonds for Industrial Decarbonization" from the book "Financing Climate Action" (authored by Labanya Prakash Jena, Saarthak Khurana, and Parag Puri).

In addition, we are grateful to our CPI colleagues Saumya Tiwari, Rob Kahn, and Elana Fortin for editing, design, and reviews.

DESCRIPTORS

SECTOR

Iron and Steel

REGION

India

RELATED CPI WORK

Discussion Paper: Financing Industrial Decarbonization

Scaling transition finance for the green industrial transition of the Indian Iron & Steel sector

RECOMMENDED CITATION

CPI. (2025). *Financing transitional activities in the iron and steel sector*. Climate Policy Initiative.

CONTENTS

ABBREVIATIONS

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BATs	Best Available Technologies
BF-BOF	Blast Furnace - Basic Oxygen Furnace
BRSR	Business Responsibility and Sustainability Report
CBAM	Carbon Border Adjustment Mechanism
CCTS	Carbon Credit Trading Scheme
CPI	Climate Policy Initiative
DDB	Deep Discount Bond
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace
EIF	Electric Induction Furnace
I&S	Iron and steel
IDBI	Industrial Development Bank of India
IFSCA	International Financial Services Centres Authority
IRDAI	Insurance Regulatory and Development Authority
MoEFCC	Ministry of Environment, Forest, and Climate Change
MoF	Ministry of Finance
MoP	Ministry of Power
MSM	Market Support Mechanism
MTPA	Million Tonnes per Annum
NSP	National Steel Policy
OECD	Organisation for Economic Cooperation and Development
RBI	Reserve Bank of India
SEBI	Security and Exchanges Board of India
STRIPS	Separate Trading of Registered Interest and Principal of Securities

FIGURES, BOXES, AND TABLES

EXECUTIVE SUMMARY

India's path to net-zero emissions by 2070 hinges on decarbonizing key sectors, including power, industry, transport, and agriculture. Among them, the hard-to-abate (HTA) sectors, such as iron and steel, are central, as they contribute significantly to the country's total GHG emissions and have limited access to green technologies with viable economics. Achieving deep decarbonization here requires more than traditional green financing. The HTA industries, which would need to transition, sit in a persistent financing gap as (1) technologies are not green enough for conventional green instruments and (2) transition pathways are capital-intensive.

As a potential solution, this brief explores a separate financing class—transition finance (TF) for the HTA sectors. It proposes a novel instrument, the Partial Deep Discount Carbon STRIPS (PDDCS) bond, to channel TF.

To set the context for TF, CPI conducted stakeholder consultations and published a discussion paper to identify four core enablers that would be essential to develop a TF market in India:

- **Sectoral and technology roadmaps** – to guide the industry and financiers along scientifically derived and context-specific decarbonization pathways.
- **Climate finance taxonomy** – to (1) identify and codify clear criteria as to which technologies may be termed as transitional and (2) create a unified classification system to guide investors, policymakers, and the real sector.
- **Corporate transition plans and credibility assessment** – to minimize the potential for greenwashing and ensure investor confidence.
- **Transition finance instruments** – which could serve as the vehicle through which TF may be channeled.

Building on the need for innovative TF instruments, the proposed PDDCS is designed to provide debt capital for transitional activities—specifically addressing high capex requirements, transition risks, and cash flow constraints for steel companies. Capital would be incurred upfront, with benefits realized over a long-term time horizon.

The features of the PDDCS are derived from legacy instruments, such as deep-discount and zero-coupon bonds, to ensure a long-term repayment period and potential tax incentives that mirror the infrastructure financing. The instrument's central characteristic is the use of carbon values generated through transitional activities enabled by the use-of-proceeds, which would result in carbon credits under India's forthcoming carbon credit trading scheme (CCTS).

The instrument aims to leverage opportunities in India's developing carbon market, where the voluntary market remains nascent. Two forms of the instrument are proposed to ensure current compliance and future readiness. Lastly, targeted consultations with FIs were conducted to gauge the current potential for uptake of the PDDCS, outlined in section 5, during which discussions identified the policy, market, and financing ecosystem-level reforms required to enable successful deployment.

1. INTRODUCTION: CONTEXT AND THE 'WHY' AND 'WHAT' OF TRANSITION FINANCE.

1.1 SECTORAL OVERVIEW

India is the second-largest producer of iron and steel (I&S) globally, with steel demand growing in sync with the country's development. A cornerstone of the economy, I&S is also one of the largest greenhouse gas (GHG) emitters, accounting for more than 10% of India's total GHG emissions.

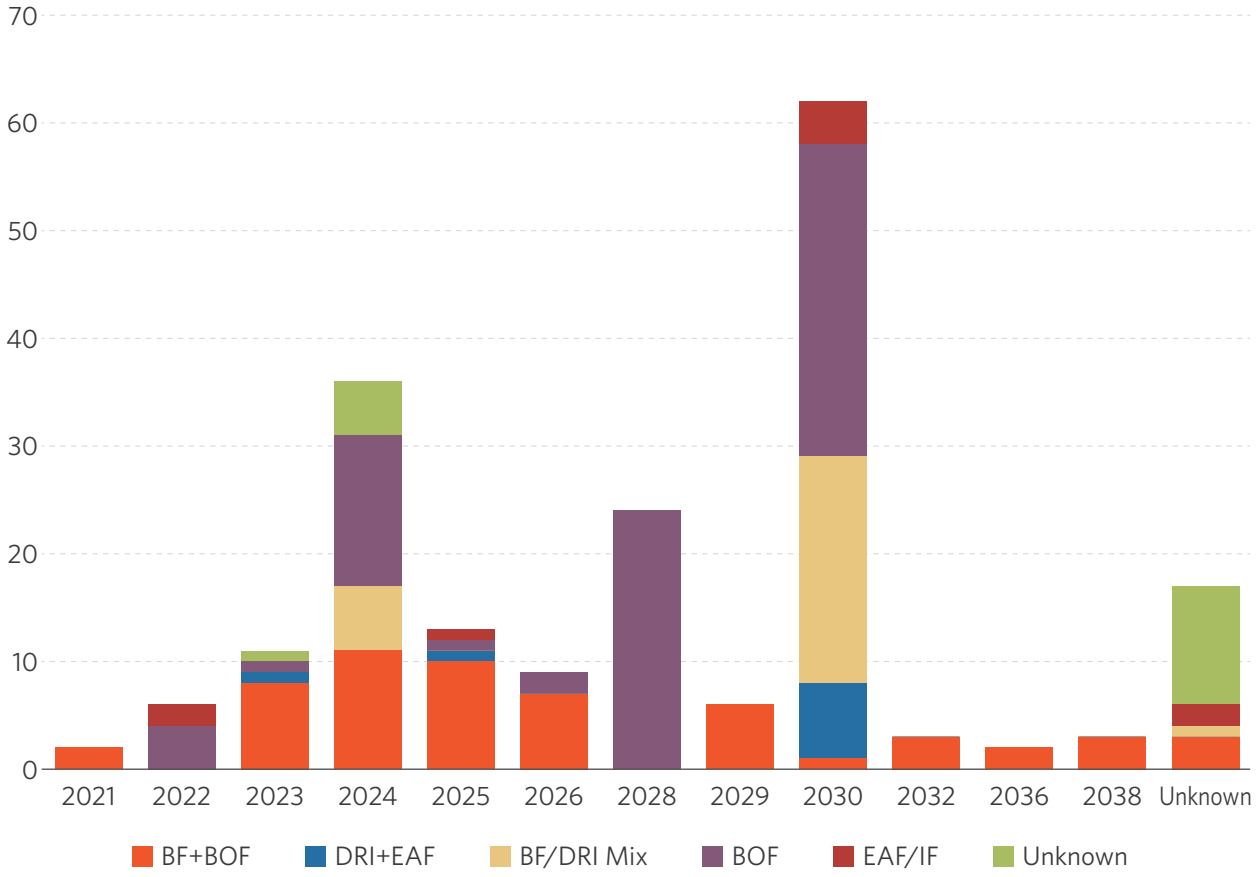
India has announced a target to achieve net zero by 2070. This will ultimately require decarbonization of hard-to-abate sectors, including I&S. While multiple companies operating in the country have announced their targets to achieve net zero by much earlier than 2070, sector-wide decarbonization will be complex due to the sector's composition. The average emission intensity (tCO_2 emitted per tonne of steel produced) of Indian steel is 2.54 (Ministry of Steel, 2024) which is higher than the global average intensity of 1.91, owing to the limited use of natural gas as a feedstock for a less emission-intensive route.

The sector may be bifurcated into primary and secondary segments. The former generally refers to large, integrated steel plants (ISPs) that utilize the Blast Furnace-Basic Oxygen Furnace (BF-BOF) steelmaking route. At the same time, the latter comprises smaller, secondary steel units relying on the Direct Reduced Iron-Electric Arc Furnace (DRI-EAF)/Direct Reduced Iron-Induction Furnace (DRI-IF) route.

The added layer of complexity in the decarbonization of the I&S sector stems from the planned capacity addition, mainly through the BF-BOF route. Nearly two-thirds (66%) of the new capacity will be added from the BF-BOF route, 9% as the DRI (coal-based) – EAF/IF route, 16% as a combination of BF, DRI, BOF, and EAF/IF, and the remainder is unknown(Kashyap, 2023). Nearly 90% of this capacity is estimated to come online by 2030, contributing to meeting domestic steel demand needed to fuel India's economic growth. However, from an emissions perspective, these trends are concerning, as the sector's emissions are expected to increase rapidly in the coming years. **As a result, the total annual emissions would more than double from 260 $MtCO_2$ per annum in 2023 to 560 $MtCO_2$ per annum by 2030** (Kashyap, 2023)**.**

Given the presence of smaller units producing steel via emission-intensive routes and planned capacity additions through BF-BOF routes, it becomes imperative to initiate a gradual transition in the sector through the integration of best available technologies (BAT). Multiple BATs may not be green or commercially viable, given the high capex and opex required for long-term investment. Transition Finance (TF), which enables capital to flow towards 'transitional activities', could help the I&S sector transition in the absence of viable alternative green technologies.

