Technical Report

Climate Club Financial Toolkit 2026 Update

Economic, de-risking and financing instruments for industry decarbonisation

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Climate Club Financial Toolkit 2026 Update

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Abbreviations and acronyms

AI	Artificial Intelligence
BF-CCS	Blast Furnace with Carbon Capture and Storage
CAPEX	Capital Expenditure
CO2	Carbon Dioxide
CEFIM	Clean Energy Finance and Investment Mobilisation Programme
CfD	Contract for Difference
CCfD	Carbon Contract for Difference
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Use and Storage
COP28	28th Conference of Parties to the United Nations Framework Convention on Climate Change
DAC	OECD Development Assistance Committee
DRI-CCS	Direct Reduced Iron with Carbon Capture and Storage
EBRD	European Bank for Reconstruction and Development
ECA	Export Credit Agency
EMDEs	Emerging Markets and Developing Economies
ETS	Emissions Trading Scheme
EPR	Extended Producer Responsibility
ESG	Environmental, Social and Governance
FDI	Foreign Direct Investment
FID	Final Investment Decision
FOAK	First-Of-A-Kind
FOEN	Swiss Federal Office for the Environment
GHG	Greenhouse Gas
GMP	Global Matchmaking Platform
H_2 DRI	Hydrogen-based Direct Reduced Iron
IFCMA	Inclusive Forum on Carbon Mitigation Approaches
IRR	Internal Rate of Return
JET-P	Just Energy Transition Platform
LC3	Limestone Calcinated Clay Cement
LCOP	Levelised Cost of Production
MDB	Multilateral Development Bank
MOU	Memorandum of Understanding
MRV	Monitoring, Reporting and Verification
Mt	Million tonnes
NWFE	Nexus of Water, Food and Energy
OPC	Ordinary Portland Cement
OPEX	Operational Expenditure
PET	Polyethylene Terephthalate
PLA	Polylactic Acid
PRO	Producer Responsibility Organisation

RDF	Refuse-Derived Fuel
SPV	Special Purpose Vehicle
TRL	Technology Readiness Level
TIDIP	Türkiye Industrial Decarbonisation Investment Platform
WACC	Weighted Average Cost of Capital

Executive summary

The industry sector accounted for as much as 40% of total global energy-related carbon dioxide (CO_2) emissions in 2024, with the iron and steel, cement and chemical industries accounting for 70% of these emissions. Achieving net zero emissions by mid-century will require a rapid and sustained scale-up of low-carbon industrial technologies.

Governments, industry, and the financial sector are increasingly committed to transforming industrial production systems to improve environmental outcomes, reduce climate risks, safeguard competitiveness and strengthen resilience. Despite this growing momentum, current investment levels in low-carbon technologies fall well short of what is needed. According to the recent joint OECD-IEA report, annual global investment in near-zero emission technologies for the steel and cement sectors will need to reach at least USD 500 billion between 2026 and 2035, around a 25-fold increase over current levels. At least two-thirds of this investment will be required in Emerging Markets and Developing Economies (EMDEs), including China, which collectively account for over 75% of global steel production and more than 85% of the total global cement output. Mobilising investment at this scale will require finance from all sources - public, private, international and domestic – with the private sector expected to provide the majority of the capital needed. It is therefore critical to identify which de-risking, economic and financing instruments (collectively referred to as financial solutions in this report) can effectively unlock and mobilise the private capital required.

This report presents an updated version of the Climate Club Financial Toolkit, originally published in March 2025. Prepared by the OECD Secretariat under Pillar III of the Climate Club Work Programme 2025-2026, its key findings (alongside the forthcoming 2026 *Mapping financial and technical assistance for industry decarbonisation in EMDEs*) served as the analytical basis for the joint OECD-IEA report cited above, which in turn informed the COP30 Joint Statement and Roadmap on International Assistance and Partnerships for Green Industry Transition.

This Financial Toolkit aims to provide a robust evidence base and analytical foundation for policymakers, industry actors and financial institutions to better understand the financial solutions that can support industry decarbonisation. It highlights concrete examples of policies and programmes that have improved access to finance, enhanced project bankability, mobilised private capital, and demonstrated potential for scale-up and replicability. It also illustrates how different financial solutions can be combined and tailored to address the risk profiles of specific low-carbon technologies in hard-to-abate sectors. This 2026 edition expands on the instruments and case studies presented in the 2025 edition of the Financial Toolkit and includes a detailed techno-economic assessment of selected low-carbon technologies in the steel, cement and petrochemical sectors.

This Toolkit can be used by project developers, industry actors, policy makers and financial institutions (both commercial banks and international finance institutions) when structuring transactions, designing support schemes or guiding investment decisions. The 32 financial instruments presented in this Financial Toolkit are categorised as either economic, risk mitigation or financing instruments.

Table 1. Overview of financial instruments presented in this Financial Toolkit

Economic instruments	Risk mitigation instruments	Financing instruments
E.1 Accelerated Depreciation	**R.1 Buyer Credit Guarantee**	**F.1 Sustainability Bonds**
E.2 Carbon Contract for Difference	**R.2 Energy Savings Insurance**	**F.2 Concessional Loans**
E.3 Carbon Tax	**R.3 First and Second Loss Facility**	**F.3 Local currency loans and facilities**
E.4 Carbon Credits	**R.4 Foreign Currency Guarantee**	**F.4 Public and private equity**
E.5 Emissions Trading Scheme	**R.5 Partial or Full Credit Guarantee**	**F.5 Results-based financing and pull financing**
E.6 Extended Producer Responsibility fees	**R.6 Performance Guarantee**	**F.6 Revolving Credit Facility**
E.7 Grants and Subsidies	**R.7 Political Risk Insurance**	**F.7 Sustainability-linked instruments**
E.8 Green Premium Financing	R.8 Sovereign Guarantees	F.8 Structured and Securitised Products
E.9 Tax Credits		**F.9 Venture Debt**
		F.10 Transition Bonds
		F.11 Lease Financing
		F.12 Subordinated and Concessional Debt
		F.13 Offtake finance
		F.14 Debt-for-finance swaps
		F.15 Policy-based loans

Note: The instruments in bold are illustrated through case studies, the full versions of which are in the Annex.

The key learnings from the 30 case studies illustrated in this Toolkit, elaborated further in Chapter 4, highlight that:

- Concessional and risk-tolerant finance plays a critical role in enabling first-of-a-kind industry decarbonisation projects to proceed. By absorbing early-stage technology and execution risks, concessional and risk-tolerant capital reduces the cost of financing and supports investment decisions in areas where commercial lenders remain hesitant. When deployed through milestone-based disbursements or supported by clear eligibility frameworks, it can also provide confidence to co-financiers and signal alignment with long-term policy objectives.
- Targeted risk mitigation instruments are essential for improving project bankability and attracting commercial lenders. By reallocating downside risk through mechanisms such as guarantees or insurance, these tools enhance borrower credit profiles and lower expected losses for senior debt providers. This enables more favourable financing terms, broadens the investor base, and allows a wider range of projects to achieve final investment decision.
- Local-currency financing and foreign exchange risk mitigation strengthen the financial resilience of industrial decarbonisation investments. When revenues and debt service are aligned in the same currency, projects are less exposed to currency-related volatility that could undermine financial viability. Foreign exchange risk mitigation tools can increase lender confidence and help mobilise domestic financial markets.
- Predictable revenue frameworks provide the certainty needed for capital-intensive low-carbon industrial investments to move forward. Mechanisms that stabilise or supplement revenues, such as outcome-based payments or long-term price commitments, improve cash flow visibility and debt serviceability. With clearer revenue expectations, lenders can offer better terms, allowing projects to scale more rapidly.
- Blended finance and sustainability-linked instruments help to mobilise private capital by aligning financial incentives with credible transition outcomes. Blended structures use risk-tolerant public capital to catalyse private investment in emerging technologies and new markets, while sustainability-linked products tie pricing to independently verified performance. The us e of

standardised key performance indicators (KPIs) and reporting enhances comparability and reduces due diligence burdens, broadening investor participation.

- Scaling and replication of industrial decarbonisation investments depend on standardisation, clear policy frameworks, and strong demand signals. Streamlined appraisal processes, common documentation, and robust monitoring, reporting and verification (MRV) reduce transaction costs and enable programmes to be rolled out across sites and sectors. When paired with predictable regulatory environments and long-term offtake or price-support mechanisms, these factors can create more stable market conditions that support multiple waves of investment.

Synthèse

Le secteur industriel représentait jusqu'à 40 % des émissions mondiales totales de dioxyde de carbone (CO_2) liées à l'énergie en 2024, les industries du fer et de l'acier, du ciment et de la chimie étant responsables de 70 % de ces émissions. Atteindre la neutralité carbone d'ici le milieu du siècle nécessitera une montée en puissance rapide et soutenue des technologies industrielles à faibles émissions de carbone.

Les gouvernements, l'industrie et le secteur financier s'engagent de plus en plus dans la transformation des systèmes de production industrielle afin d'améliorer les résultats environnementaux, de réduire les risques climatiques, de préserver la compétitivité et de renforcer la résilience. Malgré cette dynamique croissante, les niveaux actuels d'investissement dans les technologies bas carbone restent largement insuffisants. Selon le récent rapport conjoint OCDE-AIE, l'investissement mondial annuel dans les technologies à émissions quasi nulles pour les secteurs de l'acier et du ciment devra atteindre au moins 500 milliards USD entre 2026 et 2035, soit une augmentation d'environ 25 fois par rapport aux niveaux actuels. Au moins deux tiers de ces investissements seront nécessaires dans les économies émergentes et en développement (EMDE), y compris la Chine, qui représentent collectivement plus de 75 % de la production mondiale d'acier et plus de 85 % de la production mondiale de ciment. Mobiliser des investissements à une telle échelle nécessitera des financements provenant de toutes les sources – publiques, privées, internationales et nationales – le secteur privé étant appelé à fournir la majeure partie des capitaux requis. Il est donc essentiel d'identifier quels instruments de réduction des risques, économiques et financiers (désignés collectivement comme des solutions financières dans ce rapport) peuvent permettre de débloquer et de mobiliser efficacement les capitaux privés nécessaires.

Ce rapport présente une version actualisée du 'Financial Toolkit' du Climate Club, initialement publié en mars 2025. Élaboré par le Secrétariat de l'OCDE dans le cadre du Pilier III du programme de travail du Climate Club 2025-2026, ses principales conclusions (aux côtés du rapport à paraître en 2026 sur la cartographie de l'assistance financière et technique à la décarbonation industrielle dans les EMDE) ont servi de base analytique au rapport conjoint OCDE-AIE cité ci-dessus, lequel a à son tour alimenté la Déclaration conjointe et la Feuille de route de la COP30 sur l'assistance internationale et les partenariats pour la transition vers une industrie verte.

Cette 'Financial Toolkit' vise à fournir une base de connaissances solide et un socle analytique robuste permettant aux décideurs publics, aux acteurs industriels et aux institutions financières de mieux comprendre les solutions de financement susceptibles de soutenir la décarbonation de l'industrie. Elle met en avant des exemples concrets de politiques et de programmes ayant amélioré l'accès au financement, renforcé la bancabilité des projets, mobilisé des capitaux privés et démontré un potentiel de montée en puissance et de reproductibilité. Elle illustre également la manière dont différentes solutions financières peuvent être combinées et adaptées pour répondre aux profils de risque de technologies bas carbone spécifiques dans des secteurs difficiles à décarboner. Cette édition 2026 s'appuie sur les instruments et les études de case présentés dans l'édition 2025 du 'Financial Toolkit' et inclut une analyse techno-économique détaillée de certaines technologies bas carbone dans les secteurs de l'acier, du ciment et de la pétrochimie.

Ce 'Toolkit' peut être utilisé par les développeurs de projets, les acteurs industriels, les décideurs politiques et les institutions financières (banques commerciales et institutions financières internationales) pour structurer des transactions, concevoir des dispositifs de soutien ou orienter des décisions d'investissement. Les 32 instruments financiers présentés dans ce 'Financial Toolkit' sont classés en trois catégories: instruments économiques, instruments de réduction des risques et instruments de financement.

Tableau 2. Vue d'ensemble des instruments financiers présentés dans ce 'Financial Toolkit'

Instruments économiques	Instruments de réduction des risques	Instruments de financement
E.1 Amortissement accéléré	**R.1 Garantie de crédit acheteur**	**F.1 Obligations durables**
E.2 Contrat carbone pour différence	**R.2 Assurance d'économies d'énergie**	**F.2 Prêts concessionnels**
E.3 Taxe carbone	**R.3 Mécanisme de première et seconde perte**	**F.3 Prêts et facilités en monnaie locale**
E.4 Crédits carbone	**R.4 Garantie de change**	**F.4 Fonds propres publics et privés**
E.5 Système d'échange de quotas d'émission	**R.5 Garantie de crédit partielle ou totale**	**F.5 Financement basé sur les résultats et mécanismes de tirage de la demande**
E.6 Redevances de responsabilité élargie du producteur	**R.6 Garantie de performance**	**F.6 Facilité de crédit renouvelable**
E.7 Subventions et aides	**R.7 Assurance contre les risques politiques**	**F.7 Instruments financiers liés à la durabilité**
E.8 Financement de la prime verte	R.8 Garanties souveraines	F.8 Produits structurés et titrisés
E.9 Crédits d'impôt		**F.9 Dette de capital-risque**
		F.10 Obligations de transition
		F.11 Crédit-bail
		F.12 Dette subordonnée et concessionnelle
		F.13 Financement par contrats d'achat (offtake)
		F.14 Échanges dette-financement
		F.15 Prêts fondés sur les politiques publiques

Note: les instruments en gras sont illustrés par des études de cas, dont les versions complètes figurent en annexe.

Les principaux enseignements tirés des 30 études de cas présentées dans ce 'Toolkit', développés plus en détail au chapitre 4, montrent que :

- Les financements concessionnels et tolérants au risque jouent un rôle essentiel pour permettre la réalisation de projets industriels pionniers de décarbonation. En absorbant les risques technologiques et d'exécution précoces, ces capitaux réduisent le coût du financement et soutiennent les décisions d'investissement là où les prêteurs commerciaux restent réticents. Lorsqu'ils sont déployés via des décaissements conditionnés à des cadres d'éligibilité clairs, ils peuvent également renforcer la confiance des cofinanceurs et signaler l'alignement avec les objectifs de politique publique à long terme.
- Les instruments de réduction ciblée des risques sont essentiels pour améliorer la bancabilité et la qualité de crédit des projets, et pour attirer les prêteurs commerciaux. En réallouant les risques à la baisse grâce à des mécanismes tels que les garanties, les assurances ou les dispositifs de protection de première perte, ces outils améliorent le profil de crédit des emprunteurs et réduisent les pertes attendues pour les prêteurs de dette senior. Cela permet d'obtenir des conditions de financement plus favorables, d'élargir la base d'investisseurs et de permettre à un plus grand nombre de projets d'atteindre la décision finale d'investissement. Ils élargissent également la gamme d'investisseurs pouvant participer, permettant aux projets de transition industrielle d'atteindre plus rapidement une échelle significative.

- Le financement en monnaie locale et l'atténuation du risque de change renforcent la résilience financière des investissements de décarbonation industrielle. Lorsque les revenus et le service de la dette sont libellés dans la même monnaie, les projets sont moins exposés à la volatilité des taux de change susceptible de compromettre leur viabilité financière. Les outils de couverture du risque de change renforcent la confiance des prêteurs et facilitent la mobilisation des marchés financiers domestiques.
- Des cadres de revenus prévisibles apportent la certitude nécessaire pour que les investissements industriels bas carbone, intensifs en capital, puissent se concrétiser. Les mécanismes de stabilisation ou de complément de revenus, tels que les paiements fondés sur les résultats ou les engagements de prix à long terme, améliorent la visibilité des flux de trésorerie et la capacité de service de la dette. Des perspectives de revenus plus claires permettent aux prêteurs d'offrir de meilleures conditions, accélérant ainsi la montée en puissance des projets.
- La finance mixte et les instruments liés à la durabilité facilitent la mobilisation de capitaux privés en alignant les incitations financières sur des trajectoires de transition crédibles. Les structures de finance mixte utilisent des capitaux publics tolérants au risque pour catalyser les investissements privés dans les technologies émergentes et les nouveaux marchés, tandis que les produits liés à la durabilité lient les conditions financières à des performances vérifiées de manière indépendante. Des indicateurs clés de performance (KPI) standardisés et des exigences de rapportage renforcent la comparabilité et réduisent les coûts de diligence raisonnable, élargissant la participation des investisseurs.
- La mise à l'échelle et la réplication des investissements de décarbonation industrielle reposent sur la standardisation, des cadres politiques clairs et des signaux de demande robustes. Des processus d'évaluation rationalisés, une documentation commune et des systèmes solides de suivi, notification et vérification (MRV) réduisent les coûts de transaction et facilitent le déploiement de programmes à travers différents sites et secteurs. Associés à des environnements réglementaires prévisibles et à des mécanismes de soutien à long terme des prix ou des contrats d'achat, ces facteurs peuvent créer des conditions de marché stables propices à plusieurs vagues successives d'investissement.

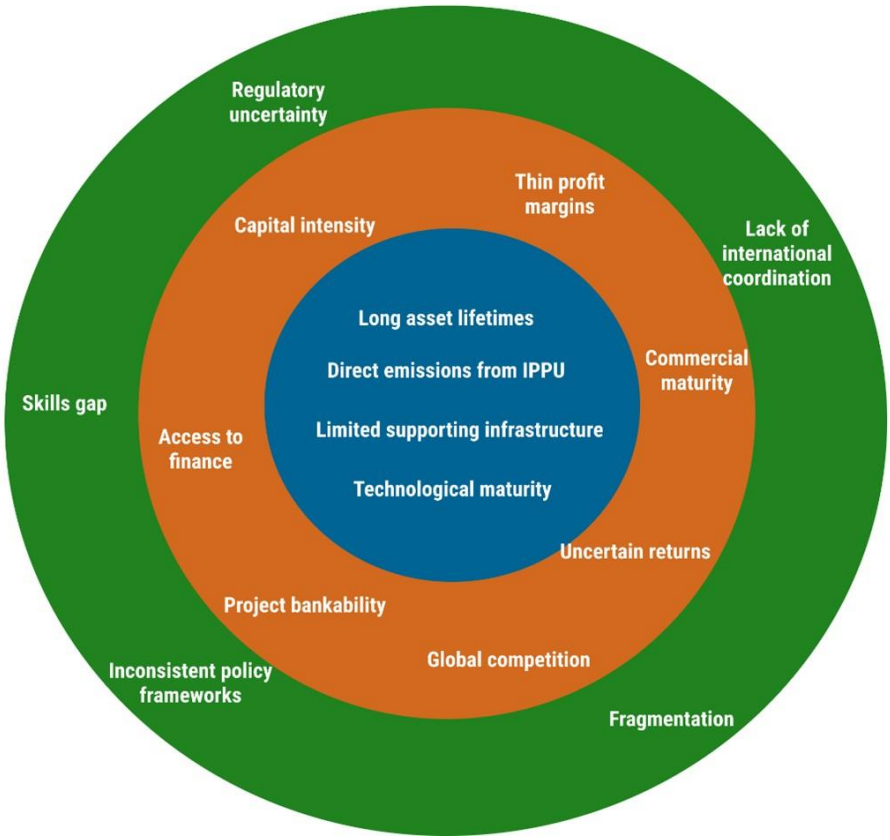
1 The role of the Financial Toolkit in supporting industry decarbonisation

Introduction

The industry sector is responsible for nearly 40% of global energy-related CO_2 emissions and plays a crucial role in the global transition to achieving net-zero emissions by 2050 (OECD/IEA, 2025[1]). Policymakers have a narrow window in which to act on industry decarbonisation while facing a wide range of challenges spanning technology and infrastructure, economics and finance, and policy and coordination. Core barriers to industry decarbonisation financing include long asset lifetimes, significant direct emissions from industrial processes, and the limited maturity of key technologies and supporting infrastructure. At the same time, high capital intensity, thin profit margins, uncertain returns, and exposure to global competition constrain investment, while projects often struggle with bankability and access to finance. These challenges are compounded by fragmented policy landscapes, limited international coordination, regulatory uncertainty, and persistent skills gaps, all of which undermine coherent and scalable action (See Figure 1).

Investment in industry decarbonisation offers a major economic opportunity, with the potential to spark new waves of innovation, create high-quality jobs, open markets for low-carbon technologies, and strengthen global competitiveness and economic resilience. It can also accelerate the development of sustainable value chains and reduce long-term exposure to volatile fossil fuel prices. Moreover, early movers stand to capture strategic advantages in emerging green industries and shape global standards and supply chains.

Figure 1. Overview of key barriers to industry decarbonisation financing



Note: Blue: technology and infrastructure challenges; Orange: economic and financial challenges; Green: policy and coordination challenges. IPPU: Industrial Processes and Product Use.
Source: Authors, based on (OECD, 2022[2]; OECD/The World Bank, 2024[3]; OECD, 2025[4]).

Strong domestic policy frameworks and supportive enabling environments are essential to driving demand for industry decarbonisation financing. Clear, stable, and credible policy signals help reduce investment risk and create predictable market conditions, and in many cases, these conditions are a prerequisite for financial institutions and the private sector to commit capital to low-carbon technologies. The *IEA Policy Toolbox for Industrial Decarbonisation*, developed under the Climate Club Work Programme, highlights the importance of such policies (IEA, 2025[5]).

For projects to move from concept to implementation, financial flows must be timely, sufficient, and aligned with project risk profiles. Deploying the right financial instrument at the right stage is key to overcoming risks and barriers faced by industrial projects.

Overview of Climate Club work

Launched at the 28th Conference of Parties to the United Nations Framework Convention on Climate Change (COP28) in Dubai in 2023, and comprising 48 members as of March 2026, the Climate Club is a high-ambition intergovernmental forum for exchange on industry decarbonisation and fosters collective action across diverse geographies. The Climate Club Work Programme 2025/26 includes eight interrelated modules across three pillars:

I. Advancing ambitious and transparent climate change mitigation policies

II. Transforming industries

III. Boosting international climate co-operation and partnerships

This Financial Toolkit was developed under Pillar III and complements other deliverables under the same Pillar, such as the Climate Club Capacity Building Programme, feeding in particularly to the Global Matchmaking Platform (GMP) ambitions to coordinate and scale up technical and financial assistance to industry decarbonisation in EMDEs.

Structure of the Financial Toolkit: reader guide

This 2026 edition of the Financial Toolkit provides an overview of all types of financial solutions, namely de-risking, economic and financing instruments that can be used to finance industry decarbonisation, both in EMDEs and in advanced economies. For each instrument, the toolkit outlines its concept, benefits and relevance to industry decarbonisation and identifies the typical providers. This instrument description is complemented by a suite of case studies to showcase how they are being implemented in real-world projects. To better illustrate how financial instruments are stacked up and their relative effect to close the competitiveness gap between baseline and low-carbon technologies, an illustrative techno-economic assessment for cement, iron and steel, and chemical and petrochemical is also presented. This assessment highlights the cost difference between conventional and low-carbon production routes, including both capital and operating expenditures, and identifies the extent to which financial instruments can bridge these gaps.

The Financial Toolkit is intended as a living document, and the present edition builds on and updates the 2025 edition of the Climate Club Financial Toolkit. It highlights 30 case studies (13 new case studies and 17 expanded versions) to illustrate the application of a wide range of financial instruments, further develops their definitions, and offers a more detailed economic assessment of selected low-carbon for the steel, cement and petrochemicals sectors. Additional case studies on the use of financial instruments for industry decarbonisation and hydrogen financing are available on the OECD CEFIM website.[1]

As governments and financial actors develop and implement financial instruments, the Toolkit will continue to be updated with additional instruments, case studies and examples of applications for selected low-carbon technologies across industrial subsectors. In terms of scope, it is important to note that this Financial Toolkit is focused on financial instruments (further categorised into economic, risk mitigation and financing instruments in Chapter 3) and does not cover overarching policy frameworks (e.g. national plans, roadmaps, targets).

The toolkit is structured as follows:

- Chapter 2 gives an overview of the challenges faced in decarbonising industry.
- Chapter 3 gives an overview of 32 financial solutions that can be used to overcome these challenges, including the benefits and relevance of each instrument to industry decarbonisation.
- Chapter 4 presents a set of 30 new and updated case studies that illustrate the application of selected financial instruments in practice. The case studies were chosen to highlight factors for success and lessons learned in applying financial instruments to industry decarbonisation projects, both in EMDEs and advanced economies. The full case studies are included in the Annex.
- Chapter 5 aims to demonstrate how multiple financial instruments can be combined and to assess their relative impact in closing the competitiveness gap between baseline and low-carbon technologies. It serves as a complement to the case studies presented in Chapter 4, which focus on the application of individual instruments.

[1] www.oecd.org/cefim

The Financial Toolkit is designed not only as a reference, but as a practical resource that project developers, industry actors, policymakers and financial institutions can use when structuring transactions, designing support schemes or guiding investment decisions. By helping stakeholders identify instruments to overcome barriers to industry decarbonisation financing, the Financial Toolkit aims to support the translation of ambition and analysis into implementable financing solutions that can accelerate industry decarbonisation at scale.

Table 3. Stakeholders that the Financial Toolkit aims to support

Stakeholder	Use of the Financial Toolkit
Project developers and industry actors	Can use the Financial Toolkit to identify the instruments that address project-specific risks across the investment lifecycle and strengthen financing strategies
Policymakers	Can use the Financial Toolkit to develop targeted instruments that enable the effective deployment of limited public finance for industry decarbonisation
Financial institutions	Can use the Financial Toolkit to structure blended finance and risk-sharing solutions that better align public and private capital while maximising development and climate impact

The Financial Toolkit also aims to offer guidance to international initiatives committed to accelerate industrial decarbonisation. It was developed to provide a knowledge base for the Climate Club's GMP, through which EMDEs can submit requests for technical and financial assistance. It is used by the GMP to guide technical and financial assistance delivery partners in selecting the most appropriate instrument(s) to respond to EMDE needs. Through the case studies, the Toolkit also helps to identify potential delivery partners and provide insights on how to design and implement economic, de-risking and financing instruments. This Toolkit also aims to help operationalise the COP30 Working Group Joint Statement and Roadmap on International Assistance and Partnerships for Green Industry Transitions.

2 Overview of challenges and approaches to finance industry decarbonisation

In the cement and steel sectors, global investment needs over the next decade for near-zero emission technologies are estimated to reach at least USD 500 billion between 2026 and 2035 (OECD/IEA, 2025[1]). This is around a 25-fold increase over current levels investment in near-zero emissions steel and cement projects globally (IEA, 2026[6]). Mobilising this scale of investment will require all sources of finance from public and private actors, as well as from both domestic and international sources.

The lion's share of financing and investment for industry decarbonisation would need to reach EMDEs, which face the dual challenge of decarbonising their industries while continuing to drive economic development. As EMDEs urbanise and expand their energy and transport infrastructure, they are expected to account for most of the growth in global industrial output.

Public finance will continue to play a central role by reducing risk, lowering the cost of capital and mobilising greater private capital. In EMDEs, international public finance, covering funding from development finance institutions, multilateral climate funds and government donors, is a crucial source of financing for decarbonisation. Recent OECD-IEA analysis shows that scaling low-carbon emission technologies in the steel and cement sectors will require USD 2 billion per year in international public finance for EMDEs by the early 2030s (OECD/IEA, 2025[1]).

Nevertheless, the scale of the financing gap for investment in climate action is too large to close without significant private sector involvement. Globally, private finance is projected to contribute approximately 70% of global investment required to meet net-zero targets by 2050 (OECD/UNDP, 2025[7]). Greater efforts are needed to mobilise private finance in industry: estimates indicate that around USD 2.1 billion of private finance was mobilised for mitigation activities in the steel, cement and chemicals sectors in EMDEs between 2012 and 2023 (OECD/Climate Club, 2026 forthcoming[8]). It is important to note that data on private finance mobilisation is sparse and lacks granularity, making it difficult to fully assess the scale of private investment for industry decarbonisation in EMDEs.

Box 1. Growing international momentum on industry decarbonisation

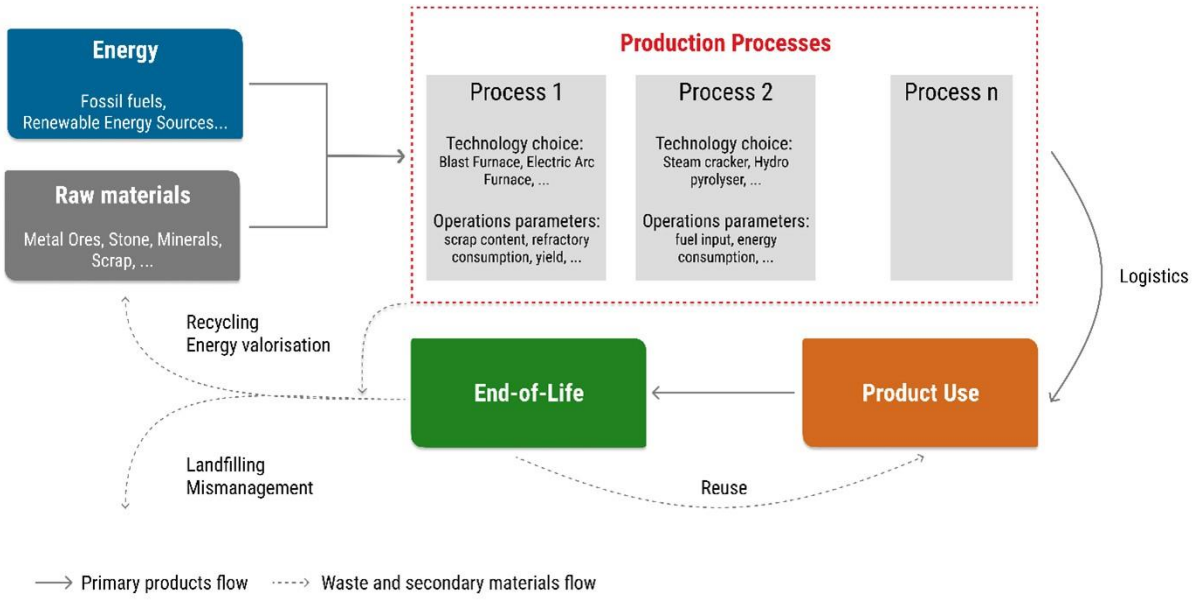
Governments, industry, the financial sector and international initiatives are demonstrating a broad and strengthening commitment to transforming industrial systems to improve environmental performance, reduce climate impacts, safeguard competitiveness and enhance the resilience of the industry sector. This momentum was clearly visible at COP30, where the Belém Declaration: Accelerating Green Industrialization in Pursuit of Global Climate and Development Goals, the COP30 Joint Statement and Roadmap on International Assistance and Partnerships for Green Industry Transition and the Climate Club's Global Pledge to grow near-zero and low-emissions steel and cement markets illustrated increasing global alignment behind industry decarbonisation.

Beyond the COP process, momentum is being sustained through initiatives such as the South African G20 Presidency's *Voluntary principles for sustainable industrialisation hubs, including low-to-zero emission hydrogen and ammonia,* as well as the growing prominence of industry decarbonisation within country platforms and finance and investment programmes. The central challenge now lies in translating these declarations, statements and pledges into concrete investments.

Financing challenges

Addressing the industry decarbonisation financing gap requires overcoming a diverse mix of financing challenges to ensure that projects with varying risk profiles can access capital. The types of challenges that a given project may face depends on the project's position within the industry value chain (See Figure 2), the specific decarbonisation solution being pursued, as well as the local context. Table 3 provides an overview of the types of financial challenges faced by each decarbonisation solution, across stages of the industry value chain.

Figure 2. Simplified industry value chain



Note: Secondary materials are any materials that are not the primary products from manufacturing and other industrial sectors. These materials can include residuals from production processes and products that have been recovered at the end of their useful life.

Table 4. Financial challenges by industry decarbonisation solution

Decarbonisation solution	Most relevant industry subsectors and actors	Most relevant steps of the industry value chain	Related financial challenges
1. Circular economy	Downstream of the industry value chain.	Raw Materials Production Processes Product Use End-of-Life (+)	Untested track records Operation costs Volume uncertainty (products and waste collection, transportation, treatment) Revenue uncertainty
2. Energy and process efficiency	All sectors, with a primary focus on SMEs.	Production processes (+) Product Use	Untested track records (for some technologies) Access to financing Revenue (savings) uncertainty
3. Electrification with renewable power	Emission-intensive industries operating with high-temperature process heat and a range of SMEs operating with low temperature process heat.	Raw Materials Energy (+) Production Processes (+) Product Use	Lack of infrastructure (weak power grid in some countries) High upfront costs Cost of capital Operation costs (case-by-case basis)
4. Biomass and synthetic feedstocks	Emission-intensive industries operating with high-temperature process heat.	Energy (+) Production and processes (+) Product Use End-of-life	Operation costs High upfront costs (sometimes) Volume uncertainty Revenue uncertainty
5. Carbon capture, use, and storage	Emission-intensive industries with high CO_2 emissions per plant and with high CO_2 concentration in flue gas.	Production Processes (+) Product Use (for CCU)	Regulatory uncertainty Untested track records Lack of infrastructure High upfront costs Cost of capital Operation costs Revenue/Volume uncertainty

Note: 1) The most exposed steps of the industry value chain are marked with (+); 2) Low carbon & renewable energy/heat and feedstocks include low-emission hydrogen and bio-based energy and feedstocks.

In practice, multiple financial instruments often need to be combined to overcome the specific financing barriers of a project. It is important to distinguish between the characteristics of the underlying technology and those of the project in which it is deployed, as these do not always evolve in parallel and may require different financing approaches. Early-stage technologies, where uncertainty is high and commercial viability is not yet proven, typically depend on grants, concessional loans or other forms of de-risking capital to offset technology-related risks and attract initial investors. At the same time, projects progress through distinct development phases (from preparation to construction and operation), each associated with its own risk profile and financing constraints. As technologies mature and projects move further along the development cycle, other tools such as insurance products, subordinated debt or equity participation can be used to address project-specific risks and mobilise private capital. The most appropriate mix of instruments must therefore be adjusted to each project's circumstances and adjusted over time. Factors such as the technology maturity, project life cycle phase, and evolving risks, costs and financing needs all shape which instruments are most effective (OECD/The World Bank, 2024[9]).

It is important to integrate distributional and just transition considerations into the design of financial instruments for industry decarbonisation, ensuring that the shift towards low-carbon production does not exacerbate existing inequalities. This means ensuring that social outcomes are embedded directly into

how financial instruments are structured, allocated and governed, as well as more broadly supporting workforce reskilling and upskilling and mitigating job losses in areas dependent on carbon-intensive industries. For example, financial instruments can incorporate social performance criteria, such as employment protection, reskilling commitments or measures ensuring local value creation, directly into their eligibility rules or incentive structures. In doing so, access to certain tools becomes contingent on demonstrable social outcomes.

Box 2. Barriers facing EMDEs in financing industry decarbonisation

EMDEs face a combination of structural barriers that significantly raise the cost and complexity of financing industry decarbonisation.

First, **higher cost of capital**, often driven by high country risk, macroeconomic volatility and limited creditworthiness, translates into borrowing costs several times higher than those faced by advanced economies. This reduces the feasibility of capital-intensive low-carbon investments and lengthens payback periods. For example, OECD work analysing financial proxy data estimates weighted average cost of capital (WACC) values for green hydrogen as ranging from 6.4% to 24% (Lee and Saygin, 2023[10]).

Second, **shallow domestic capital markets** constrain the availability of long-tenor financing in local currency. Limited participation from institutional investors, such as pension funds and insurance companies, reduces the pool of patient capital needed for large industrial projects, while also increasing reliance on international financing. Many firms face foreign exchange mismatches, with project revenues denominated in local currency while debt is often available only in hard currency (currency that is widely accepted around the world and stable in value), exposing industry decarbonisation projects to exchange rate risk.

Third, EMDEs often have **limited fiscal space**, restricting their ability to deploy tax credits, concessional loans or subsidy schemes at the scale required to de-risk first-of-a-kind (FOAK) low-carbon projects. Competing development priorities, ranging from health to education and infrastructure, further tighten budget constraints. As a result, many EMDEs face a difficult trade-off between scaling up climate investments and safeguarding debt sustainability.

Finally, **weak monitoring, reporting and verification (MRV) systems**, coupled with incomplete industrial emissions baselines, hinder the development of robust project pipelines. Inadequate data raises due diligence costs for financiers and reduces investor confidence in emissions reduction outcomes. Recent work under the OECD Inclusive Forum on Carbon Mitigation Approaches (IFCMA) highlights that the assessment of embedded emissions is constrained by the availability and granularity of data (OECD, 2025[11]).

All these factors underscore the importance of establishing robust **enabling conditions** that foster environment that is conducive to investment in industry decarbonisation projects. Such enabling conditions span a wide range of dimensions that support project preparation and implementation across the entire project cycle, including:

- Project identification: clear national and sectoral decarbonisation strategies, predictable business and industrial policy frameworks, sustainable finance taxonomies to classify eligible projects, Environment Social and Governance (ESG) criteria to align investments
- Project preparation and negotiation: institutional and technical capacity building, green public procurement, public-private partnerships
- Project implementation: reskilling and upskilling support, access to enabling infrastructure, labels, standards and certification schemes

- Project evaluation: capacity building for MRV, evidence of technology performance and financial viability

The public sector plays a critical role in establishing the framework to deliver on these enabling conditions, but it is not alone in this effort: effective industry decarbonisation in EMDEs also depends on the active engagement of the private sector, development finance institutions and other international partners. Technical assistance is a prerequisite for many EMDEs, as it strengthens institutional capacity and supports the early-stage project preparation needed to build a viable pipeline of investable decarbonisation projects.

Source: Enabling conditions based on (Cordonnier and Saygin, 2023[12]).

Financing approaches

The economic, derisking and financing instruments presented in this Financial Toolkit can be deployed under various financing approaches to support industry decarbonisation. These approaches determine how risks are allocated, how public and private capital can be combined, and how financing structures evolve as technologies and markets mature. They are often framed within broader financing concepts, such as sustainable finance, climate finance and transition finance, which provide a common language for aligning capital with climate objectives. To clarify how these terms are used in this Toolkit, Box 3 provides working definitions of these key concepts.

Blended finance, the strategic use of development finance for the mobilisation of additional finance towards sustainable development in EMDEs, is a widely-used method for providers of development finance and the private sector to work together and leverage each other's resources and knowledge (OECD, 2022[13]). While blended finance has not scaled as rapidly as hoped and has mobilised relatively limited private finance, when designed well, it can help address market failures by mitigating risks, improving project bankability, and demonstrating the viability of new technologies or business models. They key challenge for blended finance is to strike a balance between providing sufficient incentives to attract private investors into frontier markets, while avoiding crowding out private sector capital that may have been forthcoming without public support. The OECD Development Assistance Committee (DAC) Blended Finance Guidance 2025 emphasises that blended finance should be targeted, time-bound and tailored (OECD, 2025[14]).

When considering how to fund major investments, corporate finance and project finance offer distinct approaches that shape how risk is allocated and how projects appear on company balance sheets. Project finance involves funding a project through a separate legal entity known as a Special Purpose Vehicle, where debt and equity are repaid from the project's own future cash flows. The key advantage of this approach is that it is off the balance sheet of the project developer and therefore does not affect the shareholders' credit and shifts a portion of the project risk to lenders (World Bank, n.d.[15]). In return for assuming this risk, lenders generally demand a higher margin (World Bank, n.d.[15]). Project finance has largely been used to drive renewable energy deployment, particularly in large parts of Africa and Latin America, where project finance accounts for 70%-80% of financing for solar projects today (IEA, 2025[16]). For industry decarbonisation projects (where technologies tend to be less mature, capital requirements are high, and revenue streams are uncertain), project finance becomes particularly attractive.

By contrast, corporate finance raises funding at the level of the parent company and records both assets and liabilities directly on the corporate balance sheet. Debt is backed by the full credit strength of the company, rather than by the cash flows of a single project. This typically lowers borrowing costs but also exposes the parent company to project-specific risks.

Box 3. Sustainable, climate and transition finance

It is important to clarify the distinction between sustainable, climate and transition finance.

Sustainable finance is a broad term covering environmental, social and governance (ESG) considerations across financial decision-making. OECD work on sustainable finance spans multiple areas, including corporate sustainability disclosure, ESG ratings and assessment methodologies, due diligence for responsible business conduct, and the alignment of financial systems with sustainability objectives. For example, the OECD has analysed transparency and comparability challenges in assessing the alignment of finance with climate policy goals, emphasising the need for robust and credible assessments of progress (OECD, 2024[17]).

Climate finance is more narrowly defined and aims at reducing emissions and enhancing sinks of greenhouse gases, reducing vulnerability, increasing adaptive capacity and mainstreaming and increasing resilience of human and ecological systems to negative climate impacts (UNFCCC, 2024[18]). The OECD plays a central role in tracking and assessing progress on climate finance from developed to developing countries under the UNFCCC Framework. The OECD's seventh assessment of progress towards the USD 100 billion climate finance goal estimates that developed countries met the goal for the first time in 2022, providing and mobilising USD 115.9 billion in climate finance for developing countries (OECD, 2024[19]).

Transition finance focuses on the finance deployed or raised by corporates to implement their net-zero transition, in line with the Paris Agreement temperature goal and based on a credible corporate climate transition plan (OECD, 2022[20]). This concept acknowledges that many carbon-intensive sectors need access to finance to invest in emissions reductions and requires such access to be based on credible transition strategies. The OECD Guidance on Transition Finance sets out the key elements of credible corporate climate transition plans, including robust governance, clear decarbonisation targets, sector- and technology-specific pathways, capital expenditure alignment and transparency on progress. The Guidance also provides recommendations for financial institutions, regulators and corporates to ensure that transition finance is effective.

To identify which activities, technologies and investments qualify as aligned with national and international climate goals, clear and credible taxonomies are key in supporting industry decarbonisation. Robust taxonomies help to reduce information asymmetries, strengthen transparency, and provide confidence to both public and private actors that capital is being directed towards outcomes that are aligned with decarbonisation pathways.

Co-ordinating finance flows

As global and national efforts to decarbonise industry expand, the need for stronger co-ordination among multiple stakeholders has become increasingly important. Effective collaboration is required among international donors and development partners, as well as with local governments, industry associations and across government institutions. Without such co-ordination, initiatives risk overlap and missing opportunities to achieve meaningful emissions reductions.

Country platforms have emerged as a promising mechanism to foster this co-ordination. These platforms provide structured forums where stakeholders can share information, align priorities, and jointly plan interventions, helping to reduce duplication of efforts and ensure that resources are allocated more strategically.

A prominent example of country platforms to date is the Just Energy Transition Platforms (JET-Ps). These international programmes are designed to support EMDEs to phase out coal power generation, scale up renewable energy, and build green industries, in a way that takes into account the social and human impact of the net-zero transition. The first JET-P with South Africa was launched at COP26 in Glasgow, with subsequent JET-Ps with Indonesia, Viet Nam, and Senegal being announced shortly afterwards. Across the four partner countries, the JET-Ps have shown significant potential to align international public and private investment flows with national priorities and reduce fragmentation, attracting nearly USD 50 billion in commitments (IEA, 2025[16]). However, disbursements have been drastically lower than committed funding, reaching less than USD 7 billion (IEA, 2025[16]). Concerns have also emerged around the quality of the finance, with only 3%-4% of JET-P pledges being grants, and the rest being loans that tend to be tied to donor agendas (Mazzucato, 2025[21]).

More recently, new country platforms with a broader scope have been established. This includes Egypt's Nexus of Water, Food and Energy (NWFE), which supports nine priority projects, focused on water, food and energy. Similarly, Brazil's Climate and Ecological Transformation Investment Platform (BIP) which, beyond energy, aims to expand investments on projects ranging from nature-based solutions and bioeconomy to industry and mobility. The Türkiye Industrial Decarbonisation Investment Platform (TIDIP), supported by the European Bank for Reconstruction and Development (EBRD), the World Bank Group and International Finance Corporation, and launched in November 2024, has a focus on industry decarbonisation. The TIDIP aims to deploy USD 5 billion by 2030 to decarbonise the steel, aluminium, cement and fertiliser sectors (EBRD, 2024[22]). Türkiye plans to expand the TIDIP to cover the glass, ceramics and chemicals sectors.

Early experiences with the first generation of country platforms worldwide, particularly the four JET-Ps, have shown that strong national ownership and sustained high-level commitment are critical to maintaining momentum and policy coherence (OECD, 2025[23]). Clear delineation of roles among domestic institutions, development partners, and technical partners is equally essential, as ambiguous mandates have led to co-ordination challenges and implementation delays (OECD, 2025[23]). Successful platforms also align closely with long-term national strategies and are supported by well-defined objectives, milestones, and project pipelines to translate transition goals into concrete investment opportunities. Finally, robust data systems remain a key requirement, as gaps in emissions, infrastructure and socio-economic data continue to impede credible planning and prioritisation.Beyond country platforms, complementary initiatives such as the Climate Club Global Matchmaking Platform, are designed to accelerate industry decarbonisation in EMDEs. Launched at COP29, the Global Matchmaking Platform provides a platform for EMDE governments to submit requests and identify technical and financial solutions to support the decarbonisation of their industrial sectors.

3 Financial instruments

Ensuring the bankability of low-carbon technologies and industrial decarbonisation projects despite market risks depends on the effective combination and co-ordinated use of multiple financial instruments. Each category of instruments can support the development of an enabling environment for investments in industry decarbonisation from the private sector and institutional investors. It is important to note that often multiple financing instruments could be leveraged for decarbonisation projects and often projects require a tailored suite of instruments. The instruments highlighted in this Toolkit can be combined and tailored to project and investor needs. For instance, de-risking instruments are a valuable tool to overcome barriers associated with financing industry decarbonisation projects and can be complimented with the use of financing to overcome funding challenges and economic instruments that provide long-term policy and regulatory support towards decarbonisation.

As in the first edition of the Toolkit, the instruments are classified under three categories:

- **Economic**: means by which decisions or actions of the government affect the behaviour of producers and consumers by causing changes in the prices to be paid for these activities. They can accelerate financing options across the public and private sector and highlight long-term commitments to net zero, reducing investment risks.
- **Risk mitigation**: instruments that help investors reduce or manage investment and project risks, typically in exchange for a fee, and thus, improve the perceived risk-reward profile of an investment. De-risking instruments can help mitigate key uncertainties associated with industry decarbonisation projects and low-carbon technologies while also lowering the total project cost.
- **Financing**: instruments that can help fund business activities, purchases, or investments. The use of financing instruments and the investment approach vary amongst technology and project.

Risk mitigation instruments, including guarantees, first- and second-loss facilities, energy savings insurance and foreign currency guarantees, aim to reduce perceived and real risks, thereby lowering financing costs and mobilising private capital. Financing instruments, such as lease financing, concessional and venture debt, bonds, credit facilities and equity, address capital intensity and liquidity constraints, particularly during early deployment and scale-up phases.

Overview of financial instruments

This section gives an overview of 32 financial instruments that can be used to decarbonise industry. This includes both instruments newly introduced since the 2025 edition of the Financial Toolkit and instruments included in the previous edition with expanded descriptions. For each instrument, the overview provides (i) the instrument's definition; (ii) a brief description of how the instrument supports decarbonisation; (iii) its potential application across the project life cycle; and (iv) the associated challenges and limitations of the use of the instrument.

Economic instruments

E.1. Accelerated depreciation

Accelerated depreciation occurs when the book value of a capital asset is reduced at an accelerated rate compared to the 'straight-line depreciation' method when the value of the asset is depreciated evenly over its lifetime. It records larger depreciation expenses during the earlier years of an asset's useful life, and smaller ones in later years. Accelerated depreciation is allowed under the 'Generally Accepted Accounting Principles', but it is not applicable to all types of assets and faces limitations in applicable rates. Several post-COVID-19 relief packages issued by governments included a provision to adjust the authorised accelerated depreciation rate for specific assets, e.g. machinery.

Accelerated depreciation lowers the taxable income during the early years of an asset's lifetime (thereby improving the companies' cash balance), while increasing taxable income in later years. For CAPEX intensive projects, such as production plants, governments can use accelerated depreciation tax policies to encourage businesses to purchase new assets and optimise their cash flows at the early and riskiest stages of a project.

The instrument can be applied to support the operation of a project, as it can provide a tax incentive to recover costs associated with project investment needs. For example, many industrial retrofit projects will require investments in low-carbon technologies. The instrument can ensure that costs associated with the investment can be recovered.

The instrument is more suitable for projects involving mature, commercially proven emissions reduction activities, rather than investments centred on early-stage or rapidly evolving low-carbon technologies. Accelerated depreciation is less suitable for emerging technologies given that such technologies often face unclear asset lifetimes. The use of accelerated depreciation on emerging technologies can have the effect of misaligning tax deductions with the asset's actual economic usefulness. The successful application of the instrument also may be limited to incumbent, capital-intensive firms implementing upgrades to existing assets or infrastructure, rather than start-ups or project developers deploying novel technologies with limited revenue streams and higher risk profiles, as for the instrument to be useful a company needs to be profitable and be able to benefit from lower taxable income.

E.2. Carbon Contract for Difference

A contract for difference (CfD) is a subsidy model to pay out the supplier of a low-carbon product based on the difference between the market price and an agreed strike price. CfDs are usually symmetrical. For instance, in the case of a low-carbon product supplier: if the strike price is higher than the market price, the CfD provider must pay the difference between the strike price and the market price; whereas if the market price is higher than the agreed strike price, the low-carbon product supplier must pay back the CfD provider the difference between the market price and the strike price. A Carbon Contract for Difference (CCfD) is a type of CfD and is characterised as a long-term agreement between public and private sector actors. The agreement will stabilise the carbon price for the execution of a decarbonisation project. It also may compensate the company for the difference between a pre-agreed strike price and the actual carbon market price.

CfDs can incentivise investment in low-carbon technologies by providing stability and predictability to future revenue streams over a long period. A CCfD can de-risk investments in emerging low-carbon technologies and bridge the gap between volatile market prices and higher effective carbon costs associated with decarbonisation projects. In addition, it can provide long-term price certainty which can mobilise private capital for decarbonisation projects or investments in low-carbon technologies.

A CCfD can be suitable for the operation of a project where de-risking the carbon price is necessary. A guaranteed carbon price is set over a specific time period or agreement period which can be helpful in mobilising projects associated with the adoption of hydrogen, or green steel. Currently the UK encourages the use of CCfDs to meet the objectives of its industry decarbonisation strategy by deploying technologies like low-carbon hydrogen.

To properly implement CCfDs, stable, credible carbon price forecasts are needed. A lack of pricing stability and complementary regulatory barriers to support the implementation of CCfDs can impact its ability to support decarbonisation efforts. In addition, co-ordination across tax and credit regimes may be necessary. These challenges often make the instrument more suitable for large-scale projects.

