Climate Club Financial Toolkit: Economic, de-risking and financing instruments for industry decarbonisation

Developed by the OECD under the Climate Club Work Programme 2024 - Pillar III, Module 2

BETTER POLICIES FOR BETTER LIVES

Outline

1. **Context and background**
2. **Economic, de-risking and financing instruments**
   - 2.1. Economic instruments
   - 2.2. De-risking instruments
   - 2.3. Financing instruments
3. **Case studies**
   - 3.1 Case studies linked to economic instruments
   - 3.2 Case studies linked to de-risking instruments
   - 3.3 Case studies linked to financing instruments
4. **Economic assessment of selected sector and technologies**
   - 4.1. Cement
   - 4.2. Iron and steel
   - 4.3. Petrochemicals and plastics

Disclaimers

Acknowledgements

- The report was developed with support from the Co-Chairs of the Climate Club (Chile and Germany) and with funding from the German government.
- The report was prepared by Joseph Cordonnier and Amylia Mesic of the OECD Environment Directorate, under the guidance of Deger Saygin, Industry Team Lead of the OECD Clean Energy Finance and Investment Mobilisation Programme, Yuval Laster, Head of the OECD Environment Finance, Investment and Global Relations Division, Kumi Kitamori, OECD Environment Deputy Director, and Fabrizia Lapecorella, Deputy Secretary General of the OECD

Context

- This toolkit is a standalone Climate Club deliverable prepared by the OECD under the **Climate Club Work Programme 2024, Pillar III, Module 2**: ***Developing a better understanding of successful financing instruments and enabling conditions to mobilise private capital***.
- The toolkit provides an **overview of 28 economic, de-risking and financing instruments** that can be used for financing industry decarbonisation, both in emerging markets and developing economies (EMDEs) and in developed countries. For each instrument, it outlines its concept, benefits and relevance to industry decarbonisation and identifies the typical providers. The description of instruments is complemented with a **suite of case studies** to showcase how they are being implemented in real-world projects. The toolkit also highlights a preliminary economic assessment for a **selection of low-carbon technologies in various hard-to-abate industries** in different country settings, which could benefit from some instruments in the toolkit.
- Developed to meet the Climate Club's objectives, and building on OECD work, **the toolkit informs financial and technical assistance providers**, in particular to **meet the requests from EMDEs on the Climate Club's Global Matchmaking Platform**. The toolkit is also laying the groundwork for Capacity Building Programme Framework on industry decarbonisation financing, designed by the OECD for the Climate Club. The ultimate objective of the toolkit is to help operationalise the COP29 Global Pledge: Scaling international assistance for industry decarbonisation.
- **The toolkit is a living document**; as governments and financial actors are currently developing and implementing (existing and new) instruments, **it will be continuously updated in 2025-2026** with other instruments, case studies, and examples of applications for selected low-carbon technologies across industrial subsectors. **Deep dives into high-priority instruments** can also be carried out under the Climate Club Work Programme 2025-2026.

Moving forward: what to do with the toolkit

How will the toolkit be used in 2025?

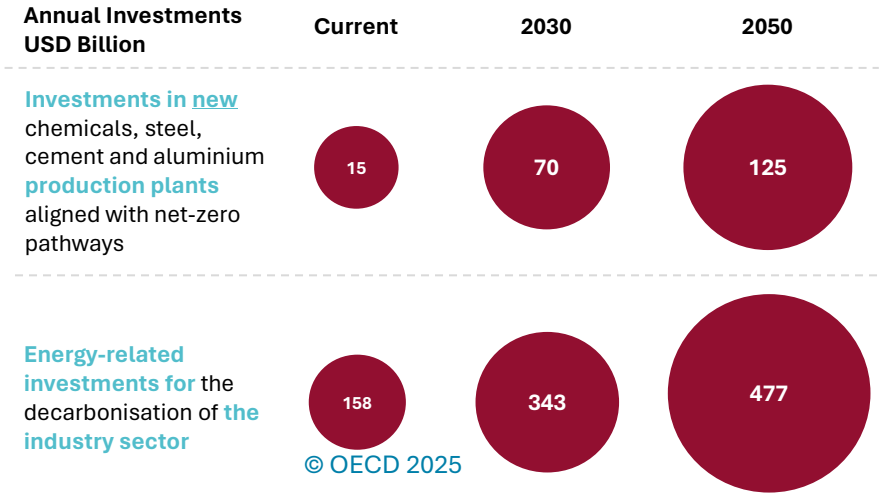
- The toolkit is part of **Pillar III** of the **Climate Club Work Programme 2025-2026**, alongside an update of financial and technical assistance mapping for industry decarbonisation in EMDEs, the implementation of the Capacity-Building Programme Framework and the operationalisation of the Global Matchmaking Platform (GMP).
- Through the GMP, EMDEs can submit requests for technical and financial support. **The toolkit will be used in the GMP to inform the delivery partners in selecting the right instrument(s) to answer EMDEs' needs**. Through the case studies, it will also **help identify potential delivery partners** and **provide insights on how to design and implement economic, de-risking and financing instruments**.
- The toolkit will also inform the *Capacity building programme framework for closing the industry decarbonisation financing gap in emerging markets and developing economies* (to be designed and implemented in 2025).

How will the work be enriched in 2025?

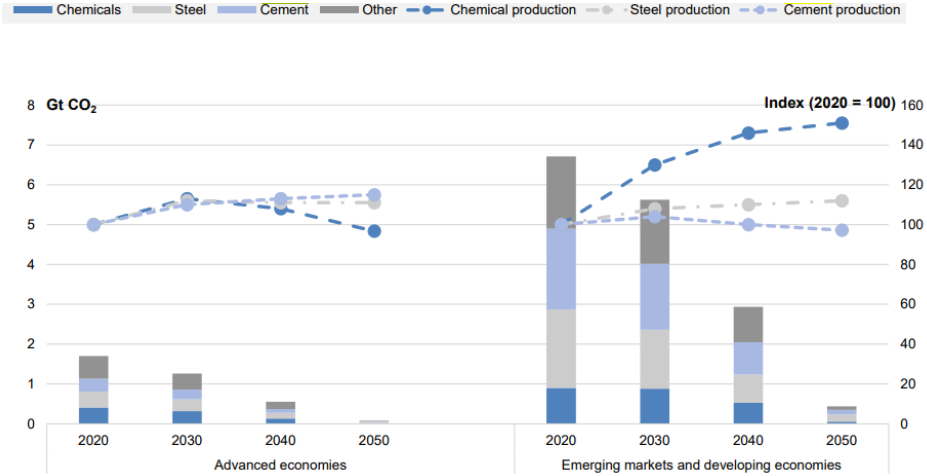
- **Further case studies will be collected to enrich the evidence base**.
- **Complementary work could be developed** on an ad hoc basis, such as:
  - Based on lessons learnt, identify measures for governments **to improve the enabling investment conditions** to successfully implement instruments.
  - Assess **how private capital can be mobilised by the instruments** and collect practical evidence.
  - **Engage with stakeholders to select and set up instruments on concrete cases**.
- **Dialogue and workshops with stakeholders**, including with governments, industry actors and the financing community will be instrumental to **exchange best practices** with the Climate Club members that have made request to the GMP.