Figure 1: Upcoming Capacity Addition



Source: *CPI Analysis*

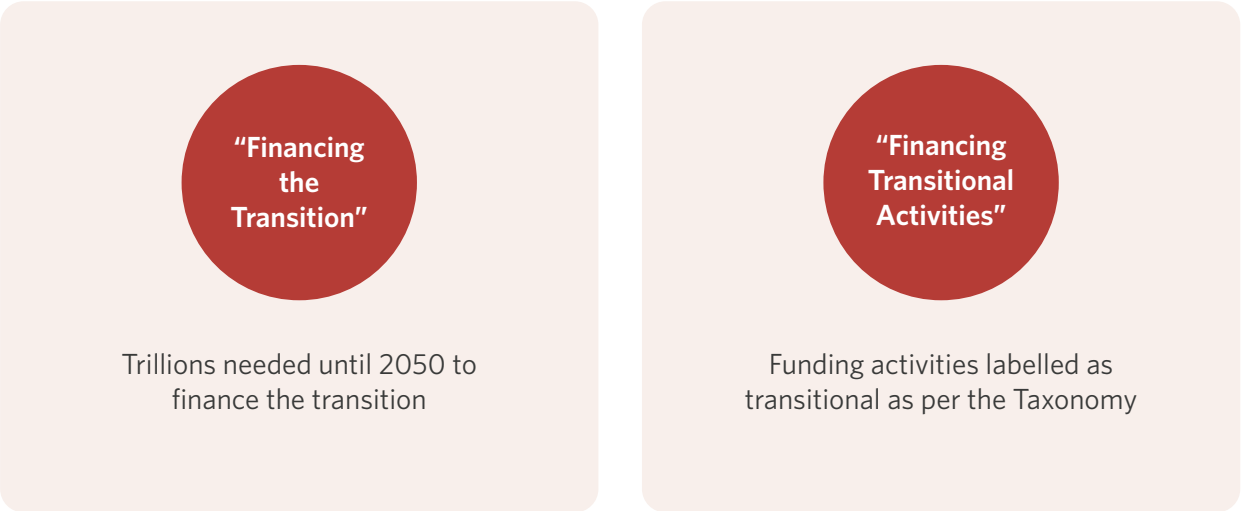
The twin objectives of this technical brief are to:

1. Highlight the current limitations of the green finance market in financing the emission reduction of hard-to-abate sectors in the absence of viable alternative green technologies and study the core enablers essential for developing a thriving TF market.
2. Propose a novel financing instrument that provides long-term debt capital to fund transitional activities and take advantage of increasing opportunities arising from carbon pricing and credit trading in view of the Government of India's upcoming Carbon Credit Trading Scheme (CCTS).

1.2 TRANSITION FINANCE – GREEN VS TRANSITION

Green and transition finance are two key components of sustainable finance that play distinct roles in achieving sustainable development. Green finance exclusively supports near-zero or zero-emission initiatives that align with the Paris Agreement, ensuring direct progress toward a sustainable economy. TF, on the other hand, acts as a bridge-funding activity that is not yet fully green but is essential for reducing emissions in hard-to-abate sectors. Rather than competing approaches, green and transition finance are complementary, working together to accelerate decarbonization. While green finance drives the immediate deployment of zero-emission solutions, TF ensures the gradual transformation of emission-intensive industries. Together, these financing approaches create a comprehensive pathway to decarbonization by enabling both the immediate deployment of green solutions and the gradual transformation of emission-intensive activities.

Figure 2: Transition Finance



The iron & steel sector faces challenges in achieving its decarbonization objectives because it typically relies on carbon-intensive technologies, with green alternatives that are either technologically nascent or economically unviable to implement across different geographies. Here, the green finance market and instruments, such as green bonds, fall short because they are designed to raise capital for projects that already qualify as environmentally sustainable, are aligned with a recognized taxonomy, and deliver zero or near-zero emissions from day one.

Mature technologies, such as solar and wind, draw most green finance, while others, such as steel producers requiring piloting of technologies such as Hydrogen-based Direct Reduced Iron (H2-DRI) and Carbon Capture, Utilization, and Storage (CCUS), have limited access to green capital (CPI, 2025b). In such a scenario, TF instruments that lower the cost of capital, share early-stage technology risks, and incentivize tangible near-term emission reductions can help avoid stranded high-carbon assets, thereby supporting both competitiveness and climate goals.

Upcoming developments, such as carbon pricing and border adjustment mechanisms, offer strong incentives to reduce emissions in these sectors. TF, as a separate financing class, could play a major role in reducing emissions from these sectors.

1.3 DEFINITION AND SCOPE

TF lacks a standard definition, and an analysis of currently published transition finance frameworks found different definitions in each, with a common focus on decarbonizing the high-emitting sectors (Slanger, 2023). The evolving nature of TF highlights that transitional activities, as they are considered today, may not qualify as transitional in the future as technology matures and low-carbon alternatives become commercially viable. A list of published TF guidelines and frameworks is attached as annexure II.

For this brief, we use the definition provided by the Asian Development Bank (ADB), as referenced in the International Financial Services Centres Authority's (IFSCA) expert committee report on TF[1].

'Transition finance is a concept where financial services are provided to high carbon-emitting industries – such as coal-fired power generation, steel, cement, chemical, paper making, aviation, and construction – to fund the transition to decarbonization'.

Table 1 broadly defines the scope of TF based on a review of existing taxonomies and guidelines. A comprehensive review is attached as Annexure III.

Table 1: Scope of transition finance.

Elements	Description
Applicability	• Accelerating transition in the hard-to-abate sector (e.g., steel, cement). • Accelerating transition in other emission-intensive sectors (e.g., phase-out of unabated fossil fuel assets). • Increase access to resources and inputs (e.g., green hydrogen)
High-level principles	• Alignment with the goals of the Paris Agreement. • Avoid carbon lock-in. • Define transition activities with no near-term green alternatives. • Transparency, monitoring, and reporting of performance, and penalties for non-performance.
Investment structures	• Equity, debt (loans, bonds, project finance), trade finance, blended finance, etc.
Instruments	• KPI-linked (general purpose loans and bonds linked to emission reduction targets). • Use-of-proceeds (directed towards low-emission assets). • Hybrid (e.g., sustainability-linked green bonds (SLGBs) - use-of-proceeds model of a green bond with the performance-based structure of a sustainability-linked bond). • Traditional loans and bonds.

Source: *CPI Analysis*

1 IFSCA Report on Transition Finance

2. TRANSITION FINANCE: CORE ENABLERS

CPI, in collaboration with the India Green Steel Network (IGSN), conducted stakeholder consultations with industry and financial sector experts on transition finance and published the findings as a discussion paper (CPI, 2025a). The paper outlined a series of core enablers and proposed recommendations to facilitate the development of a TF market in India and to enhance its mobilization and deployment. To lay the foundation for the novel financing instrument, the core enablers have been discussed briefly here.

2.1 SECTORAL AND TECHNOLOGY ROADMAPS

Technology pathways and roadmaps2 are used by companies, financial institutions (FIs), governments, and regulators for transition plans and target setting. Globally, widely used roadmaps for the I&S sector are:

- IEA Iron and Steel Technology Roadmap: top-down economy-wide and sectoral pathway to net-zero emissions (IEA, 2020).
- Mission Possible Partnership's Steel Sector Net-Zero Transition Strategy (ST-STSM): bottom-up agent-based simulation pathway (Mission Possible Partnership, 2022).

India-specific technology pathway: India's NZE target is 2070. The context-specific factors related to a rapidly growing, developing economy and resource endowment mean that the Indian I&S sector will follow a different decarbonization trajectory than developed countries. Therefore, the pathway will differ from the two mentioned above.

Any sectoral pathway that is used as a reference should ideally meet specific criteria to ensure credibility: (1) climate alignment (compatible with goals of the Paris Agreement); (2) sufficient granularity (periodic - 5-year or decadal - data on emissions trajectory and technology choices); (3) transparency (availability of modelling assumptions and results to stakeholders); (4) validation from the industry and other stakeholders; (5) adaptability (to context-specific constraints).

The Ministry of Steel (MoS) has outlined a long-term, high-level technology roadmap and defined a carbon emissions trajectory up to 2030, which will also serve as the reference for India's Carbon Credit Trading Scheme (CCTS). In the current absence of a nationally adopted long-term sectoral pathway, other pathways such as the IEA's 'Iron and Steel Roadmap for India' or the Mission Possible Partnership's 'Steel Sector Transition Strategy Model' may serve as the reference for companies and FIs. As India has net-zero targets for 2070, existing pathways, which are usually developed against 2050, may not be suitable and will need to be revised and aligned with the Indian context. A national pathway could be applicable if it is scientifically derived.

2 Literature such as EU Roadmap 2050, SBTi decarbonization pathway et cetera often use pathways and roadmaps interchangeably. For this paper, we define sectoral pathways as milestone-linked outcomes while a technology roadmap defines usage of different technologies at different points of time to complement sectoral pathways in achieving the desired milestones.

2.2 TAXONOMIES AND CRITERIA FOR ELIGIBLE TRANSITIONAL ACTIVITIES

Taxonomies are used to define eligible activities for green or sustainable finance, bringing diverse stakeholders such as investors, policymakers, and corporations under a common banner. Taxonomies generally set overarching environmental objectives, including climate mitigation, adaptation, resilience, circular economy, ecosystems, and biodiversity. The Indian government has announced plans to develop a 'Climate Finance Taxonomy' and has published a 'Climate Finance Taxonomy Framework' in May 2025 (Department of Economic Affairs, 2025) towards this goal. In addition, a comprehensive review of currently published taxonomies from various jurisdictions is attached as annexure III.

Climate finance taxonomies serve several key functions, including defining different types of activities — green, transitional (on a credible path), and ineligible. Transitional activities are defined to support sectors that cannot yet fully decarbonize. They refer to economic activities that are not fully aligned with the Paris Agreement objectives in the near term but are still considered necessary in the short to medium term as part of the broader decarbonization journey. By including transitional activities, taxonomies pave the way for a phased approach to net-zero, supporting efforts to reduce emissions in hard-to-abate sectors that cannot meet the green criteria.

Several approaches exist for determining which economic activities qualify as transitional. An earlier CPI discussion paper proposed three criteria: 1. directly listing activities, such as identified low-carbon technologies and fuels (e.g., hydrogen-based DRI); 2. setting quantitative thresholds, upper thresholds for emission intensity in primary steel production and lower thresholds for scrap utilization in secondary steel production; and 3. an approach that combines quantitative thresholds with eligible technological options. (CPI, 2025a).

2.3 CORPORATE TRANSITION PLANS AND CREDIBILITY ASSESSMENT

Transition plans at the national, sectoral, and entity levels are the cornerstones of industrial transition to lower emissions. A critical enabler of TF flow to corporates is the presence of a feasible, benchmarked, ambitious, and credible transition plan.

A robust transition plan reduces the risk of greenwashing while nudging firms to undertake meaningful decarbonization measures. This undermines both the broader nationwide goals of a net-zero economy and investor confidence. Transition plans must be developed and evaluated against rigorous benchmarks and aligned with science-based targets.

CPI has developed an eleven-element framework for assessing the credibility of corporations' transition plans. Please refer to Table 2 below. The objective is to harmonize expectations across stakeholders and support a consistent interpretation of 'credibility' in the context of TF.