E.3. Carbon Tax

A carbon tax is a government-imposed fee on emission-generating activities, used to internalise the costs of carbon emissions, with a rate that is applied directly to GHG emissions (OECD, 2024[24]). This differs from a fuel excise tax which is levied on the quantity of fuels. However, most countries administer explicit carbon taxes in the same way as fuel excises, and do not tax CO_2 directly but instead calculate the corresponding rate in common commercial units such as kilograms (OECD, 2024[24]). A carbon levy can also be calculated to tax the emissions embedded in certain products when they are imported into a given jurisdiction.

A carbon tax incentivises companies to reduce their carbon footprint. An imposed fee on carbon emissions increases the costs for polluting production routes and therefore increases the competitiveness of technologies that release less CO_2.

A carbon tax or levy can support the operation and financing of decarbonisation projects by incentivising a shift toward low-carbon industrial processes. For example, a carbon levy raises the cost of emitting carbon, motivating firms in the hard-to-abate sector to invest in low-carbon technologies. For instance, a steelmaker that has implemented an energy efficiency programme to save 1 million tonnes (Mt) CO_2 per year would save EUR 100 million annually in avoided levy payments if the levy is set at EUR 100 per tonne of CO_2. Revenues raised from levy payments can be recycled into public funds that support further decarbonisation initiatives.

The implementation of a carbon tax requires robust monitoring, reporting and verification systems for its use (MRV). It is most applicable to hard-to-abate sectors such as steel, where industrial competitiveness can be at risk. Firms in carbon-intensive industries may face higher production costs than competitors in countries without a carbon price. This can lead to carbon leakage and weaken industrial competitiveness creating socio-economic and environmental impacts.

E.4. Carbon Credits

Carbon credits are a tradeable instrument issued by a carbon crediting mechanism, representing a verified emission reduction or removal equivalent to 1 t CO_2-eq. They are distinct from permits (or allowances) that represent the right to emit 1 t CO_2-eq of GHG emissions. At COP29, countries have agreed on the building blocks that set out how carbon markets will operate, making country-to-country trading and a carbon crediting mechanism operational (United Nations Climate Change, 2024[25]). This mechanism, known as the Paris Agreement Crediting Mechanism, sets out a methodology, registry and third-party auditors, which provides infrastructure that other crediting mechanisms could build on or align with (United Nations Climate Change, 2025[26]). It may be essential to ensure the environmental integrity of the carbon credit markets.

Companies can use carbon credits to decarbonise their operations via the purchase of carbon credits. These assets can be traded on a regional, national or state/provincial level carbon market. Buyers of carbon credits can claim the carbon emission reduction to support sustainability activities in the business

and net-zero pledges and promote companies to embed net-zero programmes within their business models.

Carbon credits are often suitable for the operation of a project within a sector with the potential for high-carbon usage e.g. steel and cement sectors. The credit allows for a threshold of carbon usage that can be traded if the full allowance is not used, therefore monetising avoided emissions. For instance, they can be useful for the adoption of industrial process upgrades and building retrofits where measurable emission reductions can occur and be tied to the monetisation of avoided emissions.

The effective use of carbon credits requires market stability and effective MRV systems. Therefore, carbon crediting platforms should have robust MRV systems in place to avoid firms that use credits for greenwashing. Likewise, governments providing credits should have emission trading systems that support a stable carbon market.

E.5. Emissions Trading Schemes

Emissions trading schemes (ETS) are a type of carbon market which works by placing a quantitative limit (a cap) on the amount of greenhouse gas (GHG) emissions in one or more sectors of the economy, while allowing allowances (or permit) trading. Each allowance represents one unit of emissions. The cap decreases annually to meet emission reduction targets. Companies may receive a certain number of free allowances that decline over time according to benchmarks tailored to specific sectors and products and can sell excess credits to other companies. Polluters with more emissions than their quota must purchase the right to emit more from emitters with fewer emissions.

The ETS supports the take-off of a carbon market where financial resources can be channelled to support emission reductions and promote international climate action. Emissions levels are monitored and reported annually to determine if they remain under the cap. An ETS requires polluting entities across sectors (industrial manufacturing, electricity, etc.) to pay for their released emissions.

Due to the increased price of carbon, firms can justify investments in low-carbon processes. The ETS can support the development and operationalisation of decarbonisation projects within firms that require investments in new low-carbon processing equipment. In turn, the investment will support a reduction in emissions and as a result increase the internal rate of return (IRR) for decarbonisation investments.

If permits are in oversupply this can reduce incentives for decarbonisation in the hard-to-abate industry. For instance, if industries choose to move outside the ETS region to avoid paying a carbon price there is the potential for carbon leakage. OECD research shows that on average, a USD 1/tCO_2-eq increase in carbon prices reduces cement and steel plants' emissions by 1.3% (Teusch, J. et al., 2024[27]). However, there is a risk that unilateral increases in carbon prices might cause carbon leakage in hard-to-abate and trade-exposed sectors (Teusch, J. et al., 2024[27]).

E.6. Extended Producer Responsibility Fees

Extended Producer Responsibility (EPR) is an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of the product's lifecycle. The main objective of EPR systems is to cover end-of-life waste management costs. Modulation of EPR fees based on product characteristics can incentivise eco-design and thereby also address upstream aspects (OECD, 2024[28]; Laubinger et al., 2021[29]).

Producers can individually or collectively fulfil their EPR obligations. In individual producer responsibility systems, producers take responsibility for their own products, whereas in collective producer responsibility systems producers of the same product type collaborate and pay an EPR fee to a Producer Responsibility Organisation (PRO).

EPR fees are not a tax, but EPR compliance schemes may trigger a fee for producers, which pay for a service. Fee schemes typically aim to cover the full net costs of operating the collection and recovery or treatment of covered products, promote eco-design among PRO members, support the recycling industry and organise awareness campaigns, usually in partnership with local authorities, to improve sorting at the source (i.e. collection and recycling costs, minus revenue from recycled material).

EPR schemes usually apply when products are placed on the market. Therefore, they mainly have a downstream focus. However, through modulation of EPR fees, they can also apply mid-stream (e.g. to impacts occurring during the use of products) or upstream (through incentivising product design). Common product groups that are subject to EPR include packaging, and electrical and electronic equipment, such as li-ion batteries as well as hazardous (industrial) waste (e.g. paints) (OECD, 2026, forthcoming[30]).

For specific low-carbon materials, EPR practices can also be applied in combination with eco-design principles and pre-determined end-of-life practices, e.g. specific recycling mandates. For instance, some countries have started applying the EPR approach to photovoltaic solar panels, aiming at ensuring the financing of their end-of-life management. Modulated EPR fees can thereby also support material re-use alongside other eco-design policies. Products and packaging with circular designs (e.g. high quantity of recyclable materials) are also less emission-intensive than conventional alternatives.

Although EPR is suitable for a range of practices, it is most commonly applied to products, when these are placed on the market and covers aspects of material design, use and end-of-life practices. It is difficult to apply EPR practices to intermediate goods such as steel or cement. Policy alignment and government oversight is necessary for the development of adequate recycling and waste removal infrastructure.

E.7. Grants and Subsidies

Grants and subsidies are direct financial aid to achieve the deployment of a specific activity or project. These instruments can be used at various stages of development, including for research and development, project preparation, subsidising capital expenditures (CAPEX) or operational expenditures (OPEX). Grants can also be used for technical assistance programmes and should be treated as a prerequisite for decarbonisation projects in EMDEs to ensure long-term success.

Grants and subsidies are conventional financing instruments, usually simple to implement. They can help to accelerate technology adoption, by directly reducing the cost of implementing the project. Grants and subsidies also provide a direct incentive and can be conditioned to eligibility criteria, e.g. specific low-carbon technologies or projects, or carbon emission reduction. Grants can be used for technical assistance, e.g. to help countries to adopt net-zero roadmaps, or at project level, to reduce the cost incurred by the project developer, thereby strengthening the business case for low-carbon technologies. Grants may also be used for financial assistance as part of a blended finance package. For instance, grants and subsidies can support demonstration projects that aim to decrease emissions from industrial and energy production.

A key benefit of grants and subsidies is that they provide direct support for the uptake of projects or R&D for emerging technologies. However, the instrument is less suitable for long-term project needs. The prolonged use of grants and subsidies may also crowd out private finance by reducing incentives for additional investment and distorting market signals.

E.8. Green Premium Financing

A green premium reflects the difference in cost between a low-carbon product and an otherwise comparable product that has been produced using more emission-intensive processes. Green premium providers partially or fully finance this price difference. While there remains debate on how to define what qualifies as “green”, the development of separate price indices, certification schemes, or contracts for low-

carbon products could provide clearer price signals and reflect demand. Green premiums make visible the additional costs of sustainable production and, when covered, can help bridge competitiveness gaps and influence consumer and buyer behaviour in favour of low-carbon alternatives. They can be applied all along the value chain and across a wide range of goods, including fuels, basic materials such as steel or cement, plastics, and end-products such as cars. Targeting green premium support to the points of greatest cost disparity can help maximise its effectiveness in driving decarbonisation.

Public procurement for example can be used to intentionally absorb or partially compensate for the green premium, thereby creating stable demand for low-carbon solutions. By explicitly accepting or financing green premiums in procurement budgets, public buyers can provide clear market signals, support early deployment of cleaner technologies, and accelerate cost reductions. The use of certification schemes or performance-based contracts can help define what qualifies as ‘green’ and ensure transparency and comparability across tenders.

Accurately determining and budgeting for green premiums in public procurement remains challenging, as cost differentials are influenced by volatile inputs such as energy prices, technology maturity, and infrastructure availability. These challenges are particularly pronounced in EMDEs, where fossil-based products often remain cheaper in the short term and public procurement budgets are constrained. In addition, procurement-based green premium financing alone may be insufficient to address the high upfront capital requirements associated with low-carbon technologies. To maximise impact, green public procurement should therefore be coordinated with complementary measures that reduce risk for suppliers and spread upfront costs over the lifetime of assets (e.g. concessional finance, guarantees or blended finance instruments).

E.9. Tax Credits

Tax credits provide an offset to tax liabilities from the state. These are often not a one-time credit, but remain applicable for a pre-determined period, or as long as the activity or technology remains eligible. Tax credits can be granted in relation to costs incurred to carry out research, development and demonstration (RD&D), first-of-a-kind (FOAK) projects, large-scale deployment, or production for selected technologies.

Tax credits provide financial incentives to invest in low-carbon options and expand manufacturing opportunities. For instance, RD&D tax credits can stimulate innovation and reduce technical risks, FOAK tax credits can bridge the “valley of death” between pilot and commercialisation, and deployment tax credits can support market uptake at scale, particularly for technologies with lower commercial availability and where real and/or perceived risk poses a challenge for investment decisions. When tax credits are coupled with grants or concessional loans this can help to increase RD&D efforts for technologies via demonstration projects and enable FOAK projects to reach financial viability and deployment projects to scale more rapidly.

Tax credits can be useful instruments in the development of decarbonisation projects specifically involving the uptake of low-carbon technologies. For instance, they can provide investment and production incentives via taxation measures and therefore reduce market barriers for technologies with lower technology readiness levels (TRLs). A TRL is a standardised framework for assessing the maturity of emerging technologies, ranging from basic scientific principles to fully proven operational systems. Tax credits can target technology demonstration projects or R&D support for increased commercialisation.

To ensure tax credits can achieve their maximum benefit, it is necessary to have a stable policy environment with long-term commitments to advancing low-carbon technology and/or climate neutrality goals. Clear and differentiated policy signals for RD&D, FOAK, and deployment tax credits are particularly important to provide continuity across the innovation cycle and reduce investment risk at each stage. Changes in policy objectives for climate neutrality can limit the use of tax credits over time and impact additional private investment by challenging investor confidence. Tax credits are most useful for the energy

and transport sector, where they can promote low-carbon technologies like battery storage, hydrogen and CCUS. Tax credits are less tailored for industrial retrofit use but many of the technologies listed above have spillover effects for industry decarbonisation. The eligibility of tax credits may vary across firms as they often target certain companies such as those with a strong bankability case for investment.

Risk mitigation instruments

R.1. Buyer Credit Guarantee

A Buyer Credit Guarantee provides a guarantee behind a loan to an overseas buyer issued by an Export Credit Agency (ECA). Instead of that bank assuming credit risk on the foreign buyer, this risk is transferred to the given ECA. The maximum coverage under the buyer credit guarantee is linked to the sum of the value of the exported goods and a share of local costs and falls under the standards of the OECD Arrangement on Officially Supported Export Credits.

The Buyer Credit Guarantee can create opportunities to supply low-carbon technologies to foreign customers and support domestic companies in gaining market share in international markets. In countries with high-risk profiles, the Buyer Credit Guarantee can unlock financing for low-carbon technologies and covers both commercial and political/sovereign risks. The OECD Arrangement on Officially Supported Export Credits improves the conditions of export credit products for green or climate-friendly projects (i.e. eligible under the “Climate Change Sector Understanding”). A Buyer Credit Guarantee can create or unlock opportunities to offer advanced low-carbon technologies to foreign markets in order to advance the decarbonisation of industrial processes.

The Buyer Credit Guarantee can be used when a project involves the export of low-carbon technologies to change the processing of product materials. This creates a transfer of technology while lowering the emissions of a specific plant. For instance, it may finance the export of a 50 MW electrolyser to produce green hydrogen for steel production.

The specific use of the Buyer Credit Guarantee depends on the risk portfolio of export credit agencies. Often the guarantee involves financing the transfer of innovative low-carbon technologies within EMDEs which can require a significant amount of risk appetite if the investment does not perform as expected. In addition, the transfer of technology can include high transaction costs that can impact the bankability of projects.

R.2. Energy Savings Insurance

ESI is a de-risking model to build up investor confidence in energy efficiency projects, designed around four key building blocks:

- A standard contract establishes supplier responsibilities in terms of supply and installation of equipment, corresponding guarantees and the promised energy savings relative to a benchmark established by the supplier.
- The technical validation carried out by an independent agency evaluates and confirms if the project’s technical potential can achieve the promised savings and defines the rules in case of disagreements on the achieved performance.
- The energy savings insurance itself is a warranty that is provided by the supplier to the customer for the committed savings. The insurance agency will compensate the client if savings do not occur as projected.
- Insured projects are financed with concessional credit lines usually set up by donor agencies and multilateral development banks (MDBs). Preferential terms can include low interest rates, grace periods and extended tenures.

ESI helps de-risk contractual risks and overcome the low creditworthiness of beneficiaries such as industrial SMEs. SMEs in EMDEs face higher transaction costs concerning industry decarbonisation projects often as a result of fixed, upfront transaction costs. While large firms can spread these costs over significantly larger revenues, SMEs cannot and therefore face higher per-unit costs. The ESI may be useful in de-risking energy efficiency projects in EMDEs by providing insurance-backed guarantees to tackle some of the constraints associated with transaction costs.

The energy savings insurance can support the operation of an energy efficiency project that aims to promote energy savings within production processes. This can include energy savings programmes within the fabric production and manufacturing of textiles. It can also support the operation of projects aiming to invest in less energy-intensive machinery in manufacturing plants.

It requires robust energy performance baselines and data from firms on existing energy use and predicted energy savings to create a bankable investment case. To ensure transparency, this will also require sufficient MRV systems and potential third-party verification. Other conditions for success depend on institutional readiness, regulations and the ability for a project to be sustainable over a prolonged period to generate impactful energy savings levels.

R.3. First and Second Loss Facility

A first loss facility is a risk-sharing agreement set up to cover potential losses incurred on portfolios of eligible assets, thus providing a first level of financial support to a Special Purpose Vehicle (SPV) and/or its investors in a securitisation transaction. The second loss facility provides a second tier of protection against potential losses and is activated when the first loss is exhausted. Providers of first and second loss facilities agree to bear losses incurred up to an agreed percentage if the borrower defaults.

First and second loss facilities reduce the perceived risk associated with financing projects in EMDEs or technologies that are still in a demonstration phase as they act as credit enhancement tools. As a result, it can increase the supply of financing available for low-carbon projects. First and second loss facilities are also useful when borrowers have limited creditworthiness or to support projects in new business segments, such as low-carbon products with limited track records to estimate potential losses.

The instrument can be applied in the concept and development of a project financing structure by creating a risk-sharing agreement to cover potential losses associated with the project's deployment. The instrument can support the bankability of a project and crowd in capital from various investors as it limits the perceived risk associated with financing projects in EMDEs. To benefit from first and second loss facilities, a strong structuring capacity is needed to attract the appropriate co-funders and donors. In addition, sustained concessional capital is needed to ensure the structure remains viable throughout project deployment.

R.4. Foreign currency guarantee

A foreign currency guarantee protects borrowers from exchange rate fluctuations, as an obligator signs an agreement to be responsible for repaying funds in the same currency as the revenue stream or at a pre-determined rate, regardless of the changes in the market exchange rates that occur over the agreement period. Foreign currency guarantees are typically used for cross-border transactions and useful for projects in EMDEs with volatile exchange rates.

Foreign currency guarantees can support the operationalisation of decarbonisation projects in firms across EMDEs by mitigating the risks associated with volatile exchange rates, particularly where investments in low-carbon technologies or retrofit programmes are financed in foreign currencies. The instrument can address mismatches between the currency of costs and revenues, thereby improving financial predictability and project bankability. Currency devaluation risks can be further managed through

structured FX hedging instruments that stabilise cash flows over the project's lifetime. Such measures enhance investor confidence and reduce the overall cost of capital for decarbonisation initiatives in high-volatility environments.

Implementation of foreign currency guarantees for industrial projects can be costly and complex to arrange in EMDEs which can deter their use. Also, it mainly protects borrowers from foreign exchange risk, leaving additional risks such as technology, inflation and demand uncovered. These additional risks can impact the bankability of projects.

R.5. Partial or full credit guarantee

Partial risk guarantees cover a private project against the risk of a government or a government-owned entity failing to perform its contractual obligations related to the project. It is not intended to cover commercial risks. A full credit guarantee is a risk-mitigation instrument under which a guarantor commits to cover 100% of a borrower's debt service obligations.

Partial risk guarantees can help mobilise private financing, especially for projects based in regions with political insecurity or that exhibit other sovereign risks. As many EMDEs suffer political instability, higher (perceived) regulatory risks, or higher risks of confiscation, expropriation or nationalisation of strategic assets, partial risk guarantees can protect foreign investors looking to develop decarbonisation projects. Full credit guarantees can support project developers transfer credit risk to the guarantor thus enhancing the creditworthiness of a project or borrower and enabling access to financing on more favourable terms such as lower interest rates, longer tenors, or increased loan volumes.

A partial risk guarantee can be used for the development and operationalisation of a project that is exposed to regulatory or offtake risk. For instance, if a project takes place in an EMDE but requires investment from foreign investors, the instrument can help mitigate risks investors face. It is also useful for projects that may be costly such as the development of a hydrogen hub which relies on multiple donor sources. Full credit guarantees are commonly provided by governments, development finance institutions, or multilateral organisations and are used to mobilise private capital for investments that face high perceived risk, including infrastructure and industry decarbonisation projects.

The coverage of the instrument can vary and is often useful for larger industry decarbonisation projects that are costly and take longer to develop. In addition, the instrument requires multilateral support, meaning that multiple actors must be effective in co-ordination and finding the correct donors for the project.

R.6. Performance guarantee

Under a performance guarantee, an insurer can bear excessive costs if expectations or timelines on a project or product are not met, e.g. underperformance, breakdowns, lack of availability or delays. If the pre-agreed amount for these costs (the deductible) is exceeded, the insurer starts to pay the major portion of the additional costs up to the agreed limit. The manufacturer can bear a certain percentage of the indemnifiable loss as co-payment.

Performance guarantees can reduce project and technology uncertainties such as construction delays, upfront cost overruns, energy or hydrogen production (capacity factor uncertainty), operation and maintenance costs. For low-carbon technology projects, performance guarantees allow insurance companies to bear costs related to technology performance which can impact project goals or outputs. To promote hydrogen deployment for example, performance guarantees can provide insurance to the supply-side production and operation phase, particularly for the production and rollout of electrolysers.

Performance guarantees can be useful for the development of projects with investments in low-carbon technologies that exhibit lower commercialisation levels. If the performance of the technology is less than expected, insurance companies bear the related costs. For instance, to develop a CCUS plant with an

attached battery storage facility, performance guarantees can provide insurance tied to the performance of the battery and carbon capture rate.

Although performance guarantees can support the adoption of innovative low-carbon technologies, there is still the need to ensure the technology will perform at a certain success rate. A lack of information on operating conditions can impact the issuance and pricing of insurance. Often technologies that have yet to reach commercialisation lack the track record to prove strong technology performance which is necessary to price the insurance.

R.7. Political risk insurance

Political risk insurance helps equity investors recover part of their investment in the event that a loss occurs due to political events. If repayments are disrupted, political risk insurance ensures that a remaining portion of losses is paid out.

The instrument can help investors access finance in EMDEs, by mitigating risk. It can protect equity investors from a possible termination of the project that the sovereign may need to compensate for. As a result, political risk insurance ensures that countries can attract investment in decarbonisation projects regardless of political stability while also enabling better financing conditions. At times, this financial instrument may be a prerequisite to the deployment of decarbonisation projects and to reach a final investment decision (FID).

Political risk insurance covers the development and operation of decarbonisation projects in EMDEs with limited political stability. This includes projects that vary across the value chain but may be impacted by policy changes. For instance, if a green hydrogen demonstration project begins with significant political buy-in but fails to be fully executed mid-development due to a change in government or political priorities, the insurance can cover the losses incurred.

Although the insurance covers political instability, technical or market risks are not covered. Often political risk insurance needs to be coupled with other instruments to ensure coverage over a variety of risks that may not directly be connected to political insecurity but are an indirect outcome. For instance, using both political risk insurance and price premiums can lower financing costs and strengthen the bankability of decarbonisation projects in EMDEs.

R.8. Sovereign guarantees

Sovereign guarantees are issued by governments that hold the responsibility to repay a financial commitment associated with a project if the primary obligator defaults (typically in their own country) and ensure that contractual obligations are met. Sovereign guarantees can enhance investor confidence in projects by mitigating regulatory, political instability and currency-related risks. Government commitments can build confidence in the project and create better financing terms and attract investors.

Sovereign guarantees can be beneficial for infrastructure and clean energy projects where accessing private capital can be difficult due to regulatory or financing barriers. The instrument also enables project financing by increasing the creditworthiness of project developers, expanding an investor base, and promoting competition in bidding.

Sovereign guarantees can be useful for the development and construction of industrial clusters such as low-carbon cement clusters or a hydrogen cluster. These types of projects are costly, time consuming and are riskier investments but have massive deep decarbonisation opportunities across the value chain. Sovereign guarantees require significant fiscal capacity, as they increase contingent liabilities for governments.

Financial instruments

F.1 Sustainability Bonds

Sustainability bonds are debt financing instruments issued in capital markets through which proceeds are raised to finance or refinance a combination of environmental and social projects. They are issued under predefined financial terms, similar to conventional bonds. As use-of-proceeds instruments, their defining feature is that the funds are earmarked for eligible expenditures aligned with sustainability objectives. These bonds may be unsecured or backed by guarantees or collateral, depending on the issuer and structure.

Sustainability bonds provide predictable, long-term financing for issuers while offering investors a transparent link between capital raised and funded activities. Their structure enables issuers to mobilise capital at scale while maintaining standard bond characteristics in terms of pricing and repayment. By linking financing to specific eligible projects, sustainability bonds enhance transparency, accountability, and traceability of funds, while supporting both environmental and social outcomes.

Sustainability bonds can support industrial decarbonisation and broader sustainable development objectives by financing portfolios of eligible projects. These may include renewable energy, energy efficiency, low-carbon industrial processes, clean transport, and social infrastructure. They are particularly relevant for issuers seeking to fund diversified investment programmes that combine environmental and social components, while ensuring that proceeds are clearly allocated to activities contributing to transition and development goals.

The effective use of sustainability bonds requires clearly defined eligibility criteria for financed projects, aligned with recognised standards and taxonomies. Strong systems for tracking and allocating proceeds, as well as regular reporting on financed activities and their impacts, are essential to ensure transparency and credibility. External reviews or second-party opinions are commonly used to strengthen investor confidence. There is a risk of greenwashing if project selection criteria are insufficiently robust, reporting is incomplete, or financed activities are not aligned with credible sustainability objectives.

F.2. Concessional Loans

Concessional loans are loans that has more favourable terms than what the market would offer. They usually apply to projects with a climate or development objective that rely on specialised financial support. The concessionality can relate for example to a lower interest rate or a longer loan tenure.

Concessional loans help to bridge the gap between funding pools from different providers for projects (e.g. financial institutions, philanthropies, national development banks). The loan alleviates financial barriers for project developers in EMDEs, such as low liquidity or limited loan tenures. In addition, the loan can de-risk decarbonisation projects via long-term loan contracts that show a commitment to achieving net-zero goals which can crowd in further investment.

Concessional debt can be used to provide loans for early-stage projects that support the deployment of first-of-a-kind (FOAK) technologies. This includes demonstration projects aimed at decarbonising manufacturing processes, material extraction, and end-use and recycling.

The instrument may be restricted to specific technologies at a certain TRL to support consistent evaluation, risk management, and decision-making across research, industry, and policy environments. The effective use of concessional debt should include the mobilisation of private investors in order to bridge financing gaps for projects with commercial viability. This would support projects where technology demonstrations are successful, and a system prototype is available.

F.3. Local currency loans and facilities

Borrowing in foreign currency can expose project developers and financiers to significant foreign exchange risks, particularly where project revenues are denominated in local currency. In such cases, a depreciation of the local currency can increase the burden of debt service obligations, thereby undermining cash flow stability and weakening project bankability. Local currency loans and facilities help to alleviate these risks by allowing project developers to finance industrial decarbonisation investments in the same currency as their revenues, thereby reducing currency mismatches and improving the predictability of debt service.

Local currency loans and facilities are particularly relevant in EMDEs, where exchange rate volatility is often higher and hedging markets are limited or very expensive. For example, clean hydrogen projects in EMDEs may face significant currency mismatch risks when revenues are earned in local currency, while equipment and debt are denominated in foreign currencies. Electrolysers used in clean hydrogen projects are currently predominantly manufactured by firms based in Europe, the United States and East Asia, resulting in substantial upfront foreign currency exposure during the construction phase. By ensuring that debt service is denominated in local currency, local currency loans and facilities can mitigate these risks.

However, local currency loans and facilities may face practical limitations. Domestic financial markets in many EMDEs may lack sufficient depth or long-term liquidity to support large, capital-intensive industrial decarbonisation projects at scale. In addition, higher domestic interest rates, inflation expectations, or limited competition among local lenders may reduce the affordability of local currency borrowing. As a result, local currency lending is often most effective when complemented by other instruments aimed at reducing borrowing costs and extending maturities.

F.4. Public and private equity

Equity financing is a type of financing where public or private investors acquire an ownership stake in a business. The raised capital can be used for the business to run and grow its operations.

The benefit of equity financing to a business is that the money received does not have to be repaid. This reduces investment risks faced by other project/company investors, especially debt investors who are repaid before equity investors. When the project or business is successful, equity can provide larger returns and allows investors to execute voting rights and influence the business' strategy. Companies (both public and private) delivering low-carbon technology, renewable energy, hydrogen etc., can provide either public or private equity investment options.

Public and private equity is necessary for the development and operationalisation of a project that involves the deployment of an emerging technology. For example, it would assist the development of a demonstration project for 400 MWh battery system launched in partnership with a clean-tech start-up. Equity tends to be needed to grow the company and/or demonstration projects prior to receiving a final investment decision (FID).

Private and public equity may not be most applicable to traditional industry decarbonisation projects given that they provide investors with low returns. Private investors may also be deterred to invest in industry-related projects because of long payback periods and capital intensity. Often investors supporting decarbonisation projects are impact investors specialising in climate-related investments, with knowledge of the industry sector. Equity is also useful for technologies that are almost at commercialisation with an emerging track record of success e.g. a TRL of 6-8.[2] The instrument is less useful for technologies at a lower TRL which may benefit more from de-risking instruments.

[2] A TRL 6 is described as a Technology Demonstrated in Relevant Environment. A TRL 7 is described as System Prototype Demonstration in Operational Environment. A TRL 8 is described as System Completed and Qualified.

F.5. Results-based financing

Results-based financing includes a range of financing tools where financing is linked and provided after the delivery of pre-agreed and verified results.[3] The funding is typically only disbursed if results are achieved, and it may also include preferential terms or credit enhancements linked to the project's performance. The results are typically predefined and monitored by an independent party or implementing agency.

Results-based financing instruments can improve the design and implementation of development programmes to achieve sustainable results. Often the instruments rely on specific climate mitigation objectives or energy and resource efficiency objectives as indicators. This ensures that the funding is used for projects with verified results.

Often results-based instruments are embedded in the financing structure of projects that can provide measurable emission reductions. For example, it may be useful for projects that involve investments in emission savings technologies like an EAF, where emissions savings per year can be measured. In addition, the instruments can be useful for projects where a firm has set a specific emissions saving rate within the production of the product. This can include a textile plant with the goal of cutting gas use by 30 percent and cutting around 6,000 tonnes of CO_2 per year through the investment of a new boiler.

Results-based instruments require measurable and verifiable outcomes from a third-party verifier for their success. At times industry decarbonisation metrics can vary across projects. In addition, limited data availability in EMDEs can impact the design of pre-determined emission reduction goals. Since the financing structure depends on the achievement of pre-determined goals, there is a significant delay in the initial investment and return on investment. Investor buy-in should be sustainable over several years as the instrument is suitable for those willing to take on long-term investment decisions.

F.6. Revolving credit facility

A revolving credit facility is a flexible line of credit between a financial institution (e.g. a bank) and an industrial company or project developer and allows borrowers to access funds up to a predetermined limit. The facility is structured with a maximum amount that can be drawn upon and typically requires regular repayments. Interest is charged only on the amount borrowed.

As the borrowers can reuse the available funds multiple times, it allows them to have constant access to funds to continue operations on a needs basis and allow for repeated use without reapplying for a new credit line. Interests are only paid on the utilised portion, making it a more cost-effective option for short-term financial needs. Revolving credit facilities are particularly suitable for decarbonisation projects with varying capital requirements over time. The instrument can be particularly suitable for projects with high risks of cash flow gaps or unforeseen cash flow movements.

A revolving credit facility is suitable for short-term construction expenses before long-term financing becomes available. For instance, it can support the development of carbon capture retrofit projects that can use the facility to cover operational expenses while waiting for other finance opportunities, e.g. carbon credit revenues. It is not suitable for long-term operational expenses. Therefore, the eligibility and use of the facility is limited given that it is best used to bridge financing gaps.

F.7. Sustainability-linked instruments

A sustainability-linked instrument is a debt financing instrument, issued as either a bond or a loan, whose financial characteristics are linked to the borrower's achievement of predefined sustainability or climate-

[3] RBF includes both pull financing sustainability-linked bonds and sustainability-linked loans.

related performance targets. Unlike use-of-proceeds instruments, sustainability-linked instruments do not restrict how the proceeds are used. Instead, interest rates, margins, or other contractual terms may vary over the life of the instrument depending on whether agreed key performance indicators (KPIs) are met. These instruments are typically issued at market terms and may be unsecured or backed by guarantees or collateral, depending on the structure.

Sustainability-linked instruments provide flexible financing for borrowers by allowing the use of proceeds for general corporate purposes while creating incentives to improve sustainability performance. They can support companies or public entities in integrating environmental or climate objectives into their overall financial strategy, without requiring the identification of specific eligible projects. These instruments are particularly relevant for firms seeking to embed sustainability targets into their business models or transition plans, including in sectors where investments are complex, phased, or not easily separable into discrete green projects.

Sustainability-linked bonds and loans can be embedded in the financing structure of industrial decarbonisation projects by aligning the cost of capital with the achievement of emission reduction, energy efficiency, or other transition objectives. They may be used alongside other instruments in blended finance structures, including concessional loans, guarantees, or equity, to support large-scale or higher-risk investments. Their flexibility makes them suitable for supporting corporate-level transition strategies, including investments in technologies such as electrification, hydrogen, or carbon capture, utilisation and storage (CCUS).

The effectiveness of sustainability-linked instruments depends on the definition of credible and ambitious KPIs and sustainability performance targets, as well as robust monitoring, reporting, and verification (MRV) systems. External reviews or second-party opinions are often used to strengthen credibility. There is a risk of greenwashing if targets are insufficiently ambitious, poorly defined, or not aligned with a credible transition pathway. In addition, the financial incentives embedded in these instruments are often relatively modest, which may limit their impact on borrower behaviour if not complemented by broader policy or financial measures.

F.8. Structured and securitised products

Structured products can be debt securities issued by banks and can be either a fixed instrument or a short-term deposit with set risks and returns outlined in a derivative contract. Returns can be linked to interest rates, the stock market, foreign exchange markets or commodities. Securitised products can be bonds, backed by loans structured into interest-bearing securities and sold on the bond market. The income generated for the securitisation is created from the assets used for the loan and then provided to the holder of the securities.

Structured products can be tailored to investor needs and adapted to risk portfolios and are offered across all asset classes e.g. for equity structured products the benchmark associated can be a stock market index. Securitised products can provide credit support and higher yields for investors looking to take on additional risk. Structured financing can be used to package financial assets related to industry decarbonisation to create a diversified portfolio, thereby mitigating risks to ensure a return on investment and attract investors looking for green investments. In addition, banks use securitisation to manage their balance sheet, which can leave room to finance additional green projects.

Structured and securitised products can be useful across the project life cycle. For instance, the instrument can blend debt and equity to attract early investors in a specific technology and monetise expected incentive payments from a given project implementing the technology. For instance, the instrument can help a developer finance capital expenditure for the development of the hydrogen DRI plant, provide cash flow during its operation and then recycle the securitised capital received from the plant to finance new projects.

The use of the product requires a mature asset pool which should come from either commercial banks or institutional investors. The risk appetite of these funders often varies, and institutional investors typically have a lower risk portfolio. This can impact investments in technologies that provide an uncertainty in returns. EMDEs may also have a higher perceived risk of investment which can deter the involvement of banks and funds.

F.9. Venture Debt

Venture debt is a form of debt financing for start-ups or early-stage companies looking for capital to expand operations. Often the lender will provide a loan tenor in 2-5 years and will structure the loan with interest payments or a convertible instrument to receive a return and some ownership in the company.

Venture debt can bridge financing gaps for early-stage companies to ensure access to growth capital in between equity and traditional bank loans. Often early-stage companies utilise venture debt after acquiring venture capital while waiting to be eligible to receive traditional loans. As a result, the instrument can bridge financing gaps for companies.

Venture debt can be useful for companies that have already received basic R&D support for their technology but are not eligible for extended project finance. For instance, if a start-up is developing a new long-duration storage technology suitable for industrial use, venture debt can help the start-up develop the technology at scale before applying the technology in a project setting. The capital gained from venture debt can support company operations, while boosting the creditworthiness that will be needed to secure additional investment.

Although venture debt has the opportunity to increase the commercialisation of technologies with deep decarbonisation potential, it requires significant investor appetite and risk. Often venture debt requires lenders to have a higher risk portfolio than commercial banks or institutional investors. Lenders can use capital from a specialised venture debt fund and often they represent a development finance institution or are considered an impact investor. In addition, for companies to receive venture debt they must already have existing equity backing and revenue streams, which can take years to develop.

F.10. Transition bonds

Transition bonds are issued to finance a company’s shift from high-carbon to low-carbon operations. The bonds focus on financing projects within firms that have developed a credible decarbonisation plan.

Transition bonds can be provided to companies that have not developed any greener practices yet, allowing them to develop a decarbonisation pathway in line with the financing received to carry out decarbonisation objectives. These bonds can help carbon-intensive companies finance their decarbonisation strategies through energy efficiency, or fuel-switching programmes.

Transition bonds can support the development of projects focused on decarbonising the production and manufacturing process of a company. For instance, they can support the development of onsite carbon capture and storage (CCS) technology to reduce emissions associated with production and processing of cement.

In order for transition bonds to be granted, robust emission reduction targets are needed at the firm level. This may include specific KPIs and credible MRV systems to ensure decarbonisation objectives can be met. Credible decarbonisation plans require research, and objectives should be time-bound to ensure success. It also requires a long-term commitment to decarbonisation at the firm level as investments in emission reduction technologies can be costly and time consuming to implement.

F.11. Lease financing

Lease financing represents an arrangement in which a company is leased a piece of equipment, machinery or vehicle that is owned by another party for a fixed period of time. Various types of leases can be issued, these include:

- Operating lease: Short- to medium-term use, when the lessor is responsible for the costs of the asset e.g. maintenance fees
- Finance lease: Long-term use, when the lessee assumes ownership risks and benefits of the asset
- Sale-and-leaseback: A company sells an asset to a financier and then leases it back
- Pay-per-use lease: Payment based on output or savings associated with the asset

Lease financing allows companies to rent the piece of equipment for a fixed-term contract, often with the option to buy it later. This allows companies to deploy emerging technologies without the upfront CAPEX costs, replace outdated equipment, improve the flexibility within the firm's balance sheets and gain access to advanced technologies that would be otherwise unaffordable. Often leases can be combined with other instruments like performance guarantees or energy savings insurances as part of a blended finance programme.

Leases can support projects at the firm level that replace machinery for new assets to decarbonise or reduce energy consumption within the production process. For instance, a textile company may lease a new industrial heat pump to replace outdated boilers. This can be linked to an energy savings insurance programme to track energy saved during the lease to understand potential returns on investment associated with the asset.

Often the use of leases is for high-cost replaceable equipment rather than equipment that cannot be easily removed without construction and infrastructure changes e.g. a blast furnace. Despite the flexibility lease financing offers, the secondary market for industrial assets can vary and gaining access to rentable equipment is not without barriers, e.g. the equipment may have to be shipped from another country or region, adding extra costs.

F.12. Subordinated and concessional debt

Subordinated debt, also known as junior debt is a loan that ranks lower in repayment priority. If the borrower defaults, the subordinated lenders are paid later than the senior lenders. Concessional debt (also known as a soft loan) provides financing at favourable terms including lower interest rates, longer repayment periods or grace periods, and partial forgiveness components.

Subordinated debt can help bridge equity and senior debt within a project's capital structure. Concessional debt can catalyse private investment on terms more favourable than what the market would typically provide. Both instruments have a combined role in the financing structure of a decarbonisation project. Subordinated debt absorbs the first losses in order to attract senior lenders while concessional debt can make a project financing more affordable.

Both instruments can be useful to the development and operation of a project. For instance, if a project is focused on building a hydrogen DRI demonstration plant, the subordinated debt can absorb the performance risk associated with hydrogen use for steelmaking. While the concessional debt lowers the interest burden to support the affordability of the infrastructure development needed for the DRI process.

Junior capital is often needed to utilise both instruments and gain investor confidence to receive a junior loan, which may be difficult to access and depends on various factors e.g. revenue and predicted revenue. In addition, it requires multi-stakeholder co-ordination and often a shared goal between parties and banks to ensure an alignment of incentives and risk management thresholds.

F.13. Offtake finance

Offtake finance is a financing arrangement in which long-term purchase agreements (offtake agreements) between a producer and one or more buyers are used to underpin project revenues and secure external financing. The instrument provides predictable and contracted cash flows through fixed prices, price floors, indexed pricing, or take-or-pay provisions.

Offtake finance reduces revenue and volume uncertainty and improves the bankability of capital-intensive projects. A central consideration in offtake finance is offtake risk, which refers to the risk that the buyer fails to purchase the agreed volumes, renegotiates contract terms, or defaults on its payment obligations. This risk is influenced by the creditworthiness of the offtaker, contract duration and enforceability, market conditions, and exposure to price or demand fluctuations.

To mitigate offtake risk, arrangements may include credit enhancements such as guarantees, letters of credit, advance payments, diversification across multiple offtakers, or public support mechanisms such as contracts for difference or government-backed offtake commitments.

The instrument can support industry decarbonisation, as it plays a critical role in enabling early deployment of low-carbon products by providing demand certainty in markets where willingness to pay and long-term demand are not yet fully established.

Offtake risk mitigation mechanisms are subject to a range of limitations particularly for capital-intensive and low-carbon industrial projects. The strength of offtake arrangements depends heavily on the creditworthiness of buyers, as weak financial positions or exposure to volatile markets increase the likelihood of default. Long-term contracts may also face challenges related to enforceability, regulatory change, or political risk, especially in cross-border or emerging-market contexts, which can lead to renegotiation or early termination.

F.14. Debt-for-finance swaps

A swap is a type of derivative, where two parties (the buyer and the seller) exchange cash flows. Typically, a swap includes two “legs”, one expressing the obligations of the seller and one expressing the obligations of the buyer. Generally, one leg is fixed while the other is variable, determined for instance by an index price or a benchmark interest rate. Debt-for-finance swaps involve the use of debt instruments that are either hedged, transformed or replicated using financial swaps. These can include interest rate swaps and/or currency swaps.

Swaps can provide risk management solutions tailored to the challenges faced by EMDEs and developers of renewable energy projects. Debt for finance swaps allows the borrower to avoid refinancing loans or bonds which can bring added costs.

Debt-for-finance swaps can help restructure existing debt to finance the costs associated with decarbonisation projects. In addition, debt can also be linked to the performance of low-carbon technologies to meet certain decarbonisation objectives. They also reduce financial risk such as changes in interest rate, commodity price, and currency volatility.

Generally, swaps are useful for projects are suited to specific needs and not for standard industry use. They tend to be best placed in a blended finance programme to provide structured financing and maximise their benefits for industrial use. In addition, there may be a limited link with debt relief directly to decarbonisation outcomes as it mainly targets financial risk not emissions.

F. 15. Policy-based loans

A policy-based loan is a loan provided to a government in support of a programme or regulatory reforms that aims to achieve specific economic, social, or sectoral objectives. A policy-based loan can disburse funds directly to a government budget but is often conditional on specific reforms of the policy programmes.

Policy-based loans can help governments reform energy or industrial sector policies to support decarbonisation objectives. This may include the phase-out of fossil fuel subsidies, introduction of carbon pricing mechanisms or enabling renewable energy integration into grids. It can also be extended to climate finance frameworks and just transition policies.

A policy-based loan may be useful for a government that is developing a specific institutional reform targeting its industrial sector. For instance, a policy-based loan may be necessary to support a fossil fuel transition plan or sub-sector specific roadmap, e.g. a roadmap targeting the cement sector.

Policy-based loans require strong government co-ordination and a commitment to achieve the stated objectives of reform over a prolonged period of time. This requires political buy-in over various years, and changes in leadership can impact a policy-based loan's effectiveness if the new government is not willing to commit to continuing the reforms. In addition, there is a risk that policy reforms are not translated into private sector investments if the market is not favourable.

Application of financial instruments across the industry value chain and in overcoming key barriers to industry decarbonisation financing and investment

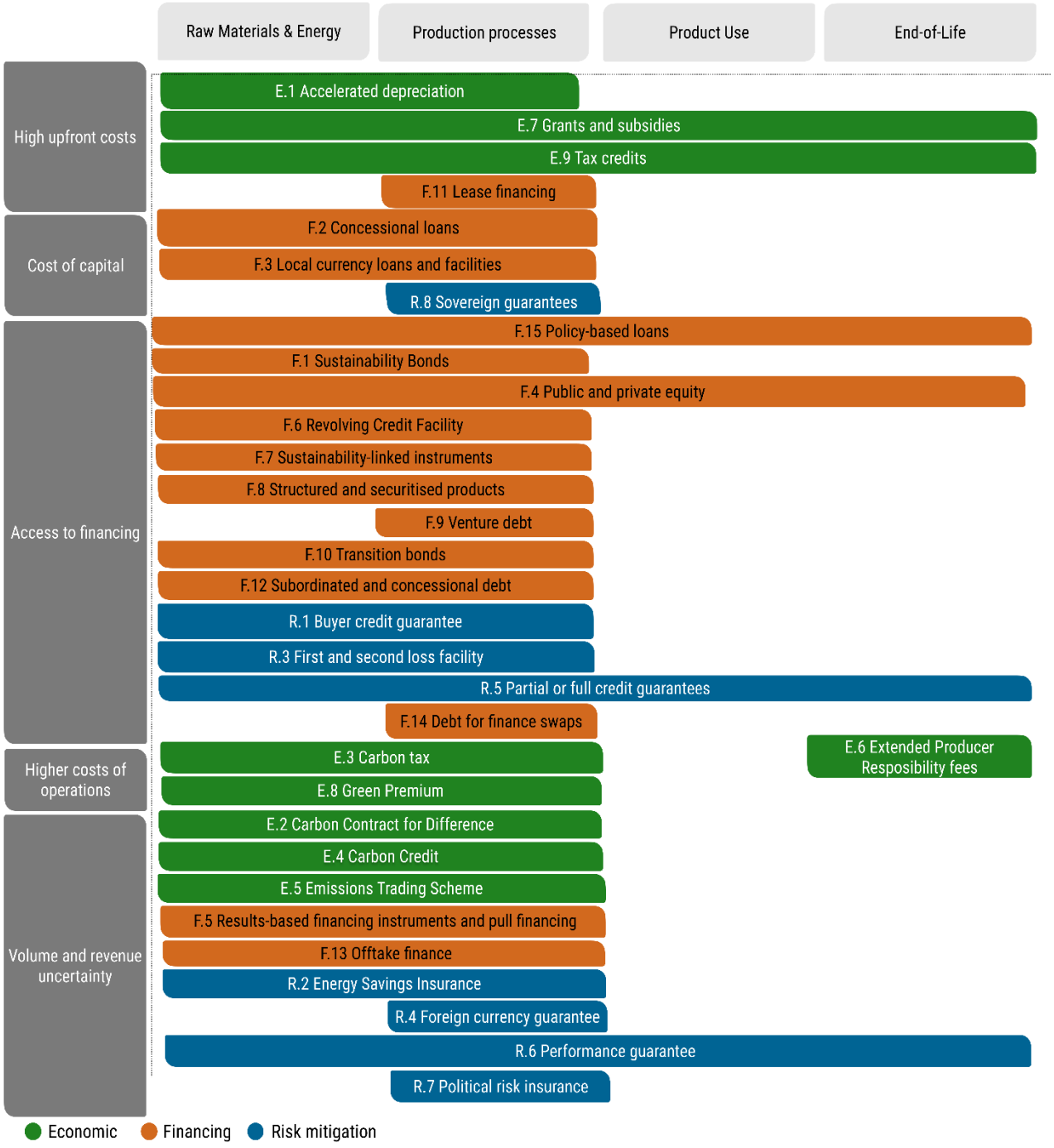
As highlighted in Chapter 2, industrial decarbonisation investments are characterised by high capital intensity, long asset lifetimes and exposure to multiple layers of risk, including technological, commercial, and policy-related uncertainties. Addressing these challenges requires an approach to financial instrument selection that reflects both the nature of the barriers faced and the stage of project and market development of the solution being implemented.

The availability of appropriately targeted financial instruments is critical to overcoming the specific barriers that impede or slow down finance and investment in industry decarbonisation. These barriers include: high upfront costs, high cost of capital, access to financing, higher costs of operations, and volume and revenue uncertainty. These constraints affect projects in different ways and at different points in the investment lifecycle, impacting both investment viability and the willingness of private finance providers to invest. Each barrier requires distinct types of interventions, as no single instrument can address all constraints effectively.

Instruments that reduce capital costs or risk are essential at early stages, while demand-side and revenue stabilising mechanisms become increasingly important as projects move toward commercialisation and scale-up. As technologies mature and project risks evolve, the emphasis of public support should shift from de-risking individual investments to reinforcing market signals and long-term commercial viability.

Ensuring that the right instruments are deployed to overcome the right barriers improves the efficiency of public support, avoids misallocation of resources, and enhances the ability to crowd in private investment. A targeted and well-sequenced mix of instruments is therefore fundamental to enabling viable investment decisions and accelerating the transition to low-carbon industrial production. Figure 3 below gives an overview of the financial instruments included in this Toolkit, mapped across the key barriers that they help to overcome as well as the stages of the industry value chain that they are most relevant for. It is important to note that while many instruments address multiple barriers, Figure 3 assigns each instrument to the barrier for which it is most directly relevant.

Figure 3. Overview of financial instruments across the industry value chain and key barriers to industry decarbonisation financing



To facilitate the identification of relevant financial instruments, Table 4 below provides an overview of the instruments illustrated in this toolkit, categorised according to the barrier(s) that they are most useful in overcoming, the relevant instrument sub-category and the way in which they address each constraint. The table is intended to support a structured assessment of how different types of instruments can respond to

distinct finance and investment challenges faced by industrial decarbonisation projects. Some instruments are presented across multiple barriers, as they are relevant to overcoming more than one constraint.

In practice, the applicability and effectiveness of each instrument will depend on project-specific factors, including technology maturity, scale, risk profile, regulatory context and market conditions. As a result, this table is not intended to be prescriptive but rather serve as a starting point to guide the identification of appropriate financial instruments.