Challenge: financing industry decarbonisation (1/2)

- **The industrial sector is responsible for about a quarter of global emissions** and plays a pivotal role in the global transition to achieve net-zero emissions by 2050. In addition, the industrial sector will provide new jobs and green growth opportunities.
- **A cumulated investment of USD 10-15 trillion would be needed between now and 2050 to decarbonise industry.** Annual investment in ***new*** production plants and energy-related investment for the decarbonisation of the industry sector must double by 2030 and at least triple by 2050; further investment to adapt current plants will be needed.



- **The financial and technical assistance for industry decarbonisation in EMDEs will have to be further prioritised.** Most of the industrial output growth is expected to take place in these countries in the next decades, which will have to cope with the double challenge of industry decarbonisation and economic development.



Challenge: financing industry decarbonisation (2/2)

Industry decarbonisation can be accelerated via various technology solutions:

- Circular economy approaches (e.g. material efficiency, reuse and recycling of materials, product life extension)
- Energy efficiency and process improvement
- Fossil fuel substitution via increased use of renewable energy sources or electrification of production processes
- Biomass and synthetic feedstocks based on low-carbon hydrogen (and CO_2)
- Carbon capture use and storage (CCUS)

Factors contributing to the current limitations to the decarbonisation of the manufacturing industry include:

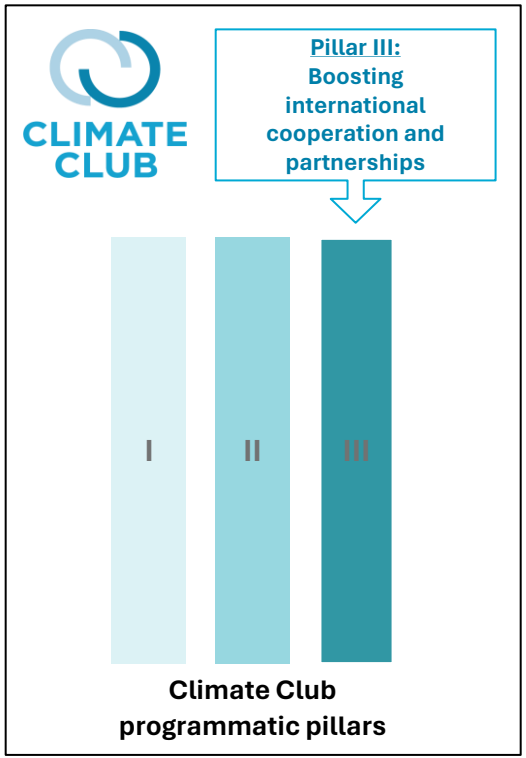
- Policy challenges: multiple government entities are responsible for industrial policymaking which at times may result in a misalignment on values and approaches.
- Industry challenges: (i) many decarbonisation solutions are not technically and/or commercially mature; (ii) industries need to remain competitive in the global market; (ii) industry players are spread across complex value chains, which requires a holistic policy approach.

The complexity of the industry sector requires an enabling environment and tailored financing solutions for transition:

- Enabling conditions to support decarbonisation and domestic policy contexts must be strengthened in order to facilitate the demand for industry transition financing and will require different market interventions and financing solutions
- The further development of financing instruments that cope with the specific challenges of industry decarbonisation-related projects will foster the uptake and scalability of these projects

Note: Financial contributions that confer a benefit (including grants, tax credits, loan guarantees amongst others), and are provided by Governments that are World Trade Organization (WTO) Members, are subject to WTO trade rules, including the Agreement on Subsidies and Countervailing Measures. In particular, subsidies contingent on exports, or upon the use of domestic over imported products are prohibited under the Agreement. Further obligations may also apply.

Overview of Climate Club work to scale up support for industry decarbonisation



- Currently comprising 43 members (as of December 2024), **the Climate Club** is an open, cooperative, and inclusive forum of climate-ambitious countries with the goal of supporting the effective implementation of the Paris Agreement and decisions thereunder.
- Building on in-house and OECD analyses and on its network of partners, the Climate Club aims to **fast-track the decarbonisation of heavy-emitting industries**, in particular in emerging and developing economies.
- The Climate Club work has three pillars:
  - I. Advancing ambitious and transparent climate change mitigation policies
  - II. Transforming industries
  - III. Boosting international climate cooperation and partnerships

Overview of Pillar III:
Boosting international cooperation and partnerships

In its 2024 Work Programme, the Climate Club has undertaken action to support this objective, with the following outputs of Pillar III:

- **Module III - 1. Mapping financing and technical assistance for industry decarbonisation in EMDEs**
  - > Report released in September 2024: detailed analysis of public bilateral and multilateral assistance, private finance mobilised by official development finance interventions, philanthropies, and institutional investors

- **Module III - 2. Developing a better understanding of successful financing instruments and enabling conditions to mobilise private capital**

Scope of this slide deck

  - > **Financing Instruments Toolkit**
  - > Design of a Capacity-Building Programme Framework on industry decarbonisation financing

- **Module III - 3. Developing a Global Matchmaking Platform (GMP) focused on improving industry decarbonisation projects**
  - > Launch of the GMP at COP29 in Baku

The toolkit helps link the Climate Club activities on ID financing

Module III-1 – The mapping

Provides an overview of financial and technical assistance for industry decarbonisation

> The steel, cement & petrochemical sectors represent 70% of global industry's CO_2 emissions but less than 1 % of the total recorded mitigation-related development finance / private finance mobilised over the last decade

> All financing sources can contribute to increasing the support to industry decarbonisation: international and domestic, public and private

Identifies areas for action

> Target more countries to tap into a significant emissions reduction potential

> Develop financing instruments that can address the specific challenges of industry decarbonisation

Module III-2 – The toolkit

Provides concrete examples of economic, de-risking and financing instruments…

> Identification, definition and illustration of the use of various instruments that are being implemented and deployed

> Best practice sharing to facilitate the replication and scale up of instruments

… building on OECD work on ID and Climate Club activities

> The OECD Framework for industry's net-zero transition is being implemented in four EMDEs in 2022-2025, identifying enabling conditions (policies, regulations, skills, etc.) and financing solutions to decarbonise industrial subsectors

> The OECD report Financing solutions to foster industry decarbonisation in emerging and developing economies (2023) highlights instruments to overcome the financial challenges to scale up investments for industry decarbonisation

> Climate Club technical workshops held in April and September 2024 brought together more than 200 participants from Finance, Industry, Government and Think Tanks to discuss challenges and present solutions for financing industry decarbonisation

Module III-3 – The GMP

Connects countries to delivery partners that can provide technical and financial assistance…

> Single-point gateway for EMDEs to raise customised requests and identify globally leading technical and financial solutions

> **Governments** can outline their industry decarbonisation needs; **companies** can profile their technology or solution; **investors and finance institutions** can respond to country requires grants and loans; **delivery institutions** can respond to countries' requests for financing and technical assistance

… through matchmaking process

> Helps prepare early-stage project studies and funding proposals to secure necessary financing, and increases awareness about new technologies, cost factors and risk mitigation tools.