Table 2: A Framework for developing and assessing the credibility of transition plans based on guidelines provided by (Climate Bonds Initiative, 2023), (OECD, 2022) and (ASEAN, 2023).

Elements	Guidance
Net Zero Emissions goal	Science-based target consistent with the 1.5° C target of the Paris Agreement, with no or low overshoot and, at the very least, well below 2° C.
Interim targets (phasing)	Long-term transition goals, accompanied by interim (short-, medium-, and long-term) quantifiable, time-bound targets. Include an explanation of methodologies, assumptions used, and benchmarking undertaken.
Technology selection	Any science-based pathways/roadmap consistent with the goals of the Paris Agreement.
Coverage: Scope 1, 2, and 3	Scope 1 & 2 at a minimum. Include Scope 3, where material and exclusion are to be explained and justified.
Use of carbon credits & offsets	It should not be used as an alternative to reducing emissions or delaying mitigation action. Ideally, there should be no more than 10% abatement.
Financing	The financial plan details the implications of the transition, the financing requirements for executing the transition plan, and how to achieve such financing.
Avoiding carbon lock-in	Identify existing assets and new investments at risk of leading to carbon lock-in. Develop a strategy and process for the responsible retirement of high-emitting assets.
Do No Significant Harm (DNSH)	Avoid harming other sustainability objectives (e.g., biodiversity) at the activity and entity levels.
Governance	Define processes and responsibilities for regular monitoring and reporting progress aligned with disclosure standards (e.g., IFRS S1 and S2), timely revisions of targets, and updated plans.
Third-party verification	Third-party verification of the credibility of transition plans and activities for effectiveness, completeness, and performance against benchmarks.
Just transition considerations	Assess and account for adverse environmental and social impacts, including on the labor force and communities, from the transition in the transition plan. A strategy for mitigating such impacts should be included in the plan.

Source: *CPI Analysis*

A detailed side-by-side analysis of the existing literature and guidance on credibility assessment of transition plans has been attached as annexure I, and an analysis of a leading steel company's transition plan against CPI's framework is attached as annexure IV.

2.4 TRANSITION FINANCE INSTRUMENTS

The IFSCA recommendations on TF prescribe categorizing all suitable instruments as TF instruments, not just those that are labeled as transition or sustainable.

TF instruments can be broadly bucketed into 4 categories:

- Key Performance Indicator-Linked - General-purpose loans and bonds linked to emission reduction targets (e.g., sustainability-linked loans (SLLs) and bonds (SLBs). These may also be referred to as 'General Corporate Purpose'.
- Use-of-proceeds - directed towards low-emission assets (e.g., Transition loans, green bonds)
- Hybrid - (e.g., sustainability-linked green bonds (SLGBs) - use-of-proceeds model of a green bond with the performance-based structure of an SLB)
- Traditional - (e.g., Traditional loans and bonds, public and private equity)

Table 3 provides an overview of instruments currently used to finance transitional activities.

Table 3: Overview of labeled instruments used to finance transitional activities.

Instrument Label[3]	Purpose	Mechanism	Allocation of Capital
Sustainability-linked loans ($2123.61 Bn)	Designed to incentivize borrowers to achieve specific sustainability targets, such as emission reduction.	The loan's interest rate step-up is linked to predetermined targets for sustainability-specific KPIs.	KPI-Linked / General corporate purpose
Sustainability-linked bonds ($279.25 Bn)	Designed to incentivize issuers to achieve specific sustainability targets, such as emission reduction.	Coupon step-up/premium on redemption/offset purchase obligation linked to the fulfillment of predetermined targets on sustainability-specific KPIs.	KPI-Linked / General corporate purpose
Transition loans ($3.30 Bn)	Designed to enable borrowers to fund an entity's transition towards a low-carbon but not completely green state.	No penalty mechanism	Use-of-proceeds
Transition bonds ($35.41 Bn)	Designed to enable issuers to fund an entity's transition towards a low-carbon but not completely green state.	No penalty mechanism[4]	Use-of-proceeds[5]

Source: *CPI Analysis*

Existing instruments to finance the transition have shown a major growth in the last few years; however, a significant financing gap exists, especially in hard-to-abate sectors (CPI, 2025b). Innovative financial instruments tailored to the sector's requirements are expected to mobilize greater investment in transition projects. They must be anchored in credible transition plans, science-based KPIs (if the instrument links interest rates to emissions reductions), taxonomy alignment, adherence to national climate goals, and be designed with incentive-based structures in mind. These instruments will allow capital to flow to where it is most required – industries that are high emitters today and whose decarbonization journey is central to achieving net-zero. Innovations in instrument design would ensure a market-shifting solution.

3 (Issuance 2021-Q1 2025, globally Environmental Finance Data
4 In most cases, no penalty mechanisms had been observed. Recently, in 2024, Japan has issued transition-linked bonds with interest rates tied to emission reduction.
5 Based on bonds issued so far. However, currently there is no universal guideline on allocation of capital for instruments labelled as 'transition'.

As the carbon market (CCTS) develops in India and carbon pricing is introduced, new opportunities for innovation in financing solutions arise. Taking advantage of carbon credits to fund transitional activities can be a significant lever for companies in the hard-to-abate sectors to offset decarbonization costs and bridge funding gaps.

In addition, the compliance procedure for obligated entities being developed by the Bureau of Energy Efficiency (BEE) mentions banking of such credits (Bureau of Energy Efficiency, 2024) which would further deepen the role of carbon in financing the transition. The next section delves deeper into the design of a novel Instrument that can leverage a combination of these levers to finance a transition project.

3. NOVEL TRANSITION FINANCE INSTRUMENT

The industrial sector is capital-intensive, and the high cost of decarbonization solutions further increases upfront capital requirements. Unlike renewable energy, there is limited demand for commodities such as green steel. Additionally, higher-priced green steel is subject to commodity cycles, as prices can fluctuate into unviability deeper and take longer to recover.

Potentially higher capital expenditure on low-carbon technologies can impact the company's profit margins, cash flows, and competitiveness. Even if the company is willing, there are challenges in raising debt or equity capital. New debt capital could be expensive, and capex for low-carbon technologies would be incurred today. Still, the full benefits would accrue over a long-term time horizon as carbon prices and regulatory requirements develop sufficiently to nudge companies to adopt low-carbon technologies.

3.1 NEED FOR AN INNOVATIVE TRANSITION FINANCE INSTRUMENT

The key to nudging private companies to invest in low-carbon technologies lies in providing access to a financing instrument that aligns with their medium- to long-term financial targets. An instrument that offers interest cost savings and defers principal and interest payments until the project becomes operational can significantly reduce the impact on financial metrics compared to conventional financing options.

Steel production units typically have long asset lives, typically 30-40 years; thus, it is critical to understand and fairly account for the cost of carbon for steel produced by conventional versus low-carbon technologies. While high-emitting BF-BOFs/Coal-DRIs might have lower per unit production cost today, considering the steady decline in Earth's available carbon budget, the projected cost of carbon is likely to significantly drive up their costs in the long run.

The international focus on carbon market mechanisms, driven by Article 6 of the Paris Agreement, the EU's Carbon Border Adjustment Mechanism (CBAM), and India's upcoming CCTS, signals that carbon pricing is poised to become a defining feature of the global low-carbon transition. Carbon prices are currently absent or low in several countries, but if they continue to rise, they will expose high-emitting companies to transition risks in the long run.

To this end, addressing the challenges and opportunities arising from the growing carbon credit market paves the way for a novel instrument. This instrument considers the lifecycle of industrial projects, such as iron and steel plants, and their cash flow patterns, providing long-term support at reasonable costs to facilitate the low-carbon transition.

3.2 DISCUSSION: LEGACY INSTRUMENTS

The paper presents a novel financing instrument named 'Partial Deep Discount Carbon STRIPS bond (PDDCS)' designed specifically for transition projects. The paper reimagines the utility of two types of legacy bonds —Deep discount and the Separate Trading of Registered Interest and Principal of Securities (STRIPS) — for financing transition projects in the Iron & Steel Industry. Before delving deeper into PDDCS, the sub-sections below highlight characteristics of deep discount and STRIPS bonds.

DEEP DISCOUNT BOND

Innovations in financial instruments have often followed the need to mitigate risks, unlock capital, or drive market competitiveness. In a traditional vanilla bond, the principal (initial investment) equals the face value (the amount returned at maturity). The bondholder receives fixed income through periodic coupon payments (interest) at regular intervals (T1, T2, ..., T5) until maturity. However, there are several other ways to issue debt. For example, sovereign debt is often raised through zero-coupon bonds – an instrument issued at a discount to face value, paying no coupons, and having its face value repaid at maturity.

After liberalization, several major government-backed and private infrastructure companies issued a type of debt instrument called the 'deep-discount bond (DDB)'. DDBs are a kind of zero-coupon bond issued at a substantial discount to face value, maturing at par after a relatively longer tenure. These bonds were particularly popular in India for infrastructure financing, as they offered long-term capital at stable costs to the issuer and tax benefits[6] to investors, higher returns than long-term fixed deposits (FDs), and exit options for subscribers. The following Table 4 analyzes the key features of such a bond.

Table 4: Characteristics of an infrastructure deep discount bond

Issuer	Issuance Year	Issue Size	Tax Benefit	Call/Put Options	Remarks
Industrial Development Bank of India (Sansad, 2023)	1996	INR 1100 crore	Interest was not taxed annually. Lump-sum tax applied at maturity[7]	Put/Call options offered at predefined intervals (usually every 5 or 7 years) Investors could exit early, and IDBI could retire bonds if interest rates moved significantly.	Designed to meet long-term infrastructure funding needs.
ICICI Bank	1995-1997	INR 500-1000 crore	Deferred taxation until redemption or sale	Embedded call options after 5-7 years Some variants offered periodic put options to enhance liquidity for investors.	Strong demand from retail and provident fund investors due to ICICI's AAA credit rating at the time.

6 However, some DDBs may have a coupon rate, and investors are required to pay taxes on income from the interest.
7 (deferred taxation) as per the Income Tax Act.

In India, DDBs were usually issued by central government-backed entities for financing, but recently, state-government-run companies have received the nod from the central government to issue deep-discount bonds (Malhotra & Dhutla, 2025).

SEPARATE TRADING OF REGISTERED INTEREST AND PRINCIPAL OF SECURITIES (STRIPS)

In the United States, treasury bonds gave rise to the concept of STRIPS, in which a strip is the coupon removed from the bond, allowing the principal and coupon to be traded separately: one as an interest-paying coupon and the other as a zero-coupon bond. The strip mechanism separates the interest from the bond itself. The bond is a zero-coupon bond sold separately at a discount to its face value. The buyer cashes it in for face value when it matures.