Table 5. Guide to financial instruments by barrier

Barrier	Instrument category	Instrument sub-category	How they address the barrier	Instrument
Upfront cost	Economic	Fiscal incentives, subsidies and fees	Instruments that directly cut initial investment costs	E.1 Accelerated Depreciation
				E.7 Grants and Subsidies
				E.8 Green Premium Financing
				E.9 Tax Credits
	Risk mitigation	Credit and payment risk mitigation	Indirectly: unlock debt financing that may otherwise not be available	R.1 Buyer Credit Guarantee
				R.3 First and Second Loss Facility
				R.5 Partial or Full Credit Guarantee
				R.8 Sovereign Guarantees
	Financing	Senior and asset-backed debt	Converting capital expenditure into operational expenditure through asset leases	F.11 Lease Financing
		Catalytic and concessional debt	Reduce financing costs, making projects with large upfront costs more bankable	F.2 Concessional Loans
				F.12 Subordinated and Concessional Debt
				F.9 Venture Debt
		Equity	Absorbs risk to leverage debt	F.4 Public and private equity
		Structured, revenue-backed and outcome-based products	Monetise future cash flows	F.5 Results-based financing and pull financing
				F.13 Offtake finance
				F.8 Structured and Securitised Products
Cost of capital	Risk mitigation	Credit and payment risk mitigation	Improve credit quality to reduce cost of capital	R.1 Buyer Credit Guarantee
				R.3 First and Second Loss Facility
				R.5 Partial or Full Credit Guarantee
				R.8 Sovereign Guarantees
		Currency and macroeconomic risk mitigation	Reduce foreign exchange volatility	R.4 Foreign Currency Guarantee
	Financing	Catalytic and concessional debt	Reduce overall cost of capital	F.2 Concessional Loans
				F.12 Subordinated and Concessional Debt
				F.14 Debt for finance swaps
				F. 15 Policy-based loans
		Equity	Provide first-loss protection	F.4 Public and private equity
		Structured, revenue-backed and outcome-based products	Reduce perceived risk by making future cash flows more predictable	F.5 Results-based financing and pull financing
				F.13 Offtake finance
Access to financing	Risk mitigation	Credit and payment risk mitigation	Protecting lenders from default risk	R.1 Buyer Credit Guarantee
				R.3 First and Second Loss Facility
				R.5 Partial or Full Credit

				Guarantee
				R.8 Sovereign Guarantees
	Financing	Senior and asset-backed debt	Provides scalable financing	F.1 Sustainability Bonds
				F.10 Transition Bonds
				F.6 Revolving Credit Facility
				F.7 Sustainability-linked instruments
				F.3 Local currency loans and facilities
		Catalytic and concessional debt	Absorb risk to mobilise commercial lenders	F.2 Concessional Loans
				F.9 Venture Debt
				F.12 Subordinated and Concessional Debt
				F.14 Debt for finance swaps
				F. 15 Policy-based loans
		Equity	Signal bankability and unlocks senior debt	F.4 Public and Private Equity
		Structured, revenue-backed and outcome-based products	Convert uncertain revenues into bankable cash flows	F.5 Results-based financing and pull financing
				F.13 Offtake finance
				F.8 Structured and Securitised Products
Operating cost	Economic	Carbon pricing and market-based instruments	Make low-carbon solutions more competitive	E.3 Carbon Tax
				E.5 Emissions Trading Scheme
				E.4 Carbon Credits
		Fiscal incentives, subsidies and fees	Indirect: can incentivise more efficient designs by embedding lifecycle costs	E.6 Extended Producer Responsibility
Revenue and volume uncertainty	Economic	Carbon pricing and market-based instruments	Offer predictable revenue streams	E.2 Carbon Contract for Difference
				E.4 Carbon Credits
	Risk mitigation	Credit and payment risk mitigation	Provide guarantor-backed obligations	R.1 Buyer Credit Guarantee
				R.5 Partial or Full Credit Guarantee
				R.8 Sovereign Guarantees
		Currency and macroeconomic risk mitigation	Protect revenue from foreign exchange fluctuation	R.4 Foreign Currency Guarantee
		Performance and political risk mitigation	Protect revenue from technical failure or political shocks	R.2 Energy Savings Insurance
				R.6 Performance Guarantee
				R.7 Political Risk Insurance
	Financing	Structured, revenue-backed and outcome-based products	Lock in demand/price/guaranteed payments upon delivery of certain outcomes	F.5 Results-based financing and pull financing
				F.13 Offtake finance
				F.8 Structured and Securitised Products

Note: As many instruments help to overcome multiple barriers, they are represented across multiple barriers.
E: Economic instruments; F: Financing instruments; R: Risk mitigation instruments.
These categories are not always strictly defined. For instance, contracts for differences are sometimes seen as a financing instrument, and sometimes as a risk mitigation instrument. Furthermore, the providers of the instruments may vary, and only the most common providers are mentioned in the table.

OCED country-level highlights that industrial decarbonisation challenges are multi-dimensional and cannot be resolved through a single financial instrument. Insights from the application of the OECD Framework for industry's net-zero transition in South Africa for example, demonstrate in practice that different

instruments are required at different points along the project life cycle. Box 4 below gives an overview of the OECD work on industry decarbonisation in South Africa (OECD, 2025[31]).

Box 4. South Africa's path to industry decarbonisation: insights from the OECD Framework for industry's net- zero transition

South Africa's iron and steel sector plays a critical role in the national economy, underpinning industrial activity, employment, and downstream value chains. At the same time, it is one of the country's most emissions-intensive sectors, making its transition essential to achieving national climate objectives and aligning with global net-zero pathways. Decarbonising steel production therefore represents both a structural challenge and a strategic opportunity for South Africa's industrial future.

To support this transition, the OECD Framework for Industry's Net-Zero Transition has been implemented in South Africa through a structured, multi-year process combining techno-economic analysis, stakeholder engagement, and policy assessment. The Framework focuses on identifying viable low-carbon production routes and understanding the conditions under which these technologies can become economically competitive. Implementation has followed a phased approach, progressing from business-case assessment and technology selection to market, financing, and enabling-conditions analysis.

The analysis concentrates on a targeted set of low-carbon technologies relevant to South Africa's steel sector, including hydrogen-based direct reduced iron combined with electric arc furnaces, carbon capture solutions, electrification, biomass use, and energy efficiency improvements. These technologies were selected based on their emissions-reduction potential, technical maturity, and relevance to South Africa's industrial context, while excluding options that are already commercially mainstream. This approach allows policy and financing interventions to be tailored to technologies that still face viability gaps.

Detailed techno-economic assessments show that while low-emissions steelmaking pathways can significantly reduce emissions intensity. Yet for technologies like hydrogen-based production there are currently face higher production costs compared to conventional blast furnace routes. The competitiveness gap is driven by high capital expenditure, elevated energy and hydrogen costs, and uncertainties related to demand and revenue. Without targeted support, these factors risk delaying investment decisions and locking in high-emissions assets.

In South Africa both policy and financial levers play a central role in bridging the competitiveness gap faced by the selected low-emissions technologies. Capital-expenditure instruments such as grants, tax rebates and concessional loans are essential to lower high upfront investment costs and support early project development, but on their own they are not sufficient to ensure long-term viability.

Yet, these instruments do not address persistently higher operating costs or revenue uncertainty once assets are operational. As a result, operating-expenditure instruments are crucial to improving bankability and sustaining investment over the lifetime of projects. Measures such as price caps, targeted support for energy and raw material inputs, and contracts for difference help stabilise costs and revenues, reduce exposure to energy price volatility, and improve the competitiveness of low-emissions production routes relative to conventional steelmaking.

In parallel, demand-side mechanisms such as green premiums can create a sustainable market for low-emissions steel by rewarding cleaner production and helping overcome weak or uncertain demand. Finally, mechanisms that assign a value to CO_2 emissions or emissions reductions, including emissions trading systems, carbon taxes and carbon credits, are key to reinforcing these measures by internalising the cost of emissions and providing a clear, long-term investment signal. Together, a well-designed mix

of CAPEX, OPEX, demand-side and carbon-value instruments is needed to address the full range of risks facing industry decarbonisation investments and unlock scale-up in the steel sector.

With the right mix of policy, financing, and enabling conditions, the decarbonisation of the steel sector can support emissions reductions while strengthening industrial competitiveness, positioning South Africa as a future supplier of low-emissions steel in a decarbonising global economy. The toolkit can support this analysis by defining a set of instruments and highlighting their real-life application through various case studies. Project developers, policymakers and financial institutions can see the limitations associated with the use of instruments and where they provide the maximum benefit while also learning from case studies. This can be applied to country examples like South Africa to promote the use of projects that support the uptake of low-carbon technologies for steelmaking.

Source: (OECD, 2025[4])

4 Case studies

Overview and methodology

This report includes 30 case studies, 13 of which are new case studies developed specifically for this 2026 edition, and 17 are updated versions of previously published case studies within the 2025 edition of the Climate Club Financial Toolkit and a 2023 OECD working paper on Financing solutions to foster industrial decarbonisation in emerging and developing economies. These case studies illustrate the application of selected financial instruments in practice, and were chosen to highlight factors for success and lessons learned in applying financial instruments to industry decarbonisation projects, both in EMDEs and advanced economies.

Several instruments, such as carbon credits, concessional loans and grants and subsidies, feature in multiple case studies, in order to present the breadth of applications across regions and sectors. The case study examples span initiatives in EMDEs and advanced economies, as well as programmes implemented by either international financial institutions, development banks or governments. Overall, these cases provide insight into the varied mechanisms used globally to mobilise investment, and de-risk investments for low-carbon technologies to enable low-carbon transitions.

New case studies covered in this 2026 edition were identified via desk research and through a survey sent to Climate Club stakeholders in May 2025. The information presented in each of the new case studies in the present edition was developed through stakeholder interviews and a review process involving the organisations leading the respective programmes.

The 30 case studies are listed in Table 6. The analysis behind each case study explores the design features, implementation modalities and observed outcomes associated with each programme/ project. This review provides insights on how each instrument is effective to supporting decarbonisation initiatives and overcoming investment barriers. The full case studies can be found in the Annex.

The case studies are presented first for economic instruments, followed by risk-mitigation instruments and concluding with the financial instruments. Each case study follows a standardised structure to ensure comparability across examples. This includes: (i) a description of the instrument and its underlying theoretical concept; (ii) an overview of the supported project(s); (iii) an assessment of the instrument's impact; (iv) lessons learnt, and (v) conditions for replicability and scalability.

Table 6. List of case studies

Instrument Code	Instrument Name	Case Study Number	Case Study Name	Year of case study preparation
E.1	Accelerated Depreciation	1	South Africa Special Economic Zones	2026
E.2	Carbon Contract for Difference	2	CCfD scheme - German Federal Ministry for Economic Affairs and Energy (BMWE)	2026
		3	The H2Global mechanism	2023
E.4	Carbon Credits	4	CO_2 Removal Certificates - Puro	2023
		5	myclimate Renewable Heat Programme	2026
E.5	Emission Trading Scheme	6	European Union Emission Trading Scheme (EU-ETS)	2026
E.6.	Extended Producer Responsibility	7	EPR Schemes - European Union	2024
E.7.	Grants and subsidies	8	Production-linked incentive - Government of India	2023
		9	FINTECC Programme - European Bank for Reconstruction and Development (EBRD)	2023
R.1.	Buyer Credit Guarantee	10	Buyer Credit Guarantees- The Danish Growth Fund (EIFO)	2023
R.2.	Energy Savings Insurance	11	Energy Savings Insurance - Green Climate Fund (GCF) / XacBank.	2023
R.3.	First and Second Loss Facility	12	Climate Syndication Platform - EBRD	2026
R.4.	Foreign Currency Guarantee	13	Eco Invest- Inter-American Development Bank (IDB) and Ministry of Finance of Brazil	2023
R.5	Partial or Full Credit Guarantee	14	InfraCredit	2026
		15	In Partial Risk Sharing Facility for Energy Efficiency (PRSF) - Energy Efficiency Services Limited. (EESL), Small Industries Development Bank of India (SIDBI), World Bank	2023
R.6.	Performance Guarantee	16	New Energy Risk	2026
R.7.	Political Risk Insurance	17	World Bank, MIGA	2026
F.1.	Sustainability Bonds	18	Sustainability Bonds - IDB and BBVA	2023
F.2.	Concessional Loans	20	Industry Decarbonisation Programme - CIF	2024
		21	High Impact Programme - EBRD and GCF	2023
		22	RAC Nama Fund - Mitigation Action Facility	2024
		23	Arabian Cement Company - EBRD	2026
F.3.	Local Currency Loans and Facilities	13	Eco Invest- Inter-American Development Bank (IDB) and Ministry of Finance of Brazil	2023
F.4	Public and Private Equity	24	SDG Namibia One Fund	2024
F.5	Results-based financing and pull financing	25	IDB's Programme to Support the Development of the Green Hydrogen Industry in Chile	2023
		26	Results-based Financing Programme- Instiglio	2024
F.6.	Revolving Credit Facility	27	Revolving Credit Facility- Credit Agricole Corporate and Investment bank (CACIB)	2026
F.7	Sustainability-linked instruments	28	Sustainability-linked Loans and Bonds – IFC	2024
F.9	Venture Debt	29	Venture Debt Programme – European Investment Bank (EIB)	2026
F.10	Transition Bonds	19	Transition Bonds- Mitsubishi Heavy Industries (MHI)	2026
F.13	Offtake finance	30	Offtake finance Programme - HSBC	2026

Note: The Eco-Invest Inter-American Development Bank (IDB) and Ministry of Finance of Brazil programme (Case Study 13) covers two financial instruments (Foreign currency guarantee and Local Currency Loans and Facilities).

Key learnings

The 30 case studies reviewed in this Toolkit provide a set of cross-cutting lessons on how financial instruments can support industrial decarbonisation across different contexts. They highlight practical ways to improve access to finance, enhance project bankability, mobilise private capital, and enable scaling and replicability of low-carbon investments. While the specific instruments and structures vary, common patterns emerge in how risks are addressed, revenues are stabilised, and public and private finance are combined to unlock investment at scale. The following sections synthesise these insights, drawing on concrete examples from both advanced economies and EMDEs.

Access to finance

Concessional finance can provide essential funding for FOAK industrial projects. Instruments such as catalytic equity or concessional loans bear early technology and execution risks that senior lenders typically will not take and lower the cost of capital, helping projects to reach investment decisions. When structured with milestone-based disbursements and clear eligibility criteria, they also signal credibility and policy alignment, improving access to co-financing. In Namibia, the SDG Namibia One facility uses a layered equity stack, including development, junior and senior tranches, to allocate early risk to public and junior capital and attract institutional investors. In Germany, EIB venture debt for Sunfire, backed by InvestEU, provides subordinated, milestone-linked financing to scale electrolyser manufacturing and has catalysed additional private capital.

Targeted risk-sharing instruments can improve the risk profile of projects and attract commercial lenders and investors. Instruments such as first and second loss or partial credit guarantees can raise credit quality and lower expected loss for senior debt providers by reallocating downside risk to donor-backed tranches. This risk transfer enables lenders to offer longer tenors at lower rates and expand the pool of institutional investors. The EBRD loan to Arabian Cement in Egypt, enabled by an EU EFSD+ first loss guarantee, and the EBRD Climate Syndication Platform's donor first loss protection both extended tenor and mobilised other lenders. In Nigeria, InfraCredit's AAA credit guarantees have enabled corporates to issue 10 to 20-year local currency bonds, widening the investor base for industrial assets.

Local currency financing and foreign exchange risk mitigation shield lenders and borrowers from currency mismatches and make debt service more predictable. Aligning project revenues and debt in the same currency reduces exposure to exchange rate volatility across the life of the asset and improves access to domestic financing. Buyer credit guarantees provided by export credit agencies (ECAs) and currency hedging instruments facilitate payments in widely accepted foreign currencies for imported equipment, supporting foreign participation. In Ghana, the EIFO buyer credit guarantee for CBI Ghana's calcined clay upgrade reduced exposure to clinker import foreign exchange risk. In Brazil, the Eco-Invest foreign exchange guarantee programme mitigates currency risk for foreign investment. In Colombia, the IDB-BBVA sustainability bond supports local market depth and access.

Improvement of bankability

Risk mitigation instruments make projects bankable by reducing lenders' exposure. Instruments such as guarantees, and loan default cover, strengthen borrower credit profiles and lower the risk of losses for commercial lenders, thus improving projects' bankability. In India, the SIDBI/World Bank PRSF offers up to 75% default coverage for energy efficiency loans, improving banks' credit cases. MIGA political risk insurance mitigates sovereign and regulatory exposures for cross-border industrial investments. The EBRD Climate Syndication Platform uses donor first loss to catalyse B-lenders alongside the Bank's A-loan.

New revenue streams and revenue stabilisation mechanisms improve and smooth cash flows. Outcome-based payments provide contracted, predictable revenue streams and a revenue floor strengthening debt serviceability and improving overall project bankability. In Switzerland, the KliK Foundation pays fixed subsidies against Federal Office for the Environment (FOEN)-certified CO_2 reductions. In Germany, BMWE CCfDs guarantee a 15-year CO_2 strike price for industrial projects. In the EU and Canada, the EU-ETS and OBPS create carbon pricing signals that support investment planning in cleaner production processes.

Comprehensive technology performance insurance can support FOAK projects to reach final investment decision (FID). Technology performance insurance transfers commissioning and underperformance risks to rated insurers. This increases confidence that the project will run as expected, and protect lenders' returns in case of technology failure. For example, New Energy Risk policies have supported novel biomass and advanced fuels systems with technology performance wraps that satisfy lenders' requirements for FOAK assets.

Mobilisation of private capital

Blended finance can support the creation of new markets and scale up the mobilisation of private finance. Blended finance – the strategic use of development finance for the mobilisation of additional finance towards sustainable development in EMDEs – can support new technologies or early-stage interventions by providing time-bound and risk-tolerant capital. As markets mature, standardised terms and a declining share of concessional finance enable larger transactions and higher levels of private finance mobilisation. For example, the EBRD-BMWE Climate Syndication Platform mobilises B-lenders alongside a donor first loss tranche in syndicated A/B loans. Climate Fund Managers' SDG Namibia One uses a layered equity stack to anchor early-stage hydrogen pipelines and crowd in institutional investors at construction.

Sustainability-linked and transition-labelled instruments can improve financing terms while ensuring environmental integrity. By anchoring pricing to credible KPIs, with external verification and transparent reporting, they align incentives and provide lenders with comparable, decision-useful information. This clarity can broaden the pool of private capital and mobilise larger syndicated funding as borrowers demonstrate progress against decarbonisation targets. For EMDE issuers, IFC's SLL/SLB frameworks standardise KPI design and verification, helping borrowers access syndicated credit on improved terms. Crédit Agricole CIB's sustainability-linked revolving credit facility shows how KPI-linked attributes can deepen relationships with banks and support pricing and tenor for transition-aligned corporates. Mitsubishi Heavy Industries' transition bonds illustrate how labelled capital markets instruments can reach a broader investor base while maintaining integrity through second-party opinions and disclosure.

ECA instruments can unlock long tenor loans in EMDEs and accelerate technology diffusion. ECAs provide loans, guarantees and insurance to support domestic companies export or invest overseas. By lowering cross-border and performance risks on imported equipment, ECAs improve bankability and terms for capital-intensive upgrades. This risk transfer can mobilise private capital by enabling commercial lenders to extend maturities and increase participation. The Climate Change Sector Understanding under the Arrangement on Officially Supported Export Credits, developed within the OECD, provides more flexible terms and conditions for climate mitigation and adaptation projects. In Ghana, EIFO's buyer credit guarantee supported financing for low carbon cement equipment at CBI Ghana, opening the market to advanced economy technology providers while allowing the buyer to secure long tenor debt on improved terms.

Scaling and replicability

Streamlining project appraisal processes in industry programmes and country platforms can accelerate and scale up industry decarbonisation. Standardised documentation, robust MRV and well-defined eligibility rules reduce transaction costs and shorten credit timelines, enabling replication across portfolios and support the expansion of project pipelines. The KliK Foundation applies a multi-project results-based model with harmonised verification, allowing rapid onboarding of additional industrial heat projects. Chile's hydrogen programme uses results-based loans via CORFO with common milestones, facilitating successive calls and portfolio growth. India's SIDBI PRSF uses templated ESCO contracts and standard risk-sharing terms, enabling multiple participating financial institutions to scale similar transactions.

Demand-side measures can help create sustained, long-term markets for low-carbon industrial goods. Firm offtake agreements and price backstops for green industrial products reduce revenue risk and create demand signals to boost market creation. Standardised offtake contracts reduce transaction costs, enabling scaling across successive programme windows. In Germany, BMWE carbon contracts for difference provide a 15-year CO_2 strike price that anchors investment decisions and supports subsequent financing rounds. In Switzerland, the KliK Foundation purchases FOEN certified emission reductions for renewable heat, creating a repeatable results-based revenue stream for multiple projects. In HSBC's offtake linked structures, long-term purchase agreements underpin early cash flows, enabling debt against forward delivery and facilitating replication as counterparties standardise terms.

Robust policy and regulatory frameworks facilitate replication across portfolios. Predictable and sufficiently ambitious carbon pricing systems and clear standards reduce policy and revenue uncertainty, enabling multi-year investment planning and portfolio scaling. Consistent rules also support replication and refinancing across programme rounds and jurisdictions by providing reliable, comparable signals. In the European Union, the EU-ETS offers a durable cap-and-trade price signal that companies use to plan and sequence decarbonisation investments. In Canada, the federal OBPS sets a credible compliance price path and clear performance standards that allow industrial projects to model cash flows and proceed to scale.

Industrial hubs with shared industrial infrastructure and tailored incentives stimulate sustainable industrial development. Zone-based incentives and one-stop shops reduce delays in permitting and appraisal timelines, enabling replication at regional level. Shared infrastructure lowers unit costs and allows multiple projects to proceed in sequence, supporting scale-up across portfolios. In South Africa, the SEZ regime combines investment facilitation and tax allowances with shared infrastructure, providing ready-to-build sites that support follow-on investment.

5 Illustrative economic assessment of selected technologies in hard-to-abate industries

Overview

This chapter provides insights into the financing of the decarbonisation of three hard-to-abate industry sub-sectors: iron and steel, cement and chemical and petrochemical. It builds and expands on the economic assessment presented in the 2025 edition of the Financial Toolkit, covering a broader range of technology options and offering greater analytical detail. As in the previous edition, levelised cost is used as the main indicator to compare the technologies. However, this chapter also illustrates how the deployment of selected financial instruments can help close the competitiveness gaps, providing practical insights into how these instruments operate at a plant level.

Cement and iron and steel together already account for more than 50% of global industrial direct emissions (IEA, 2025[32]). The chemical and petrochemical sector, which is the broader category encompassing petrochemicals, contributes a further 18% of industrial CO_2 emissions (World Economic Forum, 2021[33]). The Climate Club Work Programme 2025/26 focuses on advancing the decarbonisation of the steel and cement sectors, with plans to gradually expand the scope to other industrial sectors such as chemical and petrochemicals (Climate Club, 2024[34]).

The section for each of the selected sectors includes:

- A sector overview explaining the importance of the sector in terms of production scale, economic relevance and emissions impact along with value chain description.
- An economic assessment illustrating how instruments may be deployed to enhance the competitiveness of a selection of low-carbon technologies. It presents a subset of low-carbon technologies for each sector and compares their competitiveness with incumbent options using Levelised Cost of Production (LCOP).[4] Only a few instruments are shown for illustrative purposes, although in practice, the deployment of technologies may require diverse sets of instruments and will depend on a case-by-case assessment of each decarbonisation project.

The selected low-carbon technologies (see Table 7) only represent a few examples of transition and low-carbon technologies which can reduce the emissions of the cement, iron and steel, and chemical and petrochemicals sectors. They have been selected based on several factors, including their potential contribution to decarbonising the sector and technological maturity. Technologies that are not yet mainstreamed and require support to ensure their competitiveness against incumbent technologies have

[4] LCOP is a measure of the average annual net present cost per unit of production. It captures both operating costs and annualised capital costs, taking account of the discount rate and project lifetime.

been prioritised. The selection builds on OECD work undertaken through the implementation of the Framework for Industry's net-zero Transition in South Africa and Indonesia for the iron and steel sector, in Thailand for the chemical and petrochemicals sector, and is enriched with further analysis prepared specifically for this Financial Toolkit for the cement sector.

Table 7. List of selected low-carbon technologies for the economic assessment

Sectors	Selected low-carbon technologies
Cement	Limestone Calcined Clay Cement (LC3), which reduces clinker use per tonne of cement and lowers emissions from calcination.
	Carbon capture and storage (CCS), which captures emissions from calcination and fuel combustion for subsequent transport and storage.
	Refuse-Derived Fuel (RDF), which replaces fossil fuels in combustion and reduces related emissions.
Iron and steel	Retrofit Blast Furnace with CCS (BF-CCS), which reduces emissions from the ironmaking process in the Blast Furnace.
	Retrofit Direct Reduced Iron production plant with CCS (DRI-CCS) combined with Electric Arc Furnace (EAF), which reduces emissions from flue gases in the hydrogen production process.
	Clean hydrogen for Direct Reduced Iron (H_2-DRI) combined with EAF, which replaces methane with hydrogen as a reductant in the DRI process.
Chemical and petrochemical	Biomass to bioethanol to bioethylene, which produces a chemically identical alternative to ethylene, focuses on decarbonising the precursor of the plastic.
	Biomass to bio-based and biodegradable Polylactic Acid (PLA), which produces a technically viable alternative to Polyethylene terephthalate (PET), focuses on decarbonising the plastic product.
	CCS, which captures emissions from process and fuel combustion of ethane-based ethylene-producing steam cracker, focuses on decarbonising the primary chemicals.

Sectoral focus 1: Cement

Global cement production reached 4 billion tonnes in 2024 (Global Cement, 2025[35]). Cement production accounts for about 6.5% of global GHG emissions (Transition Pathway Initiative, 2025[36]). Net CO2 content per tonne of cementitious material amounts to 567 kilogram in 2023, based on GCCA in Numbers data (GCCA, n.d.[37]).

The cement value chain can be divided into three main stages: clinker production, cement production and concrete production. The calcination process and fuel combustion used to produce clinker account for about 80% of CO_2 emissions in clinker production. The remaining emissions are mainly linked to electricity use in the cooler, cement mill and raw mill. In practice, the final emissions associated with cement depend on the clinker content of the product, the fuel mix used in kiln combustion, the emission factor of the electricity supply and the efficiency of the equipment.

Diverse actions can be undertaken to reduce direct and indirect emissions in cement production (IEA, 2023[38]):

- Efficiency measures, which include material and energy efficiency
- Fuel shift, which includes shifts to bioenergy, hydrogen, and other fuel shifts
- Electrification
- Carbon Capture, Use and Storage (CCUS)

Of the technologies presented in Table 7, CCS offers the highest emission-reduction potential for the cement industry. CCS can reduce emissions in the range of 70%-90% from the cement plant's direct emission. Meanwhile Limestone Calcined Clay (LC3) can reduce direct emissions by up to 40%, with the actual reduction depending on factors such as the mix ratio and the distance to the clay source. Refuse-Derived Fuels (RDF) only reduces fuel combustion emissions and can deliver up to 20% emission reduction depending on the thermal substitution rate and the organic content of the RDF.

Illustrative economic assessment of selected low-carbon technologies

LC3 is a new type of cement combining clinker, calcined clay and limestone. Its key benefit is that it provides similar performance to Ordinary Portland Cement (OPC)[5] while emitting less CO_2 during its production process (LC3, n.d.[39]). LC3 reduces emissions by lowering clinker content, which minimises calcination-related emissions, and by requiring less heat to calcinate the clay compared to limestone, thereby reducing fuel combustion emissions (LC3, n.d.[39]). Following joint development by academic institutions in Switzerland, India and Cuba in 2013, LC3 commercialisation has taken up since around 2020s, starting with deployments at Noida Airport in India (Global Cement, 2025[40]) and the Tilia Tower in Switzerland (EPFL, 2024[41]). At least 27 commercial scale LC3 production facilities have been established globally as of 2025 (GCCA-LeadIT, n.d.[42]), with most projects being developed in Africa and South America.

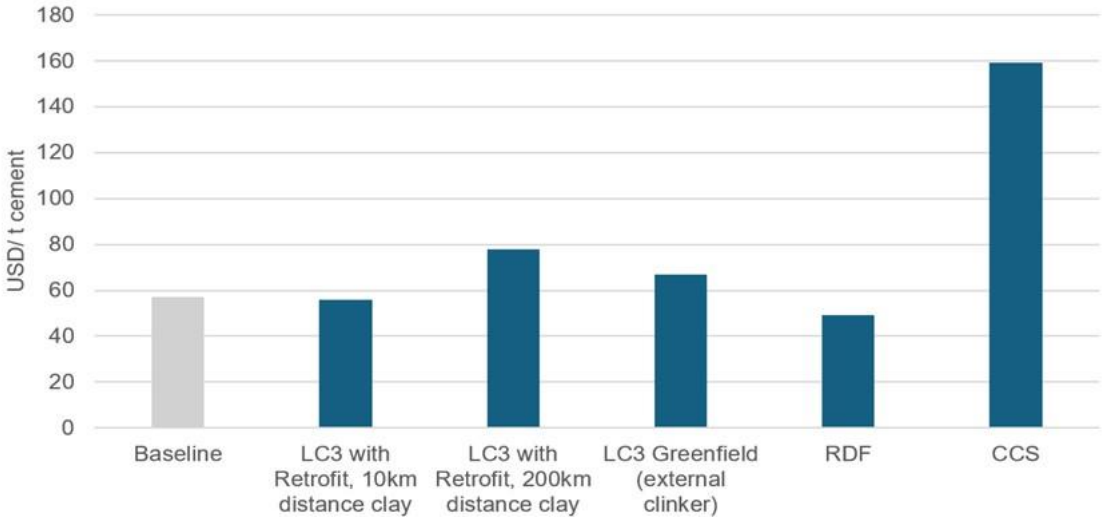
CCS is a technology with the potential to substantially reduce both calcination and fuel combustion emissions. CCS is expected to play a key role in achieving net-zero emissions in the cement sector (GCCA, 2022[43]), accounting for around one-third of total emissions reductions contribution. There are at least 72 cement-sector CCS globally, with status ranging from feasibility study to commercial scale (GCCA-LeadIT, n.d.[42]). The Brevik plant, owned by Heidelberg, is a recent example of commercial-scale CCS deployment, with the capacity to capture 400,000 tonnes of CO_2 annually (Heidelberg Cement, 2022[44]). Most CCS projects in the cement sector are located in Europe (GCCA-LeadIT, n.d.[42]).

The use of RDF as an alternative fuel is already common in the cement industry, although further scale-up is required. RDF is produced from waste, including industrial and municipal solid waste, and consists largely of combustible materials such as plastics and biodegradable waste (GCCA, 2020[45]). High RDF utilisation is well established in Europe, but adoption varies in other regions. In China, for example, gaps in waste treatment systems and the absence of a mature waste-derived fuel industry limit its use (RMI, 2022[46]). To meet the sector's net-zero pathway, global use of alternative fuels, including RDF, is expected to increase to around 22% by 2030 and 43% by 2050 compared to 2020 levels (GCCA, 2022[43]).

The illustrative LCOP comparison (see Figure 4) shows that most of the selected low-carbon technologies are relatively competitive with the baseline. For LC3, the retrofit case with a 10-kilometre clay source is at parity with the baseline, while the retrofit case with a 200-kilometre clay source is 36% costlier. The RDF case is more competitive than the baseline driven by payment received from waste processor and high RDF calorific value. Enabling waste regulations such as EU Waste Framework Directive in EU can maximise RDF consumption in cement plants by prioritising prevention, reuse, recycling, and recovery over landfill. Meanwhile, cement produced with CCS costs around 2.7 times more than the baseline and thus will be the focus of illustrative example for the instrument deployment.

[5] OPC is a cement which has 90-95% clinker content. OPC is a common type of cement used globally.

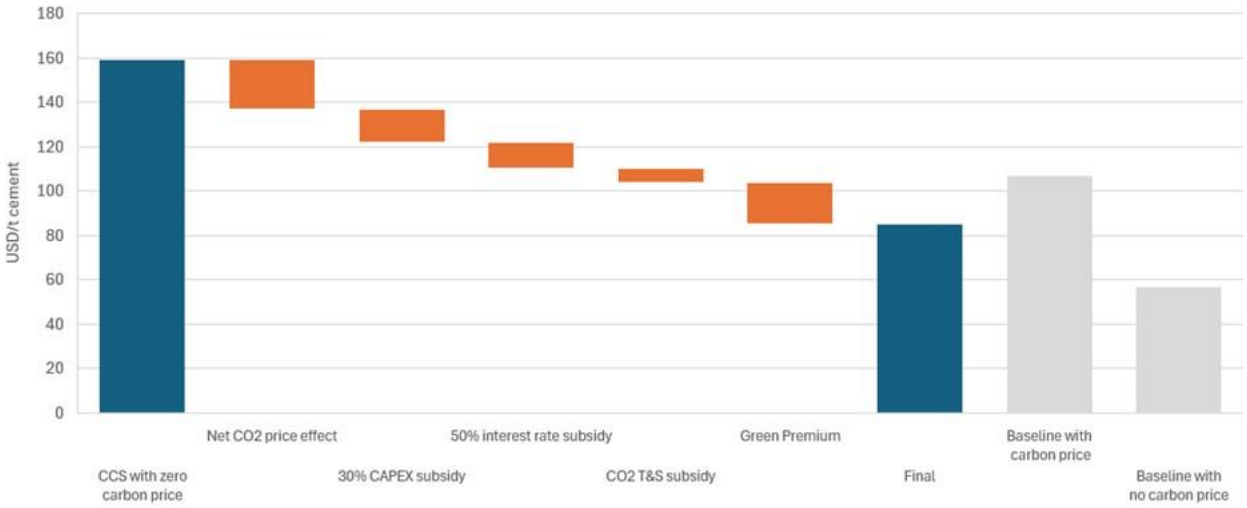
Figure 4. Comparison of the levelised cost of production between selected low-carbon technologies and a benchmark cement plant



Note: LC3: Limestone Calcined Clay Cement, RDF: Refuse-Derived Fuel, CCS: Carbon Capture & Storage. LC3, RDF, CCS technologies can be retrofitted to an existing cement plant, hence the comparison in this figure is based on incremental approach. Assumptions for the model reflects global benchmark. 1) Baseline**:** No capital expenditure is included. The baseline is integrated cement plant with a capacity of 1 million tonnes (Mt) per year and an 80% clinker-to-cement ratio. The emission intensity is based on global average. Production is assumed to operate with two kilns of 500 kt per year and 300 kt per year capacity, both running at full utilisation. 2a) LC3 retrofit, 10 km clay source: The smaller kiln in the baseline case (300 kt per year) is retrofitted for clay calcination, with capital expenditure of USD 9 million. This results in fuel cost savings of 19% and electricity cost savings of 23%. Additional costs for clay quarrying are included. A discount rate of 8% and an asset lifetime of 15 years are assumed. 2b) LC3 retrofit, 200 km clay source: The same assumptions as in 2a apply, with the addition of clay transport costs and clay purchase costs. 2c) The LC3 plant is assumed to purchase clinker and limestone while having access to its own clay resource. Capital expenditure is assumed at USD 60 million. A discount rate of 8% and an asset lifetime of 20 years are assumed.3) CCS retrofit**:** In this case, the plant invests only in the capture unit and pays third parties for transport and storage services. The capture rate is assumed at 70% of direct emissions, which reflects lower capture rate on retrofit application. Capital expenditure is assumed at USD 464 million. Additional energy consumption for carbon capture is assumed at 5 GJ per tonne of CO_2 captured. The asset lifetime is assumed to be 30 years. 4) A baseline plant retrofitted with an RDF feeding system, including a gas bypass. The plant receives payment from waste processor and targets a 50 percent thermal substitution rate. Heat consumption is assumed at 3 800 MJ per tonne of clinker, with 50% substituted by RDF. Capital expenditure is assumed at USD 38.6 million. The plant is assumed to receive a gate fee of USD 70 per tonne of RDF from the waste processor. The project lifetime is assumed at 20 years, with a discount rate of 8%. The LCOP comparison is based on zero carbon price.

The deployment of multiple instruments illustrates that the LCOP of a CCS retrofit in a cement plant can become competitive compared to the baseline case, as shown in Figure 5. Carbon price acts as a crucial instrument, providing the underlying regulatory framework for low-carbon solutions. In this example, it plays a particularly important role for CCS by generating carbon credits for captured CO_2 while emissions from the baseline case. In the illustrative model, the LCOP of the base case increased by 180%, while the net of carbon price and carbon tax reduces the LCOP of CCS case by 15%. The other instruments applied in the analysis to improve the competitiveness of CCS case are in the form of subsidies, ranging from one-time CAPEX subsidy to longer term interest rates, transport and storage subsidies, and the green premium.

Figure 5. Illustrative deployment of financial instruments to improve CCS case levelised cost of production



Note: The deployment of financial instrument is made under a carbon pricing assumption, with a CO_2 price increasing from USD 50 per tonne of CO_2 in 2030 to USD 200 per tonne of CO_2 in 2050. While the baseline with carbon price follows the carbon pricing scenario, baseline with no carbon price follows zero carbon price. CCS: carbon capture and storage, LCOP: levelised cost of production, CAPEX: capital expenditure, T&S: transport and storage. 1) Net CO_2 price effect: In the CCS case, the installation remains subject to carbon pricing for residual emissions, while receiving carbon credits for stored CO_2. 2) Interest rate subsidy: a 5% interest rate subsidy reduces the interest rate from an initial 10% to 5%. 3) Green premium: For illustrative purposes, the green premium is modelled as a cost reduction. A premium of 30% applied to 50% of total sales volume is assumed.

Sectoral focus 2: Iron and Steel

Global crude steel production reached 1.9 billion tonnes in 2024 (worldsteel, 2025[47]). Global steel production emitted an estimated 4.1 billion tonnes of CO_2-eq in 2024, which includes direct and indirect emissions (worldsteel, 2025[48]). The sector accounted for around 7% of global CO_2 emissions (World Economy Forum, 2024[49]). The global emission intensity, accounting of all production pathways, amounted to 2.2 t CO_2 per tonne of steel. Three quarters of those are direct emissions resulting from fuel combustion and process (worldsteel, 2025[48]).

The emission intensity of conventional crude steel production varies across pathways. BF-BOF averages around 2.3 tonnes of CO_2 per tonne of steel (worldsteel, n.d.[50]). Other processes have lower emission intensities, with scrap-based EAF at 0.7 tonnes of CO_2 per tonne of steel and fossil-based DRI-EAF at 1.4 tonnes of CO_2 per tonne of steel (worldsteel, n.d.[50]). Within each pathway, emission intensity also depends on production inputs, particularly metallic inputs and reductants.

Emission reduction strategies in the iron and steel sector may be grouped as follows (worldsteel, 2025[48]):

- Efficiency: focus on existing production pathways and harness similar or higher output with less resource and energy which result in CO_2 reduction. It includes efficiency using digitalisation and Artificial Intelligence (AI).
- Maximise scrap availability and use: higher scrap utilisation in the production process
- Breakthrough technologies: deployment of technologies such as direct and indirect use of hydrogen, lower carbon and circular reductants, and electrification among others.

Of the technologies presented in Table 7, H_2-DRI has the highest potential to reduce direct emissions in the iron and steel sector, with direct emissions possibly amounting to only 0.08 t CO_2/t crude steel,

representing a 95% reduction compared to the baseline BF-BOF. DRI-CCS direct emissions may reach 0.2 t CO_2/t crude steel (which represents 89% reduction compared to the baseline) and BF-CCS may reach direct emissions of 0.7 t CO_2/t crude steel (which represents 61% reduction compared to the baseline).

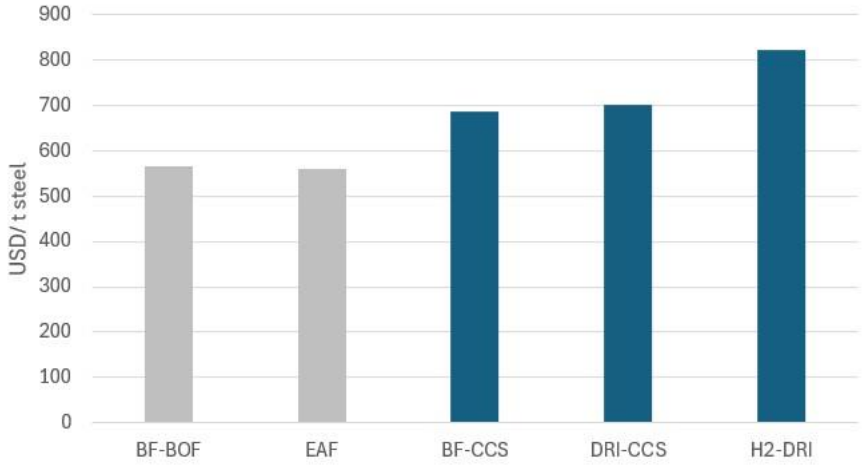
Illustrative economic assessment of selected low-carbon technologies

Carbon capture in BF and DRI offers significant potential to reduce emissions in the steel sector. In the BF-BOF process, around 73% of emissions can be captured, as full abatement would be economically prohibitive (Agora Industry, Wuppertal Institute, and Lund University, 2024[51]). DRI has advantages over BF for carbon capture, due to higher CO_2 concentration in the process gases and lower asset complexity. Six commercial scale CCUS projects for iron and steel sector are in the development pipeline globally. The Al Reyadah CCUS facility, owned by Emirates Steel Arkan in United Arab Emirates (UAE), is the first carbon capture installation in the iron and steel sector, applied to a DRI asset (IEEFA, 2024[52]). The project has 800,000 tonnes of CO_2 capture, transport and injection capacity and the CO_2 is used for oil and gas sector (CSLF, n.d.[53]).

Low-carbon H_2 DRI is a technology for decarbonising the ironmaking stage of the DRI-EAF steelmaking process. In this process, the conventional syngas reductant (CO and H_2) is replaced with pure hydrogen. There are more than 30 H_2 DRI projects globally, with most development happened in Europe (Leadit, n.d.[54]). Recent commercial scale project example includes Salzgitter Flachstahl's purchase of H_2 DRI technology from Danieli (Danieli, 2023[55]). In addition to purchasing the H_2 DRI technology from technology providers, steelmakers must also lock in access for long-term supplies of low-carbon hydrogen ahead of the commercial operation date (Eurometal, 2025[56]).

In the illustrative case in Figure 6, H_2-DRI LCOP is 43% higher than the baseline BF-BOF and has the highest cost among the low-carbon technologies. BF-CCS is 21% higher and DRI-CCS is 24% higher than the baseline. The higher cost of H_2-DRI is driven by increased operating costs mainly due to hydrogen supply.

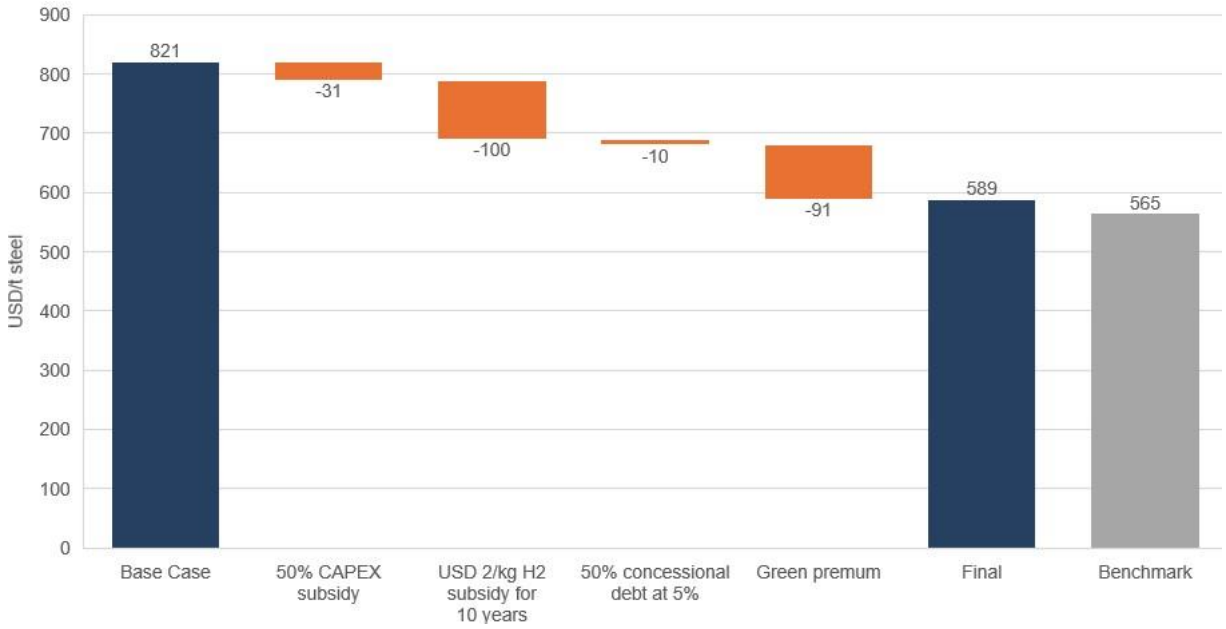
Figure 6. Levelised cost of production comparison between selected low-carbon technologies and the baseline for steel sector



Note: BF-BOF: Blast Furnace-Basic Oxygen Furnace, EAF: Electric Arc Furnace, CCS: Carbon Capture and Storage, DRI: Direct Reduced Iron H_2: Hydrogen. 1) BF-BOF revamping**:** A baseline scenario of an illustrative integrated BF-BOF steel plant with a capacity of 2 Mt per annum, 20% scrap input, and coal as fuel. A reference scenario of a scrap-based EAF is also provided to illustrate the cost of secondary steelmaking. The EAF has the same capacity of 2 Mt per annum, with electricity supplied from the grid. Capital expenditure is assumed at USD 150 million, with an asset lifetime of 20 years. The weighted average cost of capital is assumed at 8%, and the BF-BOF operates at a capacity factor of 90%. 2) BF-BOF with CCS retrofit**:** A BF-BOF plant with the same capacity as the baseline, retrofitted with CCS. The steel producer only pays for transport and storage and does not invest in pipeline or storage infrastructure. Capital expenditure for CCS is assumed at USD 200 million, in addition to the revamping capital expenditure. The capture rate is assumed at 85%, with an operating factor of 90%. The weighted average cost of capital is assumed at 8%, and the asset lifetime at 20 years. 3) DRI-EAF with CCS**:** This option is assumed to be a fully greenfield investment equipped with CCS, with total capital expenditure of USD 2 billion. The steel producer only pays for transport and storage fees and a third party is assumed to invest on the transport and storage infrastructure. The weighted average cost of capital is assumed at 12.7%, and the asset lifetime at 20 years. 4) Low-carbon hydrogen DRI-EAF**:** A greenfield low-carbon hydrogen integrated DRI-EAF with a capacity of 2 Mt per annum and 30% scrap input. The steel producer purchases low-carbon hydrogen but does not invest in its production or transport infrastructure. This option is assumed to be a greenfield investment with capital expenditure of USD 1.9 billion, where hydrogen and renewable electricity are sourced externally. The weighted average cost of capital is assumed at 12.7%, and the asset lifetime at 20 years. In the default scenario, the hydrogen price is assumed at approximately USD 4 per kilogram, declining gradually to USD 2 per kilogram by 2038.

With the largest gap of competitiveness compared to the baseline, H2-DRI case will require deployment of multiple instruments to close the gap (see Figure 7). Hydrogen supply cost subsidy and green premium contributed to the majority of the effort to close the competitiveness gap. CAPEX subsidy also contributed to close the gap, albeit with a lesser degree. In this example, concessional debt contributed the least, however in practice it is also a key instrument to create a bankable business case.

Figure 7. Illustrative deployment of financial instruments to improve low-carbon hydrogen direct reduced iron levelised cost of production



Note: CAPEX: Capital expenditure 1) For illustrative purposes, the green premium is modelled as a cost reduction. A premium of 30% applied to 50% of total sales volume is assumed. 2) Base case is H2-DRI with no carbon price, while benchmark is BF-BOF without carbon price.

Sectoral focus 3: Chemical and Petrochemical

The petrochemical industry is highly complex and diverse, with many interconnected components, plastics representing only one of its products. Primary chemicals which are the foundational building block in the industry include ethylene, ammonia, and methanol among others. Global production capacity of ethylene in 2021 amounts to 220 million tonnes (GPCA, 2021[57]). Meanwhile, ammonia production in 2023 amounted to 150 million tonnes globally (USGS, 2024[58]). Global methanol production capacity is 110 million tonnes, contributed by more than 90 methanol plants (Methanol Institute, n.d.[59]). Plastic is one of the key markets for petrochemical products, with around 99% of plastic products still relying on petrochemical inputs (European Bioplastics, 2025[60]). Global plastic production reached 414 million tonne in 2023 (Plastics Europe, 2024[61]).

Petrochemicals production begins with crude oil and natural gas feedstocks that are refined to extract key intermediates such as naphtha, ethane, propane, and butane, which serve as the basic hydrocarbon inputs for the sector. These feedstocks are processed in petrochemical facilities, where thermal cracking and related conversion technologies break them down into High Value Chemicals (HVCs) including light olefins such as ethylene and propylene and aromatics such as benzene, toluene, and xylenes, which are fundamental building blocks in the industry. The primary olefins ethylene and propylene are then polymerised into polymers such as polyethylene and polypropylene that form the basis of plastic materials used across a wide range of industrial and consumer applications.

Petrochemical production consumes energy both as feedstock and as a fuel source. Around 57% of global petrochemical direct emissions come from fuel combustion and 43% from process emissions (Bashmakov, 2022[62]). Total direct emissions from production, product use and waste handling amounted to 1.6 gigatonnes (Gt) of CO_2 per year, while indirect emissions related to electricity supply accounted for 0.6 Gt of CO_2 per year (Saygin and Gielen, 2021[63]). Carbon-intensive processes include steam cracking and reforming. Steam cracking, which requires very high temperatures, is a major source of sector emissions.

To reduce direct and indirect emissions from the chemicals production and plastics industry, the following strategies can be applied:

- Feedstock emission reduction: examples include switching fossil-based molecule with biomass-based such as biomass to HVCs, biomass used for direct production of alternative plastics, and alternative fuels used for the steam cracker.
- Production process emission reduction: examples include improving energy efficiency in the steam cracker, switching to low-carbon sources for process heat generation and power supply, and CCUS.
- Recycling and end-of-life management of plastic products: examples include mechanical recycling, chemical recycling, and waste-to-energy.

Among the technologies presented in Table 7 for the chemical and petrochemical sector, bioethylene has the potential for achieving negative emissions. This is due to the absorption of CO_2 through photosynthesis when the feedstock crops are farmed, resulting in net-negative emissions (Bishop, Styles and Lens, 2021[64]; Benavides, Lee and Zarè-Mehrjerdi, 2020[65]). Based on cradle-to-gate analysis, PLA can reduce on average 70% of the direct and indirect emissions. Meanwhile, CCS could reduce up to 77% of the direct emission of the ethane-based steam cracker.

Illustrative economic assessment of selected low-carbon technologies

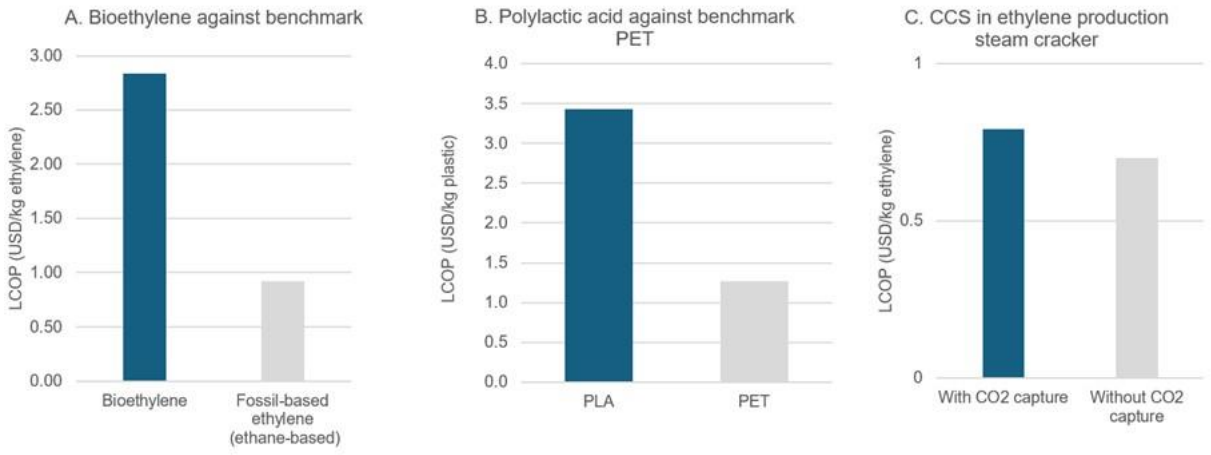
The biomass-to-bioethanol-to-bioethylene process transforms biomass, such as sugarcane, into a molecular building block for plastics. Molasses from sugarcane is fermented and distilled to produce bioethanol, which is then catalytically dehydrated to produce bio-ethylene. The resulting bio-ethylene is used in the polymerisation phase to produce biopolyethylene. Global production of bio-ethylene remains nascent. Notable companies in the sector include Braskem, a Brazilian firm with a capacity of 260,000 tonnes per year (Braskem, 2023[66]), and a joint venture between Braskem and SCG Chemical from Thailand, planning a 200,000 tonnes capacity facility in Thailand, with first production scheduled for 2027 (Chemical Engineering, 2025[67]).