Structure of the toolkit

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1 Economic, de-risking and financing instruments

- A selection of 28 financial instruments are chosen that are successful within both EMDEs and developed economies to advance low-carbon solutions
- Classification under economic, de-risking and financing instruments

Note: the instruments have been selected based on literature review, expert consultation and availability of case studies. The list of instruments may evolve, either adding new instruments that had not been identified, or removing instruments with limited evidence of their direct use for industry decarbonisation projects.

2 Case studies of available instruments

- Highlight the success factors of instruments to support industry decarbonisation projects
- Reflect the takeoff of low-carbon technologies
- Highlight diversity of regions, instruments and providers

Note: the list of case studies will be continuously updated to increase the evidence-base of the design and implementation of instruments, as well as the support provided to concrete projects.

3 Economic assessment of selected technologies

- Steel: Renewable Hydrogen and Carbon Capture Use and Storage (CCUS)
- Cement: CCS and Limestone Calcined Clay Cement (LC3)
- Petrochemicals: Biomass based solutions and CCUS

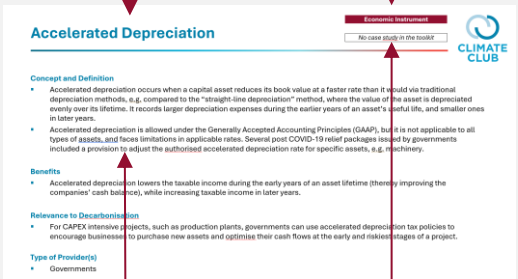
Note: the calculations presented in this version are *work in progress*, based on the technologies selected under the implementation of the OECD Framework for industry's net-zero transition in 2023-2025. Future versions of the Toolkit will include the final calculations and estimation of the impact of several instruments.

Reader's guide

1 Economic, de-risking and financing instruments

Instrument name

Instrument category



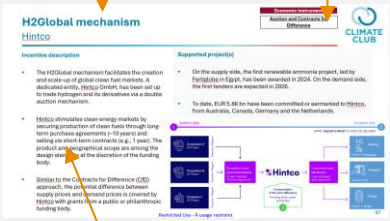
Description of the instruments

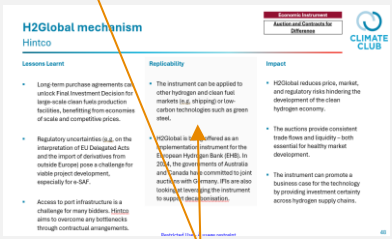
Clickable links to related case studies

2 Case studies of available instruments

Case study name

Clickable link to related instrument

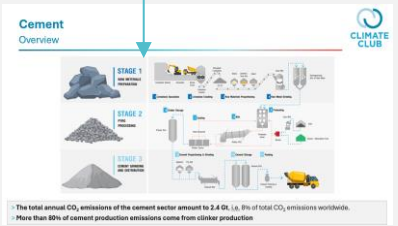


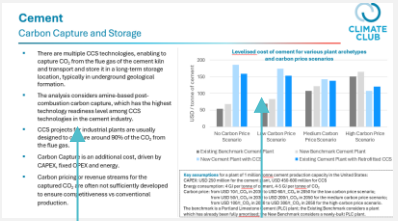


Case Study description

3 Economic assessment of selected technologies

Sector Overview





Description of low-carbon technology

(Levelised) cost of production

Outline

1. Context and background
2. **Economic, de-risking and financing instruments**
    - 2.1. Economic instruments
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    - 2.3. Financing instruments
3. Case studies
4. Economic assessment of selected sector and technologies

Economic, de-risking and financing instruments

Definitions

Economic instruments

The OECD defines economic instruments as “a means by which decisions or actions of the government affect the behavior of producers and consumers by causing changes in the prices to be paid for these activities”. National and regional policy frameworks can promote enabling environments for industry decarbonisation. They can accelerate financing options across the public and private sector and highlight longterm commitments to net-zero reducing investment risks.

De-risking instruments

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

Instruments such as debt or equity financing that can help to fund business activities, making purchases, or investments. The use of financing instruments and the investment approach vary amongst technology and project.

Note: the "category" is not always strictly defined. For instance, contracts for differences are sometimes seen as a financing instrument, and sometimes as a de-risking instrument. Furthermore, the providers of the instruments may vary, and only the most common types of providers are listed in the subsequent slides.

Economic, de-risking and financing instruments

Overview of instruments covered in this report

Economic

E.1. Accelerated Depreciation
E.2. Auction and Contract for Difference
E.3. Carbon Tax
E.4. Carbon Credits
E.5. Emission Trading Schemes
E.6. Extended Producer Responsibility Fees
E.7. Grants and Subsidies
E.8. Green Premium Financing
E.9. Tax Credits

De-risking

D.1. Buyer Credit Guarantees
D.2. Energy Savings Insurance
D.3. First and Second Loss Facility
D.4. Foreign Currency Guarantee
D.5. Partial Risk Guarantee
D.6. Performance Guarantee
D.7. Political Risk Insurance
D.8. Sovereign Guarantees
D.9. Swaps and Derivatives

Financing

F.1. Bonds
F.2. Concessional Loans
F.3. Local Currency Loans and Facilities
F.4. Public and Private Equity
F.5. Pull Financing Instruments
F.6. Results-Based Financing Instruments
F.7. Revolving Credit Facility
F.8. Short-term Loans
F.9. Structured and Securitised Products
F.10. Sustainability-Linked Instruments

> Various economic, de-risking and financing instruments are already available

> Combining instruments can help address multiple barriers when developing an industry decarbonisation project. Some instruments can be considered to have characteristics of multiple of categories (Economic, De-risking and Financing)

Accelerated Depreciation

Economic Instrument

No case study in the toolkit

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Concept and definition

- 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 (GAAP), 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.

Benefits

- Accelerated depreciation lowers the taxable income during the early years of an asset lifetime (thereby improving the companies' cash balance), while increasing taxable income in later years.

Relevance to decarbonisation

- 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.

Type of provider(s)

- Governments

Auction and Contract for Difference

Economic Instrument

Hintco / H2Global

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Concept and definition

- Auctions refer to competitive bidding processes for the supply or demand of low-carbon products or electricity generated by renewable energy.
- 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.

Benefits

- Auctions allow for price discovery and support market formation for nascent technology.
- CfDs and auctions can incentivise investment in low-carbon technologies by providing stability and predictability to future revenue streams over a long period.

Relevance to decarbonisation

- Auctions and CfDs can help mitigate the risks related to the lack of market for low-carbon products, both in terms of price and volume. They can notably remove the disadvantages associated with the higher levelised costs of low-carbon products compared to conventional ones.