3.3 PARTIAL DEEP DISCOUNT CARBON-STRIPS BOND

To support the financing of industrial decarbonization, we propose the **Partial Deep Discount Carbon-STRIPS (PDDCS)[8] Bond** is an instrument that reimagines the traditional vanilla bond by incorporating a long-term horizon, deep discount pricing principles, and features from the STRIPS framework to manage carbon returns. These bonds are specifically designed to address cash flow constraints, principal value requirements, balance risk and return, and generate carbon value.

The PDDCS are long-term partial deep discount bonds that could provide debt capital for 25-30 years to account for the longer life cycles of steel plants. They specifically target low-carbon solutions, which contrasts with the 10-15 year debt durations typically available to companies in this sector. These bonds will integrate the partial deep discount feature with assured coupon payments after x years in cash or carbon rights.

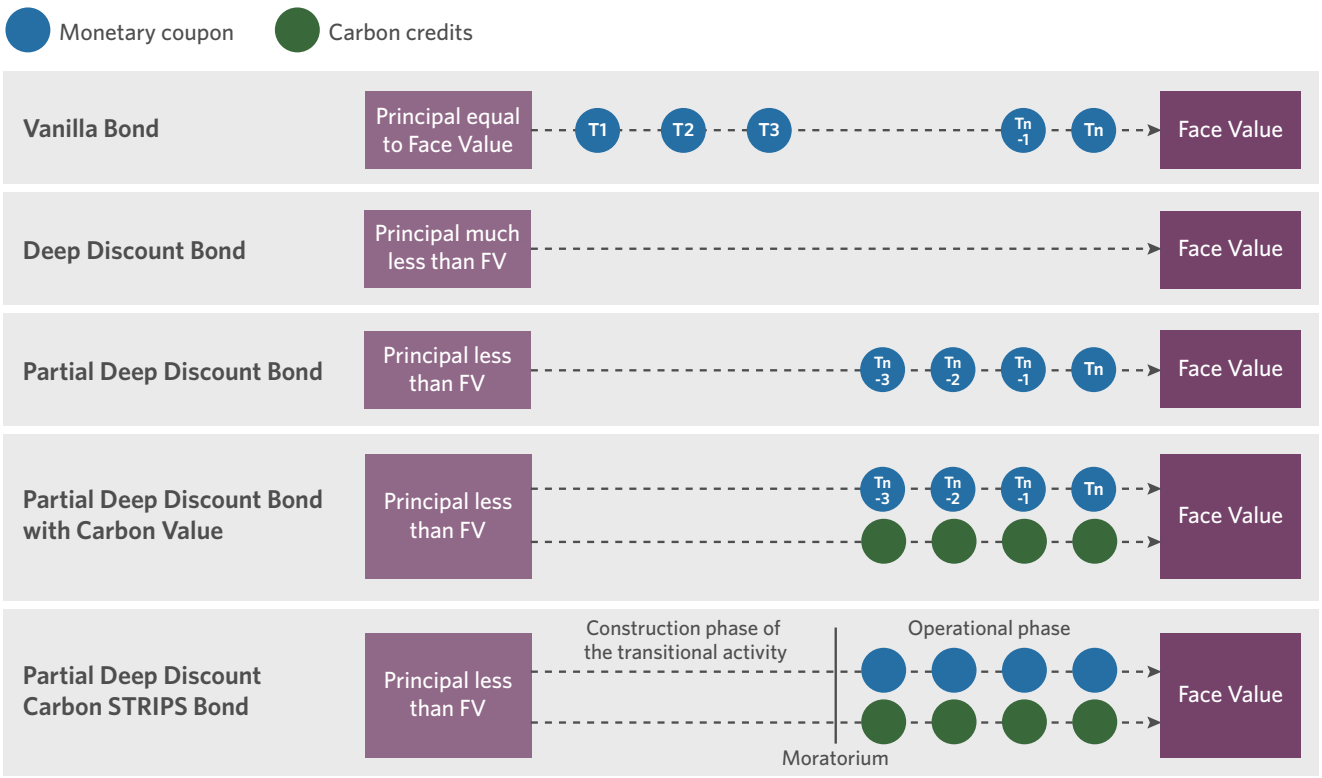
The PDDCS is envisioned as a future-ready financial instrument that will work in partnership with both the capital and carbon markets. Since India's CCTS is still under development, some of its features may not be applicable in the initial phase of deployment. Therefore, a more nuanced and market-ready version is discussed in section 4. This section focuses on the PDDCS.

IDEATION

The Iron & Steel producer issues a PDDCS bond to the investor. The investors (bondholders) play a central role by providing monetary investment, which flows to the Iron & Steel producer and is earmarked explicitly for transitional activities.

8 Partial deep discount bonds, like deep discount bonds, are issued at less than the face value but may include some coupon payments after an initial moratorium period, although fewer than those in vanilla bonds.

Figure 3: Reimagining Deep Discount Carbon-STRIPS (PDDCS) Bond from Vanilla Bonds



The Iron & Steel producer, which could be a company focused on reducing carbon emissions or implementing low-carbon technologies, uses funds from bondholders to finance transition projects. The transition projects will generate carbon credits, which could potentially be utilized for coupon repayment.

The bond's discount can be structured to yield more than other fixed-income securities during the initial construction period of the transitional activity, serving as a risk premium. After x years, ideally aligning with the construction period of transition projects, the investor has two options:

A. Exercise a put option after x years, which pays back the interim face value of the bond and exits.

B. Or continue holding the bond principal or coupon, or both, after x years. The principal will be paid at the end of the bond tenor, and the coupon will be paid periodically, either in carbon credits or cash.

Since the coupon holder can choose to be paid either in carbon credit or cash, the payment option will be determined by the prevailing carbon credit price in the market. If the realizable carbon returns exceed the cash coupon yield, investors would prefer carbon rights (scenario A). Alternatively, if the prices of carbon were lower than the coupon yield, investors would prefer monetary repayments (scenario B).

Scenario A will arise when the price of carbon is higher, driving sales of carbon credits in the carbon market and making them more lucrative than fixed cash repayments.

Scenario B will arise when the carbon price is lower, leading investors to prefer cash repayment over carbon credits.

Both scenarios are expected to present opportunities and challenges for the bond-issuing entity.

Scenario	Challenges	Benefit
A	Lost opportunity of realizing a higher carbon price.	Hedge against the fluctuation in carbon price.
B	Selling carbon at a lower price and repaying the coupon holder at a higher value.	

To overcome these challenges, the bond-issuing entity can enter into an agreement with an emission offset buyer before issuing the bond. The 'emission offset buyer of last resort' is an entity that provides a price-support mechanism, and hedges against the losses in scenario B (please refer to 3.4). It can guarantee the offtake of a minimum number of carbon credits from the transition project at a mutually agreed price, with an option to purchase additional carbon credits at a pre-agreed strike price. This will limit the size of bond issuance because a portion of the carbon credits has already been pledged to an emission offset entity. However, it also helps cover the risk in Scenario B when the carbon price is lower than the coupon value. The inventory of additional credit arising in scenario B can potentially then be sold to the offset entity as additional carbon credits, subject to agreement in the initial contract.

Figure 4: Scenario Diagram

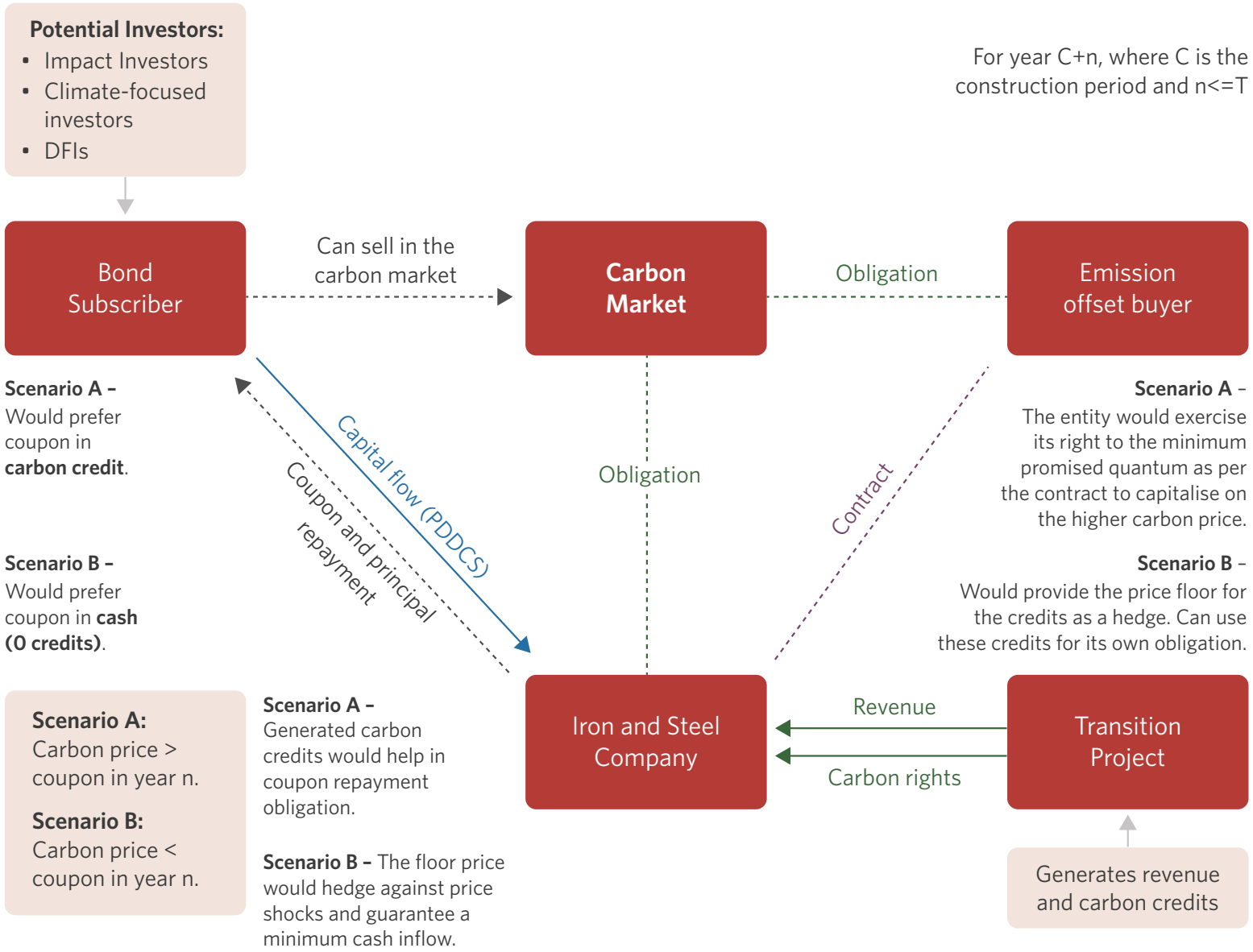


Figure 4 shows the relationships among the entities involved in the two scenarios mentioned. The bond's structure and interaction flows are built to attract a diverse range of investors, including banks, impact investors, and development finance institutions (DFIs) interested in sustainable investments with a decarbonization focus. This instrument may help developing economies reduce the immediate need for financial resources by encouraging private investment in decarbonization. Overall, the PDDCS bond offers a unique investment opportunity by combining traditional financial returns with the potential for gains in carbon markets. This dual benefit would make it an attractive option for investors while injecting adequate capital into transition projects.