The direct biomass-to-bioplastic route, PLA, is more established than bio-ethylene, with global production in China, the US, and Thailand. The production of bio-based, biodegradable PLA begins with feedstock collection and conversion, followed by fermentation to produce lactic acid. Lactic acid is then polymerised with lactide to form PLA pellets. China is the largest producer and exporter, with a capacity of 300,000 tonnes per year. Other producers include the US, as well as Canada and Thailand (Business News Wire, 2025[68]).

Carbon capture in the petrochemical industry focuses on capturing emissions, with post-combustion technology being the most common**.** Emission points such as the steam methane reformer have higher CO_2 concentrations, improving the efficiency of carbon capture. Globally, carbon capture for chemical plants is quite nascent, with projected estimate of industry capture capacity beyond 2030 only 25 million ton of CO_2 in total (Global CCS Institute, 2025[69]).

In the illustrative analysis (see Figure 8.), CCS has the smallest levelised cost gap compared to the baseline, while feedstock cost drives the levelised cost of bio-based plastic technologies. The levelised cost of CCS retrofit excluding the transport and storage cost to the steam cracker is 15% higher than the baseline, which is the smallest gap compared with CCS in the cement and iron & steel sectors. On the other hand, the levelised cost of bioethylene is more than three times the baseline, mainly due to the cost of bioethanol. PLA has a levelised cost 2.6 times higher than the baseline, driven by the cost of lactic acid. Reducing the cost of bioethanol and lactic acid will therefore be crucial to lower the cost of bio-based plastics.

Figure 8. Comparison of the levelised cost of production between low-carbon technologies and conventional options in the petrochemicals sector

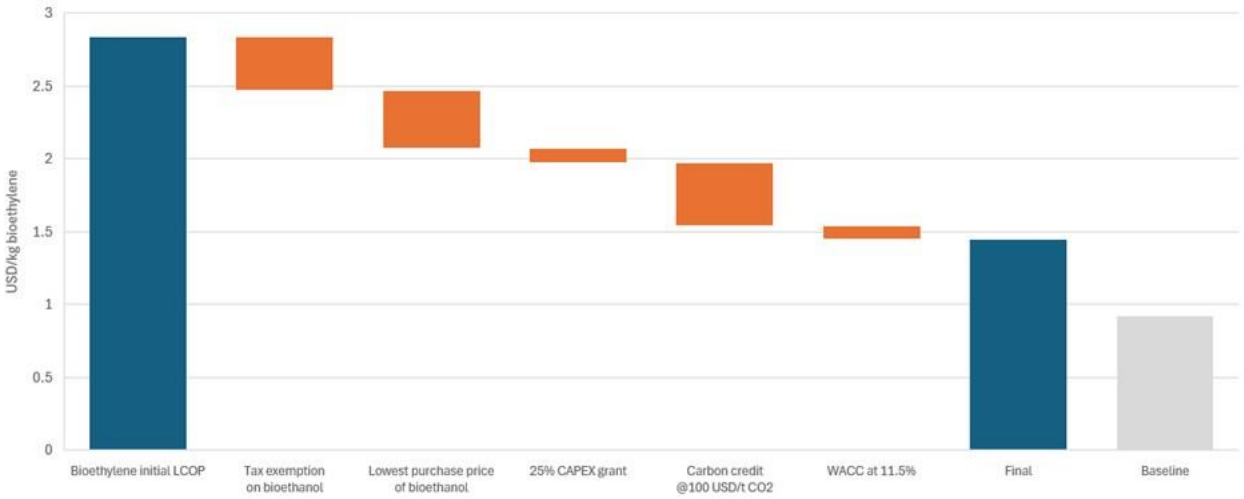


Notes: LCOP: levelised cost of production, PLA: polylactic acid, PET: polyethylene terephthalate. The LCOP comparison is based on the following scenarios and conditions[6] 1) In Panel A, for biomass to bioethanol to bioethylene, the analysis focuses on bioethylene production, with ethane-based ethylene as the baseline. The bioethylene plant has a production capacity of 200,000 tonne and sources bioethanol from a third party.the bioethylene plant capacity is 200 000 tonne/year, with 30-year asset lifetime. The bioethanol price which serves as input,is USD 0.69/liter. CAPEX is USD 526 million, with 15% WACC. This case also includes tax on bioethanol which is particular to the country works in Thailand. 2) In Panel B, for biomass to PLA, the focus is on resin production, with polyethylene terephthalate (PET) as the baseline. The PLA plant has a production capacity of 75,000 tonne and sources lactic acid from a third party. The PLA plant capacity is 75 000 tonne / year, with asset lifetime of 30 years. The purchase price of lactic acid as input is USD 1.25/kg. The CAPEX is USD 552 million, with 15% WACC. 3) For the CCS option, the focus is on the ethane-based ethylene-producing steam cracker, excluding the transport and storage cost.The CCS system captures 90% of emissions from the ethylene-producing steam cracker, with an asset lifetime of 20 years. Capital expenditure is assumed at USD 200 million per million tonnes of CO_2 captured. The weighted average cost of capital is assumed at 11%. Additional energy consumption is assumed to increase direct emissions by 15%. Transport and storage costs are not included. All LCOP comparisons are presented at zero carbon price.

Bioethylene competitiveness gap can be reduced by deploying instruments which lower input and investment costs, along with adding cash flow from carbon credits as illustrated in Figure 9. In this example, as tax to bioethanol drives up the input cost to bioethylene producer, bioethanol tax exemptions and competitive price contribute the most to the improvement. It will be crucial to understand the main drivers of bioethanol feedstock cost in the country where the project is planned to be deployed. Carbon credits from carbon removal by bioethylene provide the second largest contribution. The deployment of multiple instruments still leaves a gap compared to the baseline of fossil-based ethylene, which must be addressed through additional measures.

[6] For more information, see (OECD, 2026[102]).

Figure 9. Illustrative deployment of financial instruments to improve bioethylene levelised cost of production



Note: LCOP: levelised cost of production, CAPEX: Capital expenditure, WACC: Weighted average cost of capital. 1) Bioethylene baseline case: The initial bioethylene case includes a domestic tax on the main input, bioethanol, which increases the effective purchase price faced by the bioethylene producer. This taxation is specific to Thailand, and a detailed understanding of bioethanol cost drivers is required when assessing project deployment in other countries. 2) Financing assumption: The weighted average cost of capital is reduced from 15% to 11.5% through the use of concessional loans and de-risking instruments.

Common findings of the economic assessment across the selected sectors

Emissions in cement, iron and steel, and chemical and petrochemical industries are driven by a high share of process emissions and extensive fossil fuel use. The prevalence of the challenges to decarbonise leads to a higher LCOP for low-carbon technologies compared incumbent fossil fuel-based ones, mainly driven by high upfront costs, increased operational expenses, and increased cost of capital.

Low-carbon technology deployment in each of the selected sectors increase the LCOP by 0-210% compared to the baseline technology. In our analysis, only RDF in the cement sector has lower LCOP compared to the baseline. CCS increases the LCOP by 15-180%, with the largest gap occurs in the cement sector. Low-carbon hydrogen tops the competitiveness gap with the baseline technology in the steel sector by 43% gap. Biomass-based feedstock may present high competitiveness gap compared to conventional feedstock in the chemical and petrochemical sector, and yet commercial plants already operates across the globe.

The deployment of financial instruments can narrow the competitiveness gap faced by low-carbon technologies in the cement, iron and steel, and chemical and petrochemical industries. Such instruments are particularly important given that many low-carbon technologies at commercial scale are expected to be first-of-a-kind deployments. This chapter presented a non-exhaustive set of instruments to help close the competitiveness gap, including capital expenditure subsidies to reduce upfront investment costs, concessional loans to lower the cost of capital, and carbon credits to generate additional revenue during the commercial phase of projects. On the demand side, public and private actors can introduce low-carbon criteria in procurement policies and strategies to stimulate demand for low-carbon industrial products.

6 Conclusion

Financing serves as a critical enabler for industry decarbonisation, and this report has demonstrated how the strategic use of financial instruments can help address project-level risks, improve bankability, and mobilise private capital. By analysing 30 case studies and an economic assessment of key industrial sectors, this updated Financial Toolkit provides evidence on how tailored combinations of financial instruments can support investment decisions and close competitiveness gaps.

The analysis also highlights that high-quality data, best practice sharing, and evidence-based approaches are essential to inform decision-making and reduce uncertainty for both public and private actors. Strong analytical foundations equip decision-makers with clarity on what works, under which conditions and with what financing approaches. At the same time, these analytical foundations must translate into concrete investment and policy action to unlock their full impact.

Crucially, sustained political commitment, stable and credible long-term policy frameworks, and strong institutional and implementation capacity are indispensable to align incentives, reduce regulatory uncertainty, and enable large-scale deployment. As governments and industry actors move from planning to execution, stronger co-ordination across ministries, financial institutions, and international partnerships will be essential to ensure that resources, incentives, and regulatory signals reinforce each other.

In this context, the Financial Toolkit serves as a hands-on resource for project developers, industrial stakeholders, policymakers and financial institutions when structuring transactions, designing support mechanisms, or shaping investment strategies. It also contributes to emerging country platforms and international initiatives by offering a common framework and actionable guidance to help mobilise finance more effectively. By identifying suitable financial instruments and highlighting replicable approaches, the Toolkit supports ambition turning into concrete, implementable financing solutions capable of accelerating industrial decarbonisation at scale.

Annex A. Case studies

Case study 1: South Africa Special Economic Zones (instrument E.1. Accelerated Depreciation)

Instrument - theoretical concept

Accelerated depreciation is a fiscal mechanism that allows businesses to write off the cost of qualifying capital assets, such as buildings, machinery, or equipment, more quickly than under standard straight-line depreciation. Instead of spreading deductions evenly over the asset's useful life, accelerated methods enable larger deductions in the earlier years of use. This front loading of tax allowances reduces taxable income in the short term, improving cash flow and lowering the cost of capital during the initial stages of a project. Governments often use accelerated depreciation as an investment incentive to encourage firms to undertake new capital expenditure, modernise equipment, or expand operations, particularly in sectors that require high upfront investment. However, while it provides liquidity benefits to businesses, it also reduces near term tax revenues for the state.

Accelerated depreciation is often part of a broader tax incentive framework aimed at encouraging targeted economic activities by reducing the fiscal burden on qualifying companies. Tax incentives take multiple forms, including reduced corporate tax rates, exemptions or deferrals of indirect taxes (e.g. VAT, customs duties), and employment-based credits. Governments deploy them to attract foreign direct investment (FDI), stimulate domestic capital formation, promote technology transfer, and foster employment in strategic sectors. For effectiveness, tax incentives require a predictable legal framework, transparent eligibility criteria, and alignment with industrial and macroeconomic policies. However, their benefits must be weighed against potential risks such as revenue loss, market distortion, and deadweight effects where subsidies support projects that would have proceeded without incentives.

South Africa's Special Economic Zones (SEZ) programme, governed by the Special Economic Zones Act No. 16 of 2014 and administered by the Department of Trade, Industry and Competition (the dtic), builds on the earlier Industrial Development Zones (IDZ) initiative. The SEZ framework broadens the policy scope to support industrialisation in diverse regions and introduces a consolidated package of fiscal incentives, which include: (i) a reduced corporate income tax rate of 15% (compared to the national rate of 28%) for qualifying companies incorporated in South Africa, deriving at least 90% of their income from activities within an SEZ, and not engaged in excluded activities (such as alcohol, tobacco, arms, certain biofuels, wholesale/retail trade, transport, finance, or real estate); (ii) an Employment Tax Incentive (ETI) available to all employers with no age restriction (compared to the national age limit of 18-29) earning below R 60 000 (EUR 2 900) per year; (iii) VAT and customs relief within Customs Controlled Areas (CCAs) in the form of import duty rebates and VAT exemptions for qualifying production, as well as VAT suspension for certain local supplies; and (iv) an accelerated building allowance of 10% per annum over ten years for qualifying capital structures erected or improved within the SEZ. Additional non-fiscal support is provided through One-Stop-Shop investor services and the SEZ Fund for infrastructure co-financing.

Within this package, accelerated depreciation is an important fiscal incentive available to firms operating in SEZs. It allows faster tax write offs for capital assets such as buildings and machinery, thereby improving cash flow during the critical early years of investment. Qualifying SEZ businesses can claim a 10% annual depreciation allowance on new or unused buildings or improvements. Importantly, eligibility requires the

tenant to own the building, however, the legislation also recognises long term notarial leases registered with the deeds office as equivalent to ownership for tax purposes. This provision extends the benefit to a broader range of investors by accommodating firms that lease rather than purchase property within the SEZ, while still ensuring compliance with ownership rules for tax treatment.

The implementation of accelerated depreciation in South Africa's SEZs involves several key actors with distinct roles:

- **National government (dtic and National Treasury):** establish the SEZ Act and related regulations, define eligibility for accelerated depreciation, and monitor compliance.
- **SEZ operators (public agencies, PPPs, or private developers):** act as intermediaries between government and investors, facilitating access to incentives and overseeing compliance within the zone.
- **Private sector investors:** develop and operate industrial facilities within SEZs, claiming accelerated depreciation to reduce taxable income.
- **Revenue authorities (South Africa Revenue Authority, SARS):** administer the allowance, verify ownership or lease compliance, and ensure correct application of the depreciation rules.
- **Provincial governments and municipalities:** provide complementary infrastructure and permitting frameworks, supporting the capital investments that benefit from accelerated depreciation.

Accelerated depreciation strengthens project liquidity by reducing taxable income in the early years, enabling firms to service debt or reinvest earnings more voluntarily. It lowers the cost of capital through a tax shield that improves project internal rates of return (IRR), making capital intensive projects more viable. It also incentivises new construction and modernisation, encouraging firms to expand or upgrade facilities rather than rely on outdated infrastructure. By stimulating fixed investment, the instrument directly supports South Africa's industrial policy objectives of manufacturing growth, localisation, and value addition.

Implementation challenges relate mainly to fiscal and administrative aspects. The state faces short-term tax revenue losses before the full investment and employment benefits materialise, which can create fiscal pressure. Administrative verification of ownership or long-term lease registration also adds complexity, requiring co-ordination between investors, SEZ operators, and SARS. In addition, uneven uptake across industries may be stimulated: firms in less capital-intensive sectors gain limited benefit from accelerated depreciation, potentially crowding investment within SEZs toward heavy manufacturing and capital-intensive industries. Some projects might also have proceeded without the incentive, raising concerns over additionality and the overall fiscal efficiency of the measure. These factors underline the need for careful monitoring, transparent reporting, and targeted application to ensure that accelerated depreciation achieves its intended purpose of catalysing productive, inclusive industrial investment.

Example of supported project description

South Africa has designated multiple SEZs, including Coega (Eastern Cape), Dube TradePort (KwaZulu-Natal), Saldanha Bay (Western Cape), and others. The Coega SEZ, the country's largest, covers 9 003 hectares adjacent to the deep-water Port of Ngqura. By 2017, it had attracted over R 30 billion (EUR 1.45 billion) in cumulative investment from 54 investors since it was established in 1999. In 2016-17, it secured 16 new investors worth R 11.69 billion (EUR 0.6 billion) and created 16 500 jobs out of which 7 170 operational and 9 330 construction jobs.

- **Country:** South Africa.
- **Industries:** automotive assembly, agro-processing, energy, chemicals, metals, logistics, business process outsourcing.

- **Investment scale:** R 30 billion (EUR 1.5 billion) cumulative (public and private), including multibillion projects such as vehicle manufacturing facilities, agro-processing plants, and logistics hubs.

The Coega Development Corporation acts as the licensed operator, overseeing zone development, investor engagement, and compliance with SEZ regulations. Governance follows the SEZ Act framework, supported by One-Stop-Shop facilities that streamline permitting and facilitate access to incentives.

Impact of the solution on the project

The advantages of accelerated depreciation compared to conventional financing are reflected in improved liquidity, competitiveness, and financial resilience for firms operating within South Africa's SEZs. By allowing accelerated recovery of capital costs, the instrument enhances cash flow during the early stages of investment and strengthens internal rates of return. This reduces reliance on external finance and improves the financial viability of projects. For export-oriented industries, when combined with reduced corporate tax rates and customs relief, accelerated depreciation improves competitiveness and encourages reinvestment, while publicly funded infrastructure further enhances operational efficiency.

From the business model perspective, accelerated depreciation directly supports cash flow by lowering taxable income during the first ten years of an investment. This improves debt servicing capacity and creates scope for reinvestment, particularly in capital intensive industries such as automotive assembly or agro processing. Combined with the 15% corporate tax rate, the allowance makes SEZ based projects more financially resilient and attractive to lenders. The ETI further reduces operating costs in labour intensive sectors, and the overall incentive framework strengthens the bankability of projects for both domestic and international financiers.

The effectiveness of accelerated depreciation is enhanced by broader enabling conditions. High quality infrastructure (ports, roads, utilities) ensures that firms can fully use new fixed assets. A predictable policy framework and clear legislative criteria reduce uncertainty in claiming allowances. Availability of a skilled local workforce allows firms to operate efficiently once facilities are established. Integration into global value chains increases demand certainty, ensuring that new capacity created under the accelerated depreciation scheme can be absorbed. The One-Stop-Shop mechanism reduces administrative risk, complementing fiscal incentives with procedural efficiency and reinforcing investor confidence. Together, these enabling conditions ensure that accelerated depreciation delivers sustainable industrial growth and enhances overall competitiveness within SEZs.

Lessons learnt

In Coega, the SEZ model and incentives have effectively attracted investment and created jobs, validating the approach when coupled with strong governance and infrastructure. However, some other SEZs have underperformed due to governance issues, weak local economic linkages, or delays in infrastructure provision.

The accelerated depreciation allowance itself does not add complexity to project preparation, as eligibility is clearly defined in legislation. However, administrative processes, such as confirming ownership or registering notarial long-term leases with the deeds office, can add procedural steps. While the One-Stop-Shop and defined frameworks aim to shorten timelines, in practice political and bureaucratic complexities have sometimes delayed project approvals and slowed the effective uptake of incentives.

The SEZ programme implementation enabled significant mobilisation of private capital. Publicly funded port and industrial infrastructure in Coega created the conditions for private investment, with around R 30 billion (EUR 1.5 billion) committed by investors. Accelerated depreciation amplified this mobilisation effect by lowering the after-tax cost of constructing facilities, making large projects more financially viable. In this

way, fiscal incentives complemented public infrastructure spending, together catalysing greater private participation.

Replicability and scalability conditions

The conditions for domestic and international replicability and scalability hinge on coherent policy alignment, institutional capacity, and infrastructure readiness. Alignment with national strategies such as South Africa's National Industrial Policy Framework 1, National Development Plan 2, and Industrial Policy Action Plan 3 ensures that the measure contributes to broader development priorities. Transparent eligibility criteria, effective monitoring, and co-ordination between SEZ operators, investors, and tax authorities sustain investor confidence and fiscal discipline. Infrastructure availability and efficient governance are prerequisites for replication, as they enable firms to realise the full benefit of accelerated capital recovery.

The scalability of accelerated depreciation depends on macroeconomic stability, policy predictability, and the strength of complementary competitiveness factors. Investor surveys consistently show that tax incentives rank relatively low among the main determinants of investment decisions compared to factors such as economic and political stability, currency volatility, market size, skilled labour availability, and the transparency of the legal framework. This suggests that accelerated depreciation can be a useful supporting measure but cannot compensate for structural weaknesses in the broader business environment. Countries seeking to replicate the instrument should therefore focus on maintaining a stable macroeconomic context and transparent governance structures. The measure is most effective when combined with complementary incentives such as corporate tax reductions, labour cost relief, and customs facilitation. Over-reliance on fiscal tools without improving the enabling environment may limit effectiveness. When implemented within a predictable regulatory framework and supported by economic stability, accelerated depreciation can attract productive investment, support industrial diversification, and promote sustainable long-term growth.

Case study 2: CCfD scheme - German Federal Ministry for Economic Affairs and Energy (BMWE) (instrument E.2. Carbon Contracts for Difference)

Instrument - theoretical concept

Germany's Carbon Contracts for Difference (CCfDs) are long-term bilateral agreements between the federal government and industrial emitters, designed to support the deployment of capital intensive, low-carbon technologies in emissions intensive sectors. The instrument aims to close the viability gap between conventional fossil-based production and climate neutral alternatives by guaranteeing a fixed strike price for each tonne of CO_2 abated over a 15-year contract period.

Under the CCfD mechanism, if the prevailing carbon price under the EU Emissions Trading System (EU ETS) falls below the strike price, the government pays the difference; if the market price exceeds it, the beneficiary returns the surplus. This structure hedges against carbon price volatility and provides the long-term revenue certainty needed to advance early mover investments in clean technologies.

Contracts are awarded through competitive tenders. Participation is restricted to projects that meet pre-defined eligibility thresholds, including emissions baseline and mitigation potential, technological maturity, and financial scale. Bids are evaluated using a composite score that rewards both cost efficiency (EUR per tonne of CO_2 avoided) and early emissions impact, with awards made until the available budget is fully

allocated. The programme is funded through the Climate and Transformation Fund with two bidding rounds planned annually by the Federal Ministry for Economic Affairs and Energy (BMWE).[7]

The policy objective of CCfDs extends beyond individual project economics. They are intended to catalyse systemic industrial decarbonisation by enabling the first wave of deep decarbonisation projects and accelerating the emergence of a CO_2 product economy in Germany and the EU. By mitigating both investment and market risks, particularly the uncertainty around future CO_2 prices, which discourages capital formation, CCfDs enable industrial operators to move beyond pilot stages and into commercial deployment. According to BMWE projections, the instrument is expected to reduce emissions in the German industrial sector by approximately 350 Mt CO_2 by 2045, corresponding to an average annual reduction of 18 Mt CO_2. This projected annual reduction represents around 10% of current annual German's industrial emissions and roughly 3% of current national emissions.

The implementation of CCfD involves several key actors with distinct roles:

- **Government authority:** Federal Ministry for Economic Affairs and Energy (BMWE)
- **Administrator:** German Emissions Trading Authority (DEHSt), part of the Federal Environment Agency (UBA)
- **Funding source:** Climate and Transformation Fund (KTF), Germany
- **Beneficiaries:** Industrial companies in hard-to-abate sectors such as chemicals, metals, cement, glass, and paper
- **Flow:** 15-year symmetric payment contracts linked to verified emissions reductions and carbon market reference prices

The CCfD scheme is characterised by several important advantages. First, it provides long term investment certainty for capital intensive, low carbon technologies by guaranteeing a stable revenue stream for each tonne of verified CO_2 abated. This price guarantee reduces exposure to carbon market volatility, enabling firms to plan and commit capital over a 15-year horizon. Second, the scheme promotes the first-of-a-kind deployment of technologies with high marginal abatement costs, such as hydrogen production, electric cracking, or large-scale heat pumps, by covering the gap between their operating costs and those of fossil-based incumbents. Importantly, the instrument supports industry decarbonisation without necessarily requiring direct capital expenditure (CAPEX) subsidies. Instead, it addresses the operational expenditure (OPEX) gap, allowing projects with already secured equity or concessional debt financing to reach final investment decision while maintaining competitive neutrality across markets.

However, the scheme presents several challenges. The application process is complex and resource intensive, requiring applicants to submit detailed techno-economic models, life cycle assessments, and emissions reduction forecasts as part of the bidding documentation. This can limit access for smaller firms or less mature projects. A robust Monitoring, Reporting and Verification (MRV) framework is also required to track annual CO_2 abatement and condition disbursements on verified outcomes, necessitating standardised protocols and sufficient third-party auditing capacity. In parallel, the public sector must have the institutional capacity to assess the cost effectiveness of bids across diverse industrial sectors, each with different baselines, maturity levels, and abatement potentials. Without clear benchmarking methodologies and technical expertise, there is a risk of inefficiencies or misallocation of funds.

Examples of supported projects

In March 2024, BMWE awarded 15 CCfDs contracts to industry decarbonisation projects across Germany, with a total funding envelope of up to EUR 4 billion from KTF. These projects are expected to deliver over 21 million tonnes of CO_2 savings over their 15-year contract terms. The selected projects cover multiple

[7] Formerly the Federal Ministry for Economic Affairs and Climate Action (BMWK).

sectors including chemicals, steel, non-ferrous metals, paper, glass, and food processing, and employ a range of technologies such as electrification, clean hydrogen, carbon capture and utilisation (CCU), industrial scale heat pumps, and biogenic feedstocks.

Contracts were awarded through a competitive bidding process, open only to projects that passed a pre-qualification phase. Minimum eligibility criteria included: (i) ≥10 000 tonnes CO_2e/year baseline emissions, (ii) ≥60% emissions reduction by year three, (iii) ≥90% technical reduction potential by year fifteen, (iv) a minimum funding volume of EUR 15 million, and (v) technological maturity (TRL ≥7) and implementation readiness. Eligible bids were scored based on cost efficiency (EUR per tonne CO_2 avoided) and total emissions reductions achieved in the first five years of operation.

The strike prices, i.e. the average abatement cost per tonne submitted by project developers, have not been published in detail. However, BMWE has indicated that the average awarded strike prices were significantly above current EU ETS levels, which fluctuated between EUR 60 and 90 per tonne during the 2023-24 period. This reflects the high operational and capital costs of the technologies supported.

According to BMWE projections, the CCfD programme aims to achieve around 350 million tonnes of CO_2 reductions by 2045, implying that future tender rounds will need to support 10 to 15 times the emissions volume covered in the first call. To this end, BMWE plans to hold two bidding rounds annually, with further funding tranches expected via the KTF.

Examples of supported projects include:

BASF SE - Industrial heat pump for CO_2 free steam production:

- **Location:** Ludwigshafen, Germany
- **Sector:** Chemicals
- **Technology:** high temperature heat pump powered by electricity from renewable energy for steam generation, 500,000 metric ton of steam per year production capacity, mainly used for formic acid production
- **Emissions impact**: avoidance of up to 100,000 tonnes of CO_2 emissions per year across BASF's Ludwigshafen site, with a 98% reduction in greenhouse gas emissions from the formic acid production process
- **CCfD funding:** up to EUR 310 million, construction to be started in 2025

Nordenham Metall GmbH (Glencore) - Fossil fuel substitution in lead smelting:

- **Location:** Nordenham, Lower Saxony, Germany
- **Sector:** non-ferrous metals, lead smelting
- **Technology:** replacement of coal, heating oil, heavy fuel oil and natural gas with biochar and renewable hydrogen
- **Emissions impact:** avoidance of up to 900,000 tonnes of CO_2 emissions
- **CCfD funding:** up to EUR 360 million

Impact of the solution on the projects

The CCfD mechanism offers several advantages over conventional financing models. It reduces cost related risks linked to carbon price volatility, a common barrier to investment in low carbon technologies with elevated operational expenditure. By guaranteeing a fixed strike price per tonne of CO_2 abated, the mechanism stabilises project revenues and strengthens the bankability of capital-intensive decarbonisation investments. The strike price reflects the full cost differential, including both capital and operating expenditure, between the low-carbon process and its conventional counterpart. Payments are made when the EU ETS price falls below the strike price; conversely, beneficiaries reimburse the surplus

if the market price exceeds it. This symmetrical design ensures predictability while avoiding overcompensation. Because support is linked to verified emissions reductions rather than output volumes or prices, the instrument minimises market distortion, enabling decarbonised products to compete on equal terms.

In terms of business model transformation and financing access, CCfDs enhance the economic viability of industry decarbonisation by stabilising abatement related cash flows. This enables companies to advance investments in technologies that lack established commercial precedents. For corporates such as BASF and Glencore, the CCfD played a key role in enabling internal investment approval processes and advancing projects toward implementation.

Complementary enabling conditions play an important role in maximising the impact of CCfDs. Access to competitively priced renewable electricity and hydrogen helps narrow the cost gap between low carbon and conventional production, reducing the required level of state support and expanding the number of projects that can be funded under a fixed budget envelope. Availability of enabling infrastructure, such as hydrogen pipelines, CO_2 transport networks, and biochar logistics, reduces implementation risk and supports timely deployment. Regulatory clarity over the 15-year contract period and beyond is of high importance, particularly with respect to carbon pricing mechanisms. While CCfDs are currently linked to the EU ETS, any future transition to an alternative pricing system would need to preserve transparency and compatibility with the contractual structure. Finally, legal certainty on state aid rules is required to ensure enforceability over the contract term, either through long term stability or through effective grandfathering provisions.

Lessons learnt

Germany's first CCfD tender was completed in less than 12 months from announcement to award, demonstrating implementation effectiveness. However, participation was primarily limited to large industrial companies, such as BASF and Glencore, with the internal capacity to manage complex technical and legal documentation, or the resources to outsource bid preparation. Applicants were required to submit detailed modelling of cost structures, emissions profiles, and abatement pathways. Projects already at an advanced stage of development were better positioned to meet these requirements. While the BMWE has not signalled changes to the eligibility framework, it has committed to holding regular tenders twice per year, providing additional time for less mature actors to prepare and enter future rounds.

The project preparation timeline was particularly extended for first-of-a-kind technologies, given the level of documentation and modelling required. Nevertheless, securing a CCfD contract significantly enhanced project bankability, facilitating internal investment decisions and unlocking complementary co-financing.

CCfDs contributed to the mobilisation of private capital across all awarded projects. Examples include BASF's heat pump and Glencore's hydrogen-based smelting upgrade, both of which were financed through corporate balance sheets. In addition, CCfDs can be combined with other public support instruments, such as capital grants or concessional loans, provided compliance with EU state aid rules is maintained. This indicates that performance-based support under CCfDs is complementary to, rather than a substitute for, upfront public financing.

The 15-year contracts are structured with annual disbursements, conditional on the achievement of pre-agreed CO_2 reductions. Verification is carried out through standardised MRV systems, aligned with EU ETS protocols. This performance-based structure ensures that public funds are disbursed only against verified outcomes, reinforcing transparency and accountability.

Replicability and scalability conditions

Replicability and scalability of the CCfD mechanism depend on several enabling conditions. First, a functioning and sufficiently incentivising carbon price mechanism, such as an emissions trading system (e.g. EU ETS), is essential to limit the fiscal cost of the scheme. A higher market price reduces the difference between the strike price and the reference price, thereby lowering the level of public support required and increasing the budgetary efficiency of the instrument. Second, the legal authority to enter into long term contracts between public institutions and industrial operators is critical. This requires compliance with applicable procurement frameworks, appropriate budgetary safeguards, and clear state aid approvals to ensure enforceability throughout the contract term. Third, strong institutional capacity is necessary to design, implement, and monitor CCfD programmes. This includes the ability to conduct transparent and competitive tenders, evaluate proposals based on cost and impact, and administer annual performance-based payments over a 15-year period. Finally, robust sectoral knowledge is important to benchmark abatement costs and emissions baselines across industries. Although the evaluation framework is formally sector agnostic, credible reference scenarios require sector specific assumptions to ensure that selected projects deliver additional and cost-effective emissions reductions beyond business-as-usual trajectories.

Case study 3: The H2Global mechanism (instrument E.2. Carbon Contracts for Difference)

Instrument - theoretical concept

The H2Global mechanism facilitates the creation and scale-up of a hydrogen market. As a public-private initiative that started in Germany in 2020, the implementation and further development of H2Global is carried out by the non-profit H2Global Foundation (OECD, 2023). An intermediary company, Hintco GmbH, trades hydrogen and its derivatives via a double auction mechanism. Hintco stimulates clean energy markets by securing production of clean fuels through long term purchase agreements (~10 years) and selling via short-term contracts (e.g., 1 year) (OECD, 2025). Individual funding tenders are defined by the product, contract duration and geographical scope (H2Global Stiftung, 2025). The specification of the design elements is at the discretion of the funding body that provides compensation payments and developed in collaboration with the intermediary (OECD, 2025).

Similar to the Contracts for Difference (CfD) approach, the potential difference between supply prices and demand prices is covered by Hintco with grants from a public or philanthropic funding body (OECD, 2025). Overall, the mechanism reduces barriers to market entry through the efficient allocation of resources via the double-auction scheme (H2Global Stiftung, 2025). In addition, it boosts investor confidence within the clean fuel market irrespective of the uncertainty around the real value of low-carbon products and risks associated with the reliability of the current carbon accreditation process (OECD, 2023).

Examples of supported project description

On the supply side, the first renewable ammonia project, led by Fertiglobe in Egypt, has been awarded in 2024. Fertiglobe will produce renewable ammonia that will be exported to Europe via the port of Rotterdam from 2027 (H2Global Stiftung, 2025). On the demand side, the first tenders are expected in 2026. To date, EUR 5.86 bn have been committed or earmarked to Hintco, from Australia, Canada, Germany and the Netherlands. In addition, H2Global has signed a Memorandum of Understanding (MoU) with Hydrogen Oman (Hydrom) to explore how the innovative, market-based H2Global mechanism can support Oman's national hydrogen strategy (H2Global Stiftung, 2025).

Impact of the solution on the project

Unique characteristics of the mechanism include its coverage of the whole value chain, from the production to consumption of hydrogen, and flexibility to off takers by ensuring access to large volumes of product and enhancing regulatory certainty through the standardisation of the contracts (H2Global Stiftung, 2025). The auctions provide consistent trade flows and liquidity – both essential for healthy market development. The instrument provides first-movers an opportunity to generate long-term offtake contracts and helps them build a business case for the technology by providing investment certainty across hydrogen supply chains (OECD, 2023).

Lessons learnt

Long-term purchase agreements can unlock a Final Investment Decision for large-scale clean fuels production facilities, benefitting from economies of scale and competitive prices. Sharing insights from the auction process, Hintco stated that regulatory uncertainties (e.g. on the interpretation of EU Delegated Acts and the import of derivatives from outside Europe) pose a challenge for viable project development, especially for e-SAF. Access to port infrastructure was identified as a challenge for many bidders (Hintco, 2024[70]). Hintco aims to overcome any bottlenecks through contractual arrangements.

For future funding rounds, Hintco aims to further improve resource and risk efficiency building on the lessons from the pilot auction. The modular approach, the flexibility to align with short-term supply-demand balance and the financial robustness of the structure makes the H2Global initiative a ready-to-scale-up solution for wider market adoption for renewable hydrogen and its derivatives (OECD, 2023).

Replicability and scalability conditions

The instrument can be applied to other hydrogen and clean fuel markets (e.g. shipping) or low-carbon technologies such as green steel. H2Global is being offered as an implementation instrument for the European Hydrogen Bank. Since 2023, the governments of Australia, Canada and the Netherlands have committed to joint auctions with Germany, and Germany has funded a new round of tenders with four regional lots to support diversification. IFIs are also looking at leveraging the instrument to support decarbonisation.

Case study 4: CO2 Removal Certificates - Puro (instrument E.4. Carbon Credits)

Instrument - theoretical concept

CO_2 Removal Certificates can be sold in carbon markets or bilaterally to promote revenue of carbon dioxide removal (OECD/Climate Club, 2025[71]). Puro.earth is a carbon-crediting platform for engineered carbon removal solutions (OECD/Climate Club, 2025[71]). Puro.earth certifies projects from CO_2 Removal suppliers based on an in-house standard (OECD/Climate Club, 2025[71]). The Puro Standard process includes a three-step method. Step 1 includes a comprehensive and technical set of guidelines and procedures for a specific carbon removal method to be eligible for credits (Cordonnier and Saygin, 2023[12]). Step 2 includes independent verification of the results of the lifecycle analysis and other evidence to ensure the carbon removal process is carried out in accordance with the Puro Standard (Cordonnier and Saygin, 2023[12]). Step 3 includes issuance of the CORC in Puro's registry (Cordonnier and Saygin, 2023[12]). Currently, Puro's removal methodologies are limited to Biochar, Carbonated Building Elements, Geologically Stored Carbon, Enhanced Rock Weathering and Woody Biomass Burial (Cordonnier and Saygin, 2023[12]). In addition, to Puro there are multiple carbon crediting platforms with several international standards and methodologies.

Examples of supported project description

NetZero is a French company founded in 2021 and is one of the 38 carbon removal suppliers today identified in Puro.earth's CORC suppliers listing (OECD/Climate Club, 2025[71]). They extract carbon to producer biochar while also generating electricity surplus in the process (OECD/Climate Club, 2025[71]).

NetZero develops projects EMDEs, particularly in tropical zones where there is a market for biochar (OECD/Climate Club, 2025[71]). Biochar is sold locally to farmers and agricultural companies as a soil amendment that improves water and nutririent retention and reduces the need for fetiliser use (Cordonnier and Saygin, 2023[12]). The surplus electricity is dispatchable and renewable and sold locally. NetZero has a full-scale plant in Cameroon, which is a large coffee-processing plant and in Brazil, which uses waste products of coffee to produce up to 4.5 kt of biochar per year (Cordonnier and Saygin, 2023[12]). NetZero will expand its operation with the construction of a third plant in Brazil (Cordonnier and Saygin, 2023[12]).

Impact of the solution on the project

CORCs help create profits for the project behind NetZero (OECD/Climate Club, 2025[71]). In April 2022, NetZero was selected by the Musk Foundation as one of the 15 milestone winners in the XPRIZE Carbon Removal competition. NetZero's policy is to provide CORCs only to companies with credible net-zero roadmaps, for instance meeting the criteria set by the Science Based Targets initiative (Cordonnier and Saygin, 2023[12]). NetZero relies on the recognition of its high-quality CDR to sell carbon credits at a price range of EUR 150-200 per ton of CO_2 (Cordonnier and Saygin, 2023[12]). Puro.earth covers the certification costs and gets a fee on transaction fees when volumes are exchanged (Cordonnier and Saygin, 2023[12]).

Lessons Learnt

CORCs can neutralise residual emissions and support their own net-zero claims (OECD/Climate Club, 2025[71]). Despite a limited track record because Puro was a new certification standard, the robustness of the certification methodology of high-permanence carbon removal projects with measurable processes ensured its success and investment from buyers (Cordonnier and Saygin, 2023[12]).

Replicability and scalability conditions

Replicable but contingent on enabling conditions needed to foster high quality CDR solutions (OECD/Climate Club, 2025[71]). Liquid markets for carbon credits would provide more transparent pricing information to the various grades of CDRs (OECD/Climate Club, 2025[71]). This can include price-management instruments such as derivatives, which could lead to better risk management for buyers (Cordonnier and Saygin, 2023[12]). Transparency on tax regulations are also necessary to help investors establish viable business plans (OECD/Climate Club, 2025[71]). Government roadmaps including sectoral emissions and compensation targets are complimentary and needed provide long-term views on carbon demand (OECD/Climate Club, 2025[71]).

Case study 5: Foundation myclimate renewable heat programme (instrument E.4. Carbon Credits)

Instrument - theoretical concept

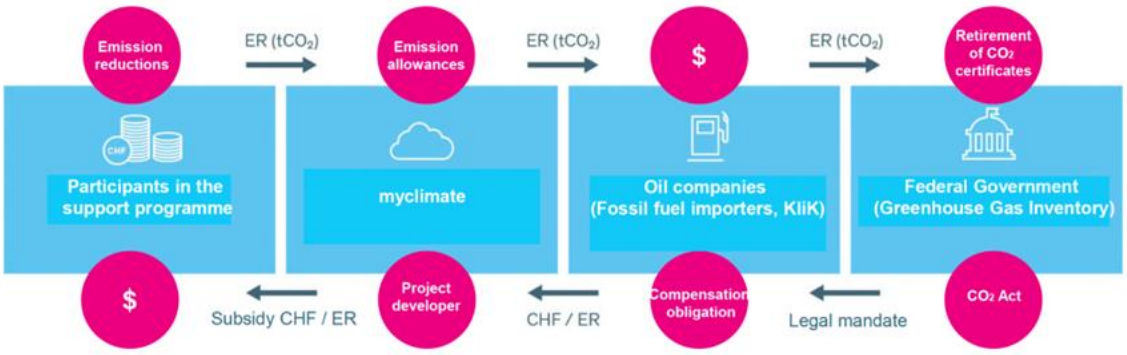
The renewable heat programme, developed and run by Foundation myclimate and co-financed by the KliK Foundation, aims to decarbonise industrial heat by replacing fossil-based systems with renewable technologies such as large-scale heat pumps, wood boilers, or thermal networks across Switzerland. These systems typically supply heat in the range of 60 °C to 120 °C, suitable for applications such as

drying, pasteurisation, or vegetable production. The subsidy is structured around the issuance and sale of CO_2 emission reduction credits, certified by the Swiss Federal Office for the Environment (FOEN).

Eligible projects must be pre-registered and demonstrate additionality, meaning they would not proceed without the incentive. Once operational, systems are metered continuously, with annual monitoring reports verified by independent auditors. FOEN certifies the resulting emission reductions, calculated as the difference from a fossil baseline. myclimate sells these credits to the KliK Foundation under a multi-year fixed price offtake agreement, valid through 2030 in line with the Swiss CO_2 Act.

Revenues from credit sales are used to pay performance-based subsidies to project owners, proportional to verified annual CO_2 reductions. The agreement also covers programme development and certification costs. As funding originates from a statutory surcharge on fossil fuel imports, support is only disbursed once measurable climate impact is delivered, linking market-based funds to verified decarbonisation outcomes.

Figure A A.1. Anchors, financial and contractual flow scheme



The programme involves a set of actors:

- MyClimate serves as programme developer and credit seller, managing registration, Monitoring, Reporting, and Verification (MRV), and co-ordinates external audits. Emission reductions are certified by FOEN and credits sold to KliK under a fixed-price agreement uniform across technologies. Only technologies that meet the additionality criteria are eligible.
- Certified engineering consultants, selected through strict quality criteria, support project preparation, feasibility studies, and technical compliance.
- Project owners are industrial firms switching from fossil fuels (gas, oil, propane) to renewable heat. They must register prior to investment and cannot benefit from overlapping public subsidies.
- KliK Foundation acts as credit buyer and represents Swiss motor fuel importers subject to the CO_2 Act's compensation obligation. Funds are raised through a surcharge on fossil fuel imports and used to purchase FOEN-certified credits, supporting the operating costs of renewable heat systems. KliK does not finance CAPEX directly.

The programme is anchored in a regulated market mechanism. Within the Swiss compliance carbon market, fossil fuel importers must offset part of their emissions by purchasing certified credits. This regulatory framework ensures stable demand. The subsidy is strictly results-based, reinforcing the link between funding and verified impact. Only projects that are not legally required and financially unviable

without support are eligible. This ensures that resources are directed to transformative projects, not business-as-usual improvements.

The instrument offers several key advantages. First, it mobilises market-based finance by generating a predictable revenue stream from credit sales, strengthening the business case for renewable heat. Originally piloted in greenhouses, the model is applicable across sectors such as food processing, light industry, and materials handling. Second, it supports robust MRV and environmental integrity through continuous metering and FOEN certification. Third, the scheme is technology neutral, enabling firms to choose context appropriate solutions.

Nonetheless, several challenges limit broader uptake. A key constraint is the high cost per tonne of CO_2 abated, driven by the capital intensity of industrial heating technologies, particularly for high capacity or bespoke systems. In many cases, even with operational savings, the payback period remains unattractive without subsidy. There is also uncertainty beyond 2030, when the current Swiss CO_2 Act, and with it the KliK Foundation's mandate, is due to expire. This creates a planning risk for investors evaluating multi-year projects. Finally, awareness and capacity among potential project sponsors remain low, particularly in small and medium-sized enterprises. To address this, myclimate and certified partners engage through sector events and industry associations to build pipeline quality and promote uptake.

Examples of supported projects

The subsidy mechanism was first implemented in the greenhouse sector and has since been extended to broader industrial applications. Both programmes follow the same structure: FOEN-certified credits and a fixed-price offtake with KliK but differ in maturity and target sectors. While the greenhouse programme has more registered projects and disbursements, the industrial programme builds on the same model to support decarbonisation in manufacturing and light industry.

The industrial programme targets high performance renewable heat systems sized between 100 kW to 3 MW and covering process temperatures between 60 °C and 120 °C. Relevant applications include wood drying, pasteurisation, cleaning, and low temperature steam generation in sectors such as timber, food, chemicals, and pharmaceuticals. Technologies include high-temperature heat pumps, biomass boilers, and hybrid systems.

As of mid-2025, most operational data available refers to the greenhouse programme:

- **Programme duration:** 2021-30 (aligned with the current Swiss CO_2 Act)
- **Projects registered:** 112
- **Projects supported:** 16
- **Disbursed budget to date:** CHF 1 million (approx. USD 1.3 million), with a projected total investment of up to CHF 12 million (USD 15 million) by 2030
- **Estimated CO_2 abatement:** 0.1 million tonnes
- **Country:** Switzerland
- **Target sectors:** Initially greenhouse horticulture; now expanding to food, chemicals, wood processing, and other light industrial sectors.

A representative case from the industrial programme is the project implemented by Balteschwiler SA, a wood processing firm based in Laufenburg, Canton Aargau. The company replaced its fossil fuel heating system, previously consuming around 30 000 litres of mazut annually, with a modular air-water heat pump system consisting of three units of 40 kW each, totalling 120 kW thermal capacity. The heat pump now provides low emission heat for a large volume production hall. As the site is located in a groundwater protection zone, geothermal energy was not viable, making air-source heat pumps the only technically acceptable renewable alternative. The installation is expected to yield annual CO_2 savings of

approximately 79 tonnes, verified under the programme's MRV and FOEN crediting process. This project exemplifies the growing potential of the industrial heat programme to decarbonise process energy demand in technically constrained yet emissions intensive sectors.

Impact of the solution on the projects

Compared to conventional financing, the programme introduces a results-based funding mechanism that strengthens the investment case for renewable heat. Projects receive no upfront capital subsidy; they are financed through conventional means or company capex, while the subsidy is paid only after verified CO_2 reductions have been certified by FOEN. The resulting carbon credit revenue stream acts as a supplementary cash flow that improves the internal rate of return, especially for projects that would otherwise be economically marginal or non-viable.

The programme benefits from a strong regulatory foundation under the Swiss CO_2 Act, which provides legal certainty for the compensation obligation until 2030. While there is policy uncertainty beyond that date, it is broadly expected that some form of offset requirement will continue, given that Switzerland is unlikely to meet its emission reduction targets without such measures. In the meantime, the fixed-price offtake agreement with KliK, underpinned by statutory obligations on fossil fuel importers, provides stable support for project developers over a five-year timeframe.

On the business model side, the subsidy improves, but does not fully close, the economic gap between fossil-based and renewable heat systems. Large, high-temperature industrial heat pumps remain more expensive than fossil alternatives, even after support. The financing solution is only effective if the subsidy covers a significant share of total investment costs, with a minimum threshold of around 10% to achieve material impact. A key factor influencing bankability is the carbon credit price mechanism. While the purchase price is fixed and uniform across all projects, it reflects a balance between project costs and the willingness of fossil fuel importers (via KliK) to pay, subject to a regulated ceiling. The maximum price is capped at CHF 160 per tonne of CO_2, corresponding to the penalty importers would face if they failed to meet their compensation obligations with domestic credits. Within this structure, the combination of FOEN certification and a multi-year credit purchase agreement with KliK helps reduce revenue uncertainty, making projects more bankable for both internal investment committees and external financiers. To prevent double counting, project owners may communicate their use of renewable heat systems but may not claim the associated CO_2 reductions once the credits are transferred to KliK.

Enabling conditions will remain important to sustain and scale the programme. The long-term effectiveness depends on regulatory clarity beyond 2030, when the current Swiss CO_2 Act expires. In parallel, technical capacity and market awareness remain low, particularly among SMEs. Continued engagement by myclimate and certified engineering partners, through industry events, associations, and targeted outreach, will be essential to build trust, develop project pipelines, and support broader deployment.

Lessons learnt

The programme has demonstrated early effectiveness in decarbonising thermal energy use, particularly in the greenhouse sector, with 16 projects already supported and over 100 registered. While broader industrial deployment is still at an early stage, the same subsidy mechanism is now being applied to other sectors, signalling a pathway for expansion.

Project preparation entails some administrative burden, notably due to the requirement for pre-registration and detailed feasibility studies, often carried out by certified engineering consultants. Nonetheless, this has not significantly delayed implementation, as the procurement and installation of heating systems typically involve long lead times regardless.

While the programme does not mobilise public funds directly, it plays a catalytic role in private investment by narrowing the cost gap between fossil and renewable heat. By providing a predictable, performance-based subsidy, paid only after verified CO_2 reductions, it improves project economics for installations that would otherwise remain financially out of reach. This approach enables companies to proceed with investments that align with long-term decarbonisation goals.

Use of funds is fully results-based: disbursements only occur after renewable heat production has been metered, monitored, verified, and certified by FOEN. This structure ensures that climate finance is directly tied to measured emissions reductions, and that subsidy payments reflect actual performance rather than projections.

Replicability and scalability conditions

The replicability of the Swiss renewable heat subsidy model depends primarily on the existence of a credible compliance carbon market. The mechanism is anchored in a legally binding national offset obligation under the Swiss CO_2 Act, which requires fossil fuel importers to compensate for a share of their emissions through the purchase of domestic credits. Replication in other jurisdictions would require a similar regulatory foundation, ensuring a stable source of demand for emission reduction certificates. An established MRV infrastructure is also critical. The programme's credibility relies on precise metering of heat consumption, annual third-party verification, and FOEN certification of CO_2 savings. This level of rigour may be challenging to replicate in markets where institutional or technical capacities are limited. Sector-specific engagement is another key enabler. Effective rollout requires the mobilisation of qualified engineering consultants and the involvement of industry associations to identify suitable project pipelines, support technical preparation, and promote awareness, particularly among SMEs that lack in-house capacity to evaluate or implement renewable heat technologies.

The renewable heat subsidy programme developed by myclimate and co-financed through credit purchases by the KliK Foundation presents a compelling model for leveraging domestic carbon market instruments to support industry decarbonisation. Although still in early stages for broader industrial heat applications, the programme demonstrates how results-based financing, high-quality MRV, and regulatory alignment can be combined to close the economic gap for renewable heat investments. Its design offers a robust and transferable blueprint for other jurisdictions equipped with compliance carbon markets and the technical infrastructure to support verified emissions reductions.

Case study 6: European Union Emission Trading Scheme (EU-ETS) (instrument E.5. Emission Trading Schemes)

Instrument - theoretical concept

An ETS sets a fixed limit (cap) on the total greenhouse gas emissions allowed in one or more sectors of the economy, while enabling the trading of allowances or permits. Each allowance and permit express the amount of pollution companies can release. The cap on emission production is reduced each year. Companies may be allocated a certain number of free allowances that gradually decrease over time, based on benchmarks specific to sectors and products (OECD/Climate Club, 2025[71]). Firms with surplus allowances can sell them to others while those emitting more than their allocated quota must purchase additional allowances from companies emitting less than their limits (OECD/Climate Club, 2025[71]).