Type of provider(s)

- Governments (providing the funding, even if other entities such as foundations can organise and implement the auction).

Carbon Tax

Economic Instrument

No case study in the toolkit

Concept and definition

- A carbon tax is a carbon pricing tool used to internalise the costs of carbon emissions and is government-imposed fee on emission generating activities. They can cover emissions from electricity and heat generation, industrial manufacturing, or transportation.
- In the OECD *'Pricing Greenhouse Gas Emissions'* report a carbon tax is defined as taxes in which the rate is linked to a fuel's carbon content, irrespective of whether the resulting carbon price is uniform across fuels and uses. This differs from a fuel excise tax which is a tax levied on fuels and are not carbon taxes.
- A carbon levy can also be calculated to tax the emissions embedded in certain products when they are imported into a certain jurisdiction.

Benefits

- A carbon tax ensures that polluting industries internalise the costs associated with carbon emissions, thereby incentivising companies to reduce their carbon footprint.

Relevance to decarbonisation

- Imposed fee on carbon emissions increases the costs for polluting production routes and therefore increase the competitiveness of technologies that release less CO_2.

Type of provider(s)

- Governments

Carbon Credits

Economic Instrument

Puro/Net Zero

CLIMATE CLUB

Concept and definition

- Carbon credits are a tradeable instrument that is issued by a carbon crediting mechanism, representing a verified emission reduction or removal equivalent to 1 t CO2-eq. They are distinct from permits (or allowances) that represents the right to emit 1 t CO2-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. This mechanism, known as the Paris Agreement Crediting Mechanism, will have its own methodologies, registry and third-party auditors, which provide infrastructure that other crediting mechanisms could build on, or align with. It can be essential to ensure the environmental integrity of the carbon credit markets.

Benefits

- As carbon credits are tradable assets, they incentivise companies to decarbonise their operations, or to purchase carbon credits to claim for lower emissions and support their decarbonisation commitments. These assets can be traded on a regional carbon market such as the EU-ETS.

Relevance to decarbonisation

- Buyers of carbon credits can claim the carbon emission reduction to support sustainability activities in the business and net-zero pledges and promotes companies to embed net-zero programmes within their business models.

Type of provider(s)

- Carbon crediting platforms, Governments

Emission Trading Schemes

Economic Instrument

No case study in the toolkit

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Concept and definition

- 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 permits) trading. Each allowance represents each unit of emissions.
- The cap decreases annually in line, with an emission reduction target. The cap is expressed via emission allowances which can be sold and traded via auctions. 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.

Benefits

- ETS allows for the development of a carbon market where financial resources can be challenged to support emission reductions and fosters international climate action.
- Emissions levels are monitored and reported annually to determine if they remain under the cap.

Relevance to decarbonisation

- Requires polluting entities across sectors (industrial manufacturing, electricity, etc.) to pay for their released emissions.

Type of provider(s)

- Governments

Extended Producer Responsibility Fees

Economic Instrument

European Union

CLIMATE CLUB

Concept and definition

- Extended Producer Responsibility (EPR) fees tend to cover the downstream costs associated with waste management, transportation, sorting and recycling/treatment. EPR regulations cover the upstream process through measures like eco-design policies while aligning the demand and supply of waste and recycling in a sustainable way.

Benefits

- EPR fees can help influence changes in design of products to facilitate sustainable waste management practices and creates a financial incentive towards the implementation of a circular economy.
- EPR fees boost the use of a recycling market and reduces landfill use and associated costs.

Relevance to decarbonisation

- Products and packaging with circular designs (e.g., high quantity of recyclable materials) are less emission intensive when they reach an end-of-life phase.

Type of provider(s)

- Governments

Grants and Subsidies

Economic Instrument

EBRD
Government of India

Concept and definition

- Grants and subsidies are direct financial aid to achieve the deployment of a specific activity or project.
- Grants and subsidies can be used at various stages of development, including for research and development, project preparation, subsidising capital expenditures (CAPEX) or operational expenditures (OPEX).

Benefits

- Grants and subsidies are conventional funding instruments, usually simple to implement. They can help to accelerate technology adoption, by directly reducing the cost of implementing the concerned project.

Relevance to decarbonisation

- Grants and subsidies 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.

Type of provider(s)

- Bilateral Development Finance Institutions, Government, Multilateral Development Banks, National Development Banks, Philanthropies

Green Premium Financing

Economic Instrument

No case study in the toolkit

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Concept and definition

- A green premium reflects the difference in cost between a low-carbon product vs a product with similar properties that has been produced through more emission-intensive process. Green premium providers finance partially or totally this price difference.
- While there remain a debate as to how to define “green”, separate price indices or contracts for low-carbon products could provide price signals and help reflect the demand for such goods.

Benefits

- Green premiums can help identify the costs associated to the purchase of a product manufactured in a sustainable way, rather than with a conventional process.
- Covering the green premium can help bridge the competitiveness gap and create the necessary conditions to influence the consumers’ behaviour to purchase low-carbon products.

Relevance to decarbonisation

- Green premiums can be applied all along the value chain and for a large number of goods: for fuels, basic materials such as steel or cement, plastics, or end-products such as cars.
- Understanding the cost gap across the value chain can help identify where the green premium could be used more efficiently to drive transformative change and advance decarbonisation.

Type of Provider(s)

- Corporations, Governments

Tax Credits

Economic Instrument

US Department of Energy

CLIMATE CLUB

Concept and Definition

- Tax credits provide an offset to tax liabilities from the state. Tax credits can be granted in relation to costs incurred to carry out R&D, pr production for selected technologies and assets.
- Tax credits 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.

Benefits

- Tax credits provide financial incentives to invest in low-carbon options and expand manufacturing opportunities. Tax credits can be useful for technologies that are not yet market ready, e.g. CCUS or green hydrogen.
- When tax credits are coupled with grants or concessional loans this can help to increase R&D efforts into technologies and low-carbon solutions via demonstration projects.

Relevance to decarbonisation

- Tax credits can help to reduce market barriers for low-carbon solutions like CCUS or energy storage technologies, which exhibit potential to reduce emission levels in various sectors.
- Tax credits provides an economic stimulus and opportunities for manufactures to expand R&D efforts for low-carbon technologies.

Type of Provider(s)

- Governments

Buyer Credit Guarantee

De-risking instrument

EIFO

Concept and Definition

- 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.

Benefits

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

Relevance to Decarbonisation

- 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.

Type of Provider(s)

- Export Credit Agencies

Energy Savings Insurance

De-risking instrument

GCF and XacBank

CLIMATE CLUB

Concept and Definition

- 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 did 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.

Benefits

- ESI helps de-risk contractual risks and overcome the low creditworthiness of beneficiaries such as industrial SMEs.

Relevance to Decarbonisation

- The ESI de-risks energy efficiency projects in EMDEs by providing insurance backed guarantee.

Type of Provider(s)

- (Re)insurance firms (providing the coverage), Multilateral Development Banks (providing grants and loans to national development banks and local financial institutions to fund the projects).