3.4 MECHANISM

The structure of the bond and its workings can be better understood in steps. In this section, we will showcase how the bond can be used to fund transitional activities.

STEP 0: ADDRESSING CARBON RISK

The risk arising from shocks to the carbon price should ideally be mitigated. Entities such as mortgage guarantee corporations are used to hedge against credit risk, but a similar framework might not fit here.

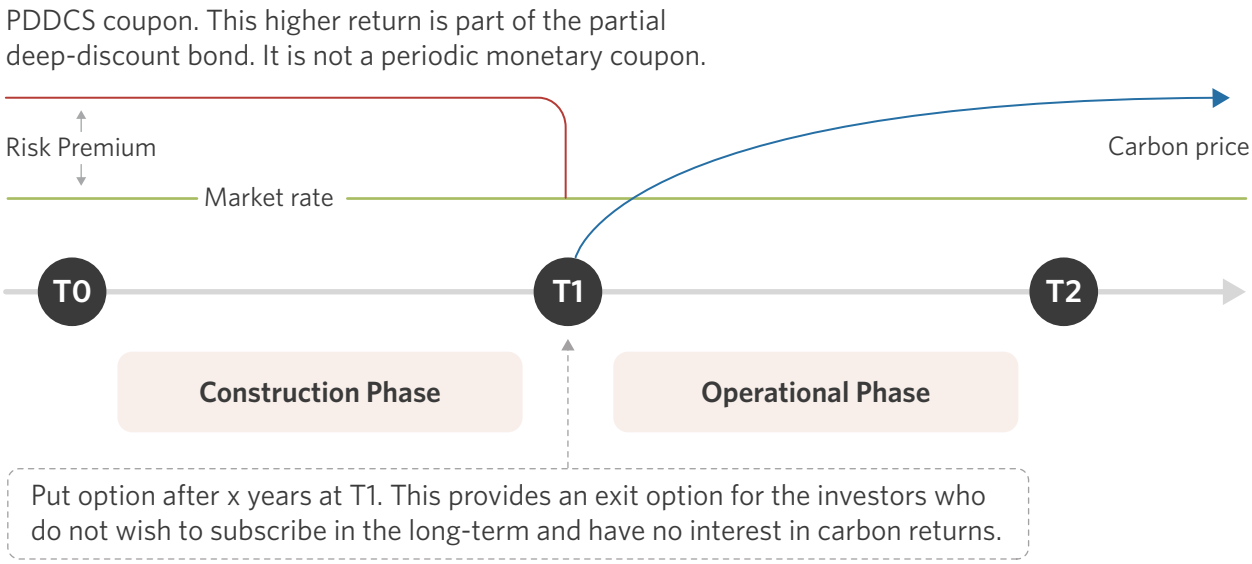
We propose a price-support mechanism (please see Figure 4)that can provide a price floor for carbon credits in exchange for the right/obligation to buy a **fixed quantum of credits**, either in Scenario B to fulfil its own compliance obligations or in Scenario A as a positive cash flow if the carbon price spikes. The entity providing the floor, referred to as 'Emission offset buyer' in this paper, may be a large industrial corporation in the sector with its own obligations to purchase credits to fulfil emission targets. This provides the offset entity with a stable price for carbon credits, enabling it to fulfil its obligations while hedging against large downward pricing risks. This price-support mechanism may be negotiated under a contract, and pre-feasibility studies would be required to estimate the emissions reductions in relation to the credit-generating potential of the transitional activity.

This is essentially step zero, where these studies are crucial to enhancing the corporation's credibility and, by extension, the transition project's credibility. It also conducts analysis of the technology and implementation risks, which would influence the ratio of carbon credit returns earmarked for the offset-buying entity vs. the investors and, therefore, dictate the bond's face value.

STAGE 1: CONSTRUCTION PHASE

At the construction stage, no finance flows are expected from the project to investors. Since PDDCS is a partial deep discount bond, coupon payments begin at the end of the lock-in period, when the project is operationalized.

Figure 5: Time-bound features[9]



The initial higher yield of the bond until time T1 will depend on the entity and its creditworthiness and may be realized through a deeper discount. At the end of this stage and before operationalization, the investor has the right to exercise the put option embedded in the PDDCS and exit their position.

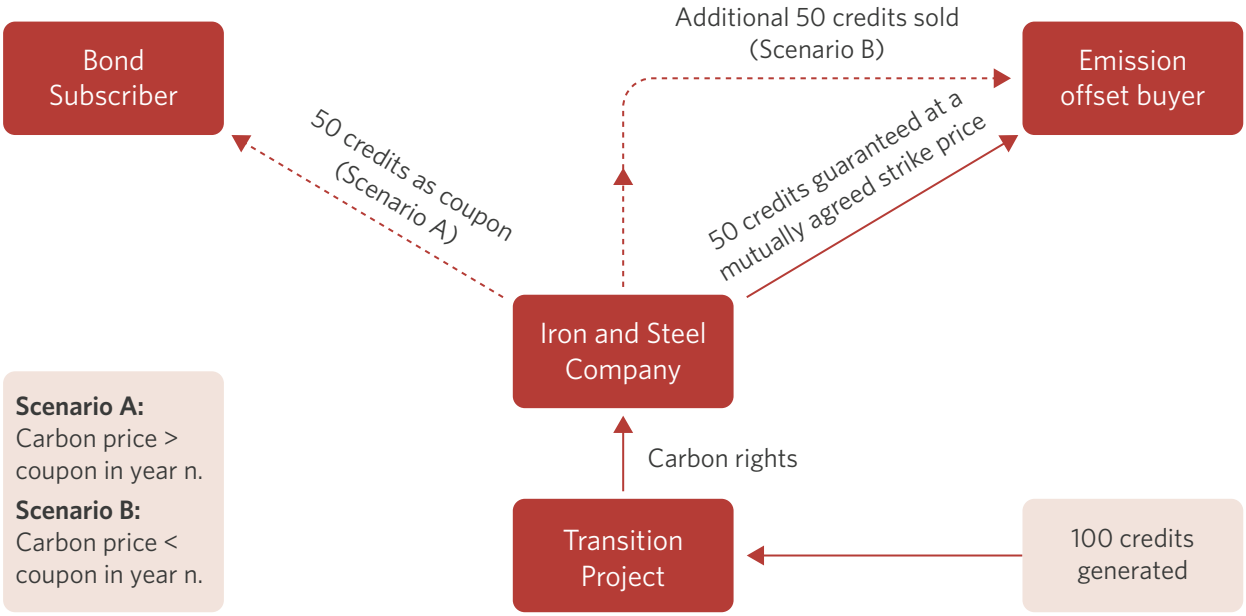
STAGE 2: OPERATIONAL PHASE

As the transitional activity generates verified carbon credits, the carbon price dictates the behaviour of the subscriber, and the emission offset buyer. An investor may prefer repayments in carbon credits in case of a carbon price higher than the coupon repayment (Scenario A) or may wish to receive coupons in the form of monetary repayment in case of a carbon price lower than the coupon (Scenario B).

The role of the 'emission offset buyer of last resort' here is central, especially in a developing carbon market where investor confidence may be low. A portion of the project's total carbon credits will be sold to the offset buyer at the agreed strike prices. The rest will be offloaded to the coupon holder based on the options exercised (repayment in monetary value or carbon credits). The uncleared carbon credits that arise may be sold to the emission offset buyer as additional credits in line with the terms of agreement.

9 For illustration. The risk premium spread here is for visualization, it benchmarks the difference between the issue value and the face value of the bond against the market rate.

Figure 6: Operational Phase Illustration



Benefits		
Iron and Steel Company	Bond Subscriber	Offset Buyer of Last Resort
Limited downside	Assured minimum return	Guaranteed credits at an agreed upon strike price and an opportunity to buy more

BHP Billiton and IFC Forest Bond (Case Study)

Innovations in instruments have led to an increase in climate finance as well. In 2016, BHP Billiton and IFC collaborated on a new type of forest bond that raised USD152 million (BHP and IFC, 2016) from institutional investors. It gave the investor the choice to receive coupons in the form of carbon credits generated from avoided deforestation instead of cash coupons. BHP Billiton provided a price-support mechanism of USD12 million so that the bond can sell a predefined minimum quantity every year. (Figure and mechanism in annexure)

4. CURRENT CHALLENGES AND POSSIBLE SOLUTIONS

As the carbon market evolves in India, the compliance and voluntary markets are further developed and synergized as envisaged in India's draft CCTS. (Bureau of Energy Efficiency, 2024). The design and application of a novel instrument must strike a careful balance between current implementation readiness and future potential.

Innovations in carbon-based financial instruments are limited in current compliance markets, as:

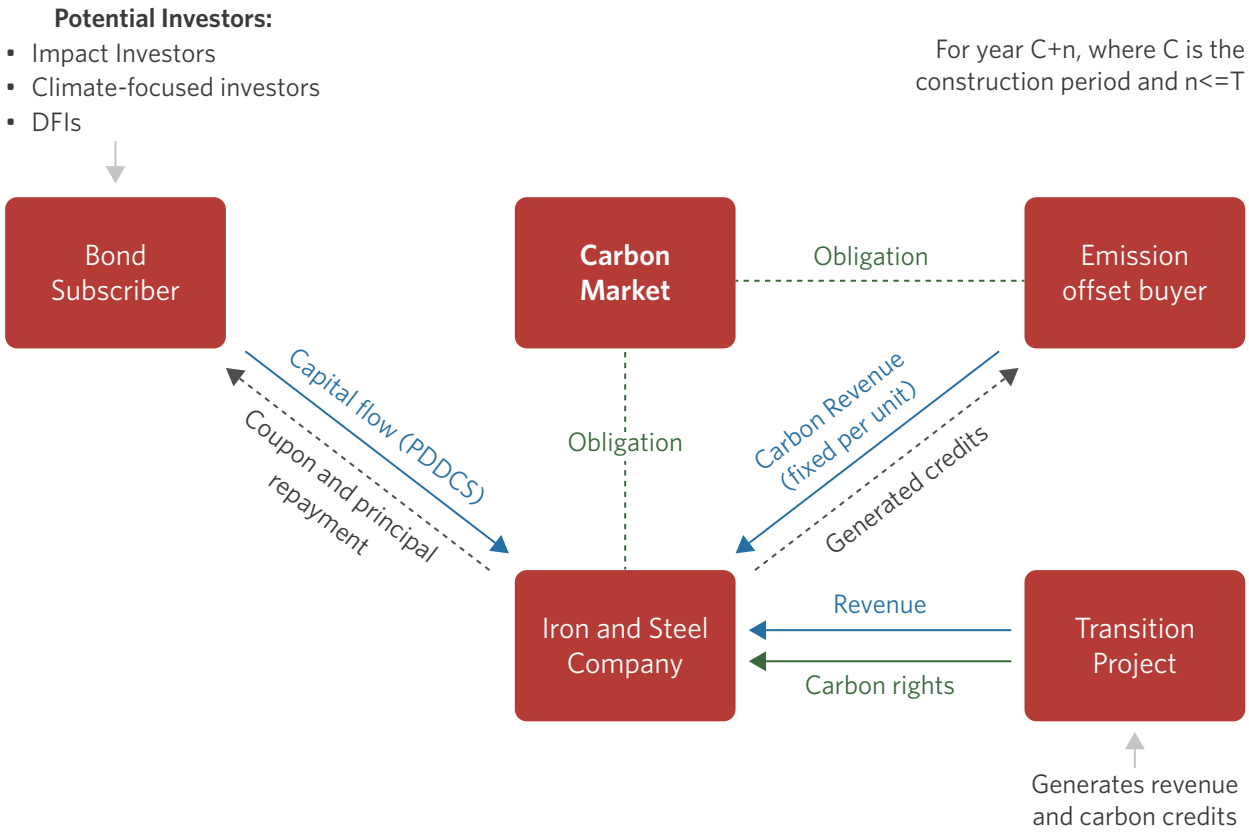
1. The current CCTS guidelines allow trading of carbon permits only among registered entities, restricting the role of individual/private investors in the carbon market.
2. The carbon rights generated from the compliance market cannot be traded outside the Indian jurisdiction.

However, as the market evolves, they present an opportunity to fine-tune the proposed instrument to meet current domestic compliance criteria and remain future-ready. Thus, an additional, flexible version of the instrument is proposed that remains functional within the current contours of the CCTS while retaining modularity to fit future frameworks. This flexible version of the financial instrument 'Partial Deep Discount Bond + Carbon (PDDB+C)' could be utilized in the interim to enable transition finance for transition projects.

MECHANISM

The 'emission offset buyer' and the 'I&S company', as showcased in Figure 7, are both obligated entities under the CCTS and can therefore trade carbon permits between themselves. The feature of coupon repayment with carbon strips to private investors can be eliminated in this scenario until regulations permit. Meanwhile, the carbon trade between the emission offset buyer and the I&S company can generate a new source of revenue to fund cash coupon repayments.

Figure 7: The instrument under a strictly-compliance market



In this case, the PDDCS becomes a 'partial deep-discount bond'. The emission offset buyer still provides a price guarantee for carbon permits to address the carbon price risk in exchange for the entire carbon generation potential of the transition project. The nature of the contract changes, and the fixed-pricing agreement between the offset buyer and the I&S company will serve as a revenue stream to repay the subscribers. An element of a risk premium arising from transition technologies can be paid to bond subscribers through a new source of revenue generated from the sale of carbon credits to 'emission offset buyers'.

As the carbon market matures and attracts more investors to build market depth, private entities/ individuals may be allowed to hold assets backed by carbon permits. This will allow for a more liquid and expanded market for carbon permits, resulting in wider integration with the capital markets and deployment of the initially proposed PDDCS instrument.

The proposed structure may have a higher degree of effectiveness and increased chances of adoption in the market if CCTS has an integrated/embedded market stability mechanism (MSM). A MSM as discussed by BEE in its consultations would help reduce the carbon price risk for both I&S companies and the emission offset buyer. Furthermore, the proposed instrument will have stronger integrity and reduced moral hazards if the issuer subscribes to jurisdictional principles in the carbon market. This is essential, as the proposed instrument is specifically designed to advance deep decarbonization in the Indian hard-to-abate industrial sectors through absolute emission reductions.

5. STAKEHOLDER INPUTS

DRIVING THE UPTAKE OF PDDCS AND OTHER TF INSTRUMENTS

To strengthen and refine the proposed instrument, CPI conducted confidential and structured consultations with a diverse set of key financial institutions and policy stakeholders.

The discussions were clustered around three broad themes: (1) policy, (2) market, and (3) ecosystem.

POLICY

On the policy front, interviewees pointed out that the uptake of instruments such as the PDDCS could be influenced through both regulatory mandates and incentive-based measures. While mandates are likely to be more effective in directing capital flows, well-designed incentives can play a complementary role by encouraging voluntary participation. A key opportunity lies in enhancing the engagement of financial institutions in the design of climate-related policies. This deeper involvement can help ensure that policy frameworks better reflect their operational realities and risk considerations.

Taxation-related concerns were raised regarding the deep-discount structure of the proposed PDDCS, which affects how gains are recognized and taxed. Clarity on how gains would be recognized and taxed is crucial for investor confidence.

Some participants emphasized the need for companies to prepare credible transition plans to mitigate the risk of greenwashing. In the absence of standardized transition planning frameworks, strict disclosure requirements, and third-party verification, firms can overstate their climate ambition. In addition, mandates requiring funds to allocate a fixed percentage of their portfolios to investments such as the PDDCS were also proposed.

MARKET

From a market perspective, several factors are critical to the uptake of such bonds.

Liquidity in the secondary market is essential to build investor confidence and drive participation. While this is true for corporate bonds in general, it is especially salient for novel structures like PDDCS, which investors may view as harder to value or trade.

Regulatory and structural limitations were also noted. Banks are currently not permitted to invest in deep-discount bonds unless they create an internal sinking fund. These limitations remove a large class of traditional investors and complicate underwriting, as banks typically act as initial underwriters and market-makers. Therefore, adopting such an instrument would require either regulatory reforms or upfront demand visibility and alternative distribution channels to gain broad market acceptance.

Another point of discussion was on the coupon paid in carbon credits. While issuers may find this attractive, investors may be unwilling to accept direct exposure to carbon credit valuation risk. A practical solution would be to use a swap or similar hedge with a high-quality counterparty to insulate investors from volatility

in carbon prices. There is also ambiguity over how carbon credits are classified as tradable assets: a clearer regulatory notification here would be useful to enhance market confidence.

Credit rating constraints: Institutional investors such as insurance companies and pension funds typically have minimum credit rating requirements, often AA or higher. Interviewees recommended three pragmatic pathways to solve rating constraints: (1) credit enhancement to lift ratings into the AA band where possible; (2) regulatory review of rating thresholds for select institutional investors for targeted instruments; and (3) diversifying the investor base for sub-AA paper by mobilizing HNIs and other forms of private capital. Capacity building on transaction advisory, disclosures, and governance structures may help improve market access for mid-sized firms. Still, it is not the primary lever for moving a paper from, say, BBB to AA.

ECOSYSTEM

Building on the discussions about developing an ecosystem for instruments like PDDCS, it was noted that mid-sized and independent steel producers, who may benefit most from such mechanisms, typically have lower credit ratings and limited market access compared to large, integrated players. Addressing this mismatch would require targeted measures such as facilitating credit enhancement, supporting aggregation platforms, and improving visibility of investable opportunities within this segment. Participants further emphasized that technology and carbon credit generation risks would need to be managed through appropriate risk-sharing mechanisms.

Regarding governance aspects, it was noted that participation could be significantly driven through more proactive support from boards of investing institutions and demand from equity holders. This highlights the potential of internal leadership and shareholder advocacy to drive momentum.

Targeted interventions in each of these three areas discussed above would not only help scale up PDDCS but could also potentially develop a wider market for sustainable finance instruments in India.

6. WAY FORWARD

As the landscape of climate finance for economic development evolves, innovative financial instruments can play a pivotal role in aligning the interests of shareholders, lenders, and policymakers. As this brief outlines, supporting industrial sectors to invest in deep-decarbonizing technologies and other transition activities can be structured in ways that also provide sufficient financial incentives for investors to subscribe.

Initially, simplified versions of such instruments would be more acceptable in the current landscape, enabling early adoption. As the carbon market expands, more complex features—such as the trade of carbon strips — can be phased in to realize longer-term potential.

For industrial players, especially in hard-to-abate sectors, unlocking capital for deep decarbonization without undermining lender or shareholder interests is crucial. By strategically decoupling carbon assets from conventional debt obligations, these instruments preserve financial stability while enabling climate-aligned investments. Thus, it invites broader investor participation in the carbon market and catalyzes new investment streams.

Lastly, building on the consultations, the need for an intermediary for such a structure was highlighted. One potential solution is to create a dedicated intermediary, such as a public guaranteeing corporation. This entity could provide liquidity and overall confidence to investors by covering penalties in the event of underperformance by an underlying asset. It could also purchase credits to ensure availability. The intricacies of such a structure can be taken further as a future area of research.

7. ANNEXURE

7.1 ANNEXURE I: COMPARISON OF THE EXISTING LITERATURE AND GUIDANCE ON CREDIBILITY ASSESSMENT OF TRANSITION PLANS.

Element	Climate Bonds Initiative (CBI)	Organization for Economic Co-operation and Development (OECD)	Association of Southeast Asian Nations (ASEAN)
Net Zero Goal - Basis	SBTi or others consistent with the 1.5° C target.	1.5°C – In case it is not possible to explain with justification. Not to breach < 2°C in any scenario.	Ideally, SBTi or country- or industry-led commitments are consistent with a 1.5 °C target with no to low overshoot or, at a minimum, well below 2°C.
Interim Targets (Phasing)	Divide into three- Short, medium & long. The reduction should be front-loaded.	The long-term transition goal is accompanied by interim (e.g., 3/5-year) quantifiable, detailed, and time-bound targets, including an explanation of the methodologies and assumptions used to derive them.	A roadmap of actions to achieve near, medium & long-term milestones.
Technology Selection	IEA technology roadmap	Sectoral technology roadmaps, such as the IEA Technology Roadmap, can guide technology selection.	No mention
Coverage – Scope 1, 2 & 3	Scope 1,2 &3. If 3 is not included, it should be explained & justified	Include scope 3 emissions in metrics, targets, and related reporting. Its omission can be justified in limited cases with careful explanation	Scopes 1, 2, as well as Scope 3, where material
Use of Carbon Credits & Offsets	Offset and carbon credits should end for residual emissions, which should be no more than 10%.	Should not be used as an alternative to reducing emissions today or as a reason for delayed mitigation action, but rather as part of the portfolio of solutions	No mention
Financing	A feasible financial plan detailing the financial implications of the transition in terms of the costs and how it will be financed	A credible transition plan will be integrated into the corporate business plan. Explicitly addressing needs and commitments for capital & operating expenditure, M&A, and R&D expenditures	Capital Allocation Plan: Financial requirements for execution of the transition plan and how to achieve such financing.