On a yearly basis companies must monitor and report emissions and surrender enough allowances, and failure to do such results in fines (European Union, 2025[72]). The price of allowances in the EU carbon market is determined by supply and demand but is subject to strict oversight rules (European Union, 2025[72]). These include limits on market power to prevent price distortions, continuous market surveillance

to detect unfair practices such as market manipulation, and strict penalties for misconduct such as fraud, and or insider trading of allowances (European Commission, 2025[73]) This increases transparency around companies' yearly emission levels.

The EU-ETS aims to generate revenues from emissions in order to finance the green transition and promote clean technology investments (European Union, 2025[72]). Revenue is generated through auctions where allowances are predominantly sold (European Union, 2025[72]). Between 2020 and 2023, the EU ETS raised over EUR 33 billion (European Union, 2025[74]). Revenues flow to national budgets and member states in order to contribute to investments for the green transition (European Union, 2025[72]). Also, a portion of the EU-ETS revenue supports low-carbon innovation through the EU Innovation Fund and the Modernisation Fund (European Union, 2025[72]). The EU innovation fund invests in projects spanning across hydrogen, battery storage, solar, wind and carbon capture, utilisation, and storage (CCUS).

Examples of supported project/ project description

Table A A.1. Phases of EU-ETS implementation

Phase 2005-2007	Phase 2 (2008-2012)	Phase 3 (2013-2020)	Phase 4 (2021-2030)
"Learning" phase of the platform Only CO_2 emissions from power generation and energy intensive industries Almost all allowances are allocated for free	Aviation sector is included 90% proportion of free allocations 2008 economic crisis led to allowance surplus, pushing down the carbon price	EU-wide emissions cap replaced national caps Auctioning becomes default allowance allocation method (57%) Funding set aside for deployment of innovative technology	Overall number of allowances to reduce at a higher annual rate (2.2%) Some sectors vulnerable to carbon leakage will continue to receive free allowances but for non-leakage sectors there is a planned phase out of free allowances. For sectors covered under CBAM free allowances will be phased out. This includes cement, iron and steel, aluminium, fertilisers, electricity and hydrogen

Currently the EU-ETS shows measured alignment with overarching climate and innovation policies like the EU green deal (European Union, 2025[72]). As of 2025, under the current phase, the maritime shipping sector is covered in terms of CO_2 from large vessels and the phase introduced the ETS 2, a new carbon pricing system designed to target fuel combustion in buildings, road transport, and small industries (European Union, 2025[75]). All phases of the EU-ETS implementation are highlighted in Table A A.1. .

Impact of the solution on the project

A direct implication of the EU-ETS programme, the drop in emissions within the power and industrial sectors. By 2023 the EU-ETS has contributed to emission reductions within power and industry plants by 47% (in comparison to 2005 levels) (European Union, 2025[74]). Yet, the industry sector emissions levels have modestly dropped in comparison to the power sector because of free allowances and technical barriers associated with decarbonisation (European Central Bank, 2024[76]). This is partly due to the number of free allocations that protect emission intensive industries from high carbon costs that could impact production competitiveness.

In phase 1 and 2 of the programme the industry sector received up to 100-80% of free allowances which contributed to surplus allowances and as a result lowered carbon prices which deters incentives to reduce emissions (European Central Bank, 2024[76]). Currently, the EU-ETS is removing free allowances for non-

leakage sectors that currently exist in the current phase of the programme that targets sectors exposed to carbon leakage sector. While sectors like cement and iron and steel still receive free allowances allowing them to only be exposed to costs for emissions above the benchmark to prevent the sector from losing competitiveness abroad. The 2026 phase out of free emission allowances will increase the financial pressure on the industry sector and raise emission costs which will limit the ability to invest in clean technologies needed for decarbonisation (European Central Bank, 2024[76]). The removal of allowances due to the Carbon Border Adjustment Mechanism that ensures imports of goods face the same carbon price as EU producers to prevent carbon leakage without providing free allowances. This will protect the competitiveness of industrial companies while incentivising emission reduction. An indirect implication of the EU-ETS shows that auction revenues help fund climate and energy initiatives, including the expansion of renewable energy, improvements in energy efficiency, and support for green innovation. Revenue generated can be earmarked to supports the uptake of low carbon technologies. For instance, the Heidelberg Materials' GeZero Project secured EUR 191 million from the EU innovation fund to capture and store 700 000 tonnes of CO_2 annually from 2029 onwards at a cement production site (Heidelberg Materials, 2023[77]).

Lessons Learnt

Key lessons from the EU-ETS demonstrate that cap-and-trade systems can drive real and timely emissions reductions, but this effectiveness hinges on a steadily tightening emissions cap and the re-investments of returns on investments in low-carbon innovation. A gradual reduction in the number of creates a stable environment in which industries can adapt to and meet emission reduction requirements, which ultimately encourages investments in low-carbon technologies (Financial Times, 2024[78]). In addition, reinvesting EU ETS revenues into low-carbon innovation via public instruments such as the EU Innovation Fund, creates a positive funding cycle is reinforced. This provides project-level benefits and driving emission reductions in energy-intensive industries and more specifically within plants themselves.

To further ensure emissions within the industry sector are decreasing a key lesson from the programmes shows that free allowances create boost surpluses of allowances and keep carbon prices relatively low. To combat this, market stability reserve (MSR) aims to respond to the large surplus of allowances built up by the system in accordance with redefined thresholds of the 'total number of allowances in circulation' (TNAC) (European Union, 2025[79]). If the threshold is above 822 million allowances then 4% of the surplus is withdrawn from future auctions and placed into the MSR, if it is below 400 million allowances then 100 million allowances are released *from* the MSR back into the market (European Union, 2025[79]). In addition, any allowances in the MSR above the previous year's auction volume are considered invalid (European Union, 2025[79]).

Replicability and scalability conditions

Several carbon trading platforms exist proving the replication and scalability of the EU-ETS. Three examples include the Republic of Korea K-ETS, the United Kingdom (UK) UK ETS and Canada's Federal Output-Based Pricing Systems (OBPS). These three cap-and-trade programmes are explained in detail Table A A.2. Examples of emissions trading systems.

Table A A.2. Examples of emissions trading systems

Country	Date of implementation	Sectors Covered	Availability of allowances	Revenue usage
Republic of Korea K-ETS	2015	Power and non-power sectors	Paid allocation allowances are provided through auctions, while free allocation allowances that are provided are based on carbon intensity and trade intensity	Climate mitigation, low-carbon innovation and climate transition justice
United Kingdom ETS	2021	Power industrial and aviation	Auctioned allowances make up 50–55% of the cap. Industry allowances account for 40% of the cap. 2-5% of allowances are applicable for New Entrants Reserve (NERs).	General budget and debt reduction
Canada Output-Based Pricing System (OBPS)	2020	Emissions-intensive and trade-exposed (EITE) sectors	Output-based allocation with no lump sum of allowances up front. Carbon pricing is only applicable to sectors with emissions exceeding the established benchmarks/ over 50 000 tCO_2-eq/year. Free allocation is linked to production.	N/A

Source: (International Carbon Action Partnership, 2025[80]; Government of the United Kingdom, 2025[81]; Government of Canada, 2025[82]; Republic of Korea, Ministry of Climate, Energy and Environment, 2025[83]).

Case study 7: EPR Schemes - European Union (instrument E.6. Extended Producer Responsibility Fees)

Instrument - theoretical concept

The OECD defines EPR as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle (OECD, 2016[84]). The role of EPR schemes is to ensure the producer's legal obligation to meet sustainable packaging recycling and recovery targets to lower consumer packaging waste and optimised material use (OECD/Climate Club, 2025[71]). EPR schemes in the EU enforce material-specific fees paid by producers and importers for the packaging that they place on the national market (OECD/Climate Club, 2025[71]). These fees are charged based on the weight of packaging (OECD/Climate Club, 2025[71]). The fees paid to EPR schemes are often used to pay private or public waste management companies or local authorities who manage the collection of waste themselves or via contractors (OECD/Climate Club, 2025[71]). Basic ambitions within EPR schemes include circular waste management, implementing circular eco-design and achieve circular targets at the member state level (European Circular Economy Stakeholder Platform, 2025[85]). EPR schemes can also be implemented at the firm level with specific circular targets within business operations. The European Union implemented several Directives that required member states to implement EPRs for Waste Electronic and Electrical Equipment (WEEE) (OECD, 2023[86]). This policy covered batteries, accumulators, and vehicles (OECD, 2023[86]).

Examples of supported project description

Other policies under the EU that encourage EPR include the legislation for End-of-Life Vehicles (ELVs), Batteries or Packaging and Packaging Waste Directive (PPWD), the Urban waste water treatment directive and the Textile Strategy (European Circular Economy Stakeholder Platform, 2025[85]). Many of these legislations are revised or are currently undergoing revision to expand EPR obligations and implement eco-modulation of EPR fees (European Circular Economy Stakeholder Platform, 2025[85]). Eco-modulation is a financial tool in EPR systems that adjusts producer fees to reflect the true environmental costs of different products (European Circular Economy Stakeholder Platform, 2025[85]). Eco-modulation systems for EPR can take various forms, such as recyclability, increased consumer awareness and recycled

content uptake, and longer product lifespans to guide fee adjustments (European Circular Economy Stakeholder Platform, 2025[85]).

Impact of the solution on the project

Early adoptions of EPR schemes can influence subsequent policy changes (OECD/Climate Club, 2025[71]). Environmental handling charges, eco-fees for production, and recycling fees can improve sustainable material use and target the entire value chain (OECD/Climate Club, 2025[71]). The adoption of EPR fees in Europe also signalled a market for ecofriendly products and waste management as EPR fees exist globally e.g. Canada, Spain, Japan and Republic of Korea (Cordonnier and Saygin, 2023[12]). There is also evidence to show that EPR fees influence innovation levels as there are studies based on EPR implementation in the People's republic of China increased the number of green patents by 23% (Cordonnier and Saygin, 2023[12]).

Lessons Learnt

EPR fees differentiate between products and packaging, and items difficult to reuse, remanufacture, repair and recycle, with items designed for reuse, remanufacturing, repair and recycling (OECD/Climate Club, 2025[71]). Past approaches did not include this differentiation measure which can weaken incentives for producers to make upstream changes to design features (OECD/Climate Club, 2025[71]). EPR systems need clear and long-term objectives, periodic reviews and evaluations to improve the effectiveness and relevance of fee modulation (OECD/Climate Club, 2025[71]). In addition, sufficient recycling infrastructure is needed to support the execution of EPR strategies and reduce waste generation. Stakeholder networks and co-ordination between producers and recyclers are important to ensure effectiveness (OECD/Climate Club, 2025[71]).

Replicability and scalability conditions

EPR fees can be strengthened and complemented with other instruments such as Green Public Procurement to strengthen market demand for eco-friendly products (OECD/Climate Club, 2025[71]).

Case Study 8: Production-linked incentive - Government of India (instrument E.7. Grants and subsidies)

Instrument - theoretical concept

Government of India introduced Production-Linked Incentive (PLI) schemes under the Self-Reliant India Initiative in order to enhance manufactures competitiveness, attract investments in innovative technologies and create efficiencies and economies of scale (OECD/Climate Club, 2025[71]). The PLI scheme was set up for 10 sectors in 2020 and another four sectors were added in 2021, along with additional funding from the Government of India (OECD, 2023[86]). The PLI scheme acts as a financial incentive in the form of cash reimbursement between 1% and 10% of net sales over a limited period (6 years) (OECD/Climate Club, 2025[71]). Two PLI Schemes are particularly suitable for industry decarbonisation: Advanced Chemistry Cell (ACC) battery and high-efficiency solar photovoltaic (PV) modules (OECD/Climate Club, 2025[71]). For both the incentive period lasted five years and the amount of the incentive depended on total actual sales, performance criteria and local value additions (OECD/Climate Club, 2025[71]).

Table A A.3. Overview of sectors covered under PLI

Industry subsector	Implementing body	Implementation start
Key Starting Materials (KSMs)/Drug Intermediates (DIs) and Active Pharmaceutical Ingredients (APIs)	Department of Pharmaceuticals	Mar-20
Large Scale Electronics Manufacturing	Ministry of Electronics and Information Technology	Mar-20
Manufacturing of Medical Devices	Department of Pharmaceuticals	Mar-20
Electronic/Technology Products	Ministry of Electronics and Information Technology	Nov-20
Pharmaceuticals drugs	Department of Pharmaceuticals	Nov-20
Telecom & Networking Products	Department of Telecommunications	Nov-20
Food Products	Ministry of Food Processing Industries	Nov-20
White Goods (ACs & LED)	Department for Promotion of Industry and Internal Trade	Nov-20
High-Efficiency Solar PV Modules	Ministry of New and Renewable Energy	Nov-20
Automobiles & Auto Components	Department of Heavy Industry	Nov-20
Advance Chemistry Cell (ACC) Battery	Department of Heavy Industry	Nov-20
Textile Products: MMF segment and technical textiles	Ministry of Textiles	Nov-20
Specialty Steel	Ministry of Steel	Nov-20
Drones and Drone Components	Ministry of Civil Aviation	Sep-21

Source: (Cordonnier and Saygin, 2023[12])

Examples of supported project description

The PLI scheme for ACC battery will set up manufacturing facilities for advanced chemical Battery Energy Storage Systems (BESS) while the PLI scheme for the higher-efficiency solar PV modules aims to build 65 GW of annual manufacturing capacity of solar PV wafers, cells, and modules across any PV technology that was a minimum module efficiency of 19.5% (OECD/Climate Club, 2025[71]). The PLI for ACC battery is based on the production level and the percentage of value addition achieved on actual sales (Cordonnier and Saygin, 2023[12]). It targets manufacturers setting up production units with a capacity of 5-20 GWh (Cordonnier and Saygin, 2023[12]). The PLI for BESS did not incentivise any specific PV technology but rather relied on various technical requirements such as a minimum module efficiency performance of 19.5% (Cordonnier and Saygin, 2023[12]). The PLI applicable to projects along the PV value chain such as silicon processing and refining, ingot-wafer manufacturing, and/or cell and module manufacturing facilities (Cordonnier and Saygin, 2023[12]).

Impact

PLI schemes have contributed to boosting the manufacturing sector in India, job generation, economic growth and exports (OECD/Climate Club, 2025[71]). Foreign Direct Investment in the manufacturing sector increased to USD 21.3 billion in the financial year 2021- 22, in comparison to USD 12.1 billion in financial year 2020-21 (OECD/Climate Club, 2025[71]). For ACC battery manufacturing, 10 domestic/international manufacturers submitted proposals for a total of 130 GWh, based on the technical bids that opened in January 2022 and 3 were selected (Cordonnier and Saygin, 2023[12]). The Ministry of Heavy Industries awarded the three beneficiaries with contracts to build 30 GWh of manufacturing capacity, with a progressive start of commercial operations from 2024 (Cordonnier and Saygin, 2023[12]). In addition, 20 GWh have been proposed for re-bidding in 2024, and to achieve a total of 50 GWh production capacity by 2030 (Cordonnier and Saygin, 2023[12]).

Lessons Learnt

The scheme has benefited 176 micro-small and medium enterprises across a variety of sectors, e.g. industry, and agriculture (OECD/Climate Club, 2025[71]). For the clean energy technologies, BESS and solar PV modules, the scheme has increased domestic manufacturing capabilities and shift manufacturing towards higher value-added products (OECD/Climate Club, 2025[71]). The PLI incentive scheme also attracted attention from international investors and companies with positive FDI, GDP, exports, employment impacts (Cordonnier and Saygin, 2023[12]). This can support the modernisation of the manufacturing sector, thereby increasing capabilities to achieve national decarbonisation targets (Cordonnier and Saygin, 2023[12]).

Replicability and scalability conditions

The scheme is highly replicable as it can be applied across a variety of sectors. Replicability will depend on financial incentives and enabling regulatory frameworks to attract manufacturing companies which are instrumental in the PLI scheme's applicability (OECD/Climate Club, 2025[71]). Financial incentives and an enabling regulatory framework to attract manufacturing companies have been instrumental for the Government of India to successfully implement the scheme (Cordonnier and Saygin, 2023[12]).

Case Study 9: FINTECC Programme - European Bank for Reconstruction and Development (EBRD) (instrument E.7. Grants and Subsidies)

Instrument - theoretical concept

To advance the implementation of innovative low-carbon technologies, the EBRD developed a multi-scope support programme: FINTECC (Finance and Technology Transfer Centre for Climate Club). The programme was created as part of a global initiative, as the 2010 United Nations Framework Convention on Climate Change Conference of the Parties mandated Multilateral Development Banks (MDBs) to establish regional technology transfer centre (Cordonnier and Saygin, 2023[12]). The programme supports businesses in implementing climate technologies and supporting climate technology transfer (Cordonnier and Saygin, 2023[12]). This includes investment, policy and technical support (Cordonnier and Saygin, 2023[12]). Through investment support companies benefit from direct CAPEX grants to implement climate technologies in countries with barriers to implementation such as a lack of regulatory frameworks or market risks (Cordonnier and Saygin, 2023[12]). The proportion of CAPEX grants within the overall capital costs of a technology is calculated using a set of calibration criteria and may be subject to an absolute cap (OECD/Climate Club, 2025[71]).

Technical support is also provided to companies working in high-risk sectors with significant climate mitigation potential (Cordonnier and Saygin, 2023[12]). This includes pre-feasibility and feasibility studies, sectorial market assessments, and early-stage project development activities to improve conditions for project implementation (Cordonnier and Saygin, 2023[12]). Policy support includes country-wide sectorial assessments to quantify climate mitigation potential, preparing or upgrading regulatory frameworks for climate, such as energy efficiency standards (Cordonnier and Saygin, 2023[12]). Policy support is granted to countries with high potential to transform a specific sector but there are country and regulatory risks present (Cordonnier and Saygin, 2023[12]).

Examples of supported project description

The programme is active in 17 countries: Armenia, Azerbaijan, Egypt, Georgia, Jordan, Kyrgyz Republic, Lebanon, Moldova, Mongolia, Morocco, Tajikistan, Tunisia, Turkmenistan, Ukraine, and Uzbekistan (OECD/Climate Club, 2025[71]). The programme targets technologies in demonstration phase, which are

in early stages of market adoption, and with potential for replicability and scale-up, and with a significant impact in carbon emissions reductions or resource efficiency (OECD/Climate Club, 2025[71]). The programme supported a glass manufacturer in Moldova implemented a technology to reduce bottles weight by up to 30%, leading to 20-30% energy efficiency gains (OECD/Climate Club, 2025[71]). In Ukraine the programme promoted the manufacturing of climate technologies via Climate Innovation Vouchers (CIV) scheme to partially pay for external expertise to facilitate and expand low-carbon innovation activity across local private businesses (European Bank for Reconstruction and Development, 2025[87]).

Impact

The grants and technical resources provide opportunities to improve manufacturing efficiency and lower implementation, and operational costs associated with transition efforts (OECD/Climate Club, 2025[71]). In-house experts in energy and water can review the energy, water and material efficiency potential of the clients' operations and assist in identifying the best way to support them in implementing investment opportunities (Cordonnier and Saygin, 2023[12]). Overall, the FINTECC programme has helped to increase energy efficiency efforts in Moldova at the Glass Container Company through a EUR 7.5 million grant to support the modernisation of production technology (OECD/Climate Club, 2025[71]). This includes the reconstruction of the melting furnace and the replacement of production machine lines (OECD/Climate Club, 2025[71]). For the CIV scheme under the FINTECC programme, EBRD plans to expand the programme to Belarus and potentially Georgia (European Bank for Reconstruction and Development, 2025[87]). FINTECC also works as a knowledge-sharing platform between different sectors in countries where EBRD is active (Cordonnier and Saygin, 2023[12]). This includes the communication of success cases, best manufacturing practices and demonstration of innovative climate technologies have improved access to finance for transition projects (Cordonnier and Saygin, 2023[12]).

Lessons Learnt

The FINTECC programme has been under implementation since the early 2010s, with numerous success stories (Cordonnier and Saygin, 2023[12]). Lessons learnt from investments show that the programme can de-risk innovative climate technology through the launch of demonstration projects (OECD/Climate Club, 2025[71]). However, policy support is needed to boost technology transfer and project implementation e.g. through regulatory support, performance standards, energy efficiency plans etc. (OECD/Climate Club, 2025[71]). Training programmes can also help local consultants learn more on climate technologies in the industrial sector which help in project implementation (OECD/Climate Club, 2025[71]).

Replicability and scalability conditions

CAPEX Grants can support demonstration projects of climate technologies with low-market penetration. The instrument is highly replicable across countries or sectors (OECD/Climate Club, 2025[71]).

Case Study 10: Buyer Credit Guarantees - The Danish Growth Fund (EIFO) (instrument R.1. Buyer Credit Guarantees)

Instrument - theoretical concept

A buyer credit guarantee is provided by a country's export credit agency (ECA) and covers the risk that a commercial bank takes on when lending to a foreign borrower or buyer of goods from the ECA's home country (Cordonnier and Saygin, 2023[12]). This means that the commercial bank will provide a loan to a foreign buyer and the credit risk is assumed by the ECA rather than on the foreign buyer (Cordonnier and Saygin, 2023[12]). However, the foreign buyer is required to provide a minimum payment usually covering

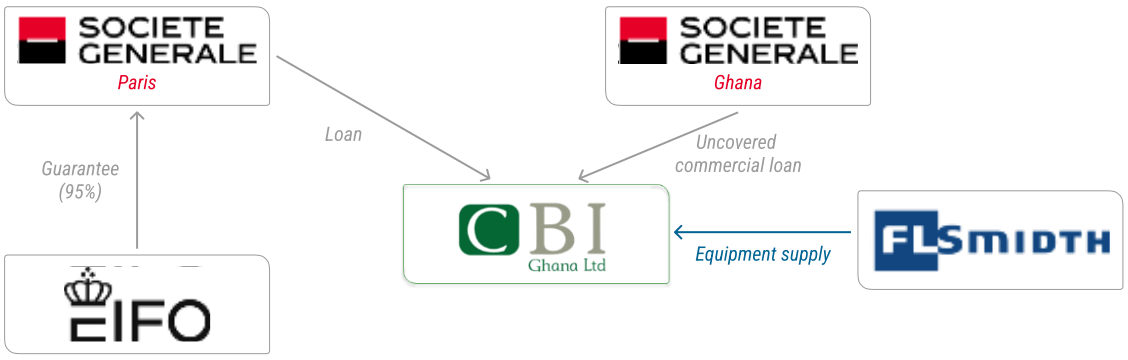
minimum 15% of the order (Cordonnier and Saygin, 2023[12]). The maximum coverage under the buyer credit guarantee is linked to the sum of the value of the exported goods and a share of local costs and falls under the standards of the OECD Arrangement on Officially Supported Export Credits (OECD/Climate Club, 2025[71]). The instrument covers both political and commercial risks such as currency inconvertibility. It can enable foreign buyers in higher-risk countries to purchase equipment for improved business operations (Cordonnier and Saygin, 2023[12]). As a result, the instrument encourages trade of technology and or products by transferring risk to the guarantee provider.

The Export and Investment Fund of Denmark (EIFO) uses the export credit guarantee to assist corporations in expanding business operations such as CBI Ghana, which benefited from the instrument to gain access to new cement processing technologies (OECD/Climate Club, 2025[71]). CBI was established by F. Scott AG, a Swiss investment company, and has been operational since 2018, focusing on grinding and bagging factories, with a capacity to grind 600 kilotonnes (kt) of cement per annum (Cordonnier and Saygin, 2023[12]). Prior to the guarantee provided by EIFO, CBI did not have a rotary kiln on site and imported clinker from North Africa (Cordonnier and Saygin, 2023[12]). The total investment amounts to more than USD 80 million, funded by a combination of ECA-backed loan provided by Société Générale and 95% guaranteed by EIFO, an untied commercial loan provided by Société Générale Ghana, and equity from the abovementioned investors (Cordonnier and Saygin, 2023[12]).

The Buyer Credit Guarantee involves several actors to ensure the structuring, financing and execution:

- **Danish Investment Fund for Developing Countries**: provided additional investments into the project with CBI Ghana
- **Norfund:** provided additional investments into the project with CBI Ghana
- **Société Générale:** provided ECA-backed loans
- **EIFO:** Project Guarantee
- **Société Générale Ghana:** provided a united commercial loan

Figure A A.2. Debt structure behind the buyer credit gaurantee



Source: (Cordonnier and Saygin, 2023[12])

Examples of supported project description

The instrument was used to finance the purchase of a cement crusher and clay calciner (OECD/Climate Club, 2025[71]). The clay calciner technology is developed by the Danish company FLSmidth, that creates calcined clay using a Supplementary Cementitious Material (SCM) which will substitute imported clinker with locally sourced clay (Cordonnier and Saygin, 2023[12]). The locally sourced clay is retrieved from an open pit site in the North Tongu District of the Volta Region (Cordonnier and Saygin, 2023[12]). The financing

aims to support CBI's existing grinding plant to expand from 600 kilo tonnes (kt) to 1.5 million tonnes (Mt) per year by establishing a new grinding mill and build a new clay calcination unit (OECD/Climate Club, 2025[71]). The new cement crusher and clay calciner will also lower the emission intensity of the plant given that calcined clay inherently has a lower GHG footprint than clinker given its limited carbonates and it requires less energy use in the production process (Cordonnier and Saygin, 2023[12]). Therefore, the impact of the guarantee is twofold: it will generate positive economic benefits for the local region such as an increase in jobs by using locally sourced clay while also reducing the product's carbon footprint by up to 20% compared to current levels (Cordonnier and Saygin, 2023[12]). The calcined clay plant in Ghana has become operational in 2025 (Heidelberg Materials, 2025[88]).

Impact of the solution on the project

The buyer credit guarantee has positively impacted CBI Ghana and its shareholders by gaining access to long-term financing in order to improve plant operations (Cordonnier and Saygin, 2023[12]). This is particularly helpful given that at the time of the transaction Ghana had a lower country rating cap (B-) which could have impacted the ability of CBI to obtain external international funding without the EIFO guarantee (Cordonnier and Saygin, 2023[12]). This in turn has positive benefits on the local economy in Ghana. For instance, the guarantee helps to close the cement demand and supply gap in the country and will add value to local resources such as kaolinitic clay, which is what will be used by CBI Ghana (Cordonnier and Saygin, 2023[12]).

Additionally, the mine(s) supplying the clay will experience more job opportunities, spurring local development, and economic growth (Cordonnier and Saygin, 2023[12]). Currently, the facility operates the 'world's largest' flash calciner and has a capacity of 400 000 t/yr of calcined clay and is planning to expand operations with financing from the International Finance Corporation (IFC) for a limestone calcined clay cement (LC3) plant in Tema (Eco-Fin Agency, 2025[89]).

The financing structure arranged by both EIFO and Société Générale enabled the sale of FLSmidth's technology to CBI (OECD/Climate Club, 2025[71]). EIFO was also able to support a Danish firm in expanding global market reach and operations globally, thereby contributing to its local economy (OECD/Climate Club, 2025[71]). As a result, Danish innovation is promoted and, more broadly, the guarantee allows clean energy technologies to be applied and tested on a global scale. From an emission reduction perspective, the guarantee has supported a CO_2 footprint reduction in cement produced by the plant while also introducing a cost competitive low-carbon cement with the same specifications as traditional cement (Cordonnier and Saygin, 2023[12]). With FLSmidth's technology, clay can partially substitute clinker, reducing reliance on imported clinker (Cordonnier and Saygin, 2023[12]). This, in turn, lowers foreign exchange risks since clinker is primarily traded in US dollars while cement is sold in local currency (Cordonnier and Saygin, 2023[12]). This is particularly important because if the local currency loses value against the US dollar, it can cost more to purchase clinker which would cause CBI Ghana to incur higher expenses. Therefore, the technology supports CBI in mitigating risks associated with reliance on imported clinker that may be caused by supply chain disruptions.

Lessons learnt

Bridging the financing gap for decarbonisation projects in EMDEs is crucial to attaining climate neutrality and meeting the ambitious climate targets set forth in the Paris Agreement. Yet it is important to consider that EMDEs may lack the necessary financial resources, and technical expertise, to finance and adopt the low-carbon technologies necessary for decarbonisation. For the decarbonisation of the industry sector, specific technologies are needed which often lack market maturity and come with higher upfront costs that need to be mitigated in order to receive the necessary amount of investment (Cordonnier and Saygin, 2023[12]). The structure of the buyer credit guarantee enabled CBI Ghana and its shareholders to access long-term financing for a technology that proved to provide positive decarbonisation and economic impacts

(OECD/Climate Club, 2025[71]). Securing the guarantee often depends on a solid track record across projects and a long-standing working relationship with the beneficiary which in this example is CBI Ghana. These factors were critical in EIFO's involvement to provide a guarantee (Cordonnier and Saygin, 2023[12]). Cement production is a significant source of CO_2 emissions worldwide, and advancing cleaner technologies in this sector is essential for reducing the overall carbon footprint of the global economy (Cordonnier and Saygin, 2023[12]). The strategic importance of this project to meet global decarbonisation efforts contributes to scalable, and sustainable industrial decarbonisation.

Replication and scalability conditions

Replication in the use of the buyer credit guarantees is applicable to various regions, and industries and therefore not specific to facilitating investments in decarbonisation projects alone (OECD/Climate Club, 2025[71]). For projects focused on decarbonisation, the replication on the use of the instruments, requires the strategic importance of aligning the project with a pathway to lowering CO_2 emissions within the sector of focus must be present (Cordonnier and Saygin, 2023[12]). Bpifrance and other ECA's often provide a buyer credit guarantees to foreign clients that wish to finance technology transfers, infrastructure development or services.

Case study 11: Energy Savings Insurance - Green Climate Fund (GCF) / XacBank (instrument R.2. Energy Savings Insurance)

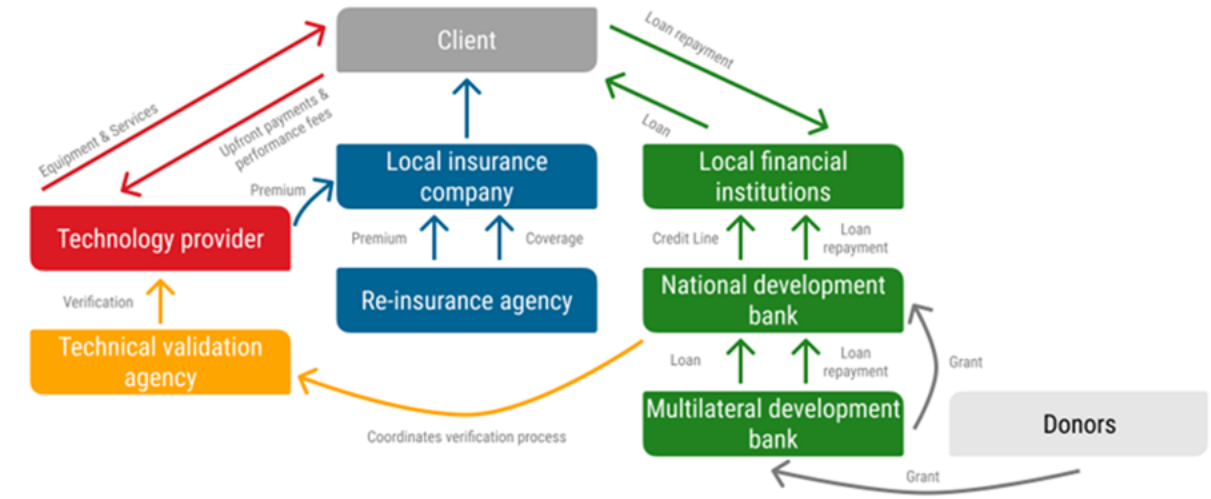
Instrument - theoretical concept

The energy savings insurance (ESI) model was first developed by the Inter-American Development Bank (IDB) with support from BASE Foundation to accelerate energy efficiency programmes (OECD, 2023[86]). It is a de-risking package consisting of financial and non-financial tools designed to increase investor confidence in energy efficiency projects (OECD/Climate Club, 2025[71]). This includes a performance warranty provided by a supplier to a customer for committed savings under a duration set by a standardised contract (OECD, 2023[86]). An insurance company provides an insurance product that backs up the commitment of the supplier (OECD/Climate Club, 2025[71]). A third-party validation entity determines the amount of the compensation if savings are not met (OECD/Climate Club, 2025[71]). In Mongolia, XacBank implemented an ESI programme worth USD 49.7 million complemented by the MSME Business Loan Programme for Greenhouse Gas (GHG) Emissions Reduction that promotes energy efficiency in renewable energy solutions in the Mongolian MSME market (OECD/Climate Club, 2025[71]). The programme is complimentary to an existing USD 60 million credit line, operated by XacBank and co-funded by GCF, known as the Micro, Small, and Medium Enterprises (MSME) Business Loan Programme for Greenhouse Gas (GHG) Emissions Reduction (Cordonnier and Saygin, 2023[12]). In 2023, a USD 25 million additional funding programme by the European Bank of Reconstruction and Finance (BERD) and GCF (XacBank II) was approved to help accelerate renewable energy and energy efficiency technology adoption in Mongolia (Cordonnier and Saygin, 2023[12]).

Key actors involved in the structuring, financing and development of the ESI programme include:

- **XacBank:** ESI implementor and donor
- **GCF:** Lender
- **EBRD:** Lender

Figure A A.3. Conceptional design of ESI



Source: (Cordonnier and Saygin, 2023[12])

Examples of supported project description

The ESI initiative in Mongolia stimulates the energy efficiency and renewable energy sector while enhancing lending support for such projects through an MSME Business Loan Programme to lower energy consumption (OECD/Climate Club, 2025[71]). The aim of this programme is to promote the use of energy efficient and renewable energy solutions in the Mongolian MSME market (Cordonnier and Saygin, 2023[12]). The primary beneficiaries for ESI initiative are more than 60 thousand MSMEs in Mongolia that experience substantial energy consumption (Cordonnier and Saygin, 2023[12]). Examples of supported projects include replacing industrial electrical and mechanical equipment with more energy-efficient alternatives, upgrading HVAC systems, improving building energy performance through measures like better lighting and insulation, and enhancing electromechanical process efficiency for manufacturing, among other initiatives (Cordonnier and Saygin, 2023[12]). Examples of projects in Mongolia (non-industry) include A 20 kW PV system installed on the rooftop of XacBank's headquarters in Ulaanbaatar (Cordonnier and Saygin, 2023[12]). The solar installation generates around 22 000 kWh annually, covering approximately 20% of the building's internal energy needs, with an investment of approximately USD 20 000 (OECD/Climate Club, 2025[71]).

Impact

The financial characteristics of the credit line are favourable and better than traditional loans offered to small enterprises, both in tenor and in cost (interest rate) which broadens the market potential for projects and allows SMEs to create longer-term, capital-intensive projects (OECD/Climate Club, 2025[71]). The ESI programme enabled the creation of non-financial tools such as a standard energy performance contract, a standard insurance policy, and a technology validation process (Cordonnier and Saygin, 2023[12]). These tools help to tailor credit line conditions to the Mongolian market while improving MSMEs' access to financing and reducing transaction costs for energy efficiency projects (Cordonnier and Saygin, 2023[12]). As a result, the ESI model has expanded the market potential for energy-efficiency projects by enabling SMEs to pursue longer-term, capital-intensive initiatives rather than limiting investments to quick-payback measures like lighting upgrades (Cordonnier and Saygin, 2023[12]). By combining technical validation, insurance, and lower-cost financing, it is encouraging more companies in countries such as Mexico,

Colombia, and Brazil to evaluate and implement larger, more complex energy-efficiency projects (Cordonnier and Saygin, 2023[12]).

Lessons Learnt

To foster its use by suppliers and clients and to increase long-term success, the instrument requires engagement from multilateral and national development banks (MDBs, NDBs), insurance companies and commercial banks enhancing their loan conditions at the country level (OECD/Climate Club, 2025[71]). The local insurer (Tenger Insurance) collaborated with regulators to adapt existing laws to support the introduction of an insurance product compatible with the ESI model with competitive conditions (OECD/Climate Club, 2025[71]). This highlights the importance of public-private collaboration to develop legal frameworks within a reasonable timeframe (OECD/Climate Club, 2025[71]). BASE also views green conditions are necessary for the ESI model to succeed and investments should not be too big or too small (OECD, 2025[90]).

Replicability and conditions for scalability

BASE is exploring with the support of the Energy Regulatory Commission of Mongolia the adaptation of the ESI model to public procurement processes (OECD/Climate Club, 2025[71]). The ESI model is currently offered by XacBank but it is open to be used by other financial institutions, and potentially more commercial banks in Mongolia may be attracted to offer specific products for climate change mitigation and adaptation (OECD/Climate Club, 2025[71]). The ESI model was also proposed in Kazakhstan to ensure energy savings of households in green social buildings, which led to developing a green-building completion guarantee (OECD, 2025[90])

Case Study 12: Climate Syndication Platform - EBRD (instrument R.3. First and Second Loss Facility)

Instrument - theoretical concept

First loss facilities are blended finance mechanisms through which concessional capital from public or donor sources absorbs the initial share of potential losses in a financing structure. Acting as a junior tranche or guarantee, they provide credit enhancement to senior lenders or co-investors and improve the overall risk-return profile of a transaction. This approach encourages private investors to enter markets or sectors with elevated risk profiles while ensuring donor resources are deployed catalytically to achieve high leverage. Such facilities are widely used in infrastructure and climate finance to address investment barriers in emerging and developing economies.

The Climate Syndication Platform (CSP), developed by the European Bank for Reconstruction and Development (EBRD) with funding from the German Federal Ministry for Economic Affairs and Energy (BMWE)[8] through the International Climate Initiative (IKI), aims to mobilise private investment in climate projects across higher risk markets in Eastern Europe, Central Asia, and North Africa. It combines a first loss risk cover (FLRC) with technical assistance (TA) to de-risk private co-financing and strengthen project preparation and implementation capacity.

CSP allocates approximately EUR 22.5 million for the FLRC and EUR 2.2 million for TA, within a total envelope of EUR 30 million. The FLRC covers from 10% up to 25% of institutional investors' (B-lenders'[9])

[8] Formerly the Federal Ministry for Economic Affairs and Climate Action (BMWK).

[9] B-lenders: In multilateral development bank (MDB) syndications, B-lenders are private co-financiers, typically commercial banks, institutional investors, or other financial institutions, that provide a portion of the total loan. Although

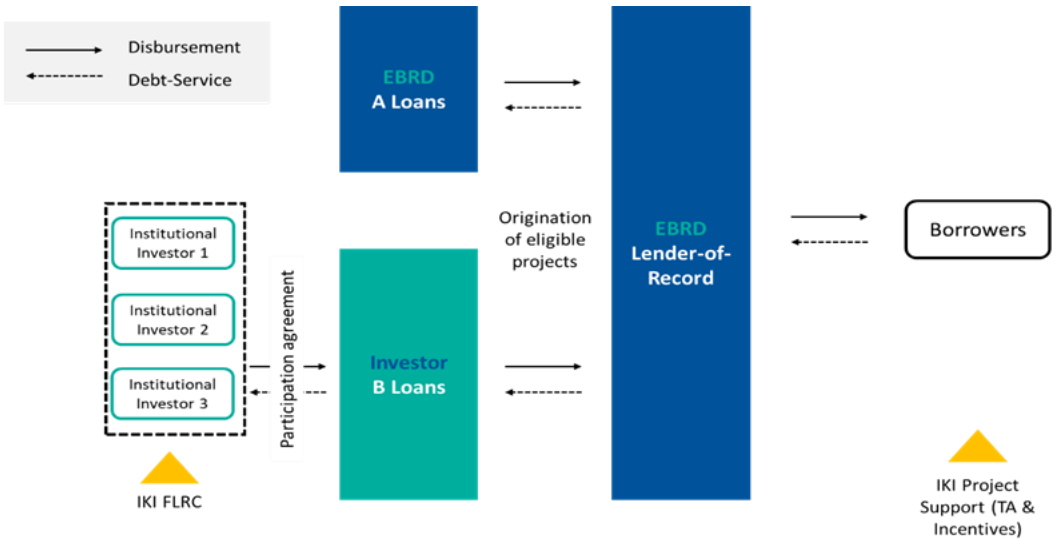
exposure under syndicated loans, while EBRD's A-loan[10] tranche remains unprotected, retaining the Bank's original risk-return exposure. According to EBRD estimates, the facility could mobilise EUR 90 to 225 million in private co-financing over an eight-year period.

The platform supports climate mitigation and adaptation projects in countries such as Armenia, Egypt, Jordan, Kazakhstan, Morocco, Türkiye, and Ukraine, among others. Initial transactions are expected in the second half of 2025. The EBRD administers the CSP, combining financial de-risking, policy dialogue, and technical support to improve project quality, attract institutional finance, and develop sustainable markets for climate aligned investments.

The CSP involves several actors with complementary roles in structuring, financing, and delivering projects:

- **BMWE (via IKI):** provides donor funding for the first loss risk cover and technical assistance, serving as the primary source of concessional capital.
- **EBRD:** acts as lender of record and administers the syndicated loan. The Bank structures A/B loans, with the A-loan financed from its balance sheet and the B-loan from private institutions under a unified legal framework. The EBRD retains full exposure on its A-loan and any risk beyond the first loss layer.
- **B-lenders (institutional investors):** provide private co-financing for eligible climate projects and benefit from the CSP's first loss protection, which absorbs initial losses in the event of borrower default.
- **Clients (project sponsors):** private entities in Eastern Europe, the Caucasus, Türkiye, the Southern and Eastern Mediterranean, and Central Asia that implement climate mitigation and adaptation investments.

Figure A A.4. Climate Syndication Platform contractual and financial flow scheme



the funds originate from these private participants, the MDB remains the lender of record, administering disbursements and repayments. This arrangement allows B-lenders to benefit from the MDB's preferred creditor status, project monitoring, and policy frameworks, thereby reducing perceived risk compared with direct lending.

[10] A-lenders: in MDB A/B loan structures, A-lenders refer to the MDB itself, which finances a portion of the loan directly from its own resources. The A-loan remains on the MDB's balance sheet, exposing the institution to full commercial and credit risk. This ensures alignment of incentives between the MDB and private co-lenders while maintaining the MDB's commitment to sound banking principles.

The EBRD originates the A/B syndicated loan, with the CSP applying first loss coverage of up to 25% on the B-loan tranche. In case of default, the donor funded FLRC absorbs the first layer of losses, improving credit quality for investors. TA supports project identification, preparation, and overall bankability.

The CSP facilitates private capital mobilisation by lowering credit risk for institutional investors and expanding sources of climate finance. In addition to risk mitigation, its technical assistance component strengthens project preparation and implementation, helping sponsors meet international standards and improve financial structuring. Donor resources are expected to catalyse up to tenfold private investment, demonstrating the leverage potential of concessional funding. The EBRD maintains full exposure on its A-loan, ensuring donor funds de-risk only private investment tranches. The facility's regional and sectoral coverage enables financing for a broad range of climate projects while maintaining complementarity between public and private finance.

Key challenges include the programme's limited size, given the EUR 30 million allocation, and the complexity of structuring A/B loans with embedded donor guarantees. Ensuring robust due diligence by B-lenders and maintaining predictable donor support will be essential for long-term sustainability.

Example of supported project description

CSP is a recently launched facility, with the first projects expected to be signed in the second half of 2025. During 2024-25, the EBRD conducted outreach activities, presenting the platform to over 30 financial institutions and engaging with institutional investors to build a transaction pipeline. IKI has provided EUR 22.5 million for the first loss risk cover and EUR 2.2 million for technical assistance within a total allocation of EUR 30 million. Depending on the coverage level, typically 10-25% of the B-loan tranche, the CSP is expected to mobilise EUR 90-225 million in private co-financing for climate related projects.

The facility supports projects across renewable energy, energy efficiency, sustainable transport, and climate-resilient infrastructure, excluding carbon capture, utilisation and storage (CCUS). Eligible countries include Armenia, Azerbaijan, Egypt, Georgia, Jordan, Kazakhstan, Kyrgyz Republic, Lebanon, Moldova, Mongolia, Morocco, Tajikistan, Tunisia, Türkiye, Turkmenistan, Ukraine, and Uzbekistan. These economies face rising energy demand and reliance on carbon intensive sectors, underscoring the need for large scale renewable and climate resilient investments. The CSP's regional scope aligns with EBRD's mandate to foster sustainable, inclusive, and green growth.

Impact of the solution on the projects

Compared with conventional financing, the CSP offers stronger risk mitigation, catalytic mobilisation, and preservation of financial discipline. The first loss coverage provides additional protection to B-lenders, improving the risk-return profile and enabling participation by institutional investors that typically avoid higher-risk markets. By absorbing a portion of potential losses, the mechanism reduces perceived country and credit risks, thereby encouraging capital flows into projects that would otherwise remain underfinanced. The facility also demonstrates how limited concessional resources can mobilise a more significant private investment, highlighting the leverage potential of blended finance. Furthermore, the CSP maintains EBRD's financial discipline, as its A-loan remains fully exposed on market terms, while donor funds de-risk only private co-financing, ensuring complementarity and adherence to sound banking principles.

The CSP expands EBRD's syndication capacity, enabling larger blended finance operations and collaboration with institutional investors. The improved risk return profile of B-loans supported by donor guarantees encourages participation by insurers, pension funds, and infrastructure investors constrained by regulatory or fiduciary limits. The combination of technical assistance and de-risking instruments enhances project design and aligns implementation with institutional investor standards, supporting EBRD's objective of scaling private capital mobilisation beyond the programme's lifetime.

Enabling conditions further reinforce CSP's impact by improving project preparation and the broader investment environment. Technical assistance strengthens financial structuring and environmental and social compliance, while policy dialogue supports renewable energy regulation, predictable tariff frameworks, and transparent permitting. Operating within broader national or sectoral platforms, such as the Green Economy Transition and Green Cities programmes, CSP contributes to market confidence and facilitates long-term private investment in low carbon growth.

Lessons learnt

The CSP remains in an early implementation phase, with the first projects expected to be signed in the second half of 2025. The EBRD's Strategy Implementation Plan 2025-27 lists the platform as "progressing, with an additional donor-funded resource dedicated to the latter." Although results are not yet measurable, the framework is operational and positioned to mobilise private capital once the first transactions reach financial close. The combination of first loss risk cover and technical assistance is expected to improve project quality and preparation by addressing bankability constraints, though donor-backed guarantees may extend transaction timelines during the pilot stage. Mobilisation targets range from EUR 90 to 225 million in private co-finance over the initial implementation period. As of 2025, no disbursements of FLRC resources have been reported; utilisation will depend on the maturity of the project pipeline. Further data will become available as projects close, clarifying the facility's effectiveness in leveraging institutional investment.

Replicability and scalability conditions

The CSP model has strong potential for replication and scale-up, contingent on continued donor support and institutional capacity within the EBRD and partner lenders. Its structure, combining first loss risk cover and technical assistance within an MDB-led A/B loan framework, offers a replicable approach to mobilising private capital in higher risk markets. Replication requires the ability to structure and administer syndicated A/B loans, strong relationships with institutional investors, and in-house blended finance expertise. A pipeline of commercially viable, climate-aligned projects and predictable regulatory frameworks are also essential to attract institutional investors. The CSP model can be extended to sectors with substantial decarbonisation needs, such as renewable energy, low carbon transport, and industrial energy efficiency. Applying similar first loss mechanisms could enhance institutional participation and scale private capital mobilisation for the green transition. Beyond EBRD's regions, the model could be adapted by other multilateral or national development banks with comparable mandates and syndication capabilities.

Case Study 13: Eco Invest - Inter-American Development Bank (IDB) and Ministry of Finance of Brazil (instrument R.4. Foreign Currency Guarantee and instrument F.3 Local Currency Guarantee)

Instrument - theoretical concept

Foreign currency guarantees are a derisking instrument that protects borrowers from exchanging rate fluctuations (OECD/Climate Club, 2025[71]). An obligator agrees to repay the funds in the same currency as the revenue streams or at a fixed rate, regardless of any fluctuations in market exchange rates during the agreement period (OECD/Climate Club, 2025[71]). Guarantees against changes in market exchange rates are helpful for reducing risks associated with cross-border transactions (OECD/Climate Club, 2025[71]).

A foreign currency guarantee can help borrowers gain access to capital markets despite existing foreign exchange risks (OECD/Climate Club, 2025[71]). This mitigates potential exposure to exchange rate volatility

(OECD/Climate Club, 2025[71]). Access to international markets and investors are important for borrowers from EMDEs to raise capital in currencies such as the EUR or USD, given they are widely traded and stable. By ensuring repayment to lenders regardless of whether the borrower is negatively impacted by exchange rate fluctuations, the risk of the investment is lowered. In turn, this attracts international investors and investments in stable currencies. For industry decarbonisation projects, foreign currency guarantees can mitigate potential discrepancies between the share of revenues and expenses in local and hard currencies (OECD/Climate Club, 2025[71]).

Brazil's Foreign Private Capital Mobilisation and Currency Hedging Programme, implemented under the National Climate Change Fund, seeks to mobilise private capital to advance sustainability projects and accelerate the deployment of low-carbon technologies, renewable energy, and energy-efficiency measures across a range of sectors (OECD/Climate Club, 2025[71]). The The programme aims to provide stability and predictability to Brazil's macroeconomic framework and creates conditions to attract private sector investments for ecological transformations (Ministerio da Fazenda, 2025[91]).

In November 2025, IDB and the Central Bank of Brazil have signed a first-of-its-kind agreement to enable up to USD 3.4 billion in foreign-exchange hedging to help mobilise private investment for sustainable development, starting with Brazil's Eco Invest Program (IDB, 2025[92]) . The programme hosts four public auctions, with the latest announced at COP30 in Belém that will focus on scaling the bioeconomy and ecotourism infrastructure in the Amazon region (IDB, 2025[92]).

Examples of supported project description

Within the programme there are four main credit lines used: blended finance, a long-term foreign exchange (FX) liquidity facility, foreign exchange derivatives, and project structuring to integrating Brazilian companies into the global financial system (OECD/Climate Club, 2025[71]). Each credit line is complementary to each other with the aim of addressing barriers to financing sustainability projects and existing market failures (OECD/Climate Club, 2025[71]). This includes the high cost of capital, incomplete FX markets, and a low supply of green projects (OECD/Climate Club, 2025[71]). For Brazil the development of green projects targeting emission reduction and sustainability is an economic opportunity given the country's abundance in natural resources which are vital for the energy transition, e.g. solar, and wind (Ministerio da Fazenda, 2025[91]).