First and Second Loss Facility

De-risking instrument

No case study in the toolkit

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Concept and Definition

- A first loss facility are 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. Providers of first and second loss guarantees agree to bear losses incurred up to an agreed percentage if the borrower defaults and therefore act as a credit enhancement tool.

Benefits

- First and Second Loss facilities reduce the perceived risk associated with financing projects in EMDEs or technologies that are still in a demonstration phase. They can increase the supply of financing available for targeted projects.

Relevance to Decarbonisation

- First and second loss facilities are useful when borrowers have limited creditworthiness or to support projects in new business segments, such as low-carbon products, where limited track records can make it difficult to estimate potential losses.
- First and second loss cover can attract and mobilise investment for decarbonisation projects despite the risk factors involved. In particular, they can crowd in private investors that would otherwise not invest in high-risk projects.

Type of Provider(s)

- Government, Multilateral Development Banks

Foreign Currency Guarantee

De-risking instrument

Inter-American Development Bank and Ministry of Finance of Brazil

CLIMATE CLUB

Concept and Definition

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

Benefits

- Foreign currency guarantees help borrowers that cannot access international markets due to a high foreign exchange risks.
- Foreign currency guarantees can help mitigate the exposure to exchange rate volatility.

Relevance to Decarbonisation

- Foreign currency guarantees help to build a better case for decarbonisation projects to raise capital projects in EMDEs, by mitigating investment risks associated with exchange rate volatility and potentially discrepancies between the share of revenues and expenses in local and hard currencies.

Type of Provider(s)

- Bilateral Development Finance Institutions, Export Credit Agencies, Multilateral Development Banks

Partial Risk Guarantee

De-risking instrument

EESL, SIDBI, World Bank

CLIMATE CLUB

Concept and Definition

- 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.

Benefits

- Partial risk guarantees can help to mobilise private financing, especially for projects based in regions with political insecurity or exhibit other sovereign risks.

Relevance to Decarbonisation

- 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 in EMDEs.

Type of Provider(s)

- Bilateral Development Finance Institutions, Multilateral Development Banks

Performance Guarantee

De-risking instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- 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.

Benefits

- Performance guarantees can reduce project and technology uncertainties such as construction delays, upfront costs overruns, energy or hydrogen production (capacity factor uncertainty), operation and maintenance costs.

Relevance to Decarbonisation

- For low-carbon technology projects performance guarantees allow insurance companies to bear costs related to technology performance which can impact project goals/outputs.
- To promote hydrogen economies, performance guarantees can provide insurance to the production of the supply side and operation phase, particularly for the production and rollout of electrolysers.

Type of Provider(s)

- Bilateral Development Finance Institutions, Insurance firms, Multilateral Development Banks

Political Risk Insurance

De-risking instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- Political risk insurance helps equity investors recovery part of their investment in case of a loss occurs due to political events. If repayments are disrupted, political risk insurance ensure that a remaining portion of losses are paid out.

Benefits

- The instrument can help investors access finance in EMDEs as it is often required to get this insurance in order to obtain financing from banks. For lenders, regulatory relief is provided.
- It can protect equity investors for a possible termination of the project that the sovereign may need to compensate for.

Relevance to Decarbonisation

- Political risk insurance ensures that countries can attract investment in decarbonisation projects regardless of political instability as it helps to enable better financing conditions. At times, this financial instrument may be a pre-request to the deployment of decarbonisation projects and to reach a final investment decision (FID).

Type of Provider(s)

- Bilateral Development Finance Institutions, Export Credit Agencies, Insurance firms, Multilateral Development Banks

Sovereign Guarantees

De-risking instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- Sovereign guarantees are issued by governments that hold the responsibility to repay a financial commitment associated with a project (typically in their own country) and ensure that contractual obligations are met.

Benefits

- 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.

Relevance to Decarbonisation

- Sovereign guarantees can be beneficial for infrastructure and clean energy projects where accessing private capital can be difficult due to barriers within an EMDE (e.g., regulatory or financing barriers). They enable project financing by increasing credit worthiness of project developers, expand an investor base, and promote competition in bidding.

Type of Provider(s)

- Governments

Swaps and Derivatives

De-risking instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- Derivatives are contracts that involve two or more parties with a value based on a specific underlying asset. The value of a derivative is linked to the performance of an asset, index, commodity, currency or interest rate. Derivative contracts help to manage risks associated with interest rates or defaults. Derivatives can include future contracts, options, forward contracts or 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.

Benefits

- Derivatives products can provide risk management solutions tailored to the challenges faced by EMDEs and developers of renewable energy projects.
- Derivatives can enable developers to predict revenue streams and mitigate financing risks.

Relevance to Decarbonisation

- Derivatives can help with the sale and purchase of carbon reduction and net zero projects and also scale up the use of voluntary carbon credits for such projects by providing liquidity.

Type of Provider(s)

- Commercial banks

Bonds

Financing instrument

IDB Sustainability Bonds

CLIMATE CLUB

Concept and Definition

- Bonds are fixed-income instrument where money is lended 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.
- A convertible bond has the option to be converted into shares of common stock in the issuing company or cash. 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.

Benefits

- Bonds are debt instruments which provides predictable returns for the lender and prevent asset loss.
- Convertible bonds are usually a cost-effective way to raise money as they offer lower interest rates than comparable conventional bonds. They also provide a certain level of flexibility, as conversion to shares can preserve cash flow.

Relevance to Decarbonisation

- Green bonds which follow the same structure as a bond can be used to raise capital from investors to finance sustainability or net-zero projects such as green hydrogen while protecting lenders from losses. Governments can issue green bonds to accelerate projects with positive environmental impacts.

Type of Provider(s)

- Commercial banks, Corporates, Governments, Multilateral Development Banks

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Concessional Loans

Financing instrument

Climate Investment Funds; EBRD/GCF; Mitigation Action Facility

CLIMATE CLUB

Concept and Definition

- A concessional loan is a loan that has more favourable terms than what the market would offer. They usually apply to projects with a climate or development objective and that could not go ahead without specialised financial support.
- The concessionality can relate to a lower interest rate, a longer loan tenure, or other features of the loan.

Benefits

- Concessional loans help to bridge the gap between funding pools from different providers for projects (e.g., financial institutions, philanthropies, national development banks).
- Concessional loans alleviate financial barriers for project developers in EMDEs, such as like low liquidity or limited loan tenures.

Relevance to Decarbonisation

- Concessional loans can de-risk decarbonisation projects via long-term loan contracts to show a commitment to net-zero and attract further investment in decarbonisation. They allow transformative decarbonisation projects to be financed.

Type of Provider(s)

- Bilateral Development Finance Institutions, Multilateral Development Banks, National Development Banks

Local Currency Loans and Facilities

Financing instrument

Eco Invest Brazil Program

CLIMATE CLUB

Concept and Definition

- Loans issued by a finance institution in the currency of where the investment is taking place. Repayments are made in the local currency to avoid risks associated with currency depreciation. The interest rate of the local currency is typically fixed.