Element	Climate Bonds Initiative (CBI)	Organization for Economic Co-operation and Development (OECD)	Association of Southeast Asian Nations (ASEAN)
Avoiding Carbon Lock-in	No mention	Identify existing assets and new investments at risk of leading to emissions lock-in and set out the steps to prevent such lock-in, including early retirement.	No mention
DNSH	No mention	Avoid harming sustainability objectives other than climate mitigation at the activity and entity levels.	No mention
Governance	Internal monitoring, accountability mechanisms, and leadership systems are needed to drive the transition.	Process and responsibilities for regular monitoring and reporting on progress towards targets, as well as for timely and regular revisions and updates of this plan.	Organizational structure & mechanisms.
Third-Party Verification	The company's transition plan is assessed and audited by an independent third-party	Third-party verification of its plan and related targets	Disclose performance, targets, and progress on an annual basis aligned with existing climate-related disclosure standards such as IFRS S1 and S2. Third-party verification on transition credibility
Just Transition considerations	Any risks to other social and environmental areas, such as biodiversity or transition, must be identified and mitigated.	Transition impacts workers, suppliers, local communities, and consumers. The transition plan will ensure decent work, adequate capacity and skills, and provide a framework for retaining, retraining, reskilling, and educational opportunities.	Assess and account for potential adverse environmental impacts and social considerations that arise from their transition plan.

7.2 ANNEXURE II: PUBLISHED GUIDELINES ON TRANSITION FINANCE

Nature of Entity	Name of Entity	Title	Release
Jurisdiction/ Regulator	**Association of Southeast Asian Nations (ASEAN)**	Transition Finance Guidance	October 2023
	European Union (EU)	EU Taxonomy regulation Taxonomy delegated regulation for Technical Screening Criteria (TSC)	June 2020 July 2021
	Japan	Basic Guidelines on Climate Transition Finance Technology Roadmaps (Iron & Steel)	May 2021 October 2021
	Monetary Authority of Singapore (MAS)	Singapore-Asia Taxonomy for Sustainable Finance	December 2023
Standard Setter/ Coalition	**Climate Bonds Initiative (CBI)**	White Paper Financing Credible Transitions Discussion Paper on Transition Finance for Transforming Companies CBI has sector criteria available for energy, transport, buildings, etc., available here	September 2020 September 2022
	Global Financial Alliance on Net-Zero (GFANZ)	Financial Institution Net-zero Transition Plans: Fundamentals, Recommendations, and Guidance	November 2020
	International Capital Markets Association (ICMA)	Climate Transition Finance Handbook: Guidance for Issuers	September 2023
Institution	**Barclays**	Transition Finance Framework	February 2024
	DBS	Sustainable & Transition Finance Framework & Taxonomy	March 2022
	Standard Chartered	Transition Finance Framework	2021

7.3 ANNEXURE III - COMPREHENSIVE REVIEW OF TAXONOMIES AND STANDARDS FROM VARIOUS JURISDICTIONS.

Jurisdiction/ Institutions/ Others	Iron & Steel Sector Activities	Reference Pathways / Roadmaps
JURISDICTIONAL TAXONOMIES		
EU Article 10(2) of Regulation (EU) 2020/852: Framework to facilitate sustainable investment Article 3.9, 5.11, 5.12 of Regulation (EU) 2021/2139: Technical screening criteria	• Aligns with Paris Agreement target of 1.5 °C. • Classifies transitional activities as those which have no technological and economically feasible low-carbon alternative, have GHG emission levels that correspond to the best performance in industry/sector, do not hamper development and deployment of low-carbon alternatives, and do not lead to lock-in of carbon-intensive assets. • Technical screening criteria for transition finance are based on specific thresholds and conditions, expected to be updated every 3 years. Criteria for iron and steel manufacturing: • Specifies upper **thresholds of emission intensity** for transitional activities related to the manufacture of iron and steel (processes including hot metal, sintered ore, coke, iron casting, EAF). • Specifies the lower threshold of steel scrap input in EAFs, relative to product output, for transitional activities related to the production of high alloy steel and carbon steel. Criteria for CO2 transportation and storage underground: • Specifies upper threshold for CO2 leakage during transport. • Requires appropriate detection systems, monitoring, and reporting of CO2 leakage during transport. • Activity may include assets that increase flexibility and management of an existing network. • Requires characterization and assessment of potential storage area to establish the suitability of the geological formation for CO2 storage. • Requires installation of appropriate leakage detection systems at CO2 storage sites and monitoring plans. • Requires compliance with EU and International standards on exploration and operation of storage sites. In addition, the criteria specify compliance requirements for transitional activities where applicable, vis-à-vis do not significant harm principle, climate change adaptation; sustainable use and protection of water and marine resources; pollution prevention and control (emissions to be within or lower than the emissions levels associated with BATs notified by the EU in 2012); and protection and restoration of biodiversity and ecosystems.	• Paris Agreement 1.5 °C. pathway.

Jurisdiction/ Institutions/ Others	Iron & Steel Sector Activities	Reference Pathways / Roadmaps
Japan Technology roadmap for "Transition Finance" in the Iron and Steel Sector, 2021	• Specifies **technological pathways** to decarbonization, including technology options, emission intensities, implementation year, and pathways from R&D to demonstration and deployment. • Aligned with the Paris Agreement. Targets carbon neutrality by 2050. • Technology categories (roadmap specifies several technologies within each category) Blast Furnace Technologies 1. Energy saving/efficient technologies (best practices). 2. Ferro-coke 3. CO2 capture and separation 4. Utilization of on-site hydrogen 5. Utilization of external hydrogen 6. Utilization of reduced iron 7. Utilization of biomass 8. Use of captured CO2 Direct Reduction Technologies 1. Direct hydrogen reduction (using natural gas and partial H2) 2. Direct hydrogen reduction (100% H2 use) 3. Carbon capture, utilization, and storage Electric Arc Furnace Technologies 1. Energy saving/efficient technologies (best practices) 2. EAF Removing impurities/large-scale EAF Continuous Casting and Rolling Technologies 1. Improvement in thermal conductivity, Power savings technologies 2. Electrification of heat	• Green Innovation Fund – Social Implementation Plan • IEA Energy Technology Perspectives (2020) • Material Economics, Industrial Transformation 2050 • Science-based targets initiative
Singapore (Monetary Authority of Singapore) Singapore-Asia Taxonomy, 2023	• Classifies economic activities as: ○ Green: activities already near-zero or aligned with the Paris 1.5 °C pathway. ○ Amber: activities not aligned with 1.5 °. pathway but are moving towards Green within a defined timeframe, or leading to emissions reductions with a sunset date. ○ Ineligible: incompatible with 1.5 °C pathway based on meeting the technical screening criteria (TSC) for substantial contribution to at least one of the Taxonomy's environmental objectives (mitigation, adaptation, ecosystem and biodiversity, resource resilience and circular economy, pollution prevention and control), while not harming others. • EU taxonomy thresholds used as starting point for decarbonization pathway, which is based on CBI's Steel Criteria. Thereafter, thresholds (e.g., emission intensity) have been projected into the future. • New facilities to meet the Green criteria. New and existing facilities that do not meet the Green criteria but have been designed to do so by 2030 are classified as Amber. • Relining is discouraged as it risks locking in assets compatible with a low-carbon future.	• EU Taxonomy • CBI Steel Criteria • Transition Finance Principles by the IPSF

Jurisdiction/ Institutions/ Others	Iron & Steel Sector Activities	Reference Pathways / Roadmaps
	• Green criteria: ○ Facilities must comply with asset-specific mitigation criteria (e.g., BF-BOF has to have CCUS with a capture rate of at least 70% and meet taxonomy's Green criteria for CO2 transport and storage; DRI-EAF, if 100% hydrogen-based, must meet the carbon intensity thresholds and specific Green criteria for hydrogen; EAF needs to use 70% of scrap as total annual inputs; etc.) ○ Facilities must comply with cross-cutting criteria. ○ Facilities must comply with fuel-specific (e.g., hydrogen) Green criteria. • Amber criteria: ○ Assets not meeting the Green criteria can be classified as Amber if the facility is designed to meet Green criteria by 2030 at the latest, or is using CCUS from the onset with a capture rate of at least 20%, and the facility has a transition plan aligned with 1.5 °C. pathway. ○ Asset-specific Amber measures have been defined (e.g., DRI or Smelting Reduction must implement decarbonization measures to decrease emissions between 2022-30 by 20% if fossil-gas-based and 40% if coal-based; etc.). Facilities must be implemented before 2030 and comply with both asset-specific and cross-cutting criteria. • Ineligible activities: ○ Facilities not complying with cross-cutting criteria, ○ Using coal for on-site electricity ○ Using certain types of biomass sources as a reducing agent and/or fuel ○ CCUS where CO2 is utilized and released immediately (e.g., urea, EoR, beverages, etc.)	
ASEAN Transition Finance Guidance, 2023 Sustainable Finance Taxonomy, 2024	• ASEAN taxonomy (Plus Standard) qualifies transition activities as belonging to Green or Amber tiers of sustainable finance. It sets out requirements, including quantitative thresholds with retirement dates (for the Amber tier), which ratchet up over time. • The guidelines qualify transitioning activities in 3 tiers: Aligned and aligning – 1.5 degrees.; Aligned and aligning – 2 deg.; Progressing. • References taxonomies of ASEAN countries (Singapore, Malaysia, Indonesia, Thailand, etc.). • Technical screening criteria available for the following sectors: Power, Construction, Real Estate, Transportation, CO2 transport and storage (steel not yet covered).	N/A
STANDARDS		
Climate Bonds Initiative Steel Criteria, 2024	• Criteria sets sector-specific climate change benchmarks to screen debt instruments, assets, and/ or entities that have climate integrity. • Differentiates between capital investments in specific measures/whole facilities and between operations pre- and post-2022. • Specifies asset-specific mitigation criteria for measures and retrofits in pre-2022 operational facilities, including: ○ BF (post 2007): Investments shall not be in relining; measure to reduce the emission intensity of production between 2022-30 by 20% and 15% if baseline intensity is above and below 2 tCO2/tcs, respectively. ○ DRI: if coal-based, measures should reduce the emission intensity by 40% between 2022 and 30.	• Sustainable STEEL Principles • IEA NZE pathway