The blended finance credit line ensures the attraction of public and private investment. The long-term FX liquidity facility ensures that currency risk is mitigated, and enablers borrows to attract financing in other currency like the EUR. Foreign exchange derivatives are financial instruments like swaps and also help to manage risks associated with volatile foreign currencies by locking in exchange rates, protecting the investor from fluctuations of the currency (OECD/Climate Club, 2025[71]). Lastly, the project structuring component ensures access to technical assistance programmes and financial structuring support in an effort to help Brazilian companies meet investor requirements (Ministerio da Fazenda, 2025[91]). These credit lines ensure that barriers impacting ecological transition projects are mitigated, investors are protected making projects less risky, and access to finance is guaranteed. For the project to be successful the Government of Brazil is aware of the substantial amount of investment needed, so several credit lines ensuring access to finance and risk mitigation are crucial (Ministerio da Fazenda, 2025[91]).

Impact of the solution on the project

The programme can leverage a substantial amount of private capital and contribute to Brazil's Ecological Transformation Plan of Brazil (ETP) (OECD/Climate Club, 2025[71]). This will later help Brazil create conditions to attract additional private foreign capital, to generate development opportunities for the country (Ministerio da Fazenda, 2025[91]). For example, it fosters the take-off of green projects which is necessary to meet Brazil's economic development goals (Ministerio da Fazenda, 2025[91]).

There are three main expectations of the programme, each having an impact on climate mitigation, development and access to green finance. First the programme will help establish Brazil as a global leader in ecological transformation and support the country's efforts in climate adaptation and mitigation (Ministerio da Fazenda, 2025[91]). This will be essential to reducing emissions and meeting its NDC; to reduce emissions by 43% by 2030 compared to 2005 levels and reach climate neutrality by 2050. Second, the programme will support Brazil's access to the international financial system, and increased access to cross-border financial transaction to secure capital for Brazilian projects (Ministerio da Fazenda, 2025[91]). This in the end will mobilise the financial system and align interests to finance green investments (OECD/Climate Club, 2025[71]). Lastly, the programme will create a successful case study of Brazill's use of best practices for mitigating risks related to currency volatility (Ministerio da Fazenda, 2025[91]). This can serve as a landmark case for other EMDEs to follow who may also face barriers to gaining access to international finance markets due to currency risks.

Lessons learnt

IDB supported the platform as a technical partner and highlighted the various challenges that need to be addressed to properly promote sustainability projects and attract investments for the green transition. The challenges identified show that the market for FX hedges suffers from low liquidity, especially for long-term periods (5 years or more) (Ministerio da Fazenda, 2025[91]). This makes it difficult and costly to manage currency risks, meanwhile, hedging costs, counterparty credit risks, and unpredictable margin calls further can limit the involvement of financial institutions and investors in projects (Ministerio da Fazenda, 2025[91]). Additionally, high currency volatility creates challenges in valuing projects in hard currency which can limit foreign equity investment (Ministerio da Fazenda, 2025[91]). From an understanding of these challenges, the four credit lines were developed. This shows that understanding the key barriers preventing project take-off and long-term investments can lead to developing a detailed investment framework that guarantees access to capital for projects in EMDEs.

In addition, to an understanding of barriers impacting foreign investments in green projects, it is important to develop robust governance frameworks for the programme (OECD/Climate Club, 2025[71]). Governance structures within the programme can ensure its success (OECD/Climate Club, 2025[71]). The platform's fundamental principles include best practices in governance, accountability, and programme effectiveness through transparent allocation and impact reporting (Ministerio da Fazenda, 2025[91]). This is done alongside independent external evaluations to ensure accuracy and transparency (Ministerio da Fazenda, 2025[91]). These best practices can build investor trust, inform decision making and ensure accountability, which are all key factors in reducing investment risks.

Replicability and conditions for scalability

The programme can be replicated in terms of its six fundamental practices. These practices are:

- Mobilise private foreign capital for ecological transformation projects.
- Promote competition among institutions by opening up the programme to all financial agents.
- Stimulate growth in capital markets and foster their development without encouraging a crowd-in effect.
- Integrate companies globally by deepening financial integration of Brazilian companies within the international financial system.
- Develop a public-private collaboration network including government, multilateral banks, public and private financial institutions, domestic and international investors.
- Ensure best practices in governance, accountability, and programme impacts, e.g. via impact reports, independent external evaluations, with the cross-cutting inclusion of climate, environmental and social criteria.

The alignment of climate commitments such as the ETP with the purposes of a blended finance programme can significantly enhance the financing of green projects while mitigating currency-related risks. Blended finance programmes, on the other hand, can reduce the cost of capital for sustainable investments. This is especially true for riskier projects impacted by potential currency volatilities. Blended finance can also mitigate the high costs of long-term hedging. The programme does this via its various credit lines and is executed within a framework that reflects the key fundamental practices listed above. These practices build investor confidence by demonstrating long-term policy stability, and clear project outcomes. Overall, Eco-invest can be replicable in countries that also have a clear ecological transformation strategy, FX market for a AAA counterparty, and institutional support for implementation (OECD/Climate Club, 2025[71]). The programme can act as a key example on the impact of public policies that promote climate-focused projects and opening the market up for international investments to climate goals (Ministerio da Fazenda, 2025[91]). Brazil's commitment to ecological transformation not only contributes to global climate goals but also creates a more attractive environment for sustainable investment.

Case Study 14: Infracredit (instrument R.5. Partial or Full Credit Guarantee)

Instrument - theoretical concept

Credit guarantees (CGs) are credit enhancement instruments designed to mobilise private capital for infrastructure and other long-term projects. A credit guarantee may be partial or full, covering part or all scheduled debt service (principal and/or interest) in case of borrower default. By sharing risk between guarantors and investors, credit guarantees improve the credit profile of bond or loan issuances, extend maturities, and lower borrowing costs. Typically provided by multilateral development banks, guarantee funds, or specialised local institutions, such instruments are particularly valuable in emerging markets where institutional investors face prudential constraints requiring investment grade or highly rated assets.

InfraCredit (Infrastructure Credit Guarantee Company Plc), established in 2017, is a specialised credit enhancement institution created to mobilise long-term, local currency financing for infrastructure projects. Its founding shareholders include the Nigeria Sovereign Investment Authority (NSIA) and GuarantCo (a Private Infrastructure Development Group company), alongside the Africa Finance Corporation, KfW, InfraCo Africa, and the African Development Bank. Additional equity investors, such as Leadway Assurance Company Limited and AIICO Insurance Plc, reflect participation from Nigeria's domestic insurance sector. InfraCredit is rated AAA on the national scale by Agusto & Co. and Global Credit Ratings.

InfraCredit provides investors with an unconditional and irrevocable guarantee of timely payment of principal and interest on infrastructure bonds. By wrapping corporate or project bond issuances with its AAA-rated guarantee, InfraCredit enhances their credit quality, enabling issuers to obtain longer tenors (up to twenty years) and more favourable financing terms otherwise unavailable in the domestic market. The callable, fully enforceable guarantee substantially reduces credit risk for investors. This mechanism has contributed to the creation of a new investable asset class in Nigeria's capital markets, attracting pension funds and insurance companies seeking long-term, high quality domestic assets.

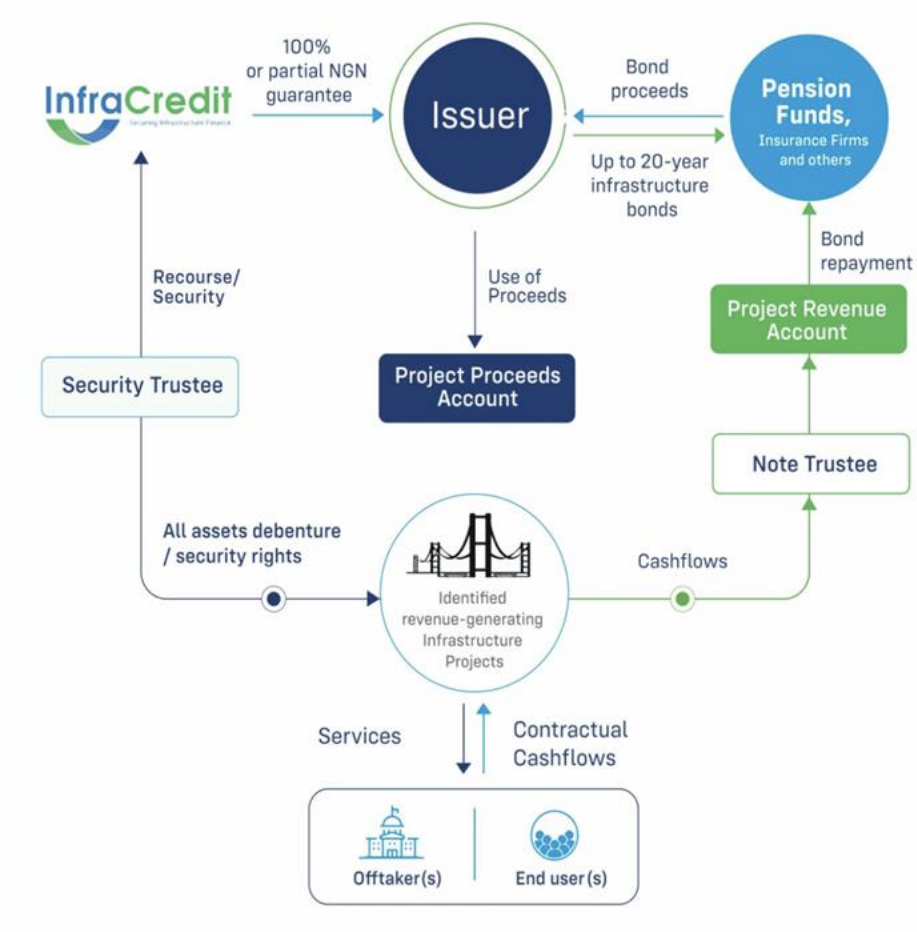
InfraCredit's guarantee capacity is supported by external partners providing complementary risk-sharing capital. Concessional first loss funding, such as the GBP 10 million (USD 13.5 million) contribution from the UK Foreign, Commonwealth & Development Office through the Climate Finance Blending Facility, supplies subordinated capital that absorbs initial losses and strengthens InfraCredit's guarantee coverage. In addition, multilateral partners such as GuarantCo, part of the Private Infrastructure Development Group (PIDG), provide second loss or counter guarantee facilities, including an NGN 20.23 billion (USD 25 million) facility for Lagos Free Zone bond issuances. These facilities, while not managed by InfraCredit, reinforce its capital structure and ability to issue guarantees. Beyond financial guarantees, InfraCredit also offers specialised products to address refinancing risks and support public-private partnership transactions.

Several actors participate in the InfraCredit guarantee structure, each playing a distinct role in the financial and contractual chain:

- **Project sponsor / Issuer:** the benefiting company (infrastructure or project company) issues local currency infrastructure bonds to raise capital for project development or expansion.
- **Guarantor:** InfraCredit provides an unconditional AAA-rated financial guarantee on the timely payment of principal and interest to bondholders.
- **First loss provider:** concessional capital from donors or DFIs (e.g. UK FCDO through the Climate Finance Blending Facility) absorbs initial losses, reducing InfraCredit's exposure and encouraging support for higher risk projects.
- **Second loss provider:** multilateral partners (e.g. GuarantCo) extend counter guarantees to cover InfraCredit's residual risk beyond the first loss tranche.
- **Investors:** domestic institutional investors (notably pension funds and insurers) subscribe to the guaranteed bonds, supplying long-term local currency capital.
- **Regulators:** Nigerian Securities and Exchange Commission (SEC) and National Pension Commission (PenCom) supervise compliance and ensure bonds qualify as investable assets for institutional portfolios.

Financial and contractual flows under the InfraCredit guarantee model follow a clear sequence. Bond proceeds flow from institutional investors to the project company or Special Purpose Vehicle (SPV) to finance infrastructure assets. InfraCredit focuses on long-tenor, local currency instruments, primarily corporate or project bonds. Revenues generated by the underlying infrastructure service debt obligations. In the event of a default, losses are absorbed first by donor funded first loss facilities and, where applicable, by multilateral second loss guarantees, ensuring full repayment to investors.

Figure A A.5. Basic transaction scheme for InfraCredit financial guarantee



The credit guarantee structure brings several benefits for both issuers and investors. It enables corporates to issue long-tenor local currency bonds of up to twenty years, mitigating refinancing risks and aligning debt service with project cash flows. The guarantee enhances the credit quality of the bonds to AAA level on the national scale, allowing access to institutional investors that would otherwise be restricted by investment grade requirements. By de-risking the asset class, InfraCredit has mobilised significant domestic savings from pension funds and insurance companies, deepening Nigeria's capital markets and expanding the pool of available long-term financing for infrastructure.

However, successful implementation requires continued institutional and financial backing. The model relies on sustained donor and multilateral participation to provide first and second loss facilities underpinning InfraCredit's risk capacity. Multi-layered guarantee structures add legal and financial complexity, potentially lengthening transaction timelines. Maintaining alignment with regulatory frameworks remains crucial to ensure guaranteed bonds retain eligibility for pension fund investment.

Example of supported project description

Since inception in 2017, InfraCredit has guaranteed NGN 311 billion (USD 200 million) of long-term local currency infrastructure bonds across 22 infrastructure projects in Nigeria and enabled 12 first-time issuers to access the domestic capital markets. Supported sectors include clean energy, captive power, gas distribution, telecommunications, transpleort, and social infrastructure.

One notable example is the Lagos Free Zone Company (LFZC) - a free trade zone developer and management company responsible for the Lagos Free Zone, registered under the Nigeria Export Processing Zone Authority. LFZC was incorporated in October 2002 and is the first privately-owned free trade zone in Nigeria, with over 830 hectares of land and numerous zonal clusters. The Company is developing an industrial and logistics zone with state-of-the-art facilities at Ibeju Lekki, Lagos which significantly contribute to Nigeria's economic development. LFZC is developing a wide range of facilities and services for the zone which includes roads, piped gas supply network, treated water supply network, street lighting and a water drainage network. The project aims to attract both domestic and international investors by providing modern infrastructure, streamlined regulatory frameworks under the Nigeria Export Processing Zones (NEPZ) Act, and direct port access. As of 2023, the Zone has attracted more than USD 2.5 billion in cumulative investment commitments, positioning it as a flagship industrial hub for West Africa.

- **Country:** Nigeria
- **Subsector:** Industrial and maritime zone infrastructure (special economic zone)
- **Issuer:** Lagos Free Zone Company (Tolaram group)
- **Size and Tenor:** InfraCredit guaranteed NGN 53 billion (USD 65.5 million) infrastructure bond programme, across three issuances: NGN 10.5 billion (USD 13 million) in 2021, NGN 25 billion (USD 30.9 million) in 2022 and NGN 17.5 billion (USD 21.6 million) in 2023.

The bonds, purchased mainly by pension fund administrators, asset managers, and institutional investors, were fully guaranteed by InfraCredit. GuarantCo (PIDG) provided a NGN 20.23 billion (USD 25 million) counter-guarantee with a 16-year tenor, enabling InfraCredit to manage its single-obligor exposure and extend full programme coverage.

Impact of the solution on the project

InfraCredit's guarantee allowed LFZC to issue a 20-year corporate bond, a maturity unprecedented in Nigeria's private debt market. The AAA-rated guarantee reduced refinancing risk compared with typical five- to seven-year unguaranteed tenors. It also lowered borrowing costs and attracted strong investor demand, achieving 165% oversubscription from domestic and international investors. Without the guarantee, the issuer would not have met the investment grade criteria required for institutional participation.

Through this mechanism, LFZC successfully raised NGN 53 billion (USD 65.5 million) in long-term, local currency financing across three bond tranches, diversifying away from shorter-term commercial loans. The proceeds are being used to finance industrial and logistics infrastructure within the Zone, including utilities, roads, and port-related facilities, reinforcing LFZC's position as a multi-sector hub integrated with the Lekki Deep Sea Port. The transaction demonstrated that private Special Economic Zone developers in Nigeria can access domestic capital markets when backed by a credible guarantee structure, thereby reducing dependence on external or foreign currency financing.

Several enabling conditions were essential to the success of the instrument. Supportive regulation by the Nigerian National Pension Commission allowed pension funds to invest in InfraCredit guaranteed infrastructure bonds, broadening the investor base. Risk-sharing arrangements with partners such as GuarantCo, which provided a NGN 20.23 billion (USD 25 million) counter guarantee, strengthened InfraCredit's capacity to extend coverage beyond its single-obligor exposure limit. In parallel, government promotion of Special Economic Zones under the Nigeria Export Processing Zones Act, combined with ongoing investment in the Lekki Deep Sea Port, enhanced the overall bankability and policy alignment of the project.

Lessons learnt

InfraCredit's full credit guarantee mechanism has been implemented effectively, demonstrating strong capacity to mobilise both domestic and international institutional capital. Since 2017, it has supported 22 infrastructure projects reaching financial close and guaranteed over NGN 311 billion (USD 203 million) in long-term local currency bonds. These transactions have helped establish a credible track record for the use of credit guarantees in Nigeria's infrastructure market.

Although each transaction requires additional structuring time to meet regulatory standards and align multiple guarantee layers, the extended preparation is offset by broader market benefits. InfraCredit has enabled 12 first-time issuers to access the domestic capital markets and to secure long-tenor financing previously unavailable to private infrastructure developers. This outcome has contributed to the gradual deepening of Nigeria's corporate bond market and the diversification of available financing instruments.

The guarantees have been catalytic in mobilising private capital, attracting over NGN 119 billion (USD 77 million) from pension funds, with participation from 18 pension fund administrators. The AAA national scale rating conferred by InfraCredit's backing was decisive in meeting institutional investors' requirements and risk thresholds. All guaranteed funds have been disbursed and are subject to InfraCredit's continuous monitoring under the credit enhancement agreements, ensuring transparency and compliance with both regulatory and contractual obligations.

Replicability and scalability conditions

The InfraCredit credit guarantee model is replicable in markets that combine strong domestic savings with underdeveloped long-term financing instruments. In Nigeria, pension assets exceed NGN 24 trillion (USD 16 billion) in May 2025, providing a deep pool of institutional capital seeking stable, investment grade opportunities. The presence of concessional first loss funding and multilateral second loss facilities remains essential to share risk and enable local guarantors to extend coverage beyond their balance sheet limits. Successful replication also depends on adherence to robust environmental, social, and governance (ESG) standards, which underpin investor confidence and ensure consistency with global sustainability frameworks. The approach is particularly relevant for emerging markets that possess growing institutional investor bases but face persistent infrastructure financing gaps and development needs.

Case Study 15: Partial Risk Sharing Facility for Energy Efficiency (PRSF) - Energy Efficiency Services Limited (EESL), Small Industries Development Bank of India (SIDBI), World Bank (instrument R.5. Partial Credit Guarantee)

Instrument - theoretical concept

In 2015 the World Bank partnered with SIDBI to set up the PRSF programme (OECD/Climate Club, 2025[71]). The PRSF aims to pro-actively address vulnerabilities of the MSME ecosystem to climate change (Cordonnier and Saygin, 2023[12]). The scheme provides financial assistance to Energy Service Companies (ESCOs) and end users for energy efficiency projects and supports loans granted by various Participating Financial Institutions (PFIs) and by SIDBI (Cordonnier and Saygin, 2023[12]). ESCOs often struggle to secure funding as lending institutions find it challenging to evaluate the long-term benefits and performance of energy efficiency projects (Cordonnier and Saygin, 2023[12]). Banks also face challenges in grasping the technical aspects of such projects, leading to cautious practices seeking the high reliability of collaterals (Cordonnier and Saygin, 2023[12]). Yet, adequate and timely credit support by the lending ecosystem is key to support MSMEs transformation towards greener processes (Cordonnier and Saygin, 2023[12]).

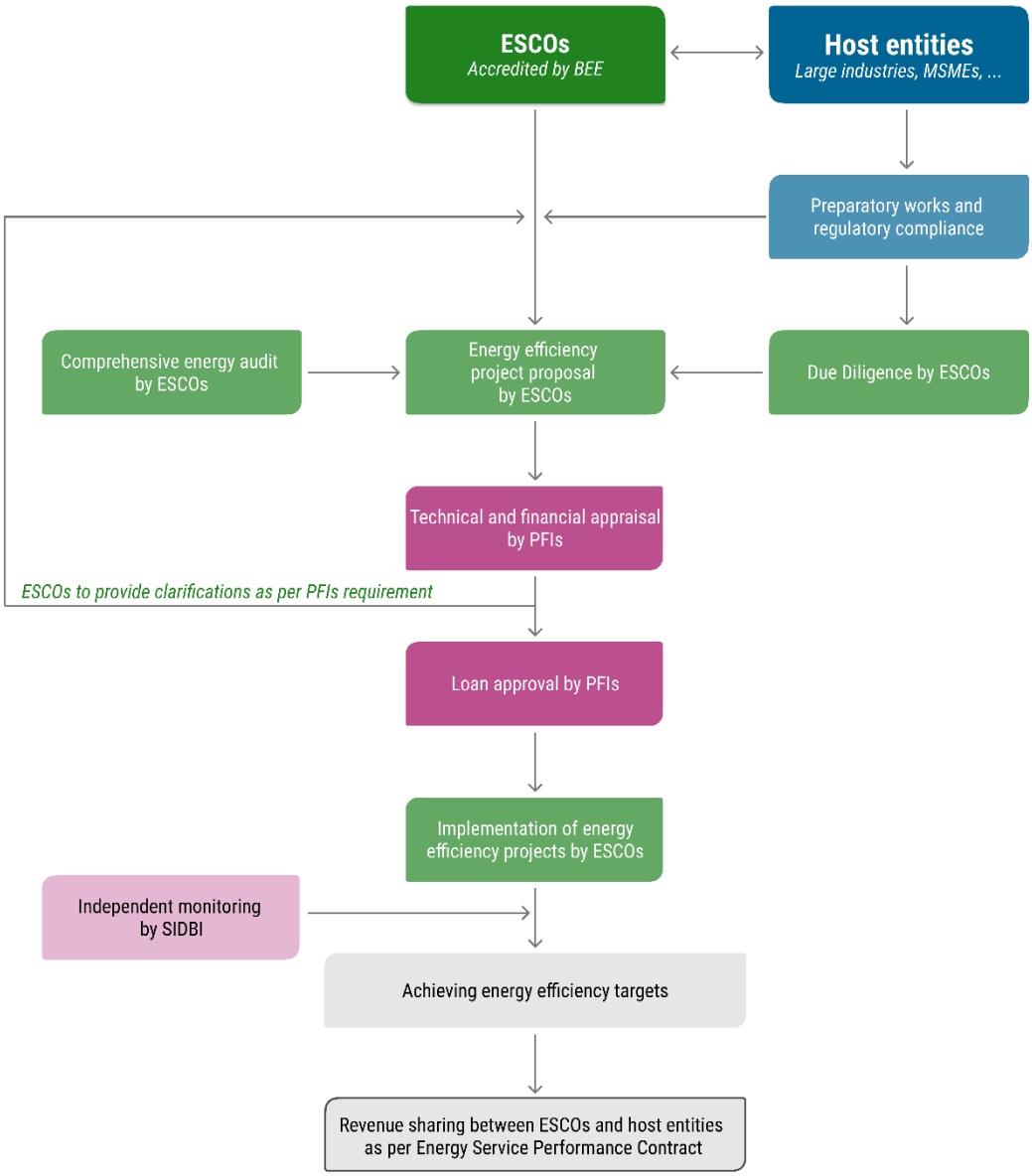
The scheme provides coverage for repayment of energy efficiency loans through its Risk Sharing Facility component as partial credit guarantees cover a share of default risk (OECD/Climate Club, 2025[71]). PRSF covers up to 75% of an energy efficiency loan, with a threshold of USD 3.6 million per project. The non-refundable annual guarantee fee amounts to 0.5-1%, depending on the guarantee loan amount or exposure and the grading of ESCO (OECD/Climate Club, 2025[71]).

The PRSF will operate as a capitalised risk-sharing facility designed to support commercial lenders by absorbing a portion of credit risk, thereby enabling ESCOs to obtain more affordable, longer-tenor financing (Global Environment Facility, 2025[93]). The fund would be drawn upon only in the event of borrower default, with payments to participating banks triggered under conditions consistent with the government's existing partial risk-guarantee framework (Global Environment Facility, 2025[93]). By reducing perceived risk and expanding the scope for private financing in the sector, the facility is intended to enhance commercial bank participation through partial coverage of their exposures, ultimately facilitating lower-cost, longer-term debt for ESCO investors (Global Environment Facility, 2025[93]).

Key actors involved the structuring, financing and execution of the scheme include:

- **World Bank:** Implementing agency
- **EESL:** ESCO to support PFI
- **SIDBI:** Independent monitor
- **Global Environment Facility (GEF):** Provider of USD 18 million grant
- **Climate Investment Funds (CIF):** Provider of USD 25 million guarantee via the Clean Technology Fund

Figure A A.6. Flowchart of project level roles and responsibilities



Examples of supported project description

One of the main objectives of the programme is to support the Government of India's efforts to transform its energy efficiency market by promoting the implementation of energy efficiency projects across various sectors (Small Industries Development Bank of India, 2025[94]). The project has a total budget of USD 43 million, comprising USD 37 million for the "Partial Risk Sharing Facility for Energy Efficiency" and USD 6 million allocated for technical assistance endeavours for energy efficiency projects (Small Industries Development Bank of India, 2025[94]). The risk sharing component of the programme is managed by SIDBI which provides the partial credit guarantees are provided to cover a share of default risk (Small Industries Development Bank of India, 2025[94]). The technical assistant component of the programme is managed by SIDBI and Energy Efficiency Services Limited and aims to support capacity building activities and other developmental/operational support that may be necessary for project uptake (Small Industries Development Bank of India, 2025[94]).

SIDBI has defined a list of eligible sectors that could benefit from PRSF. This includes: (i) large industries, such as cement, steel, paper or chemical plants, but excluding thermal power plants; (ii) industrial MSMEs are eligible including retrofits, expansion with reduction of specific energy consumption and greenfield projects; and (iii) non-industrial actors, such as municipalities (e.g. for street lighting), commercial buildings such as hotels, hospitals or office buildings, and power distribution companies. These projects vary in focus, including street lighting for non-industrial entities like municipalities, while industrial MSMEs are eligible for retrofits or greenfield projects (OECD/Climate Club, 2025[71]). As of January 2025, the SIDBI reported that the number of projects supported by the PRSF has grown from 6 in 2016-17 to 75 in 2023-24 (OECD/Climate Club, 2025[71]). Overall, the PRSF has offered partial default risk coverage to 15 participating financial institutions for loans supporting energy efficiency projects carried out by 40 ESCOs (OECD/Climate Club, 2025[71]). As a result, energy efficiency has improved, for instance through the replacement of outdated machinery and the adoption of heat recovery (OECD/Climate Club, 2025[71]).

Impact of the solution on the project

The scheme has mobilised over USD 100 million in private financing for companies and, as a result, has supported industrial firms in establishing baseline energy consumption and identifying opportunities for further improvement (OECD/Climate Club, 2025[71]). These efforts have resulted in total annual energy savings of 371 GWh, including 100 GWh from industrial projects (OECD/Climate Club, 2025[71]). As a result, the scheme has delivered positive outcomes in emissions reduction and has enabled ESCOs, who may not have had sufficient access to capital to achieve these impacts at this scale. In addition, it has increased the bankability of energy efficiency projects and unlocks investment from lenders which can be used for various improvements in efficiency and long-term climate action goals.

Lessons learnt

PRSF has been able to minimise the perceived risk of the lending institutions by way of (i) technical screening of the proposals by experts; (ii) enhanced awareness and upskilling of the credit officers, and (iii) standardised documents for Energy Saving Performance Contract and environmental safeguards due diligence (Cordonnier and Saygin, 2023[12]). By doing so, PRSF could trigger investment in areas where a traditional approach by lending institutions was insufficient (Cordonnier and Saygin, 2023[12]).

Capacity building on both the demand and supply sides plays a critical role, with the success of the instrument and project support (OECD/Climate Club, 2025[71]). For instance, capacity building activities can ensure support in project development and take-off, especially for firms who are developing their first energy efficiency project. It can also help generate a strong pipeline for projects, support the development of specific targets to reduce energy consumptions via knowledge sharing activities such as workshops highlighting successful projects that exist (Cordonnier and Saygin, 2023[12]). As a result, over 100 ESCOs, 5 000 energy professionals, and 10 000 MSMEs have been directly supported or informed through the programme (Cordonnier and Saygin, 2023[12]). The introduction to support financial investments and capacity building are necessary. Multilateral and national partners have contributed best practices that supported the PRSF in achieving its objectives (Cordonnier and Saygin, 2023[12]).

In addition, the programme addresses the vulnerabilities of the MSME ecosystem to climate change by reducing perceived risks associated with investments in ESCOs (OECD/Climate Club, 2025[71]). MSMEs play a crucial role in developing economies by contributing significantly to GDP and job creation (Cordonnier and Saygin, 2023[12]). Yet MSMEs face various barriers in attracting investment while large companies can benefit from specialised facilities aimed at improving their financing options (Cordonnier and Saygin, 2023[12]). Creating a specific MSME financing programme to support the uptake of, high-risk, early-stage pilot projects is needed to advance decarbonisation efforts.

Replicability and conditions for scalability

Similar programmes could be replicated in other countries facing similar barriers as India. For instance, SIDBI is developing similar targeted schemes to support strategic technologies and sectors. For example, SIDBI, in partnership with the World Bank, is currently designing a new financing facility specifically aimed at industry decarbonisation (Cordonnier and Saygin, 2023[12]).

Case Study 16: New Energy Risk (instrument R.6. Performance Guarantee)

Instrument - theoretical concept

Technology performance insurance is a structured de-risking instrument designed to facilitate the financing of technology-based infrastructure projects by covering the risk that a new or commercially unproven technology may not perform as expected. This is particularly relevant in first-of-a-kind (FOAK) projects or early commercial deployments where lenders and investors are reluctant to provide capital without assurances around technology reliability and operational outputs.

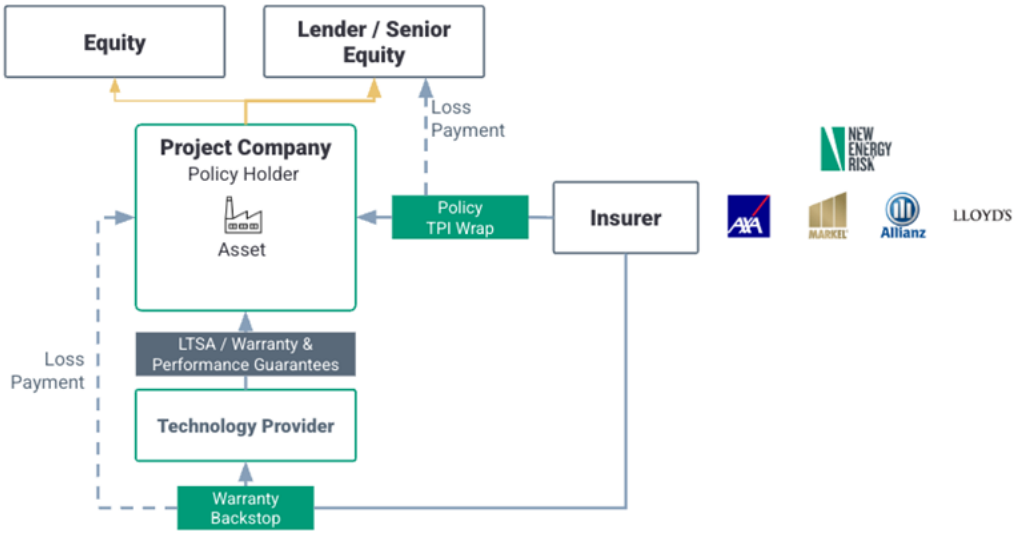
The insurance operates by transferring specific post completion technical risks, such as failure to reach or maintain target output or efficiency during commissioning and operations, from project capital or equipment suppliers wishing to offer creditworthy warranties to the insurance market. By providing coverage linked to predefined performance levels, it enables project developers to access lower cost capital, meet lender requirements, or avoid tying up equity in reserve accounts.

New Energy Risk (NER) is a managing general underwriter that provides technology performance insurance on behalf of A-rated insurers, such as Markel and AXA XL. While it does not carry risk on its own balance sheet, NER performs underwriting, technical due diligence, and risk modelling to support transactions. NER has developed and applied a set of structured insurance products that address technology underperformance risk in novel infrastructure projects. These include: (i) warranty backstops, which enhance the creditworthiness of manufacturer warranties by placing the financial backing of an investment grade insurer behind the Original Equipment Manufacturer (OEM) performance commitments; if the manufacturer is unable to fulfil the warranty due to default, the insurer steps in; (ii) performance insurance wraps, which provide direct protection to lenders or senior equity investors by covering shortfalls in project output below a minimum threshold required for debt service or return targets; in the event of underperformance, the insurer may cover the resulting financial gap; (iii) collateral replacement policies, which serve as substitutes for letters of credit or cash reserves typically required by customers or financiers to cover performance remedies, thereby freeing up capital for developers or suppliers; and (iv) contingency funding insurance, which supports projects with identifiable technical risks (e.g. failure of a key process step) by funding corrective measures such as redesigns or retrofits. By aligning insurance coverage with lender requirements, these products improve project bankability and support the deployment of new technologies in sectors including renewable fuels, biomass, circular economy, hydrogen, and carbon capture.

The instrument involves multiple actors and follows defined contractual and financial flows, which are outlined below:

- Project developer or Special Purpose Vehicle (SPV): insurance policyholder.
- Technology provider: provides performance guarantees and technical data.
- NER: designs the insurance policy and performs due diligence.
- Insurer (Markel, AXA XL, etc.): assumes liability and pays claims, if triggered.
- Senior lenders / bondholders: beneficiaries or loss payees under the insurance policy

Figure A A.7. Actors involved, financial and contractual flow scheme



Coverage is tailored to the financial structure of each project, typically aligned with the period required to service debt or meet investor return expectations. Policies may cover commissioning and up to 10 years of operations, with insurance limits reaching USD 450 million depending on the scale and risk profile of the project.

Among its key advantages, the instrument facilitates the financing of projects using first-of-a-kind technologies by mitigating performance uncertainty. It reduces perceived risk for financial institutions by introducing a creditworthy backstop for underperformance, bridging the gap between technical innovation and traditional lending criteria. By providing a third-party risk allocation mechanism, the instrument enables projects with a limited commercial track record to access capital at earlier stages. It also replaces or reduces the need for letters of credit and equity reserves, improving internal capital allocation and liquidity for developers. The presence of insurance-backed coverage enhances lender and investor confidence and often improves pricing and terms. Finally, it strengthens customer uptake by assuring performance reliability, accelerating the commercial adoption of novel technologies.

Implementation challenges include data availability and quality, policy customisation requirements, and insurance capacity limitations. Insurers require consistent and detailed technical, operational, and financial data, often from pilot or demonstration units, to assess technology performance risk. Incomplete or inconsistent datasets can delay or constrain underwriting, particularly for early-stage technologies. Each policy must also be tailored to the specific project configuration, necessitating iterative modelling and co-ordination between developers, engineers, and financiers. This enhances risk alignment but introduces procedural complexity that may affect transaction timelines. Finally, global insurance capacity for technology performance risk is currently estimated at USD 350-450 million per project. For large scale or multi-phase infrastructure projects, this may be insufficient, requiring co-insurance or layered policy structures to achieve adequate coverage.

Examples of supported projects description

Yilkins deployed a master insurance policy to support the commercialisation of its modular biomass drying and torrefaction systems. The master policy established a pre-agreed insurance framework under which project-specific certificates could be issued for each new deployment, without requiring full re-underwriting

for every new project. This structure enabled efficient and repeatable underwriting of multiple small- to mid-scale industrial installations. Within the first 12 months, three insured projects were contracted. The model has since facilitated market entry in India, Japan, and Europe.

- **Country:** Netherlands (demonstration and HQ), India (Jamnagar), Japan (Yamaguchi), France (Mons-en-Barœul).
- **Industry subsector:** biomass upgrading drying and torrefaction for renewable heat and fuel production.
- **Insurance solution:** master policy issued by Markel enabled issuance of tailored warranty backstop certificates for each project, removing the need for letters of credit or performance bonds. The solution served both as a bankability enhancement and a technology validation instrument.
- **Size of investment:** individual deployments range from pilot to 10+ tonnes/hour commercial units. Notably, a torrefaction plant for Reliance Industries in Jamnagar was financed with Rabobank and Atradius involvement.

To support deployment across diverse projects and customer profiles, NER conducted a detailed techno-economic and actuarial assessment of Yilkins' demonstration unit. This analysis formed the basis of the master policy agreement, which defined the core terms of coverage for future projects. For each new installation, Yilkins could request a project specific insurance certificate aligned with the relevant technical configuration and performance criteria. This approach provided customer confidence, streamlined contracting, removed the need for customer facing collateral, and enabled Yilkins to expand without taking on additional balance sheet exposure.

Technology performance insurance has also been applied to larger and more complex infrastructure projects: Bloom Energy (USA) utilised warranty backstop coverage for multiple fuel cell projects in different regions, supporting expansion of its deployment activities. The insurance instrument contributed to the company's ability to secure financing for successive projects and facilitated broader commercialisation of its fuel cell technology. Brightmark (USA) used a performance insurance policy underwritten by AXA XL to support a USD 185 million green bond issuance for its plastics-to-fuel facility. The insurance enabled bond placement, though the project later underwent court supervised restructuring. Fulcrum BioEnergy (USA) applied a custom insurance wrap for its waste-to-SAF plant in Nevada, supporting a USD 175 million, 20-year bond. While the policy helped close financing, the project later faced execution issues following EPC contractor default, ultimately followed by failure of the project.

These cases illustrate the instrument's adaptability across sectors and scales: from modular biomass systems to large-scale advanced fuels. They also highlight the importance of broader project execution and delivery frameworks beyond technical de-risking.

Impact of the solution on the projects

Advantages versus conventional financing are reflected in the ability of the instrument to reduce risk perceptions and improve access to capital for emerging technologies. Yilkins was able to proceed without traditional collateral or equity guarantees by offering insurance-backed warranties, which facilitated investor confidence and improved capital efficiency. Bloom achieved lower financing costs and a shorter transaction timeline, as the presence of insurance support provided clarity and reassurance to credit committees. Brightmark gained access to institutional bond markets despite the underlying technology being relatively new to investors, with the performance insurance serving as a key risk mitigant. Fulcrum obtained long-tenor debt at reduced pricing, supported by the insurance policy's role in reallocating technology related risk away from senior lenders.

Impact on business model and access to finance varied across the projects and illustrates how insurance mechanisms influenced technology deployment. Yilkins moved from demonstration to commercial

deployment across multiple international markets, including India and Japan, using the insurance solution to support contracting without relying on its own balance sheet. Bloom scaled its fuel cell operations and expanded market presence with the support of insurance-backed warranties, which helped facilitate consistent financing. Brightmark leveraged the instrument to issue green bonds and, despite later restructuring, retained site operations, indicating continuity in its commercial efforts. Fulcrum reached financial close through a combination of equity and long-term debt at improved terms, but ultimately failed to complete the project, highlighting the importance of complementary execution capacity beyond technical risk mitigation.

How enabling conditions complemented the instrument is reflected in a number of shared features across the supported projects. All three had validated pilot data and independent technical assessments, which reduced underwriting uncertainty and allowed insurers to model performance risk with greater accuracy. This was essential in demonstrating technology viability at commercial scale. Structured offtake agreements or the presence of creditworthy end users, such as Reliance Industries for Yilkins and Marathon Petroleum for Fulcrum, helped ensure predictable revenue streams, a critical factor for both insurers and lenders in evaluating project bankability. Fulcrum's early-stage eligibility for a USDA loan guarantee provided an additional signal of baseline technology readiness and governance, although the project was ultimately financed through private sources.

Lessons Learnt

The solution proved effective in terms of transaction structuring and mobilisation of private capital. Yilkins expanded into multiple markets under the master policy framework, demonstrating replicability. Brightmark secured bond financing and continued operations following restructuring, while Fulcrum reached financial close with long tenor debt and equity. However, Fulcrum's project ultimately failed to complete commissioning, highlighting that performance insurance addresses technical risk but cannot mitigate broader execution, operational or market related challenges.

In terms of project preparation, NER underwriting generally requires 8-16 weeks but is typically conducted in parallel with other development activities. Rather than extending the timeline, the insurance process can accelerate financial close by streamlining technical and financial due diligence and reducing later stage approval hurdles.

Across the three cases, the insurance instrument facilitated private capital mobilisation, particularly through improved access to debt markets and reduced reliance on equity funded contingencies. While insurance was central to project bankability, there is no public indication that payouts were triggered for Yilkins or Brightmark. Fulcrum's insolvency occurred before any reported claim activity.

Replicability and scalability conditions

The replicability and scalability of technology performance insurance depend on a combination of technology, market, and policy factors. The instrument is well suited to technologies with quantifiable output metrics and validated pilot or demonstration data, as this enables insurers to assess and model risk with sufficient confidence. The use of master policy structures, as demonstrated by Yilkins, supports scalability by allowing repeat issuance of tailored certificates across different projects and jurisdictions without full re-underwriting. This approach facilitates streamlined deployment across multiple clients, technologies, and countries. The instrument is particularly applicable in sectors with modular or process-based systems, such as biomass, pyrolysis, hydrogen, sustainable aviation fuels (SAF), carbon capture, power systems, circular economy solutions, mineral processing, and water treatment, where performance metrics can be standardised and monitored. Replication is also more likely in jurisdictions with stable legal frameworks, creditworthy offtakers, and supportive industrial or climate policies, which provide a predictable environment for insurance underwriting. In these contexts, insurance can operate alongside

public support mechanisms or export credit instruments, reducing the need for large equity cushions or contingency reserves.

Case Study 17: Global Steel Dust Gulf LLC - Saudi Arabia - World Bank, MIGA (instrument R.7. Political Risk Insurance)

Instrument - theoretical concept

Political Risk Insurance (PRI) is a risk mitigation instrument designed to protect cross-border investors and lenders from losses stemming from non-commercial risks in the host country. These risks include government interference, breach of contract, political violence, or foreign exchange restrictions, all of which can materially affect the financial performance or viability of long-term investments. PRI is commonly applied in Emerging Markets and Developing Economies (EMDEs), where perceived or actual political risk may constrain private sector participation in infrastructure, industrial, or decarbonisation projects. By addressing such risks, PRI can improve the risk-return profile of investments and facilitate access to long-term finance.

Under the World Bank Group Guarantee Platform, PRI is provided by the Multilateral Investment Guarantee Agency (MIGA), a member of the World Bank Group. MIGA's PRI aims to promote foreign direct investment into EMDEs by mitigating the impact of political risks that are typically beyond the investor's control. These include government actions or political instability that disrupt project operations, profitability, or ownership structures.

MIGA's PRI coverage addresses five key political risk categories. Transfer restriction and inconvertibility protection safeguards investors from losses due to government-imposed constraints on the conversion or transfer of local currency abroad, ensuring the repatriation of dividends and debt service. Expropriation covers loss resulting from actions that reduce or eliminate ownership or control without adequate compensation. War and civil disturbance protect against physical damage or business interruption caused by politically motivated violence, including terrorism and unrest. Breach of contract offers coverage when the host government fails to honour a contractual obligation, and no recourse is available through local courts or arbitration. Non-honouring of sovereign financial obligations applies when a sovereign or sub-sovereign entity fails to meet a payment due under a guarantee or financial contract backed by a sovereign undertaking.

In addition to these core products, MIGA offers specialised instruments such as Non-Honouring of Financial Obligations by State-Owned Enterprises (NHFO-SOE) and Capital Market Guarantees, which cover risks associated with investments involving state owned entities and cross border bond issuances. These instruments allow PRI to support more complex financial structures and a wider range of counterparties.

By reducing both actual and perceived political risks, MIGA's PRI improves investment terms, reduces financing costs, and extends maturities. It is particularly effective in enabling long-term infrastructure, industry decarbonisation, and clean energy investments in high-risk environments. PRI can be deployed on a standalone basis or in conjunction with other de-risking tools offered by the World Bank Group, such as IBRD partial risk guarantees.

PRI transactions involve a series of actors and structured contractual relationships designed to protect the investor while maintaining accountability in the host country:

- The guarantee holder is typically a foreign investor providing equity and/or shareholder loans to a local entity.
- The host country is the jurisdiction where the project operates and in which political or regulatory risks are present.

- The local entity, typically structured as a joint venture or special purpose vehicle, is the project company through which the investment is made.
- The insurer, MIGA, issues the political risk guarantee to de-risk the investment and compensate the investor in case of a covered loss.

Financially, the guarantee holder invests capital into the local entity, while MIGA issues a political risk insurance contract for a defined term, typically extending up to 20 years. The guarantee specifies the risks covered, such as transfer restriction, expropriation, or political violence, and defines the conditions for compensation. If a covered event occurs, MIGA compensates the investor for eligible losses and assumes the investor's subrogation rights to pursue recovery from the host government. This structure protects investor returns while reinforcing the host country's accountability to maintain a stable investment environment.

MIGA guarantees can cover a wide range of financial instruments including equity, shareholder loans, non-shareholder loans, and project finance debt. They are also applicable to capital market instruments, facilitating participation by commercial banks and institutional investors in syndicated or structured finance transactions. This versatility makes PRI an important enabler of private investment across diverse sectors and financing models.

PRI offers three core advantages for investors. First, it mitigates sovereign and political risks, enabling capital deployment in high-risk jurisdictions. Second, it mobilises private finance by improving project bankability and reducing perceived risk for equity and debt providers. Third, it supports long-term investment viability, particularly in sectors requiring stable, multi-year capital commitments such as industry decarbonisation and infrastructure. These effects contribute to both commercial outcomes and broader development impact.

However, several challenges affect implementation. Country eligibility is subject to MIGA's risk assessments and host country compliance with environmental, social, and governance (ESG) standards, which may limit coverage in fragile or low-capacity contexts. The scope of coverage is confined to political (non-commercial) risks, meaning that market, operational, or technology risks must be mitigated separately. In addition, the due diligence process, including Environmental and Social Impact Assessments (ESIA) and legal reviews, can extend preparation timelines. These procedural requirements, though necessary for quality assurance, may add complexity to project development.

Despite these constraints, the strategic benefits of PRI, notably improving investor confidence, enabling access to long-term finance, and supporting cross border capital flows, make it a central instrument within the World Bank Group's de-risking toolkit.

Example of supported project description

Global Steel Dust Gulf LLC (GSDG) is a joint venture between Global Steel Dust Ltd. (Switzerland) and Khudair for Trading and Contracting Co., established to develop and operate Saudi Arabia's first facility for recycling electric arc furnace dust (EAFD) - a hazardous by-product of steel production. Located in Dammam Second Industrial City, the facility uses Waelz Kiln technology, an internationally recognised method for recovering zinc and iron from EAFD, classified as Best Available Technique (EU BREF) and Best Demonstrated Available Technology (US EPA).

The plant processes over 110 000 metric tonnes of EAFD annually, yielding approximately 43 000 tonnes of Waelz Zinc Oxide (WZO) for export and 82 500 tonnes of Waelz Iron Product (WIP) for use in local construction and cement sectors. Commissioned in 2016 and operational since 2017, the project aligns with Saudi Arabia's Vision 2030 goals for industrial diversification and environmental protection. By diverting hazardous waste from landfill and enabling resource recovery, the facility exemplifies circular economy principles in the steel value chain.

MIGA issued USD 15.3 million in PRI to the Swiss sponsor, covering both equity and shareholder loans under its standard political risk instrument. The guarantee covered transfer restriction, expropriation, and war and civil disturbance. It was approved by MIGA's Board in April 2016 for a 10-year tenor, matching the long-term investment horizon of the facility.

- **Country:** Saudi Arabia
- **Industry subsector:** steel dust recycling (non-ferrous metals recovery)
- **Project size:** approximately USD 23 million total project investment

The project, with a total capital investment of approximately USD 23 million, was structured as a 50/50 joint venture reflecting cross border collaboration and alignment with local policy priorities. The industrial location enabled streamlined access to infrastructure and regulatory authorities. Environmental and operational permits were issued by the Presidency of Meteorology and Environment (PME), the Saudi Industrial Property Authority (MODON), and Civil Defence. The Environmental Impact Assessment (EIA) was conducted by ARENSCO, ensuring compliance with local and international standards.

Impact of the solution on the project

MIGA's PRI delivered several advantages compared to conventional financing. Its de-risking function improved the project's financial viability by mitigating non-commercial risks and enabling bankability for a foreign sponsor entering a new market. The presence of a multilateral guarantor signalled credibility and increased investor confidence. As the first hazardous waste recycling facility of its kind in the MENA region, the project would likely not have proceeded without such risk mitigation.

The PRI also enabled a viable business model for waste recovery in a market where EAFD is typically landfilled. It supported the commercialisation of zinc and iron by-products, with WZO exported to European buyers and WIP sold domestically. The 10-year guarantee allowed for capital intensive, long-term operations aligned with resource efficiency and circular economy objectives.

The effectiveness of the instrument was reinforced by enabling conditions in Saudi Arabia. The project was aligned with national policy objectives under Vision 2030, received institutional support through MODON and PME, and benefitted from partnerships with engineering universities and technical training programmes. These factors supported both project implementation and local capacity development.

Lessons Learnt

The PRI instrument proved effective in enabling the project. The facility was constructed and entered operation without significant environmental incidents. MIGA's guarantees, coupled with the project's adherence to robust ESG safeguards, provided the necessary assurance for foreign investment in a high-risk industrial segment.

Project preparation timelines were moderately extended due to due diligence requirements, particularly the EIA and Environmental and Social Review Summary (ESRS). However, these processes enhanced project quality and introduced risk management mechanisms that supported long-term resilience. The additional preparation time was therefore offset by greater operational credibility and alignment with international norms.

PRI was critical in mobilising private capital. By reducing political risk exposure, the instrument enabled Global Steel Dust SA to proceed with equity and shareholder loan investments. Following issuance of the guarantee in 2016, the funds were disbursed, and the plant was delivered on time and within planned capacity, validating the role of de-risking instruments in early-stage industrial projects.

Replicability and scalability conditions

PRI is broadly replicable across sectors such as infrastructure, clean energy, industry decarbonisation, and advanced manufacturing, especially in hard-to-abate segments. It is most relevant where sovereign, regulatory, or currency-related risks constrain private investment, including in waste recovery and low-carbon industrial processes.

The instrument has been successfully deployed by MIGA since 2016 across multiple geographies and sectors, including renewable energy, climate-smart agriculture, and clean transport, often in combination with concessional finance. Replication potential is particularly high in MENA, Sub-Saharan Africa, and South and Southeast Asia, where political risk remains an important barrier to private investment.

However, certain barriers persist for replication at scale, such as limited awareness among smaller sponsors, regulatory uncertainty, and the complexity of meeting environmental and social requirements. Replicability is strengthened when host governments offer transparent permitting, enforceable regulation, and investor protections. PRI is most impactful when aligned with national climate strategies or industrial policies, and when complemented by public co-financing or Foreign Direct Investment (FDI) incentives. These factors collectively enhance the instrument's scalability and effectiveness in catalysing private capital in higher-risk contexts.