Benefits

- Borrowing in foreign currency can expose financers to risks e.g., debt and debt service payments which can increase when local currency depreciates. Local currency loans help to alleviate these risks.

Relevance to Decarbonisation

- Provides project developers in EMDEs the ability to finance decarbonisation projects in local currency to avoid increases in repayments as a result of currency depreciation.
- For example, clean hydrogen projects can be exposed to currency depreciation risks if revenues are denominated in local currency, but debt is denominated in a foreign currency. The electrolysers that will be used in clean hydrogen projects in EMDEs will be mostly from Europe, the USA and/or East Asia. The instrument mitigates risks associated with the currency differences, by ensuring that repayments to technology providers are in local currency rather than foreign hard currencies.

Type of Provider(s)

- Commercial banks, Multilateral Development Banks, National Development Banks

Public and Private Equity

Financing instrument

Industry Decarbonisation Program, Climate Investment Funds (CIF)

CLIMATE CLUB

Concept and Definition

- 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.

Benefits

- The benefit of equity financing to a business is that the money received doesn't 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 allow for investors to have voting rights and influence the business' strategy.

Relevance to Decarbonisation

- Companies (both public and private) delivering low-carbon technology, renewable energy, hydrogen etc., can provide either public and private equity investment options.

Type of Provider(s)

- Commercial banks, Corporates, Governments, Institutional investors, National Development Banks

Pull Finance

Financing instrument

Instiglio Pull Finance

Concept and Definition

- Pull financing mechanisms link payments with predetermined criteria set out by the lender and receiving party. When objectives set out in the contract are met, payments are received through models like milestone payments, or payment-by-results with open access where rewards are granted for the delivery and verification of agreed-on results.

Benefits

- Pull financing is beneficial for EMDEs where investment opportunities are less attractive for private investors. It is also beneficial for scaling-up emerging and innovative technologies that may provide high social impact but lack investment attraction in the private market.

Relevance to Decarbonisation

- Pull finance mechanisms address barriers EMDEs face in deploying decarbonisation efforts by linking premium payments to desired outcomes, such as emission reductions.

Type of Provider(s)

- Commercial banks, Governments, Institutional investors, National Development Banks

Results-based financing instruments

Financing instrument

Inter-American Development Bank
Instiglio

CLIMATE CLUB

Concept and Definition

- Results-based financing includes a range of financing tools where financing is linked and provided after the delivery of pre-agreed and verified results. 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.

Benefits

- Results-based financing instruments can improve the design and implementation of development programs to achieve sustainable results.

Relevance to Decarbonisation

- Results-based financing instruments can use climate mitigation objectives or energy and resource efficiency objectives as indicators. By doing so, it ensures that the funding is used for projects with verified results.

Type of Provider(s)

- Commercial banks, Governments, Multilateral Development Banks

Revolving Credit Facility

Financing instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- A revolving credit facility (RCF) 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. RCF is considered as a short-term financing option.

Benefits

- 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.
- Interest is only charged when an amount is borrowed from the credit line. Interests are only paid on the utilised portion, making it a more cost-effective option for short term financial needs

Relevance to Decarbonisation

- RCF are particularly suitable for decarbonisation projects with varying capital requirements over time; it can be particularly suitable for projects with high risks of cash flow gaps or unforeseen cash flow movement.

Type of Provider(s)

- Commercial banks, Multilateral Development Banks

Short-term Loans

Financing instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- A loan for temporary purposes to attain capital for business or project needs. The borrower is required to pay the amount due with interest by a predetermined date e.g., one year or six months after the loan.
- The loan repayment period is shorter than other loans as it typically last at a maximum of 18-20 months. Long-term loans on the other hand can last upwards 20 years.
- There are different forms of short-term loans such as lines of credit, cash advances, or installment loans.

Benefits

- For new businesses or developers, the short-term loan can provide cash flow to cover costs of operations or project needs.

Relevance to Decarbonisation

- They can provide financing assistance for riskier decarbonisation projects that may not be able to receive long-term loans or other types investments due to technology immaturity or regional considerations like political instability.
- Short-term loans can be applied for small-scale projects (such as energy efficiency). For larger projects with longer repayment period, they may play a more minor role, e.g. to manage cash flow gaps.

Type of Provider(s)

- Commercial banks, Multilateral Development Banks

Structured and Securitised Products

Financing instrument

No case study in the toolkit

CLIMATE CLUB

Concept and Definition

- 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.

Benefits

- 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.

Relevance to Decarbonisation

- Structured financing can be used to package financial assets related to industrial 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.

Type of Provider(s)

- Commercial banks

Sustainability-Linked Instruments

Financing instrument

Indorama Ventures, Natura & Co and Votorantim Cimentos (Brazil)

CLIMATE CLUB

Concept and Definition

- Sustainability-linked bonds (SLBs) and Sustainability-linked Loans (SLLs) are innovative performance-based financial instruments that allow companies to raise capital for general corporate purposes, while providing visibility to their ESG targets.
- SLL and SLB market has seen rapid and continued growth, as consumers and investors prioritise environmental and social goals in their strategic decision-making.

Benefits

- 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. They are easily replicable across sectors and countries. It is a flexible tool for debt raising that can be used for general corporate purposes at convenient financial cost.

Relevance to Decarbonisation

- Sustainability-Linked Instruments can create the incentive for companies to commit to their announced environmental goals or to implement decarbonisation plans to reduce emissions.

Type of Provider(s)

- Corporates

Outline

1. Context and background
2. Economic, de-risking and financing instruments
3. **Case studies**
    - 3.1 Case studies linked to economic instruments
    - 3.2 Case studies linked to de-risking instruments
    - 3.3 Case studies linked to financing instruments
4. Economic assessment of selected sector and technologies

Introduction

Overview of Case Studies

- The case studies selected for the financial toolkit pertain to EMDEs but they are also applicated to developed economies to highlight **key lessons learnt and replicability.**
- The case studies highlight a variety of funders: ***public, private and financial institutions.***

Purpose of Case Studies

- The case studies provide an example of how each financial instrument exemplified in the toolkit have been applied to advance industry decarbonisaion and the deployment of low-carbon technologies.
- Each case study is linked to one of the **28 financial instruments** that are either classified as de-risking, economic or financing instrument to dive deeper in their application and benefits. The case studies showcase the **different actors financing industry decarbonisation and the importance of tailoring instruments to different subsectors and technologies.**

Benefits of Case Studies

- **The case studies provide concrete examples of how the array of risks to finance industry's net-zero transition can be overcome through a variety of financial instruments** that help attract the necessary capital for the projects and ensure their competitiveness with incumbent technologies, once implemented.