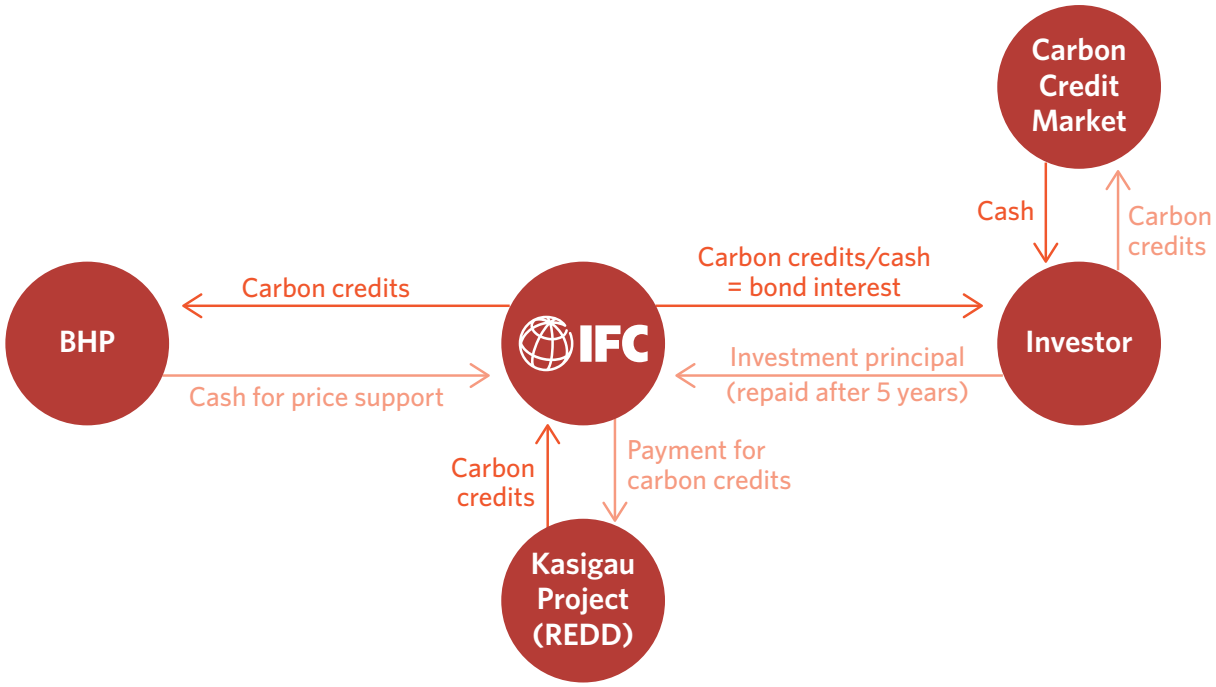
Jurisdiction/ Institutions/ Others	Iron & Steel Sector Activities	Reference Pathways / Roadmaps
	○ Other asset-specific and additional criteria for hydrogen, CCUS, and biomass, and criteria for adaptation and resilience to be met. ○ Provides a (non-exhaustive) list of eligible activities such as WHR, PCI, TGR, CDQ, Oxyfuel burners, carbon capture, switch to hydrogen and biomass, etc. ▪ Specifies facility-specific mitigation criteria for new iron and steel production facilities post-2022, including: ○ BF-BOF/ Smelting reduction/ Gas-based DRI with integrated CCU/S having at least 70% capture rate. ○ Scrap-EAF to have at least 70% scrap as total annual inputs. ○ Hydrogen DRI to meet criteria for hydrogen. ○ Others, including additional cross-cutting criteria. ▪ Specifies facility-specific mitigation criteria for new iron and steel production facilities pre-2022, including: ○ BF (post 2007): Investment shall not be in relining; a bundle of measures that reduce the emission intensity of production between 2022-30 by 20% and 15% if baseline intensity is above and below 2 tCO2/tcs, respectively. ○ Others including hydrogen, CCU/S, biomass-specific and cross-cutting criteria. ○ List of measures that can be bundled provided (similar to above) ▪ Performance targets to align with entity-level pathway thresholds (adopted from IEA NZE pathway and approach followed by Sustainable STEEL principles of differentiating between primary and secondary producers) every 3 years. ▪ Specifies criteria for certification of entities and SLDs as: ○ 'Aligned' (similar to Green in MAS taxonomy) if the production facility/ specific measures (to which the Performance Indicator of the debt is linked in case of SLD) meet the entity-level pathway thresholds and other criteria laid out above at the time of certification, and their future Performance Targets continue to meet the declining thresholds to 2050; ○ 'Transitioning' (similar to Amber in MAS taxonomy) if they don't meet the entity-level pathway thresholds and other criteria at the time of certification, but will align by 2030 and continue thereafter through to 2050.	
ICMA Methodologies Registry	▪ ICMA has published a Methodologies Registry, which includes a list of tools to specifically help issuers validate their emission reduction trajectories (does not prescribe a trajectory on its own).	See methodologies registry.

7.4 ANNEXURE IV

Element	Guidance	A leading steel company
Net-zero emissions goal	The science-based target is consistent with the 1.5° C target of the Paris Agreement, with no to low overshoot and, at a minimum, well below 2° C.	• Net-zero target year is 2050 • The targets for phases I and II have been derived from the IEA iron & steel technology roadmap published in 2020. • Consistent with the 1.5° C scenario.
Interim targets (phasing)	The long-term transition goal is accompanied by interim (short-, medium-, and long-term) quantifiable, time-bound targets. Include an explanation of methodologies, assumptions used, and benchmarking undertaken.	• The net-zero target year for 2050 is divided into two phases: Phase I – 2030, and Phase II – 2030 to 2050. Contrary to the three phrases advised. • The current emission intensity of 2.36 tCO2/tcs will go down to 1.95 tCO2/tcs by 2030 and to 0.996 tCO2/tcs by 2050. The emissions are not front-loaded. • Follows IEA's sectoral roadmap for emission targets. • The trajectory is more ambitious than the country's goal; however, it is not more ambitious than that of IEAs or SBTis.
Technology selection	Any science-based pathways or roadmaps are consistent with the goals of the Paris Agreement.	• For phase I, the bet is on energy efficiency, material circularity, renewable energy, operational efficiency, etc. Phase II bets on reducing the cost of green hydrogen and CCU/S. • While the sustainability report talks about partnerships & opportunities, there is no specific roadmap for adoption or securing funding for technologies beyond 2030.
Coverage: scope 1, 2, and 3	Scope 1 & 2 at a minimum. Include Scope 3, where material and exclusion are to be explained and justified.	• The company will be net-neutral in carbon emissions for all operations under direct control. There is no specific mention of the inclusion or exclusion of scope III emissions.
Use of carbon credits & offsets	It should not be used as an alternative to reducing emissions or delaying mitigation action. Ideally, there should be no more than 10 percent abatement.	• No clarity on the use of offsets. Considering the plan suggests an emission intensity of 0.996 tCO2/tcs in 2050, offsets and CCUS will play an essential role in net zero.
Financing	The financial plan details the implications of the transition, the financing requirements for executing the transition plan, and how to achieve this financing.	• The company has raised two SLBs linked to its 2030 emission-intensity reduction target; however, its sustainability report does not chart a path for raising or deploying funds beyond 2030.
Avoiding carbon lock-in	Identify existing assets and new investments at risk of leading to carbon lock-in. Develop a strategy and process for the responsible retirement of high-emitting assets.	• No mention.

Element	Guidance	A leading steel company
Do No Significant Harm (DNSH)	Avoid harming other sustainability objectives (e.g., biodiversity) at the activity and entity levels.	No mention.
Governance	Define processes and responsibilities for regular monitoring and reporting progress aligned with disclosure standards (e.g., IFRS S1 and S2), timely revisions of targets, and updated plans.	The governance framework is in place with the Board of Directors at Apex
Third-party verification	Third-party verification of the credibility of transition plans and activities for effectiveness, completeness, and performance against benchmarks.	No mention.
Just transition considerations	Assess and account for adverse environmental and social impacts, including on the labor force and communities, from the transition in the transition plan. A strategy for mitigating such impacts should be included in the plan.	No mention.

7.5 ANNEXURE V



8. REFERENCES

ASEAN. (2023, October 17). *ASEAN Transition Finance Guidance*. https://www.theacmf.org/sustainable-finance/publications/asean-transition-finance-guidance

Bureau of Energy Efficiency. (2024, July). *Detailed Procedure for Compliance Mechanism under CCTS*. https://beeindia.gov.in/sites/default/files/Detailed%20Procedure%20for%20Compliance%20Procedure%20under%20CCTS.pdf

Climate Bonds Initiative. (2023, September 20). *Guidance to Assess Transition Plans*. Climate Bonds. https://www.climatebonds.net/data-insights/publications/guidance-assess-transition-plans

CPI. (2025a, February 25). Scaling transition finance for green industrial transition of the Indian Iron & Steel sector. *CPI*. https://www.climatepolicyinitiative.org/publication/scaling-transition-finance-for-green-industrial-transition-of-the-indian-iron-steel-sector/

CPI. (2025b, June). *Global Landscape of Climate Finance 2025*. https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2025/

Department of Economic Affairs. (2025, May). *Climate Finance Taxonomy Framework*. https://dea.gov.in/sites/default/files/%28F%29%20Draft%20Framework%20of%20Indias%20Climate%20Finance%20Taxonomy%20for%20publication%206th%20May%202025%20%281%29.pdf

IEA. (2020, August). *Iron and Steel Technology Roadmap – Analysis*. IEA. https://www.iea.org/reports/iron-and-steel-technology-roadmap

Kashyap, Y. (2023, September 6). Taking Stock of Steel: India's Domestic Production Outlook and Global Investments in Green Steel Production. *CPI*. https://www.climatepolicyinitiative.org/taking-stock-of-steel-indias-domestic-production-outlook-and-global-investments-in-green-steel-production/

Malhotra, K., & Dhutla, D. (2025, April 22). Indian state-run firms seek government nod to issue deep-discount, long-tenor debt. *Reuters*. https://www.reuters.com/markets/asia/indian-state-run-firms-seek-government-nod-issue-deep-discount-long-tenor-debt-2025-04-22/

Ministry of Steel. (2024, September). *Greening the Steel Sector in India*. https://steel.gov.in/sites/default/files/2025-03/GSI%20Report.pdf

Mission Possible Partnership. (2022, September). *Making Net-Zero Steel Possible*. https://www.missionpossiblepartnership.org/action-sectors/steel

OECD. (2022, October 2). *OECD Guidance on Transition Finance*. OECD. https://www.oecd.org/en/publications/oecd-guidance-on-transition-finance_7c68a1ee-en.html

Sansad. (2023, February 7). *Deep Discount Bonds*. https://sansad.in/getFile/annex/259/AU537.pdf?source=pqars#:~:text=5%2C300%20with%20a%20maturity%20of,of%20Rs.5%2C300%20per%20Bond

Slanger, D. (2023, November 28). Defining Transition Finance: Exploring Its Purpose, Scope, and Credibility. *RMI*. https://rmi.org/defining-transition-finance-exploring-its-purpose-scope-and-credibility/