Case Study 18: Sustainability Bonds - IDB and BBVA (instrument F.1. Sustainability Bonds)

Instrument - theoretical concept

Bonds are fixed-income instruments through which money is lent to a company or government with a fixed interest rate set for the duration of the investment. It is often backed by a sovereign guarantee or security. The lender repays the issuer with interest in addition to the original face value of the bond, which must be repaid in full at maturity (OECD/Climate Club, 2025[71]). Some bonds are backed by a sovereign guarantee or specific assets (OECD/Climate Club, 2025[71]).

There are two key bond types: convertible and non-convertible debentures (NCDs). A convertible bond has the option to be converted into shares of common stock in the issuing company or cash (OECD/Climate Club, 2025[71]). Non-convertible debentures (NCDs) are fixed-income securities issued by companies or private enterprises to raise capital from investors, usually offering a higher interest rate than convertible bond, and cannot be converted into shares of an entity (OECD/Climate Club, 2025[71]).

The benefits associated with the use of the bond, include predictable returns to the lender given the loan needs to be paid at face value by a specified date to prevent asset losses for the lender (OECD/Climate Club, 2025[71]). For projects pertaining to decarbonisation, green bonds are useful in raising capital from investors to finance sustainability projects while protecting lenders from losses (OECD/Climate Club, 2025[71]). For instance, governments can issue green bonds to accelerate sustainable development projects. One example is Australia's Green Treasury Bond which helps to finance projects to support the net-zero economy and targets infrastructure development and water management (Australian Government, The Treasury, 2025[95]).

Bonds also prove useful to accelerating industry decarbonisation efforts. For instance, the Inter-American Development Bank (IDB) deploys bonds to finance green projects in Colombia. The IDB supported Banco Bilbao Vizcaya Argentaria Colombia S.A. (BBVA Colombia) in the issuance of a USD 100 million in sustainable bonds to finance green and social projects in Colombia to meet various Sustainable Development Goals (SDGs (OECD/Climate Club, 2025[71]). Overall, the bond will allow BBVA Colombia to grow its capital base and advance its growth strategy by focusing on portfolios dedicated to sustainable and inclusive development (IDB Invest, 2024[96]) The issuance of the bond follows the use of sustainable

bond standards set by ICMA and BBVA's Sustainable Debt framework (OECD/Climate Club, 2025[71]). In addition to the financing element, IDB Invest provides advisory services to help BBVA develop tailored financial solutions for SMEs in the Amazon region (IDB Invest, 2024[96]).

Key actors involved in the structuring and financing of sustainability bond include:

- **BBVA:** Lender of USD 100 million in sustainable bonds
- **IDB:** Support lender

Examples of supported project description

The bond finances green and social projects in SDGs targeting Zero Hunger (SDG 2), Gender Equality (SDG 5), Affordable and Clean Energy (SDG 7), Decent Work and Economic Growth (SDG 8), Industry, Innovation, and Infrastructure (SDG 9), Sustainable Cities and Communities (SDG 11), and Partnerships for the Goals (SDG 17) (OECD/Climate Club, 2025[71]). More specifically, the funds will be used to finance green projects, including sustainable construction, energy efficiency, agriculture, and the circular economy (IDB Invest, 2024[96]). The funds will expand the financing of BBVA's green and social portfolios and design of financial services for micro, small- and medium-sized enterprises (MSMEs) to promote sustainable and inclusive development via sustainable bio-businesses and financial services for underserved populations (OECD/Climate Club, 2025[71]). Projects receiving financing under the bond will target climate change and equitable growth (OECD/Climate Club, 2025[71]).

Impact of the solution on the project

The use of the bonds prioritises inclusive sustainable development targeting unrepresented populations across Colombia. MSMEs in the Amazon region of Colombia will have the chance to receive the funding and benefit from financial services from BBVA (OECD/Climate Club, 2025[71]). The growth of MSMEs in the Amazon region can help to promote sustainable bio-businesses and improve access for underserved populations through market analysis, service design, and pilot testing of projects (IDB Invest, 2024[96]). This approach helps Amazonian communities leverage their knowledge and expertise, already used within their businesses. It also ensures that financial services and initiatives are well-suited to the community's specific needs. As a result, it stimulates growth across local businesses by providing them with tailored support, improving access to finance, and fostering sustainable economic development in the region.

Lessons learnt

Since the bond was disclosed in August 2024 and approved in October 2024, results from its use have not yet been published.

Replicability and conditions for scalability

The bond structure is replicable across other areas but requires a partnership between international financial organisations and development banks. IDB Invest acted as anchor investor with a subscription for USD 50 million, complemented with an IFC subscription of USD 50 million (OECD/Climate Club, 2025[71]). Partnerships across financial institutions are essential for the issuance of bonds at this scale, as it requires pooling capital commitments from various sources. Financial commitments worth USD 100 million are often beyond the capacity of a single financial institution.

Such partnerships not only provide the capital needed but also bring together expertise, risk-sharing mechanisms, and credibility. Shared knowledge is crucial for attracting additional investment from the private sector and successful project implementation. This model provides a valuable blueprint for other

IFIs and development banks to undertake when mobilising capital for green and sustainable development projects or setting up a sustainable development finance programme leveraging the use of bonds.

Case Study 19: Transition Bonds - Mitsubishi Heavy Industries (MHI) (instrument F.10. Transition Bonds)

Instrument - theoretical concept

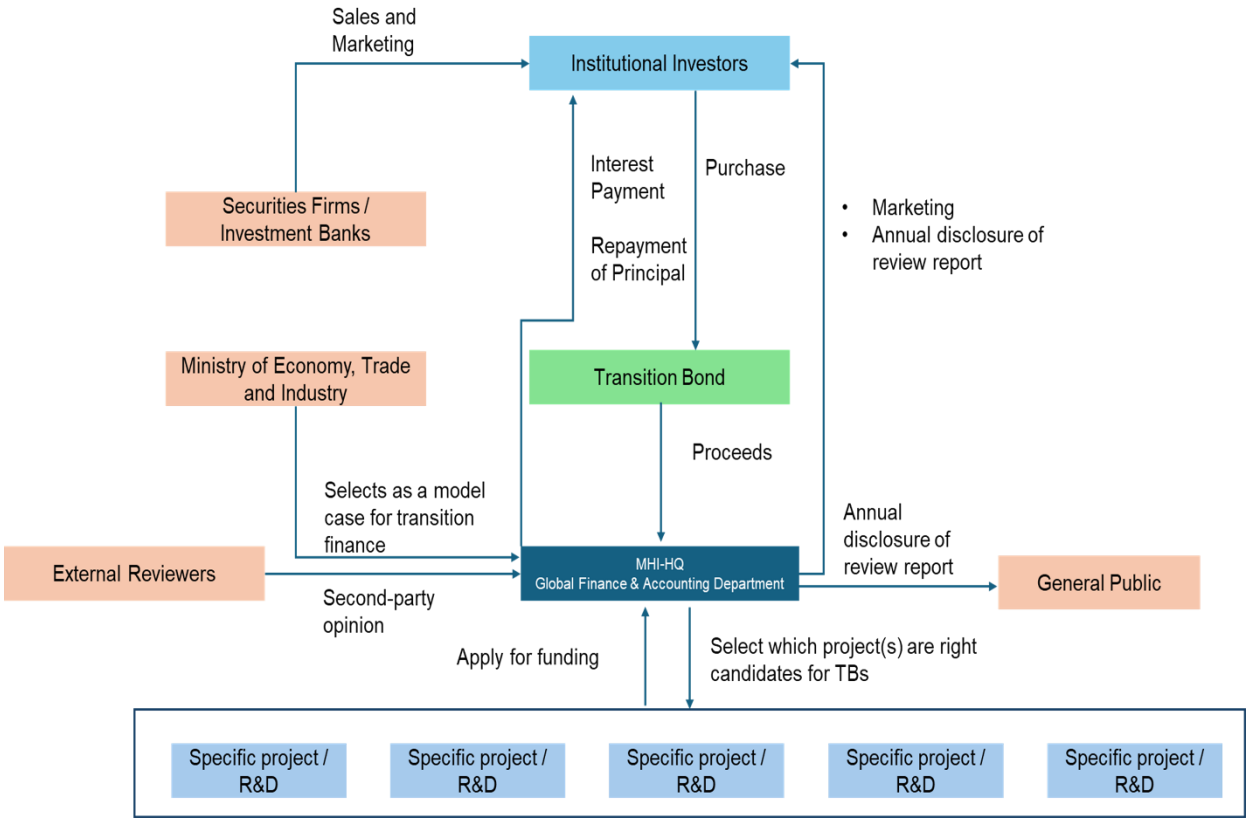
Transition Bonds are capital market instruments used to finance decarbonisation projects in sectors where full emissions elimination is not yet feasible. They provide access to debt capital for companies in hard to abate industries pursuing science-based transition strategies, as well as for companies that provide decarbonisation solutions. Unlike green bonds, which are restricted to taxonomy aligned activities, transition bonds accommodate interim solutions and technologies on credible pathways to net zero.

MHI, an industrial conglomerate headquartered in Tokyo, Japan, launched its Green/Transition Finance Framework in 2022 to finance its climate strategy through bond markets. The framework enables the issuance of green and transition bonds, with proceeds allocated to eligible projects proposed by business units and approved by the CFO. MHI obtained a second-party opinion from DNV Business Assurance Japan K.K., confirming alignment with the ICMA Climate Transition Finance Handbook, Japan's Basic Guidelines on Climate Transition Finance, and the Green Bond Principles.

The bond framework brings together a range of financial and institutional actors, each playing a distinct role in ensuring alignment with transition objectives and investor confidence:

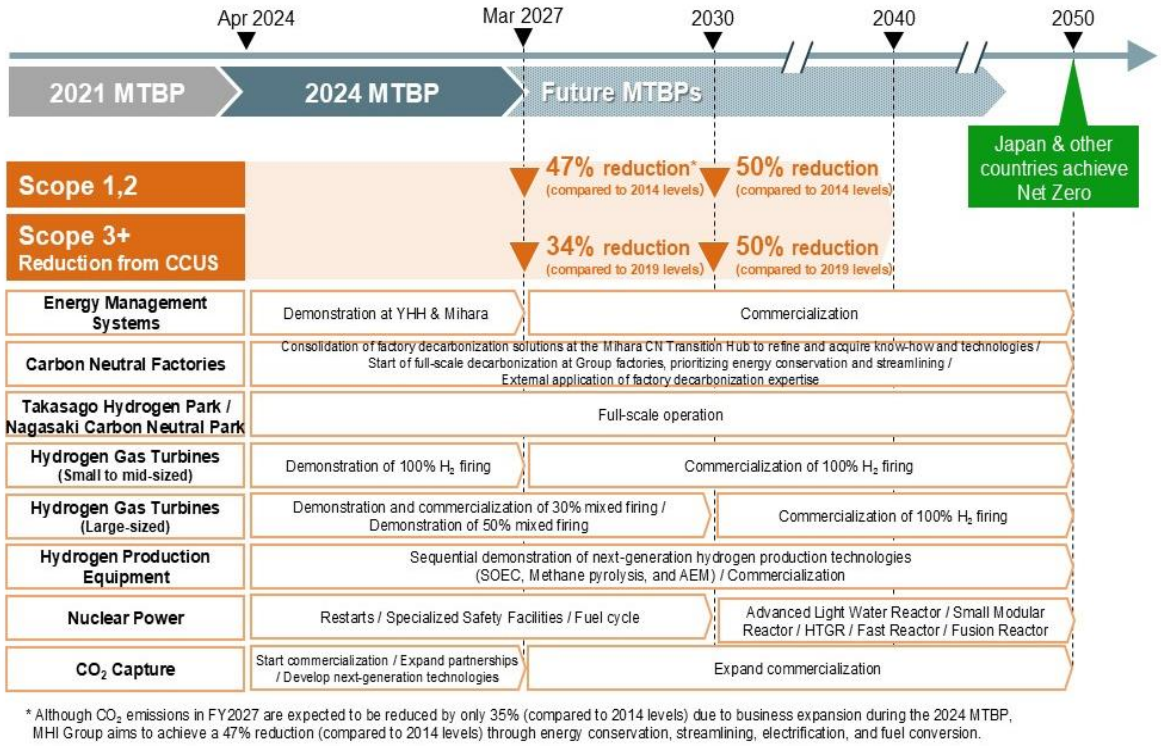
- Issuer: MHI
- External Reviewer: DNV Business Assurance Japan K.K.
- Investors: Institutional investors
- Use of proceeds: R&D, CAPEX, business development, and operations for projects aligned with Japan's sectoral roadmaps (power, gas, steel, chemicals)

Figure A A.8. Overview of bond framework



The framework supports MHI's decarbonisation roadmap. By 2030, MHI targets a 50% reduction in Scope 1 and 2 emissions (relative to 2014), and a 50% reduction in Scope 3 emissions (relative to 2019), largely through the deployment of low carbon fuel technologies and carbon capture, utilisation and storage (CCUS). By 2040, it aims for net zero emissions across its value chain, ten years ahead of Japan's Nationally Determined Contribution (NDC). Transition bond proceeds fund energy efficiency, hydrogen, CCUS commercialisation, and low carbon manufacturing.

Figure A A.9. MHI Transition Roadmap



Source: (MHI, 2025[97])

Key advantages of the transition bond structure include its ability to provide access to capital markets to finance long-term, capital-intensive decarbonisation projects, enabling companies like MHI to pursue large-scale infrastructure and technology investments aligned with their climate objectives. It broadens the eligible use of proceeds to include transition-aligned but not yet fully green technologies, such as hydrogen turbines, thereby supporting interim solutions along credible net zero pathways. It enables long-term R&D financing in developing solutions and technologies for its hard to abate sectors clients by offering dedicated resources for early-stage development and pilot deployment, which are sometimes underserved by traditional finance. The instrument also enhances MHI's positioning among ESG investors by increasing transparency through project level allocation and impact reporting, improving investor confidence. Transparency is essential, as developing solutions and technologies for clients in hard-to-abate sectors takes many years and is not always immediately visible to stakeholders. By issuing Transition Bonds and publishing annual reviews that detail the use of proceeds and the resulting environmental benefits, MHI provides both institutional investors and the general public with clear insight into its activities. MHI views these disclosures as an effective way to communicate its efforts and long-term commitment to the investor community.

Implementation challenges include the need for credible transition plans and detailed disclosures are necessary to uphold investor trust and meet external verification standards, potentially increasing the reporting burden. Additionally, investor appetite is conditioned by market alignment with government climate roadmaps and the availability of sector.

Example of supported project description

MHI has issued three transition bonds from 2022 until 2024 for the total amount of JPY 30 billion (USD 200 million) to projects focused on the energy transition. Proceeds from transition bonds are directed to flagship R&D and demonstration projects in hydrogen, CO_2 capture, and energy efficiency.

- **Country:** Japan (primarily)
- Industry subsectors: Power (hydrogen, hydrogen production, gas turbines), industry (hydrogen direct reduction of iron, CCUS
- Size of investment: within JPY 30 billion (USD 200 million) programme; specific use of funds is disclosed as follows:

Table A A.4. Use of funds

		Billion JPY
No.	Project	Total in Billion JPY
1	Hydrogen gas turbine	12
2	Hydrogen production (blue or turquoise, etc.)	6
3	Metals machinery (hydrogen-reduced ironmaking etc.)	1
4	CO_2 capture and storage	7
	Total so far	26
	Amount of Transition Bond issued	**30**
	Proceeds to be used	**4**

Examples of projects financed under the transition bond framework include:

- R&D into hydrogen gas turbines (100% firing, co-firing) with 100% CO_2 reduction potential
- Development of hydrogen gas turbine
- Development of hydrogen production
- Development of metals machinery (hydrogen-reduced ironmaking)
- Development of CO_2 capture and storage

The governance and implementation arrangements of the transition bond framework are designed to ensure technical relevance, financial oversight, and transparency. Project application is initiated by business units and selected by the Finance Department and approved by the CFO who reports to the Executive Committee and Board as to the current status. Annual impact reports disclose CO_2 reduction and allocation status.

Impact of the solution on the project

Advantages relative to conventional financing includes the ability of transition bonds to enable longer term planning for industry decarbonisation by securing multi-year funding for a verification stage that is yet to be commercialised, R&D, demonstration, and scale up activities that could be excluded from short term corporate finance frameworks. They provide visibility to investors through transparent allocation and impact reporting, while signalling alignment with a credible transition plan. They also support capital intensive verification stage technologies that are yet to be commercialised but are aligned with decarbonisation pathways but may not qualify under green bond taxonomies.

Impact on access to finance is straightforward as access to transition bond proceeds improves MHI's ability to attract international and domestic sustainability-focused investors. Internally, the framework strengthens

capital allocation by linking investment decisions to science-based targets. Enabling conditions include policy alignment with Japan's industry decarbonisation roadmaps and eligibility under its sectoral strategies. Additional factors include the Green Innovation Fund (NEDO) and hydrogen development strategies, which de-risk projects and improve investment visibility across sectors.

Lessons learnt

The instrument was implemented effectively. MHI demonstrated alignment with international transition finance principles, notably those established by the International Capital Market Association (ICMA), Japan's Ministry of Economy, Trade and Industry (METI), and the Ministry of the Environment (MOEJ). The Green/Transition Finance Framework was recognised by institutional investors and external reviewers for its governance structure, clarity of eligibility criteria, and transparency of allocation and impact reporting.

The instrument did not materially extend project preparation timelines, as project pipelines were already aligned with the company's strategic roadmap and budget cycle. The underlying technologies supported, such as hydrogen gas turbines and production of hydrogen, hydrogen-based fine ore reduction for ironmaking (HYFOR), and CO_2 capture and storage that require long development and demonstration cycles. However, the availability of dedicated transition bond proceeds enabled continuity of capital across R&D, pilot, and pre-commercial phases, helping to smooth investment planning.

Although transition bonds are not backed by concessional finance or public guarantees, the instrument has supported the mobilisation of private capital. Proceeds were raised from institutional investors, particularly those with sustainability mandates. MHI's explicit alignment with national decarbonisation roadmaps and its engagement of a recognised second-party opinion provider (DNV) enhanced credibility and expanded the pool of prospective buyers, contributing to broader investor participation.

Disbursement mechanisms were implemented in line with the eligibility framework. Funds were allocated to approved projects as outlined in the use of proceeds criteria, with any unallocated proceeds temporarily held in cash or equivalent instruments. This practice supports disciplined capital deployment and reinforces transparency in the eyes of investors.

Replicability and conditions for scalability

The model is replicable in sectors characterised by high emissions and long asset lifecycles, such as power generation, steelmaking, chemicals, and maritime transport. These industries benefit from transition bond frameworks that accommodate incremental decarbonisation technologies aligned with long-term climate goals. Replication is particularly feasible in jurisdictions with clear national decarbonisation strategies and strong ESG regulatory environments. In these contexts, policy alignment, disclosure expectations, and investor mandates converge to support issuance and uptake.

Key prerequisites for scalability include credible national transition roadmaps that provide visibility on sectoral abatement pathways, strong internal governance mechanisms to manage project selection and reporting, transparent and science-based emissions reduction plans, and investor confidence underpinned by robust second-party opinions and adherence to international transition finance guidelines.

Case Study 20: Industry Decarbonisation Programme - CIF (instrument F.2 Concessional Loans)

Instrument - theoretical concept

The Industry Decarbonisation Programme by CIF provides a combination of climate finance instruments such as loans and guarantees and promotes private sector involvement to integrate sustainable practices

in high-emitting industries in developing economies (OECD/Climate Club, 2025[71]). Countries receiving funding include Brazil, Egypt, Mexico, Namibia, South Africa, Türkiye and Uzbekistan (Climate Investment Funds, 2025[98]). Targeted investments can focus on technology innovation such as hydrogen or advanced manufacturing, enable clean energy and electrification, support the uptake of circular economy strategies and build the foundation for resilient, low-emission economies (Climate Investment Funds, 2025[98]). Complimentary to the programme is the Industry Decarbonisation Programme Evaluation and Learning Toolkit designed to support funding applications (OECD/Climate Club, 2025[71]). It acts as a guide to inform the use of evaluation and learning approaches throughout the lifecycle of the Industry Decarbonisation Programme, and associated projects to ensure a meaningful impact (OECD/Climate Club, 2025[71]).

Examples of supported project description

The specific sector focus is on the industrial, high emitting sectors and low-carbon technologies that can help to reduce emission levels and integrate sustainable practices in industries in EMDEs. Each project in the eligible countries will focus on different sectors and priorities as highlighted Table A A.5. .

Table A A.5. List of projects by eligible country

Country	Project Focus
Brazil	Bridging Brazil's financing and policy gaps in industry decarbonisation.
Egypt	Industrial transformation for the cement and steel sectors.
Mexico	Advance innovations in green hydrogen, energy efficiency, circular economy models, and eco-industrial parks.
Namibia	Finance infrastructure for green hydrogen, eco industrial parks and clean supply chains.
South Africa	Reindustrialisation aligned with just transition principles
Türkiye	Development of the Türkiye Industrial Decarbonization Investment Platform (TIDIP),
Uzbekistan	Accelerate early-stage decarbonisation efforts in heavy industry.

Source: (Climate Investment Funds, 2025[98])

Impact

CIF will invest up to USD 1 billion in the programme. The programme is viewed as an opportunity to provide unique investment windows to support innovation, increase demonstration projects for new technologies, while creating a fair, inclusive, and just transition for industries and the countries they operate in (OECD/Climate Club, 2025[71]). The programme is also the first global concessional finance initiative that is investing in the reduction of industrial GHG emissions in developing countries (Climate Investment Funds, 2025[98])

Lessons Learnt

Given the programme has just collected Expressions of Interest (as of end January 2025) and selected the countries and their focus there are no lessons learned to report at the time of writing.

Replicability and conditions for scalability

CIF's Industry Decarbonisation Programme builds on the experience from other CIF activities, such as the Clean Technology Fund (CTF), that uses a blend of financial instruments for investing in clean technology projects in low- and middle-income countries. In 2024, the 130 projects funded by the CTF have achieved a yearly GHG emissions avoidance of 39.3 Mt CO_2 and energy savings of 6 136 GWh. The cumulative amount of co-financing for CTF-supported projects is USD 31.3 billion, including 26% mobilised from the

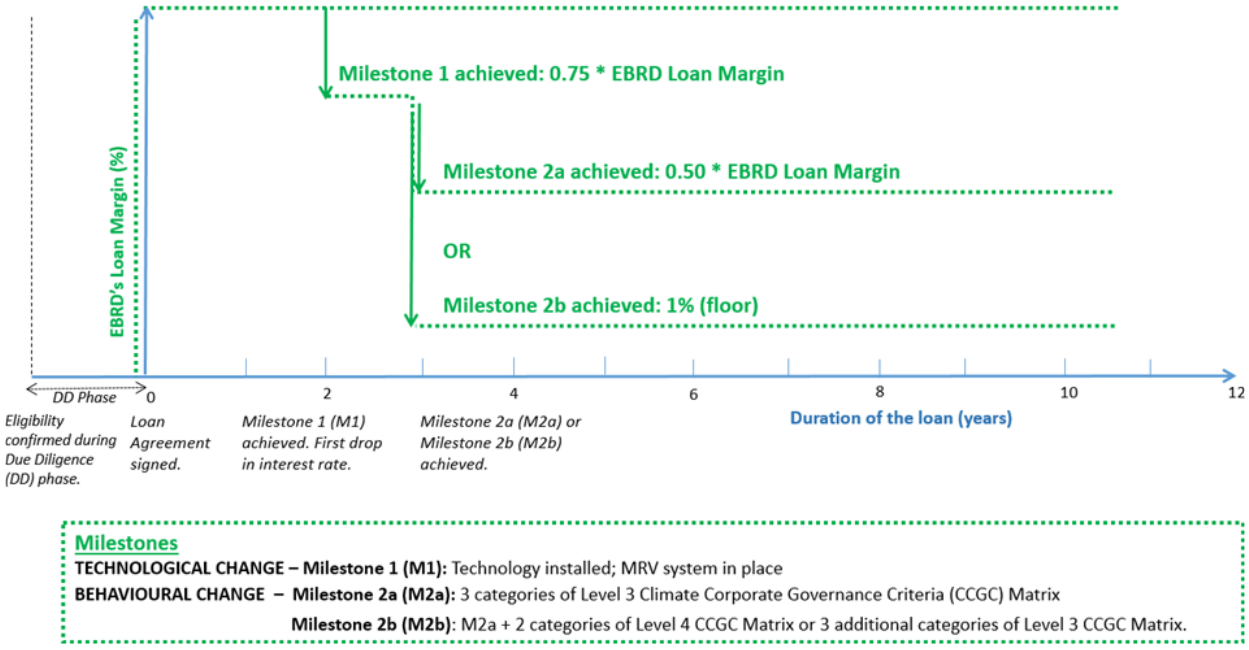
private sector. CTF funding has been deployed in many countries, including but not limited to Brazil, Egypt, Indonesia, Kenya, Mexico, Nigeria, Peru, South Africa.

Case Study 21: High Impact Programme - EBRD and GCF (instrument F.2. Concessional Loans)

Instrument - theoretical concept

The High Impact Programme for the Corporate Sector (HIP) promotes the uptake of low-carbon technologies in seven select countries: Armenia, Kazakhstan, Jordan, Morocco, Serbia, Tunisia and Uzbekistan (OECD/Climate Club, 2025[71]). HIP is a partnership between the Green Climate Fund (GCF) and the European Bank for Reconstruction and Development (EBRD) (OECD/Climate Club, 2025[71]). The programme combines the use of grants, and an investment programme. A total of USD 5.42 million in grants are issued to develop low-carbon strategies and prepare investments through the development of corporate low-carbon gender-responsive strategies (OECD/Climate Club, 2025[71]). The investment programme is worth USD 1.01 billion to support high climate impact projects in targeted industrial sectors, where loan rates have a discount if certain predefined milestones are met, with an interest rate floor of 1% (OECD/Climate Club, 2025[71]). In addition, USD 1.45 million in grants are issued to develop low-carbon sectorial roadmaps and knowledge sharing (OECD/Climate Club, 2025[71]). The disbursement period of the facility is six years with a repayment period of 12 years maximum tenor for loans under the programme (Cordonnier and Saygin, 2023[12]).

Figure A A.10. Illustrative impact of sustainability-linked interest rate (loan margin) by milestone



Source: (Cordonnier and Saygin, 2023[12])

Examples of supported project description

HIP aims to reduce emissions by 17 million tonnes of carbon dioxide equivalent in 20 years through the uptake of low carbon technologies in the industrial sector and stimulating behavioral change at the corporate governance and management level (OECD/Climate Club, 2025[71]). The manufacturing

industries eligible for financing under the HIP include construction materials, fertilizer, chemicals, iron and steel, aluminum, pulp and paper, and glass (Cordonnier and Saygin, 2023[12]). The aim of the programme is to overcome key barriers to the uptake of climate technologies. For instance, financing barriers contribute to higher costs that early adopters of technologies face due to a lack of access to suitable financial products with adequate pricing (Cordonnier and Saygin, 2023[12]). Barriers at the firm level include identifying, prioritising, developing, implementing and monitoring low-carbon projects and the respective climate governance procedures (Cordonnier and Saygin, 2023[12]).

Impact

The HIP highlights the possibility to boost the commercial viability of low-carbon investments in industry through its multi-component approach (OECD/Climate Club, 2025[71]). The HIP links climate considerations at a project level with the uptake of long-term climate corporate governance performance that is supported by the adoption of sectoral low-carbon trajectories (OECD/Climate Club, 2025[71]). The programmes innovative edge includes linking the accomplishment of climate-based metrics with financial benefits for the sponsor of the project (Cordonnier and Saygin, 2023[12]). In addition, the HIP facility leverages a technical assistance component under Component 1 in which different stakeholders of the corporate sector receive capacity building to enhance their understanding and capacity to strategically adapt to the climate change agenda (Cordonnier and Saygin, 2023[12]). Technical assistance aims to address the lack of corporate capacity to identify low-carbon projects across industries, and the development of corporate low-carbon strategies (Cordonnier and Saygin, 2023[12]). This enables corporates to integrate risk analysis and to include climate change considerations into strategic decision making and investment planning (Cordonnier and Saygin, 2023[12]).

Lessons Learnt

The programme is under implementation with results focusing on buildings, cities, industries and appliances alongside energy generation and access (OECD/Climate Club, 2025[71]). Previous facilities under GCF that included climate-specific financing products and alongside EBRD's experience in finance industry development ensure the efficient execution of this programme and the achievement of project- and industry-wide objectives (Cordonnier and Saygin, 2023[12]).

Replicability and conditions for scalability

The programme can be replicated via the use of funds from international finance institutions and development banks that utilise concessional finance as a main financing component (OECD/Climate Club, 2025[71]). It is expected that the abilities acquired by different companies in the corporate sector to seek and invest in high-climate impact technologies will extend to changes across the entire sector to boost innovation (OECD/Climate Club, 2025[71]). Success stories emerging from the HIP can also encourage more investments in specific technologies across companies and industry subsectors (Cordonnier and Saygin, 2023[12]). To support the integration of climate technologies across companies and subsectors, the sectoral roadmaps developed and rolled-out under this programme will improve the conditions for climate-related investments (Cordonnier and Saygin, 2023[12]).

Case Study 22: RAC Nama Fund - Mitigation Action Facility (instrument. F2. Concessional Loans)

Instrument - theoretical concept

The RAC Nama Support Project, implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) between 2016 and 2021 had three project components: policy, technology and financial assistance. The RAC NAMA Support Project has been funded by the Mitigation Action Facility (MAF), established in 2012 as a multi-donor (mainly grant-based) programme to provide technical support and climate finance for mitigation projects (OECD/Climate Club, 2025[71]). The total budget amounted to EUR 14.7 million, of which EUR 8.3 million for financial assistance (the RAC NAMA Fund) in the form of grants and concessional loans (0% rate) (OECD/Climate Club, 2025[71]). The Electricity Generating Authority of Thailand (EGAT) created the RAC NAMA Fund as Thailand's first climate finance project (OECD/Climate Club, 2025[71]).

Key actors of the fund include:

- **MAF:** Fund implementor
- **GIZ:** Co-developer
- **Ministry of Energy, Thailand:** Receiver

Supported Project(s)

The project targeted three market segments of refrigeration and air-conditioning (RAC) technologies: residential air-conditioners, commercial refrigeration appliances and chillers (OECD/Climate Club, 2025[71]). RAC accounts for approximately 20% of Thailand's total GHG emissions as a result of refrigerants with high global warming potential and high levels of energy consumption (Mitigation Action Facility, 2025[99]). The project focuses on four areas of activity: 1) production and sale of green refrigeration and air conditioning (green RAC) equipment; 2) capacity building on servicing and use; 3) revisions to the policy and financial framework; and 4) awareness raising of benefits and the need for behavioural change (Mitigation Action Facility, 2025[99]).

Impact

In total the project received EUR 143 million of private contributions (OECD/Climate Club, 2025[71]). The GHG mitigation of the project resulted in 1.05 Mt CO_2-eq. The fund resulted in 270 900 units of green cooling technology sold while 10 RAC technologies manufacturers in Thailand were supported (OECD/Climate Club, 2025[71]). An additional reduction of million t CO_2-eq will be avoided indirectly by 2030 as a result of policy changes support by the project (Mitigation Action Facility, 2025[99]). Within the sector, manufacturers were able to produce technically advanced, sustainable and competitive products for the domestic and export markets (Mitigation Action Facility, 2025[99]). In turn, this boosted job creation and increased training opportunities for technicians within the service sector while consumers benefited from lower energy and refrigerant bills (Mitigation Action Facility, 2025[99]).

Lessons Learnt

Targeted financial instruments, in combination with tailored policy and regulatory support, create impactful results and can be adequate and timely for the region/sector applied in (OECD/Climate Club, 2025[71]). Financial institutions with an interest to engage in decarbonisation efforts in emerging and developing economies are strong implementing partners. Guarantees can help to facilitate access to capital (OECD/Climate Club, 2025[71]). Private sector manufacturers and large end-users continue to be a key

driving force behind the project and benefits that have come from the project's implementation (Mitigation Action Facility, 2025[99]).

Replicability and conditions for scalability

The combination of grants and concessional loans can be useful for supporting local manufactures (OECD/Climate Club, 2025[71]). Grants and loans with environmental mitigation and intersectional elements can help boost sustainable and social development (Mitigation Action Facility, 2025[99]). Grants can help to decarbonise production lines at the company level, while loans with an interest rate of 0% can support the market introduction of new technologies and attract end-user demand for green products and technologies (OECD/Climate Club, 2025[71]).

Case Study 23: Arabian Cement Company - EBRD (instrument. F2. Concessional Loans)

Instrument - theoretical concept

Concessional loans are debt instruments extended on terms more favourable than those available in commercial markets, typically characterised by below-market interest rates, longer repayment tenors, grace periods, or subordinated structures. They are deployed by multilateral development banks (MDBs) and development finance institutions (DFIs) to address market failures where high costs of capital or perceived risk prevent financing of projects with strong environmental or social benefits. Concessionality can be provided directly through MDB balance sheets or indirectly through blending with donor resources or guarantee facilities. Their aim is to mobilise private investment by lowering financing costs, derisking early mover technologies, and aligning financing flows with policy objectives such as climate mitigation and industrial decarbonisation.

The EBRD integrates concessional lending into its broader toolkit of debt, equity, and risk sharing instruments to accelerate the clean transition in its countries of operations. Concessionality is typically achieved through blended finance structures, in which EBRD resources are combined with donor funds from facilities such as the European Union's EFSD+, the Green Climate Fund (GCF), or the Clean Technology Fund (CTF). This approach allows EBRD to provide longer maturities, reduce pricing, or introduce subordinated tranches, thereby addressing barriers to investment in high risk or early-stage decarbonisation projects. The concessional component is generally coupled with technical co-operation, capacity building, and alignment with EBRD's Environmental and Social Policy, ensuring both financial additionality and development impact. In 2025, concessional lending is expected to amount to approximately EUR 423 million, embedded within an overall envelope of EUR 2.08 billion in concessional finance and technical co-operation, underscoring its increasing importance in EBRD operations.

The actors involved and associated financial, and contractual flows can be summarised as follows:

- **Financier:** EBRD, often with donor or EU guarantee support.
- **Borrower:** private corporates, financial institutions, or public entities in EBRD's regions of operation.
- **Financial flows:** funds are disbursed in tranches according to project milestones; repayments flow back under agreed senior or subordinated loan terms. Risk sharing mechanisms provided by donors absorb a share of potential losses.
- **Technical co-operation:** frequently accompanies concessional finance, supporting project preparation and environmental and social compliance.

Key advantages include providing longer tenor and more favourable terms than domestic markets, thereby improving liquidity and investment feasibility. By attracting co-financing from private lenders through risk sharing, concessional loans catalyse investment in higher risk sectors and regions. They support the demonstration of new technologies or business models, accelerating learning curves. Coupling with technical assistance further enhances environmental and social performance, which improves project quality and replicability. Each of these elements contributes to addressing the cost and risk barriers that hinder the uptake of low carbon solutions.

However, concessional loans require careful structuring to avoid market distortion and ensure additionality. Implementation risk remains high in projects involving untested technologies, where performance data is limited. Monitoring and reporting obligations can extend preparation timelines, while dependence on donor funding introduces continuity risks linked to external contributions.

Example of supported project description

The EBRD has provided a 5-year senior secured loan of EUR 25 million to the Arabian Cement Company (ACC) in Egypt. The facility, structured in two tranches, a committed EUR 15.9 million and an uncommitted EUR 9.1 million, was enabled by the European Union's EFSD+ guarantee mechanism, which absorbs part of the credit risk. This structure allowed EBRD to offer financing conditions that remain more advantageous than those typically available from domestic Egyptian banks, even though a 5-year tenor is relatively short for capital intensive industry decarbonisation projects.

In Egypt, corporate and project finance loans for industrial facilities are often limited to three to five years, with high interest rates reflecting sovereign and currency risk, making longer tenor funding difficult to access. Against this backdrop, the concessional element lies not only in the maturity but in the improved pricing, reduced collateral intensity, and the ability to finance first-of-a-kind decarbonisation technologies. Moreover, industrial energy efficiency and fuel switching upgrades in the cement sector are typically implemented over 18-30 months, meaning that the 5-year horizon still accommodates construction, commissioning, and early operational performance under the EBRD loan.

ACC, the sixth largest cement producer in Egypt, operates one of the country's largest cement plants, a sector that accounts for a significant share of national industrial emissions. Decarbonising cement production is critical for Egypt's climate objectives. The EBRD loan finances the introduction of hydrogen injection technology and expanded use of alternative fuels at ACC's production facility, reducing reliance on fossil fuels and improving energy efficiency.

- Country: Egypt
- Sector: Manufacturing - cement production
- Investment size: EUR 25 million loan within a EUR 28.09 million overall envelope
- CO_2 abatement potential: 130 000 tonnes of CO_2 annually

Governance arrangements were defined through an Environmental and Social Action Plan (ESAP) and supported by EBRD's Shareholder Special Fund (SSF), which provided EUR 48 000 in technical co-operation to develop a corporate low-carbon pathway and assess Carbon Border Adjustment Mechanism (CBAM) readiness, as well as up to EUR 2 million in grants to implement climate mitigation measures. The EU's EFSD+ guarantee under the Municipal Infrastructure and Industrial Resilience (MIIR) window provided up to EUR 3.75 million in unfunded first loss cover to de-risk the transaction. The project was approved by EBRD's Board in July 2024 and publicly disclosed in March 2025. ACC, which operates under ISO 9001, 14001, 45001, and 50001 standards, oversees implementation and compliance with EBRD monitoring and reporting obligations.

Impact of the solution on the project

In terms of advantages compared with conventional financing, the EBRD concessional loan provided financing conditions unavailable on the domestic market, notably longer maturity and improved pricing supported by the EFSD+ guarantee. This reduced ACC's cost of capital and supported project preparation and compliance with EU-aligned climate requirements such as Carbon Border Adjustment Mechanism (CBAM). The structure also enhanced ACC's ability to deploy higher risk low carbon technologies, including hydrogen injection and alternative fuel systems, improving competitiveness and signalling transition alignment to investors and customers. By combining concessional financing with grants and technical assistance, EBRD ensured the project's technical and financial viability while contributing to Egypt's decarbonisation strategy.

In addition to these effects on bankability, the instrument enhanced ACC's access to finance by improving its ability to meet lender expectations on climate alignment. This strengthened credibility in capital markets and helped position the company as an early mover in industry decarbonisation, reinforcing commercial differentiation in a sector exposed to emerging trade and carbon adjustment mechanisms.

The enabling conditions supporting the instrument further amplified its impact. The EFSD+ public guarantee provided risk mitigation essential for mobilising capital in a high emission sector, as it absorbed initial losses and reduced perceived credit risk for the operation. The concessional package, including EUR 48 000 in technical co-operation from the SSF and up to EUR 2 million in grants, supported the development of ACC's Paris-aligned transition pathway, allowing the company to implement measures that improve long term resilience. Technical co-operation also reduced implementation risk by strengthening project preparation and ensuring alignment with EBRD environmental and social policies, while consistency with Egypt's national climate strategy provided a stable policy environment that increased confidence among financiers.

Lessons learnt

This experience shows that the concessional loan instrument was implemented effectively, with the blended structure of EBRD finance, donor-backed guarantees, and technical assistance enabling investment in a higher risk decarbonisation technology that would not have been financially viable under market conditions alone. The concessional component proved catalytic by lowering financing costs, reducing collateral requirements, and providing the risk comfort necessary for a first-of-a-kind industrial application. Importantly, the loan's design, including a conditional second tranche, demonstrated how concessional structures can be used to manage technical and financial uncertainties while preserving discipline through phased disbursements.

The preparation timeline did not materially exceed standard EBRD processes, although co-ordination with EU guarantee providers and alignment with technical co-operation activities added procedural steps. These additional requirements nonetheless strengthened the project's design and reduced implementation risks, illustrating that concessional lending can improve project readiness when technical assistance is well integrated.

Regarding mobilisation of private capital, the concessional loan primarily supported an EBRD balance sheet operation and did not aim to crowd in commercial lenders directly. However, by demonstrating the feasibility of financing low-carbon industrial upgrades under a de-risked structure, it contributes to lowering perceived technology and credit risks for future market participants. The use of the EFSD+ first loss guarantee showed that concessional loans are most effective when paired with targeted risk sharing instruments, with the guarantee functioning as a critical enabler of longer tenor and enhanced loan conditions.

Replicability and scalability conditions

Successful replication of such instruments depends on three main conditions: the availability of donor-funded risk sharing facilities and concessional capital; technical co-operation to strengthen corporate transition planning and ensure credible implementation pathways; and robust environmental and social management systems at borrower level to meet MDB requirements. Concessional loans are particularly suited for first-of-a-kind industry decarbonisation projects, with strong potential for scale up as technologies mature, risks decline, and concessional resources are deployed programmatically across sectors and geographies.

Case Study 24: SDG Namibia One Fund (instrument F.4. Public and Private Equity)

Instrument - theoretical concept

Equity financing is a type of financing where public or private investors acquire an ownership stake in a business. The raised capital can be used for the business to run and grow its operations (OECD/Climate Club, 2025[71]). Public equities are defined as shares in publicly traded companies while private equity investments are amongst privately held firms. Public equity can contribute to diversified investment portfolios and stocks can be publicly traded. Additionally private equities cannot be publicly traded on stock exchanges but rather include instruments like venture capital, and growth equity. This is more useful for companies looking for initial capital investments to spur growth.

One key project using the public and private funds is the SDG Namibia One Fund. This fund is a USD 1.1 billion blended finance vehicle that mobilises investment in Namibia's green hydrogen sector, with a target to finance 207 kilotonnes (kt) of renewable hydrogen production per year (OECD, 2025[100]). It uses both public and private funding, while also leveraging grants and investment capital to mitigate risks associated with the project and attract additional private sector investment (OECD, 2025[100]).

The instruments used in the fund vary and include development finance, junior equity, ordinary equity and senior equity (OECD, 2025[100]). The development financing instrument is designed to address the development risks associated with the project, while the junior, ordinary, and senior equity financing instruments are allocated after financial close, in preparation for the project's construction phase and capital expenditure requirements (OECD, 2025[100]). The development tranche of the fund is worth USD 100 million, while its equity tranche covering junior, ordinary and senior equity is worth USD 1 billion (OECD, 2025[100]).

The SDG Namibia One Fund is developed in partnership between the Climate Fund Managers (CFM), the Environmental Investment Fund of Namibia (EIF) and Invest International (OECD, 2025[100]). Climate Fund Managers is a climate finance specialist, established as a joint venture between the Dutch Development Bank (FMO) and Sanlam InfraWorks, Africa's largest non-banking financial institution (OECD, 2025[100]). EIF is mandated to raise money for Namibia's economic and sustainable development and Invest International is a joint venture between the Dutch Government and the Dutch Development Bank (FMO), that supports Dutch-affiliated companies in financing impactful projects that contribute to Sustainable Development Goals (SDGs) (OECD, 2025[100]).

Invest International provided a grant of EUR 40 million, while the European Commission contributed an additional EUR 25 million through its Global Gateway Strategy, a global infrastructure and investment initiative (OECD, 2025[100]). Both EIF and CFM, invested 1% of the total fund size in the second tier (OECD, 2025[100]). At COP27, the European Investment Bank (EIB) and the Government of Namibia signed a letter of intent to raise EUR 500 million, part of which is planned to be invested through SDG Namibia One (OECD, 2025[100]).

The fund is managed by NH2 Fund Managers, a partnership between EIF and CFM (OECD, 2025[100]). The NH2 Fund Manager is 51% owned by CFM NL, which itself is a joint venture between CFM (75%) and Invest International (25%) (OECD, 2025[100]). The remaining 49% is owned by EIF (OECD, 2025[100]). SDG Namibia One follows a typical general partner (GP) and limited partner (LP) structure meaning it has an investment committee that makes investment decisions, including an independent member (OECD, 2025[100]). Investment decisions must be approved by the investment committee, while some important strategic decisions need approval from the fund advisory board or general member meetings (OECD, 2025[100]).

Key actors of the fund include:

- **CFM:** Co-developer and invested 1% of total fund size. Co-owner of the NH2 Fund Managers.
- **EIF:** Co-developer and invested 1% of total fund size. Co-owner of the NH2 Fund Managers.
- **Invest International:** Co-developer and funded by the Dutch government FMO. Provided a grant of EUR 40 million.
- **FMO:** Co-developer of CFM.
- **Sanlam InfraWorks:** Co-developer of CFM.
- **European Commission:** provided a grant of EUR 25 million.
- **NH2 Fund Managers:** Managing bodie and is a partnership between EIF and CFM.

Examples of supported project description

The fund's investments in Namibia are part of the Southern Corridor Development Initiative (SCDI) which aims to help Namibia achieve energy self-sufficiency, enhance regional energy security by exporting 14 GW of clean power to the Southern Africa Power Pool (OECD, 2025[100]). The fund will also support global decarbonisation efforts by providing international ports like Port of Rotterdam will clean molecules (OECD, 2025[100]).

Specifically, the fund will accelerate the expansion of the HyIron's Oshivela Project, which is Africa's first climate-neutral iron plant (Climate Fund Managers, 2024[101]). HyIron is a partnership between Namibian and German renewable energy and engineering companies, and the plant will use a reduce iron ore in a rotary kiln using green hydrogen as the reducing agent in order to produce direct reduced iron (DRI) (Climate Fund Managers, 2024[101]). The Oshivela project is an extension of HyIron's successful pilot in the TS Elino laboratory in Germany, which began commissioning in 2024 and has an annual output of 15 000 tonnes of green DRI (Climate Fund Managers, 2024[101]).

Impact of the solution on the project

The project will support Namibia's position as a global hub for green hydrogen innovation, with positive impacts for social and economic development in the country (Climate Fund Managers, 2024[101]). For instance, the development of renewable hydrogen projects will contribute to the opening of 900 permanent jobs and 6 000 construction jobs (Climate Fund Managers, 2024[101]). The project is also expected to reduce carbon emissions by approximately 3.6 million tonnes of CO_2 annually (Climate Fund Managers, 2024[101]). The reduction of emissions helps Namibia align itself with global efforts to address climate change and achieve climate neutrality. In addition, it supports Namibia's efforts to contribute to developing sustainable energy solutions via the production of green hydrogen.

Overall investment in the plant will help promote and accelerate the wider adoption of clean energy technologies such as hydrogen-based DRI. Hydrogen-based DRI is still considered an emerging technology with the most advanced plants still under construction or early operations, which makes the investment in the technology riskier than conventional technologies such as natural gas based DRI

(Climate Fund Managers, 2024[101]). The fund can support investments to use the technology within the plant and demonstrate the impact of H_2 DRI at scale.

Lessons learnt

The project is successfully launched, supported by the additional mobilisation of funds and is commissioned as a Phase 1 pilot (OECD, 2025[100]). Successful implementation can be partly dedicated to the blended finance approach within the fund complemented with clear supporting frameworks and extensive partnerships (OECD, 2025[100]). In addition, obtaining initial public grant funding and a pre-existing offtake agreement (as was the case for HyIron) are necessary and helpful in derisking projects associated with emerging technologies like hydrogen-DRI.

Replicability and conditions for scalability

Expansion for Phase 2 is expected in 2025-26 with the Oshivela Project building on HyIron's successful pilot at the TS Elino laboratory in Germany. It serves as a prime example of scaling up a hydrogen DRI project (Climate Fund Managers, 2024[101]). Yet several conditions need to be in place to ensure successful replication for clean hydrogen projects. The first condition is the alignment of regulatory national and international climate policies and objectives (OECD, 2025[100]). This will ensure an enabling environment that promotes investor confidence in emission reduction projects and will benefit regulatory support for infrastructure development (OECD, 2025[100]). The second condition is the effective use of public-private partnerships as exemplified in the SDG Namibia One Fund (OECD, 2025[100]). These partnerships can leverage resources, expertise and risk-sharing and provide a diversification of financing streams, which is necessary for financial stability for capital intensive projects such as those targeting emission-intensive industries (OECD, 2025[100]).

Case Study 25: IDB Programme to Support the Development of the Green Hydrogen Industry in Chile (instrument F.5. Results-based Financing and pull financing)

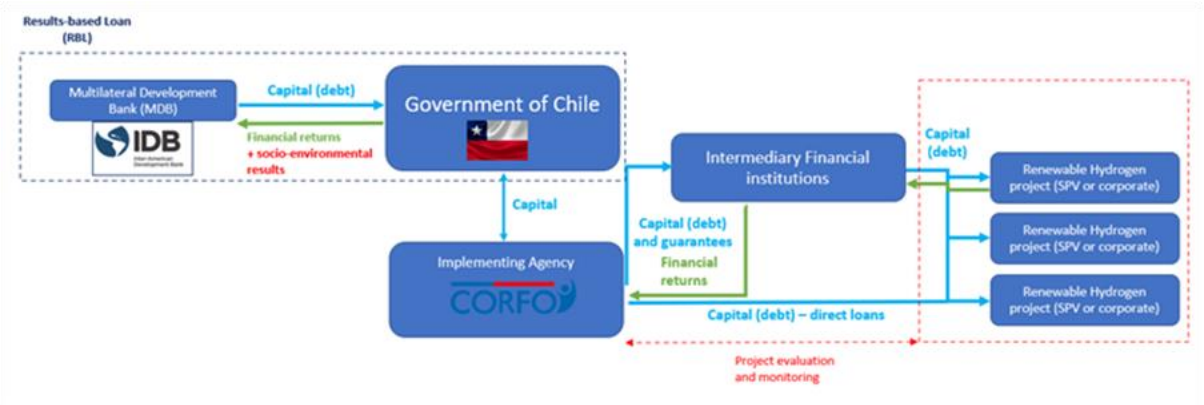
Instrument - theoretical concept

Results-based financing is defined as a set of financial instruments in which the disbursement of funds occurs after a pre-agreed outcome is achieved (OECD/Climate Club, 2025[71]). This approach ties financing directly to performance and to a specific project scope and predetermined goals that clearly defined in advance and monitored by an independent body. This approach helps ensure that funding is directed toward projects that demonstrate measurable and verified outcomes (OECD/Climate Club, 2025[71]). Results-based financing partly overlaps with other concepts like pull financing. Pull finance instruments can include Advanced Market Commitments (AMCs), Buyers Clubs, Carbon contracts for Difference, and Prize Challenges, among others (OECD/Climate Club, 2025[71]).

The Government of Chile and the Inter-American Development Bank (IDB) have created a USD 400-million financing programme aimed at strategically fostering the development of Chile's green hydrogen and derivatives sector to accelerate the decarbonisation of its economy (OECD/Climate Club, 2025[71]). The objectives of the programme are twofold: 1) To promote private investment in green hydrogen and derivative projects, with an allocation of USD 350 million; and 2) to expand the provision of public inputs to support the green hydrogen and derivatives industry and stimulate domestic demand, with USD 50 million allocated for this purpose (Cordonnier and Saygin, 2023[12]). The programme follows a "Loan based on results" (LBR) approach which is a public sector sovereign guaranteed loan in which disbursement of funds are directly linked to the achievement of predefined, sustainable results monitored by an independent

party (OECD/Climate Club, 2025[71]). The disbursement period is six years and there is a total repayment term of 24 years, which includes a 6.5-year grace period (OECD/Climate Club, 2025[71]). The outcomes and disbursements are monitored by an independent party (OECD/Climate Club, 2025[71]). The USD 50 million loan, which represents 12.5% of the programme, will use a mix of credit lines, subsidies, and technical assistance to boost capacity building, hydrogen demand, innovation and entrepreneurship (OECD/Climate Club, 2025[71]).