Industry decarbonisation case studies

Key lessons learnt

Instruments

- Direct public support for **targeted or timebound uses**
- **Derisking instruments** to optimise the leverage of public resources

Co-operation

- **Knowledge sharing and matchmaking platforms** to facilitate implementation
- **Multi-stakeholder approaches**

Enabling conditions

- **Capacity building** to strengthen institutional readiness and industry maturity
- Key role of **sustainable taxonomies**

Replicability and scale-up

- **Innovative financial instruments** for early stages of project/ technology development
- Importance of **project pipelines**

List of Case Studies

Blue print: case study in the toolkit

Red print: no case study in the toolkit

CLIMATE CLUB

Economic

E.1. **Accelerated Depreciation**

E.2. **Auction and Contract for Difference**
Hintco/H2Global

E.3. **Carbon Tax**

E.4. **Carbon Credits**
Puro/Net Zero

E.5. **Emission Trading Schemes**

E.6. **Extended Producer Responsibility Fees**
European Union

E.7. **Grants and Subsidies,**
EBRD; Government of India

E.8. **Green Premium Financing**

E.9. **Tax Credits**
US Department of Energy

Derisking

D.1. **Buyer Credit Guarantees**
EIFO

D.2. **Energy Savings Insurance**
GCF/XacBank

D.3. **First and Second Loss Facility**

D.4. **Foreign Currency Guarantee**
IDB and Ministry of Finance of Brazil

D.5. **Partial Risk Guarantee**
EESL/SIDBI/World Bank

D.6. **Performance Guarantee**

D.7. **Political Risk Insurance**

D.8. **Sovereign Guarantees**

D.9. **Swaps and Derivatives**

Financing

F.1. **Bonds**
IDB and BBVA Sustainability Bonds

F.2. **Concessional Loans**
Climate Investment Fund; EBRD/GCF; Mitigation Action Facility

F.3. **Local Currency Loans and Facilities**
Eco Invest Brazil

F.4. **Public and Private Equity**

F.5. **Pull financing instruments**

F.6. **Results-based financing instruments**
IDB; Instiglio

F.7. **Revolving Credit Facility**

F.8. **Short-term Loans**

F.9. **Structured and Securitised Products**

F.10. **Sustainability-Linked Instruments**
Indorama Ventures and JSW Steel; Votorantim Cimentos

Note: the "category" is not always strictly defined. For instance, some programmes or funds may use several instruments, and the definitions of instruments may overlap.

H2Global mechanism

Hintco

Economic Instrument

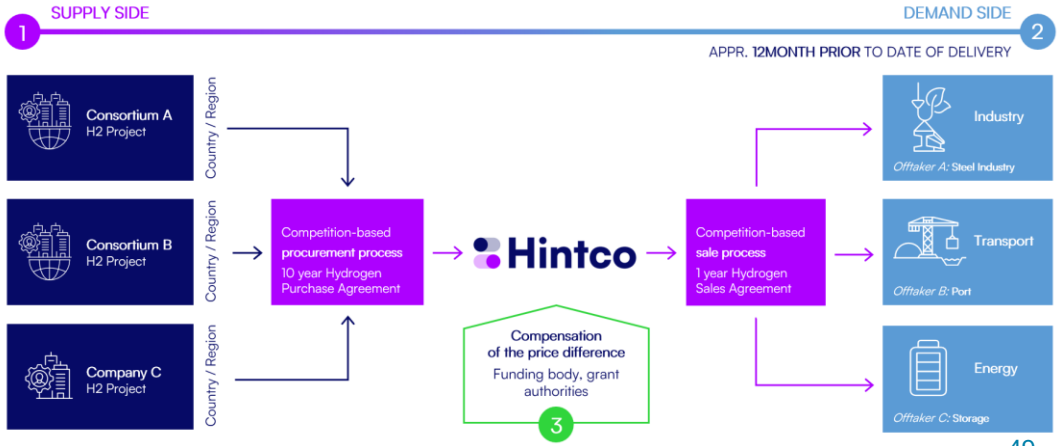
Auction and Contracts for Difference

Incentive description

- The H2Global mechanism facilitates the creation and scale-up of global clean fuel markets. A dedicated entity, Hintco GmbH, has been set up to trade 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). The product and geographical scope are among the design elements at the discretion of the funding body.
- 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.

Supported project(s)

- On the supply side, the first renewable ammonia project, led by Fertiglobe in Egypt, has been awarded in 2024. 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.



H2Global mechanism

Hintco

Economic Instrument

Auction and Contracts for Difference

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.
- 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 is a challenge for many bidders. Hintco aims to overcome any bottlenecks through contractual arrangements.

Replicability

- 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 (EHB). In 2024, the governments of Australia and Canada have committed to joint auctions with Germany. IFIs are also looking at leveraging the instrument to support decarbonisation.

Impact

- H2Global reduces price, market, and regulatory risks hindering the development of the clean hydrogen economy.
- The auctions provide consistent trade flows and liquidity – both essential for healthy market development.
- The instrument can promote a business case for the technology by providing investment certainty across hydrogen supply chains.

CO_2 Removal Certificates

Puro

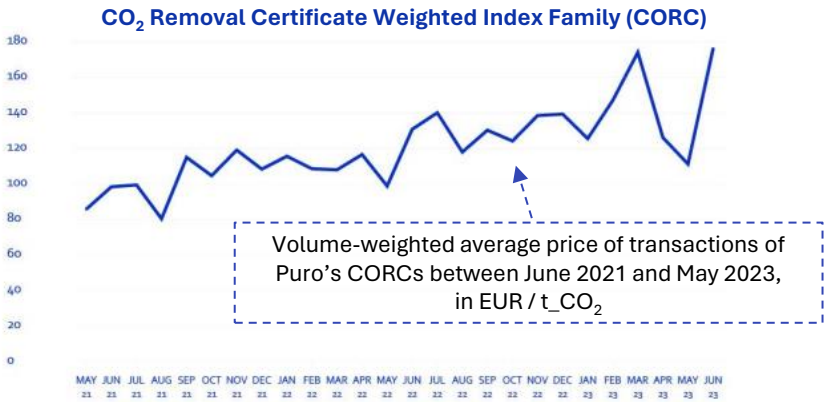
Economic Instrument

Carbon Credits

CLIMATE CLUB

Incentive description

- CO_2 Removal Certificates (CORCs) can be sold in carbon markets or bilaterally to promote revenue of carbon dioxide removal (CDR).
- Puro.earth is a carbon-crediting platform for engineered carbon removal solutions. Puro.earth certifies projects from CO_2 Removal suppliers based on an in-house standard. There are multiple carbon crediting platforms outside of Puro with several international standards and methodologies.



Supported project(s)

- 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. They extract carbon to producer biochar while also generating electricity surplus in the process. Biochar is sold locally while surplus electricity is dispatchable and renewable and sold locally.
- NetZero develops projects in emerging and developing economies, particularly in tropical zones where there is a market for biochar.
- NetZero has a full-scale plants in Cameroon and in Brazil.

CO_2 Removal Certificates

Puro

Economic Instrument

Carbon Credits

CLIMATE CLUB

Lessons Learnt

- CORCs can neutralise residual emissions and support their own net-zero claims.