Figure A A.11. IDB results-based loan structure



Source: (Cordonnier and Saygin, 2023[12])

Examples of supported project description

For the IDB Financing programme with Government of Chile, the aim of expanding the hydrogen sector aligned with Chile's National Green Hydrogen strategy which includes encouraging investments in the Chilean industrial sector (OECD/Climate Club, 2025[71]). More specifically the energy sector and the hard-to-decarbonise industries such as fertilisers, chemicals, steel and mining are priority sectors (Cordonnier and Saygin, 2023[12]). The USD 350 million loan's executing agency is Chile's Production Development Corporation (CORFO), an autonomous public institution responsible for fostering competitiveness and encouraging product diversification (Cordonnier and Saygin, 2023[12]). CORFO will design the loan's components to align with specific development objectives for the hydrogen and derivatives industry. For the first component, it will develop specialised financial instruments such as credit lines and guarantees (Cordonnier and Saygin, 2023[12]). This will help support investments in the renewable hydrogen value chain, targeting additional financial support from commercial banks and credit unions (OECD/Climate Club, 2025[71]).

The IDB loan will help with the design and execution of innovative projects that promote hydrogen (Cordonnier and Saygin, 2023[12]). These projects have a maximum funding limit of USD 4 million and include technical assistance provided by CORFO (Cordonnier and Saygin, 2023[12]). Training and innovation programmes for research and development are capped between USD 240 000 and USD 480 000, with subsidies covering 40% to 80% of the costs (Cordonnier and Saygin, 2023[12]).

Impact of the solution on the project

Key indicators under the IDB loan programme include the number of projects obtaining permits, installed electrolysis capacity, private sector hydrogen demand, employment increases in the sector, and investment in hydrogen-related research and development (Cordonnier and Saygin, 2023[12]). This ensures that the programme addresses the primary financial challenges encountered by developers for renewable hydrogen generation projects in Chile (OECD/Climate Club, 2025[71]). The programme also offers lower-

cost financing aimed at pilot projects to support their deployment and enhance the operational track records related to hydrogen (OECD/Climate Club, 2025[71]). By making funding more accessible to early movers in the industry, the high initial risks and costs associated with early-stage technologies can be overcome and the development of pilot projects, the viability of the technology is improved (OECD/Climate Club, 2025[71]). This ultimately accelerates the development of the hydrogen supply chain.

Lessons learnt

The IDB financing programme in Chile is still in the early stages of implementation. However, key findings to date highlight three core components: technical assistance, private investment, and blended finance. First, technical assistance programmes can have multiple impacts such as validating technologies and businesses models (OECD/Climate Club, 2025[71]). A technical assistance component can ensure the further adoption of other financing programmes, promote innovation within the sector and support project developers build projects with sustainable results (OECD/Climate Club, 2025[71]). These are crucial factors for expanding the supply chain and meetings the goals listed in the Chile national hydrogen strategy. Second, private investments from financial institutions such as commercial banks, can be supported via the use of concessional financing and other types of interventions (OECD/Climate Club, 2025[71]). This can maximise the socio-economic and environmental impacts of a programme (OECD/Climate Club, 2025[71]). Third, blended finance instruments alongside MDB support and other international institutions are crucial for effective programme design and capital allocation (OECD/Climate Club, 2025[71]). Fourth political support is needed to ensure the bankability of the project. In Chile there was government buy-in to for such a programme via the recent adoption of its National Hydrogen Strategy. This was a key lever to the development of working with IDB to receive a loan with the objective of contributing to the development of the green hydrogen and derivatives in Chile (OECD/Climate Club, 2025[71]).

Replicability and conditions for scalability

The IDB-Chile example proves that credit lines and guarantee funds backed by public institutions can accelerate national renewable hydrogen agendas (OECD/Climate Club, 2025[71]). Yet the structure of this loan can be used for a variety of purposes beyond hydrogen development.

Case study 26: Results-based Financing Programme- Instiglio (instrument F.5. Results-Based Financing and pull financing)

Instrument - theoretical concept

Another example deploying Results-based financing is Instiglio's Results-based Climate Finance (RBCF) programme. In the RBCF programme results are defined as milestones that demonstrate progress in reducing greenhouse GHG emissions (OECD, 2025). These include emission reduction credits (ERCs), which can be applied toward meeting a country's Nationally Determined Contribution (NDC) targets (OECD, 2025. The programme relies on the use of metrics to outline the pre-agreed indicators and conditions under which funds are released (OECD, 2025). These metrics ensure transparency, accountability, and alignment with climate objectives (OECD, 2025). Programme disbursements are structured along a defined timeline based on verified emissions reductions (OECD, 2025). Instiglio also has a pull finance programme, which provides economic incentives and ensures demand for the innovation and scaling of low-carbon technologies (OECD, 2025). By reducing the market risks associated with adopting these innovations, pull finance can also drive private investment in the process (OECD, 2025).

Examples of supported project description

Instiglio's RCBF programme, focuses on supporting country engagement with RBCF and carbon markets (OECD, 2025. This includes developing targeted training materials and enhancing access to climate finance resources like the guidebook for the World Bank's Transformative Carbon Asset Facility (TCAF), co-authored by Instiglio (OECD, 2025.

Impact of the solution on the project

Similarly to the IDB hydrogen programme in Chile, Instiglio's RBCF model can support climate action goals and monetise meaningful emission reductions while building country capacity (OECD, 2025). This approach provides additional funding sources to advance climate action while enhancing preparedness, technical capacity, and infrastructure (OECD, 2025). This may include monitoring, reporting, and verification (MRV) systems that promote transparency and accountability and in turn improve investor confidence in projects (OECD, 2025). By linking payments to measurable results, it incentivises effective climate initiatives and supports climate policy reform by establishing accountability mechanisms and strengthening the frameworks necessary for effective policy and programme implementation (OECD, 2025).

Lessons learnt

Instiglio outlines several contextual factors and lessons learnt necessary to maximise the use of RBCF. These include key metrics, political support, good governance, and technical factors. For the programme to be successful, needs to be a basic level of administrative capacity for the programme to be properly managed (OECD, 2025. This includes a robust MRV model with several parameters such as the outcome payer, use of payment metrics and timing (OECD, 2025). Technical support can maximise the value add of RBCF by understanding implementation cost and defining a pricing structure that reflects costs while incentivising action (OECD, 2025).

Replicability and conditions for scalability

The RBCF model can support countries or firms meet specific climate targets while receiving financial assistance for their implementation (OECD, 2025). The program is designed to be flexible to support different applications.

Case study 27: Revolving Credit Facility - Credit Agricole Corporate and Investment bank (CACIB) (instrument F.6. Revolving Credit Facility)

Instrument - theoretical concept

A Revolving Credit Facility (RCF) is a loan facility that provides a borrower with flexible access to funds up to a committed ceiling, generally for liquidity or working capital. It can be drawn, repaid and redrawn during its tenor. When structured as a Sustainability-Linked RCF (SLL-RCF), the facility margin (i.e. the interest rate spread paid above the benchmark rate, which reflects the borrower's credit risk) and in some cases commitment fees vary depending on performance against Sustainability Performance Targets (SPTs) linked to Key Performance Indicators (KPIs), such as CO_2 intensity, renewable energy share, or certification of sites. SLL-RCF is not tied to specific green use of proceeds but instead integrates ESG performance incentives into the borrower's broader corporate treasury operations, aligning day-to-day financing costs with sustainability outcomes.

Crédit Agricole Corporate and Investment Bank (CACIB) has structured several SLL-RCF and SLL-loans in recent years. For example, it arranged a EUR 300 million SLL-RCF for EDF in 2019 and supported Micron in 2021 with a USD 2.5 billion SLL-RCF alongside a USD 1.2 billion SLL-term loan. CACIB has also been involved in facilities for large European corporates in the industrial and consumer sectors. In 2024, it introduced a Sustainability-Linked Loan Financing Bond (SLLB) Framework, which refinances portfolios of SLL-loans, including RCFs, under a bond structure.

The actors involved and the associated financial and contractual flows can be summarised as follows:

- **Borrower:** corporation agreeing to sustainability-linked KPIs. Margin adjustment mechanism: if the borrower meets or exceeds KPIs, the margin decreases (favourable), if not margin increases (penalty).
- **Lenders or syndicate:** banks or trading partners providing the RCF and monitoring KPI performance.
- **External verifiers or rating agencies:** independent third parties reviewing and confirming KPI achievement on an annual basis, ensuring accountability and integrity of the mechanism.

The key advantages of the instrument are that it provides corporate liquidity while incentivising sustainability performance, helping companies reduce financing costs when meeting ESG objectives. It also promotes continuous improvement without constraining the use of proceeds to specific green assets, making it compatible with standard credit structures. Its flexibility allows replication across sectors and geographies, aligning financing terms and corporate capital allocation with decarbonisation and broader sustainability objectives.

The main implementation challenges are that defining clear, measurable KPIs and ensuring credible third-party verification remain essential. The instrument also entails additional structuring and reporting requirements compared to a conventional RCF. Moreover, insufficiently ambitious targets could lead to reputational risks or greenwashing concerns.

Example of supported project description

SSAB is a Swedish steelmaker and one of the largest producers in the Nordic region, with an annual crude steel production capacity of approximately 8.8 million tonnes and holding around 40-45% of the Nordic steel market. SSAB has committed to a fossil free steel strategy, aiming to replace coal-based blast furnaces with electric arc furnaces (EAFs) powered by renewable electricity, using renewable hydrogen based direct reduced iron (DRI) and steel scrap as inputs.

- **Country:** Sweden.
- **Industry subsector:** steel production.
- **Expected commissioning:** end of 2028.
- Impact equivalent to a reduction of ~7% of Sweden's annual CO_2 emissions.
- **Size of investment:** EUR 4.5 billion total capex; green financing package covering ~60% of cost.
  - Green financing package: EUR 2.3 billion package structured by CACIB in April 2025:
  - SEK 15 billion (EUR 1.4 billion) syndicated loan backed by Riksgälden's Credit Guarantees for Green Investments (up to 80% cover, max tenor 15 years).
  - EUR 808 million syndicated loan covered by SACE (Italy's export credit agency).
  - SEK 1.15 billion (EUR 105 million) Loan from the Nordic Investment Bank (NIB).
  - Additional green loan of EUR 430 million covered by Euler Hermes/Allianz Trade was arranged in June 2025. The proceeds are earmarked specifically for the construction of SSAB's new fossil-free steel mill in Luleå, complementing the EUR 2.3 billion financing package.

In addition, SSAB maintains a EUR 700 million RCF maturing in 2029, syndicated with international banks, undrawn at end the of 2024. While not currently sustainability-linked, SSAB's Green & Sustainability-Linked Finance Framework explicitly allows for SLL-RCFs at refinancing.

The governance and organisational arrangements for the financing structure combine corporate, public and international financial institution contributions in a co-ordinated manner, ensuring both bankability and alignment with SSAB's transition strategy. SSAB acts as the borrower under its Green & Sustainability-Linked Finance Framework, with CACIB serving as lead structuring bank and co-ordinating lender engagement. Public guarantee support is provided by Swedish National Debt Office (Riksgälden) in Sweden, SACE in Italy, and Euler Hermes/Allianz Trade in Germany, each reducing credit risk and enabling long-tenor financing for a first-of-a-kind industry decarbonisation investment. Nordic Investment Bank (NIB) participates as a co-lender, strengthening the project's financial robustness through International Financial Institution (IFI) involvement. The framework is externally reviewed by Sustainalytics, and annual KPI reporting ensures transparency and consistency with international standards.

Impact of the solution on the project

The advantages of the solution compared with conventional financing are that the RCF provides a liquidity buffer supporting SSAB's investment grade profile and thereby lowers its cost of capital relative to unsecured corporate debt. Future conversion of the RCF into an SLL-RCF would allow financing costs to adjust directly in line with CO_2 intensity reduction targets and strengthen internal incentives for decarbonisation. In addition, an SLL-RCF can broaden the lender base and potentially improve pricing when targets are met, as sustainability-linked features are increasingly integrated into banks' capital allocation and risk assessment frameworks.

The impact on SSAB's business model and access to finance is reflected in how the combined corporate framework, which integrates both green and sustainability-linked instruments, demonstrated the feasibility of financing large industry decarbonisation investments while maintaining corporate liquidity. This approach strengthened SSAB's credibility with international investors by aligning its financing structure with institutional ESG expectations. Moreover, the package reinforced the bankability of a low carbon steel project of EUR 5 billion scale, thereby improving long-term access to capital.

Enabling conditions further supported the effectiveness of the instrument. Sweden's Credit Guarantees for Green Investments programme, introduced in 2021, played a pivotal role by reducing lender risk and facilitating longer-tenor financing. Strong corporate governance and annual KPI reporting under Sustainalytics' second-party opinion enhanced transparency and maintained lender confidence. In addition, the broader EU policy context, including Fit for 55 and the Carbon Border Adjustment Mechanism (CBAM), provided long-term regulatory certainty that reinforced the strategic case for fossil free steel.

Lessons learnt

The effectiveness of implementation is demonstrated by the fact that the EUR 700 million RCF remains fully committed and undrawn, providing stable liquidity support within SSAB's capital structure. The broader EUR 2.7 billion green financing package for the Luleå project was concluded within one year of approval. This rapid execution, co-ordinated by CACIB together with sovereign and ECA guarantee providers, indicates strong implementation capacity.

Regarding the project preparation timeline, the renewal of the RCF followed standard corporate treasury practices and therefore did not result in delays. In contrast, negotiations associated with sovereign and ECA guarantees required additional time, however, the existence of Sweden's established green guarantee framework helped streamline co-ordination and mitigate potential bottlenecks.

The mobilisation of private capital was influenced differently across the instruments. The RCF operates as a private facility supported by SSAB's strengthened credit profile and does not depend on public finance. Conversely, the broader green financing package demonstrated that public guarantees provided by Riksgälden, SACE and Euler Hermes played a catalytic role in attracting commercial lenders to participate in a large-scale industry decarbonisation project such as the Luleå investment.

The use and disbursement of funds also differed between instruments. The RCF remains undrawn, serving as committed but unused liquidity that SSAB may access as needed and operating as a standby buffer to reinforce its investment grade profile throughout the construction period. In contrast, the loans backed by sovereign and ECA guarantees have been fully disbursed and constitute the central financing mechanism supporting the Luleå decarbonisation project.

Replicability and scalability conditions

Replicability and scalability depend on several conditions. The flexibility of the SLL-RCF structure enables deployment across sectors and geographies, as it aligns with established corporate treasury practices. Successful replication requires credible and verifiable KPIs supported by robust monitoring and independent third-party verification to maintain integrity. In advanced markets, SLL-RCFs can be implemented on a fully commercial basis without public guarantees. In emerging markets and developing economies, however, replication may depend on complementary public risk sharing mechanisms such as national guarantee schemes, Export Credit Agencies (ECAs), Multilateral Development Banks (MDBs) and Development Finance Institutions (DFIs). Global instruments such as the EU's EFSD+ guarantee, together with blended finance structures, could support private bank participation in similar sustainability-linked facilities under more challenging market conditions.

Case study 28: IFC Sustainability-linked Loans and Bonds (instrument F.7. Sustainability-linked instruments)

Instrument - theoretical concept

Sustainability-linked loans (SLLs) and bonds (SLBs) are the common "transition finance" instruments with varying financing and/or structural characteristics can vary depending on whether the issuer achieves predefined sustainability objectives (Cordonnier and Saygin, 2023[12]). The use of the instruments is replicable across different sectors and countries as they provide a flexible debt-raising tool, used for general corporate purposes (OECD/Climate Club, 2025[71]). The favorable financing terms can be useful for companies based in EMDEs that face barriers to attracting private investment to achieve sustainability targets (OECD, 2025[100]).

Sustainability-Linked Bonds (SLBs)' characteristics (such as the coupon of the bonds) vary depending on whether the borrower or issuer achieved sustainability performance targets (SPTs) for a predefined set of Key Performance Indicators (KPIs), which can cover a range of environmental and/or social targets (OECD/Climate Club, 2025[71]). SLLs' and SLBs' financial and structural characteristics (such as the interest rate of a loan or coupon of a bond) vary depending on whether the borrower or issuer achieved sustainability performance targets (SPTs) for a predefined set of Key Performance Indicators (KPIs), which can cover a range of environmental and/or social targets (Cordonnier and Saygin, 2023[12]). Generally, a financial compensation is granted to investors if SPTs are not met. SLBs include a penalty mechanism that is triggered in the event of non-compliance with pre-stipulated SPTs. Penalty mechanisms can include coupon step-ups (most common), premium payments upon maturity set as fixed percentage of redemption amount, or obligations to purchase offsets to meet the SPT calculated as a percentage of the nominal amount (Cordonnier and Saygin, 2023[12]). In case of SLLs, the interest rate on the loan increases if SPTs

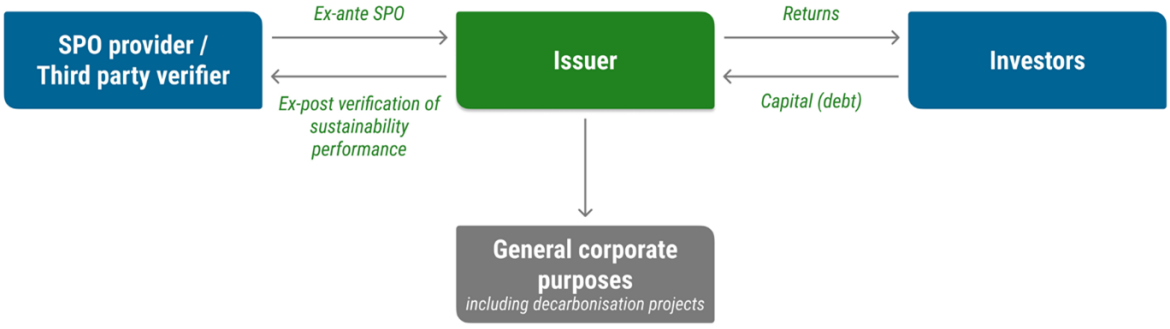
are missed (OECD, 2025[100]). The instruments can be particularly useful in implementing decarbonisation plans to reduce emissions (OECD/Climate Club, 2025[71]).

IFC has worked with Indorama Ventures Limited (IVL), CEMEX, and JSW Steel Ltd by providing SLBs and SLLs. Each showcase a different approach to supporting corporate decarbonisation efforts in EMDEs. Indorama Ventures Limited (IVL) is a chemicals company with headquarters in Bangkok. Thailand, that produces a range of plastic polymers, chemicals, and fibers (Cordonnier and Saygin, 2023[12]). The company received a SLL (syndicated loan) issuance in 2020 and an SLB issuance in 2021 (Cordonnier and Saygin, 2023[12]). These targets can help track progress and the company's ability to meet the objectives of the sustainability strategy.

CEMEX is a Mexican cement company that produces, distributes, and markets cement, ready-mix concrete, aggregates, related building materials and urbanisation solutions (Cordonnier and Saygin, 2023[12]). CEMEX operates in over 50 countries across the Americas, Europe, Africa, the Middle East, and Asia (Cordonnier and Saygin, 2023[12]). Under the issued SLL and SLB CEMEX tied its coupon and interest rates to ambitious SPTs focused on reducing net CO_2 emission intensity to below 475 kg CO_2 per tonne of cement by 2030 (Cordonnier and Saygin, 2023[12]). This is a substantial decrease from the 630 kg CO_2 per tonne of cement intensity in 2015 (Cordonnier and Saygin, 2023[12]).

Lastly, JSW Steel Ltd, a multi-national steel company based in Mumbai India, is India's second largest private steel company and largest steel exporter (Cordonnier and Saygin, 2023[12]). JSW Steel became the first company in the global steel sector to issue a USD-denominated sustainability-linked bond to reduce emissions and carbon intensity.

Figure A A.12. SLB structure



Source: (Cordonnier and Saygin, 2023[12])

Examples of supported project description

The SLL awarded to IVL in 2020 was USD 255 million with a maturity of 5 years with an SPT related to composite ESG (Cordonnier and Saygin, 2023[12]). The SLB on the other hand was worth THB 10 million, equivalent to USD 292 million with a maturity of 5.7-10.5 years (Cordonnier and Saygin, 2023[12]). The SPT related to the SLB include a reduction in GHG emission intensity, increased PET recycling rates, and renewable electricity consumption.

In accordance with the SLL and SLB CEMEX plans on sourcing 55% of its electricity from clean energy by 2030 and increasing the use of alternative fuels such as biomass and waste residues in its cement production process (Cordonnier and Saygin, 2023[12]). In 2020, CEMEX received an SLL worth USD 3.2 billion, with a maturity of 5 years and SPTs related to CO_2 emissions reduction, increases in clean electricity consumption, and alternative fuels adoptions (Cordonnier and Saygin, 2023[12]). CEMEX also received in

2021 an SLL through a syndicated credit facility worth USD 3.25 billion with a maturity of 5 years and the same SPT targets.

To meet the goals within the company's 2025 Sustainability Strategy, IVL established three SPTs: a 10% reduction in GHG emissions intensity between 2020 and 2025, a 3.5-fold increase in the use of recycled PET in its production process, and a target to source 25% of its electricity from renewable sources by 2030 (Cordonnier and Saygin, 2023[12]).

In line with its corporate-level Sustainability Framework established in 2020, JSW received a bond in 2021 to align its corporate financing with its sustainability goals and to demonstrate a strong commitment to the framework's objectives (Cordonnier and Saygin, 2023[12]). This includes a reduction in carbon intensity by 23% for steel products produced between 2020-2023 (Cordonnier and Saygin, 2023[12]). JSW received an SLB worth USD 1 billion with a maturity rate of 5-10 years with the SPT targeting CO_2 emission reductions (Cordonnier and Saygin, 2023[12]).

Impact of the solution on the project

Sustainability-linked instruments analysed in the case studies have been used for corporate financing needs (Cordonnier and Saygin, 2023[12]). For instance, they can be used to refinance existing traditional loans, possibly extending their tenure, as SLLs typically have 5-10-year maturities, and linking them to company-wide sustainability KPIs (Cordonnier and Saygin, 2023[12]). However, the success in reaching industry decarbonisation goals might need to rely on the development and deployment of breakthrough technologies (e.g. clean hydrogen and carbon capture, utilisation, and storage), which may require project-specific and longer-term financing (Cordonnier and Saygin, 2023[12]). This could in some cases require a mix of public (where needed and additional, at concessional terms) and private financing, as some of these investments are capital-intensive and have long payback periods (Cordonnier and Saygin, 2023[12]). OECD research on the case studies, shows that an interesting model to boost the development of low-carbon technologies for industry could be one where companies play a transformational, "venture capitalist" role, by collaborating with clean technology development companies and start-ups and eventually carrying out equity investments (Cordonnier and Saygin, 2023[12]).

The use of sustainability-linked instruments also plays a key role in embedding sustainability objectives across all areas of a business. It helps create stronger collaboration and alignment between various departments and ties financial performance to ESG objectives (Cordonnier and Saygin, 2023[12]). This can support decarbonisation objectives across companies in EMDEs and provide them with access to finance such plans (Cordonnier and Saygin, 2023[12]). For hard-to-abate sector companies this is particularly useful in financing emerging technologies such as CCUS, that have high-investment risks but profound impact on reducing emissions (OECD/Climate Club, 2025[71]). For investors, these instruments offer greater transparency and insight into a company's sustainability commitments, decarbonisation strategy, and the financial roadmap supporting those goals (Cordonnier and Saygin, 2023[12]).

Lessons learnt

Sustainability-linked instruments are relatively cost-effective to put in place for companies that have already defined and committed to reaching sustainability targets and addressing environmental impacts (Cordonnier and Saygin, 2023[12]). This requires companies to develop transparent monitoring systems using details SPTs and KPIs. The development of such systems provides verified sustainability performance and data disclosures which in turn can engage investors (Cordonnier and Saygin, 2023[12]). Yet the adoption of these instruments relies on certifiers and third-party verification to ensure adequate transparency (Cordonnier and Saygin, 2023[12]). This can help to develop unbiased opinions and to provide assurance to lenders and investors that the instrument is aligned with market principles (Cordonnier and Saygin, 2023[12]).

Conditions for scalability

SLBS can be replicable various hard-to-abate sectors as the only requirement is the development and implementation of sustainability or emission reduction commitments (OECD/Climate Club, 2025[71]). The credibility and strength of the selected KPIs and SPTs, along with a company's ability to effectively track and monitor its performance, are crucial factors in ensuring the replicability of the approach (OECD/Climate Club, 2025[71]). SLL and SLB principles promote effective monitoring, through the development of credible KPI's and SPTs. These principles help corporate borrowers, lenders, and investors develop financing frameworks (Cordonnier and Saygin, 2023[12]). Credible and well defined SPTs can attract investor confidence and shows the issuer is genuinely committed to improving its sustainability performance (Cordonnier and Saygin, 2023[12]). By following SLL and SLB principles, KPIs and SPTs can be well defined, consistent over time, and comparable with those used in similar instruments across different industries (Cordonnier and Saygin, 2023[12]). Loan Market Association (LMA), the Asia Pacific Loan Market Association (APLMA) and Loan Syndications and Trading Association (LSTA) work together to publish and update the SLLP, providing voluntary guidelines to ensure transparency, integrity, and consistency in sustainability-linked loans. While the ICMA oversees the Green Bond Principles (GBP), Social Bond Principles (SBP), and Sustainability Bond Guidelines (SBG**)** as well, a key body behind most frameworks for sustainable bond use in global capital markets. All these guidelines are voluntary but adopted by investors and are key requirements for the successful replication of sustainability-linked instruments.

Case study 29: Venture Debt Programme – European Investment Bank (EIB) (instrument F.9. Venture Debt)

Instrument - theoretical concept

Venture debt is a form of growth capital structured as a long-term loan that combines both debt and equity-like features. It is designed for innovative, venture-capital-backed SMEs and mid-cap companies that are not yet (sufficiently) profitable but require capital to scale up operations. The instrument retains the contractual characteristics of debt, such as interest payments and repayment at maturity, while incorporating equity-like components such as warrants (rights granted to the lender to purchase a small portion of company shares at a pre-agreed price) or success fees, allowing the lender to participate in a limited share of the company's future upside. This hybrid structure provides a balance between fixed income financing and the potential for higher returns, compensating lenders for the elevated credit risk associated with pre-profit, asset-light companies.

Although sometimes compared to mezzanine finance, venture debt differs in its objectives and structure. Mezzanine loans are generally used by mature companies to finance acquisitions or expansion and are subordinated to senior debt, whereas venture debt targets earlier stage firms with high growth potential but limited access to conventional bank lending. Positioned between equity and traditional debt, venture debt complements equity rounds by providing non-dilutive funding that extends the company's cash runway and supports investment in R&D, production capacity, and commercialisation.

Venture debt facilities often include performance-linked mechanisms that align incentives between borrower and lender. Instruments such as warrants or success fees enable the lender to share in a portion of the company's value appreciation in the event of a liquidity event, such as an IPO or trade sale. This arrangement ensures that both parties benefit if the company performs well, while the borrower retains ownership and control.

The EIB Venture Debt programme builds on this model to address the funding gap faced by Europe's high growth, innovation and technology-driven enterprises. Backed by the European Commission's InvestEU guarantee, it enables the Bank to provide long-term, risk tolerant loans to companies that fall between

venture capital and conventional debt eligibility. The programme typically offers loan amounts ranging from EUR 15 million to EUR 50 million. While sector-agnostic by design, the instrument has been deployed extensively in cleantech and deep tech, building on the EIB's long standing experience in venture debt for life sciences. It complements other EU innovation initiatives, including the European Innovation Council (EIC) Accelerator and the European Investment Fund's support for the venture capital ecosystem, thereby reinforcing the continuum of EU financing for innovation and industrial decarbonisation. Since the launch of the Programme, the EIB has committed over EUR 6 billion in venture debt across more than three hundred innovative firms in sectors such as life sciences, deep tech and cleantech. Within cleantech, the EIB Venture Debt programme is particularly relevant for cleantech firms operating in areas such as energy, mobility, the bioeconomy, circular economy, and industry decarbonisation, where early commercialisation continues to require substantial R&D and manufacturing investment.

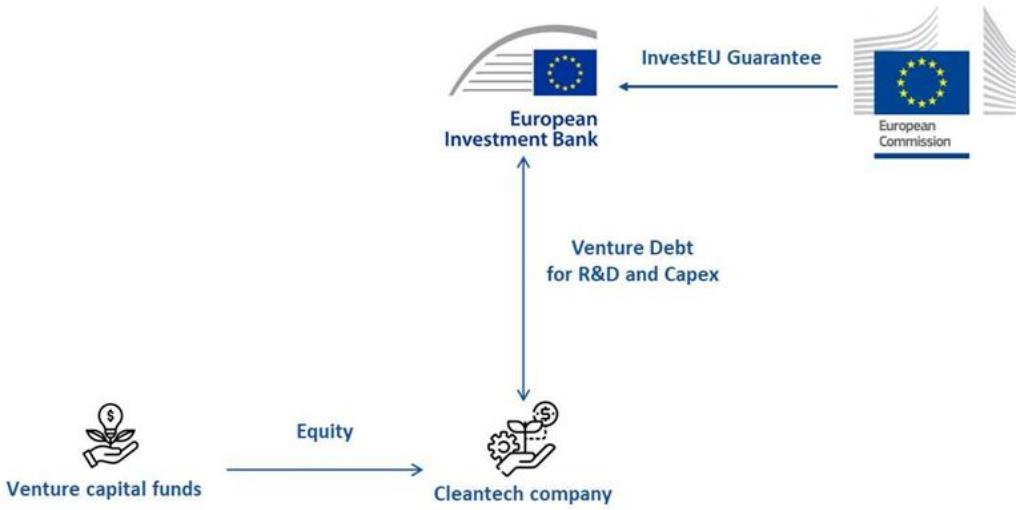
EIB Venture debt provides long-term financing with tranches linked to the achievement of technical, financial, or commercial milestones, such as technology validation, implementation progress, revenue generation, or follow-on equity rounds, aligning disbursement with the gradual de-risking of the project. Repayment structures are adapted to project-specific cash flow profiles and may include bullet repayment options, interest, payment-in-kind (PIK), royalties, or equity-linked remuneration. These mechanisms ensure that financing terms remain consistent with the company's growth trajectory and capacity to generate returns. Loan availability can extend up to four years to reflect the long lead times typical of technology scale up, with maturities regularly up to 10 years after signature.

By combining patient capital with a risk-sharing EU guarantee, the instrument plays a pivotal role in mobilising private investment, accelerating industrial innovation, and supporting the European Union's broader climate and competitiveness objectives under the Green Deal and Net-Zero Industry Act.

Main actors involved and financial flows are articulated as follows:

- European Investment Bank (EIB): structures and provides the loan.
- European Commission (InvestEU): shares risk by offering a guarantee to EIB.
- Beneficiary company: SME or small mid cap (often invested by venture capital funds) receives funding to support the growth stage or early commercialisation phase, covering expenditure in EU27, Norway or Iceland.
- Private investors: already invested in beneficiary companies, benefit from the reduced need for further equity rounds, reduced dilution and improved investment signal.

Figure A A.13. EIB venture debt financial flow scheme



The Venture Debt instrument offers several advantages that make it particularly suited for scaling innovative companies. By providing debt finance that does not dilute existing shareholders, it enables founders and early investors to preserve ownership while still accessing substantial growth capital. The loans are structured more flexibly than conventional bank lending, with features such as bullet repayments, unsecured structures, and performance-based remuneration that adapt to the company's evolving cash flow profile. This flexibility allows firms to match debt service with project milestones rather than fixed repayment schedules. In addition, EIB participation strengthens and diversifies the borrower's funding base, signalling strong public sector backing and improving credibility with private investors, suppliers, and future financiers.

At the same time, the instrument presents several implementation challenges that reflect its focus on higher risk, early-stage borrowers. Transactions require extensive technical, commercial, and financial due diligence to assess innovative technologies or business models that often lack a long operational track record. Structuring milestone-based disbursements, combining deferred repayment terms with performance-linked components, can make transactions complex and time and labour intensive for both the EIB and the borrower. Access is therefore limited to firms with a high degree of innovation, strong expected growth and demonstrable investor support, typically those already backed by reputable venture capital funds, ensuring that public resources target projects with credible market validation and scalability potential.

Supported project description

In December 2023, the EIB signed a EUR 70 million venture debt facility, within an approved envelope of up to EUR 100 million, with Sunfire GmbH, a German clean technology company developing two advanced electrolyser technologies: Solid Oxide Electrolysis Cells (SOEC) and pressurised alkaline electrolysers, both important for large scale clean hydrogen production. The facility supports Sunfire's R&D activities as well as its industrialisation and manufacturing expansion, positioning the company as a key player in Europe's emerging hydrogen economy. Backed by an InvestEU guarantee, the EIB offered flexible terms and a significant ticket to sustain Sunfire's rapid development phase. The Bank carried out extensive due diligence to assess technological maturity, market potential, and operational capacity. Disbursements are made in tranches, each contingent on the achievement of pre-defined technical, financial, and commercial milestones.

- Country: Germany

- Industry: Clean hydrogen and industry decarbonisation
- Project type: Scale up of electrolyser manufacturing
- Financing size: Up to EUR 100 million approved, EUR 70m signed and EUR 30m available for follow-on
- Structure: Multi-tranche loan, linked to milestones

Given the company's early-stage profile, the facility combines interest payments with an equity-linked remuneration feature in the form of synthetic warrants. Unlike conventional warrants that confer the right to acquire equity, synthetic warrants entitle the lender to a success-based payment upon a liquidity event, such as an IPO, trade sale, or refinancing, calculated as a percentage of the company's fair market value at that time. This mechanism allows the EIB to participate in the project's upside while avoiding any direct ownership stake, thereby maintaining its role as a debt financier while ensuring that public support remains aligned with the company's performance.

Impact of the solution on the project

Compared to traditional bank lending, the EIB Venture Debt facility demonstrates the catalytic role of public de-risking in mobilising large scale cleantech investments. Unlike conventional bank loans, venture debt provides less dilutive growth capital at a stage when project funding needs exceed the capacity of venture capital investors but remain too risky for private equity or commercial lenders. For Sunfire, this meant access to long-term, flexible financing that could not have been secured through banks alone, given the company's growth stage and capital intensity. While commercial banks continued to provide much needed short-term working capital lines under domestic guarantee schemes, the EIB's intervention filled a structural gap by offering patient capital with an extended maturity and milestone-based disbursements. This approach improved the company's financial credibility and facilitated its overall EUR 500 million fundraising, which included Series E equity investors and support under the Important Projects of Common European Interest (IPCEI) framework.

The EUR 70 million EIB loan directly supported Sunfire's industrial scale up, financing the construction of its first commercial scale SOEC factory in Germany. The EIB's participation also enhanced Sunfire's credibility with investors, customers, and policymakers by signalling institutional confidence in the company's technology and financial structure. The transaction thereby strengthened Europe's capacity to produce electrolysers domestically and contributes to building a resilient and competitive hydrogen value chain.

A combination of national and European enabling conditions made the transaction feasible and strategically relevant. Germany's national hydrogen strategy, together with significant state subsidies approved under IPCEI, created a predictable demand environment for clean hydrogen technologies. At the EU level, alignment with REPowerEU and the Net-Zero Industry Act reinforced the project's strategic importance in achieving the target of 100 GW of electrolyser capacity by 2030. Finally, the InvestEU guarantee provided by the European Commission enabled the EIB to offer terms that would likely not be available in private markets, ensuring adequate risk sharing while supporting the rapid commercialisation of innovative clean energy technologies.

Lessons learned

The experience with Sunfire confirms that venture debt, when combined with a public guarantee, can effectively support large-scale industry decarbonisation projects in high risk, emerging sectors. The instrument proved well suited to bridging the financing gap between early-stage equity and commercial bank lending. Its milestone-based structure ensured disciplined, phased capital deployment, linking disbursements to verified technical and financial progress while maintaining alignment with the company's development trajectory.

Transaction preparation required approximately six months from the start of due diligence to signature. This timeframe reflected the need for comprehensive technical and financial assessments, co-ordination between multiple investors, and alignment with EU and national funding mechanisms such as IPCEI. While the structuring process was resource-intensive, it ensured compatibility among financing sources and reduced execution risk at later stages.

The EIB operation had a positive signalling effect and directly contributed to mobilising private capital. The Bank's commitment improved Sunfire's investment profile as it was raising new equity and working capital facilities, both of which were successfully completed on schedule. This confirms that venture debt complements, rather than replaces, private equity and short-term corporate financing, by improving the borrower's credibility and overall capital structure.

The InvestEU guarantee played a decisive role in enabling the EIB to provide the facility and to assume higher technology and market risks associated with an emerging hydrogen economy. Without such risk-sharing support, the transaction size and tenor would have been constrained by standard EIB credit parameters. The case therefore illustrates the importance of EU-level de-risking instruments in enabling commercially viable financing for pre-commercial clean technologies and in strengthening Europe's industrial innovation base.

Replicability and scalability conditions

The replicability of the EIB Venture Debt model depends on the continued availability of public guarantees such as InvestEU or equivalent risk-sharing frameworks provided by development banks, national programmes, or multilateral climate finance facilities. These instruments are crucial to enable higher risk tolerance in financing pre-commercial technologies. A strong pipeline of innovative firms with clear scale up potential is also critical, as venture debt relies on market ready companies with proven technologies and credible investor backing. Successful replication further requires institutions with the technical capacity to evaluate complex industrial technologies and to structure milestone-based, performance-linked financing. Supportive national and regional industrial policies, such as hydrogen, battery, or circular economy strategies, provide an enabling environment by creating stable demand expectations and policy continuity.

The venture debt approach has strong scalability potential, within cleantech particularly for capital-intensive manufacturing projects such as electrolysers, carbon capture systems, energy storage technologies, or sustainable chemicals. It is especially relevant in developed and upper-middle-income economies where venture-backed industrial scale ups already operate and where complementary equity and grant instruments are accessible. With appropriate risk-sharing mechanisms and donor-backed guarantees, the model could also be extended to emerging markets through multilateral development banks or blended finance facilities, provided that institutional capacity and policy frameworks support long-term private sector participation in low carbon industrial development.

Case study 30 Offtake finance Programme - HSBC (instrument F.13. Offtake finance)

Instrument - theoretical concept

Offtake finance refers to a set of debt instruments that allow project developers, typically in early commercialisation stages, to borrow against the value of contracted future revenues secured through an offtake agreement. An offtake agreement is a binding contract through which a buyer commits to purchase a defined volume of future output (e.g. carbon credits, renewable fuels, clean hydrogen, biochar, or other decarbonisation commodities). Such agreements provide predictable cash flows, which can be leveraged

to obtain debt financing even when the developer lacks collateral, has limited operating history, or works with emerging technologies that are not yet bankable through conventional project finance.

In early-stage climate and carbon dioxide removal (CDR) industries, developers are often unable to access commercial debt due to construction risk, technology risk, and the small scale of individual projects. Offtake finance bridges this gap by lending against future contracted revenues, reducing reliance on grants or equity and accelerating capital deployment. This approach is increasingly relevant for a small yet growing pool of CDR developers which have proven their technology at pilot scale and have secured offtake agreements for commercial scale assets but are unable to access capital at affordable rates to build the asset.

Two main categories of CDR offtake finance instruments can be distinguished. Outcome bonds mobilise institutional capital, typically through a multilateral development bank (MDB) acting as issuer or arranger, by redirecting part of the interest paid by the issuer towards the upfront capital expenditure (CAPEX) needs of the project developer. In this structure, the bond issuer channels a portion of the coupon to the developer, while the developer commits part of the future offtake revenues, such as carbon credit sales, to service bond repayments. This mechanism relies on strong credit intermediation by the issuing institution and the presence of a credible offtaker, allowing institutional investors with limited risk appetite for early-stage climate technologies to participate. Outcome bonds are therefore particularly suited to emerging markets and to nature based or CDR assets that would otherwise be too risky or too small for conventional institutional debt. Investor protection can be enhanced through buffers, for example by limiting borrowing to around 50% of the contracted offtake value, which helps ensure full repayment even if project delivery underperforms.

Advance payment solutions, by contrast, involve commercial bank lending directly to the project developer, secured against the value of a signed offtake agreement. Rather than mobilising capital markets investors through a bond structure, these instruments rely on the balance sheet and risk appetite of commercial banks. Given banks' sensitivity to construction and operational risk, advance payment solutions typically incorporate performance insurance or operational guarantees. The bank advances a share of the contracted offtake value, usually up to around 50%, to finance CAPEX, with repayment linked to the future delivery of credits or lowcarbon products. Intermediaries may play a role in matching developers with offtakers, insurers and lenders, and in standardising due diligence processes. These structures are particularly relevant for first-of-a-kind (FOAK) or small-scale assets where project finance is unavailable and institutional investors are unwilling to take early-stage risk.

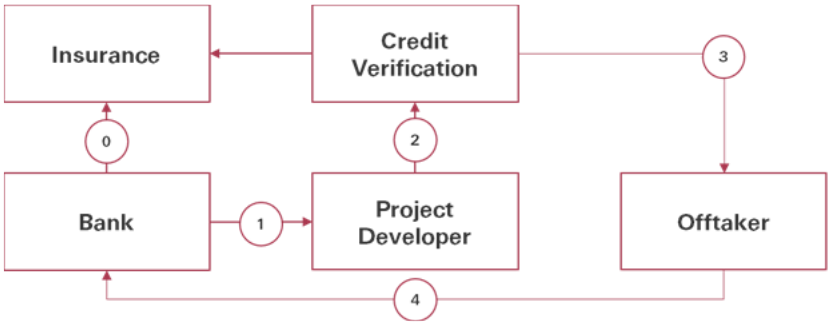
In terms of actors involved, offtake finance relies on a clearly defined allocation of roles across the project value chain:

- Project developer: builds and operates the asset and assigns future revenues from the offtake agreement to the financier as part of the security package.
- Offtaker / buyer: a corporate or institutional purchaser that commits to buy the project output under a long-term contract (for example Microsoft or British Airways), thereby underpinning future revenues.
- Financier: either institutional investors, typically participating through MDB-arranged outcome bonds, or commercial banks providing advance payment loans on their balance sheet.
- Insurance providers: cover construction, performance or operational risks, particularly in advance payment structures where bank exposure to early-stage risk is material.
- Brokers / platforms: in some cases, specialised intermediaries structure the transaction, align risk appetites across parties and support technical and financial due diligence.

From a financial and contractual perspective, the advance payment solution follows a sequential flow designed to protect lenders while providing early liquidity to developers. The bank first secures insurance coverage to mitigate construction and operational risks and then advances a defined share of the offtake

contract value, typically around 40-50%, to the project developer to fund early stage CAPEX or operational expenditure (OPEX). The developer constructs the asset and generates credits or low carbon products, which are subject to third-party verification prior to delivery. Once verified, the outputs are transferred to the offtaker under the existing contract, and payment flows are directed first to the bank to repay the advance, with any residual revenues accruing to the developer. This ordering of cash flows links repayment to verified performance, reduces credit risk for financiers, and enables developers to access upfront capital without undermining investor security.

Figure A A.14. Advance payment solution scheme



From an economic perspective, the instrument offers several advantages. By anchoring financing in contracted revenues, offtake finance improves the bankability of early-stage decarbonisation technologies and enables access to debt where conventional collateral is unavailable. It facilitates the mobilisation of institutional and private capital into small scale or capital constrained CDR and industry decarbonisation projects by reducing revenue risk. Risk aligned structuring, including caps and buffers on borrowing volumes, enhances resilience against under delivery. By providing upfront capital expenditure liquidity, the instrument also supports the transition from pilot projects to commercial deployment.

At the same time, implementation remains challenging. Transactions are complex to structure and require extensive stakeholder co-ordination to align the risk appetites of developers, offtakers, financiers and insurers. Economic viability often depends on sufficiently large or aggregated offtake volumes to justify transaction costs. Technology and delivery risks remain material, particularly for FOAK assets, necessitating insurance or guarantees. In addition, fragmented markets with heterogeneous offtake terms and project risk profiles complicate standardisation and scaling.

Example of supported project description

HSBC is a global banking group headquartered in London, operating in more than 60 countries. It provides commercial and corporate banking, global markets, trade finance and wealth management services. Public disclosures indicate that HSBC provided or facilitated around USD 447.7 billion in sustainable finance and investment between 2020 and mid-2025, with a longer-term ambition to mobilise up to USD 1 trillion by 2030. This positions the institution as a significant actor in financing activities relevant to industry decarbonisation and low-carbon development.

Within this broader mandate, HSBC has expanded its work on offtake-linked financing structures that enable early-stage decarbonisation and carbon removal projects to access debt based on long term contracted revenues. This involves assessing whether offtake agreements, such as multi-year carbon credit purchases or renewable commodity supply contracts, provide sufficient revenue certainty to underpin repayment. Through co-operation with MDBs and participation in blended finance structures, HSBC contributes to models that translate contracted offtake revenues into predictable cash flows, enabling

developers to access upfront capital while maintaining alignment with verification and performance-based delivery. The bank's role typically focuses on financial structuring, credit assessment and investor intermediation to support credible repayment pathways and mobilise private capital.

An illustrative example is the HSBC supported World Bank outcome bond implemented in Brazil. The project, developed by Mombak, involves large-scale afforestation and ecosystem restoration activities aimed at generating high integrity carbon removal credits through long-term forest establishment and sustainable land management. It targets the restoration of degraded land at scale and delivers durable carbon sequestration outcomes aligned with international certification standards, alongside biodiversity and local socio-economic co-benefits. Borrowing under the structure was capped at up to 50% of the value of a long-term carbon credit offtake agreement with Microsoft, with the bond size aligned to the project's capital expenditure needs.

- Country: Brazil
- Industry subsector: Nature-based carbon removal (afforestation)
- Size of investment: Borrowing capped at up to 50% of the contracted Microsoft offtake; bond size aligned with project CAPEX needs

From a governance and organisational perspective, the outcome bond was arranged by the World Bank as issuer, with HSBC acting in a supporting financial role. Mombak entered into a long-term offtake agreement with Microsoft, which formed the revenue basis for repayment. The World Bank structured the bond so that part of the coupon was redirected to the developer as upfront capital expenditure support, while institutional investors subscribed under standard MDB credit terms. Verification of carbon credits and delivery monitoring were embedded in the repayment mechanism, and a delivery buffer was incorporated to protect investors. Bond proceeds were used for land acquisition and planting activities, with repayment sourced from future verified credits and borrowing limits ensuring investor repayment even if delivery fell below expectations.

A second example is an advance payment solution structured for UnDo, a developer of enhanced rock weathering projects, with British Airways as offtaker and Standard Chartered as lender. UnDo's project deploys finely milled basalt on agricultural land to accelerate natural mineral weathering processes that capture and store atmospheric CO_2 in stable carbonate form. Deployments rely on partnerships with farmers and combine field operations, measurement protocols and digital verification to generate high quality carbon removal credits delivered under a multi-year offtake agreement. The financing supported a small pilot scale facility, with the bank advancing up to around 50% of the contracted offtake value.

- **Country:** United Kingdom (offtaker), global developer operations
- **Industry subsector:** Technology based CDR (enhanced rock weathering)
- **Size of investment:** Small pilot scale facility; bank advance up to 50% of contracted offtake value

The governance arrangement for this transaction involved co-ordinated engagement between UnDo, British Airways, Standard Chartered, Cur8 as intermediary, and insurance providers. Cur8 aligned stakeholder requirements, conducted due diligence and structured verification and payment flows. Standard Chartered provided the loan secured against assigned offtake revenues, while insurers covered construction and operational risks. Verified deliveries triggered payment flows from the offtaker, with the bank repaid first under an agreed cash flow waterfall before residual revenues reached the developer. This structure enabled commercial lending for a FOAK CDR deployment that would otherwise have lacked access to debt financing.

Impact of the solution on the project

Relative to conventional financing, the HSBC supported outcome bond provided access to long tenor finance that would not have been available through standard corporate or project debt, particularly for an

afforestation developer without an operating track record. By borrowing against contractually-secured offtake revenues, the developer reduced reliance on equity and grant funding and accelerated project expansion, while investors benefited from de-risked return profiles supported by structured repayment mechanisms and delivery buffers.

In terms of business models and access to finance, outcome bonds allow developers to shift from equity dependent financing towards scalable debt structures backed by contracted revenues, strengthening financial sustainability over time. Advance payment solutions similarly provide liquidity to FOAK developers that would otherwise be excluded from commercial bank lending, enabling early deployment and learning-by-doing.

The effectiveness of these instruments is reinforced by enabling conditions. Creditworthy corporate offtakers such as Microsoft and British Airways are central to supporting long tenor debt. The involvement of a MDB and the participation of HSBC enhanced investor confidence, while robust monitoring, reporting and verification frameworks ensured the integrity of revenue streams. As the CDR industry matures, these enabling conditions may allow a gradual transition towards more conventional debt financing, with offtake-backed structures acting as a transitional mechanism.

Lessons learnt

Both examples demonstrate that offtake finance can be implemented effectively for small scale and FOAK CDR projects, mobilising institutional and commercial capital that would otherwise remain unavailable. However, structuring outcome bonds and advance payment facilities is resource-intensive and can lengthen project preparation timelines due to multi-party alignment, insurance requirements and complex due diligence. Once standardised templates and processes are established, the potential for scaling improves.

The HSBC supported outcome bond illustrates how institutional capital can be mobilised for high-risk climate projects when anchored in credible offtake agreements and strong credit intermediation. While outcome bonds rely on the credit standing of the issuing institution and the offtaker, advance payment structures demonstrate how insurance can be used to mitigate construction and operational risks and unlock commercial bank lending.

Replicability and scalability conditions

For replication and scalability, several conditions are critical. Aggregation of multiple small offtakes is often required to reach a scale at which transaction costs, due diligence expenses and structuring efforts become economically viable, particularly for small or modular CDR projects. The use of standardised offtake contracts and clearly defined bankability criteria reduces legal and financial complexity, shortens preparation timelines and facilitates replication across projects and geographies. Credible monitoring, reporting and verification frameworks are essential to underpin the integrity and predictability of revenue streams, ensuring that financiers can rely on verified delivery for repayment. Replicability further depends on the availability of creditworthy buyers willing to enter into multi-year purchase agreements that provide sufficient revenue certainty, as well as on the presence of intermediaries capable of structuring and co-ordinating multi-party transactions. These conditions are particularly relevant in emerging markets, where project risks are higher and MDB involvement can play a catalytic role by strengthening credit intermediation, standard setting and investor confidence.

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