Replicability

- Replicable but contingent on enabling conditions needed to foster high quality CDR solutions:
  - *Liquid markets for carbon credits would provide more transparent pricing information*
  - *Transparency on tax regulations can help investors establish viable business plans*
  - *Government roadmaps including sectoral emissions and compensation targets can provide long-term views on carbon demand*

Impact

- CORCs help create profits for the project behind NetZero.
- In April 2022, NetZero was selected by the Musk Foundation as one of the 15 milestone winners in the XPRIZE Carbon Removal competition.
- The Puro standard has increased buyers' confidence since the COEC with NetZero was negotiated.

EPR Schemes for Packaging

European Union

Economic Instrument

Extended Producer Responsibility Fees

Incentive description

- 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.
- EPR schemes in the EU enforce material-specific fees paid by producers and importers for the packaging that they place on the national market. These fees are charged based on the weight of packaging.
- 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.

Supported project(s)

- The example EPR scheme is focused on the European Union and its packaging regulations however the EPR scheme covers a wide variety of sectors like batteries, electric vehicles, and electronics.

EPR Schemes for Packaging

European Union

Economic Instrument

Extended Producer Responsibility Fees

Lessons Learnt

- EPR fees now differentiate between products and packaging, and items difficult to reuse, remanufacture, repair and recycle, with items designed for reuse, remanufacturing, repair and recycling. Past approaches did not include this differentiation measure which can weaken incentives for producers to make upstream changes to design features.
- EPR systems need clear and long-term objectives, periodic reviews and evaluations to improve the effectiveness and relevance of fee modulation.
- Stakeholder networks and coordination between producers and recyclers are important to ensure effectiveness.

Replicability

- EPR schemes are being implemented globally in other countries and sectors.
- EPR fees can be strengthened and complemented with other instruments such as *Green Public Procurement* to strengthen market demand for eco-friendly products.

Impact

- Early adoptions of EPR schemes can influence subsequent policy changes.
- *Environmental handling charges, eco-fees for production, and recycling fees* can improve sustainable material use and target the entire value chain.

Economic Instrument

Grants and Subsidies

FINTECC

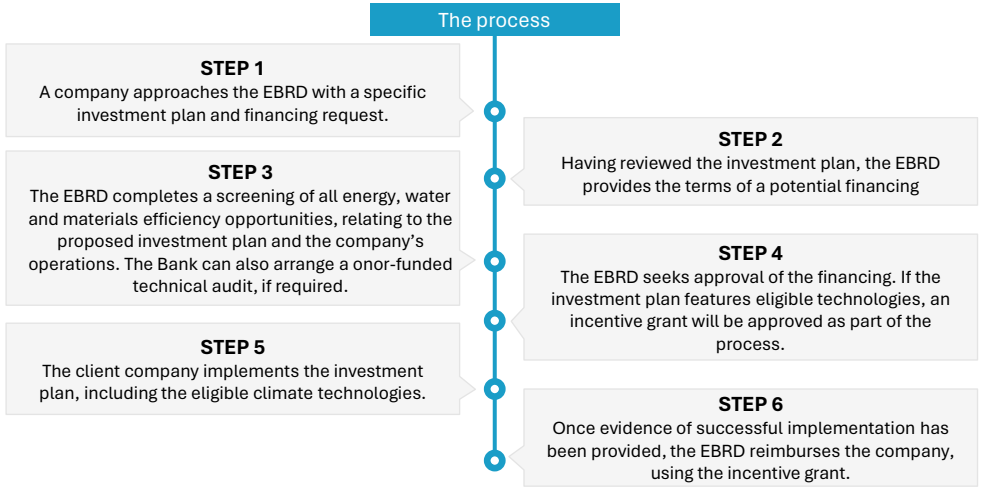
European Bank for Reconstruction and Development (EBRD)

Incentive description

- 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 is active in 17 countries: *Armenia, Azerbaijan, Egypt, Georgia, Jordan, Kyrgyz Republic, Lebanon, Moldova, Mongolia, Morocco, Tajikistan, Tunisia, Turkmenistan Ukraine, and Uzbekistan.*
- EBRD customers can apply for FINTECC support along with traditional EBRD financing. 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.

Supported project(s)

- The program 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.
- Example: a glass manufacturer in Moldova implemented a technology to reduce bottles weight by up to 30%, leading to 20-30% energy efficiency gains.



Economic Instrument

Grants and Subsidies

FINTECC

European Bank for Reconstruction and Development

Lessons Learnt

- The programme can de-risk innovative climate technology through the launch of demonstration projects.
- Policy support is needed to boost technology transfer and project implementation e.g. through regulatory support, performance standards, energy efficiency plans etc.
- Training programs can help local consultants learn more on climate technologies in the industrial sector which help in project implementation.

Replicability

- CAPEX Grants can support demonstration projects of climate technologies with low-market penetration.
- The instrument is highly replicable across country or sector.

Impact

- CAPEX grants provide investment opportunities in countries that may lack regulatory frameworks, markets, or exhibit supply chains risks or technology risks.
- The grants provide opportunities to improve manufacturing efficiency and lower implementation, and operational costs associated with transition efforts.
- The FINTECC program 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. This includes the reconstruction of the melting furnace and the replacement of production machine lines.

Production-Linked Incentive (PLI)

Government of India

Economic Instrument

Grants and Subsidies

Incentive description

- 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.
- 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).
- Two PLI Schemes are particularly suitable for industry decarbonisation: Advanced Chemistry Cell (ACC) battery and high-efficiency solar photovoltaic (PV) modules. 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.

Supported project(s)

- The project takes place in India and focuses on accelerating the implementation of low-carbon technologies.
- 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%.

Economic Instrument

Grants and Subsidies

Production-Linked Incentive (PLI)

Government of India

Lessons Learnt

- The scheme has benefited 176 micro-small and medium enterprises across a variety of sectors e.g., industry, and agriculture.
- 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.

Replicability

- Highly replicable as it can be applied across a variety of sectors: PLI schemes are implemented in 14 different sectors in India.
- Replicability will depend on financial incentives and enabling regulatory frameworks to attract manufacturing companies which are instrumental in the PLI schemes applicability.

Impact

- PLI schemes have contributed to boosting the manufacturing sector in India, job generation, economic growth and exports.
- Foreign Direct Investment in the manufacturing sector increased to USD 21.34 billion in the FY 2021-22, in comparison to USD 12.09 billion in FY 2020-21.

Inflation Reduction Act

US Department of Energy

Economic Instrument

Tax Credits

Incentive description

- The Inflation Reduction Act (IRA) directs new federal spending towards emission reduction, boosting US economic competitiveness, innovation and industrial productivity. Committed funds are delivered through a mix of instruments: tax incentives, grants and loan guarantees.
- The IRA includes several programmes to reinvigorate American manufacturing by promoting private investments for decarbonisation in the industrial sector. This includes the expansion of the 48C Advanced Energy Project Credit to include industrial decarbonisation projects that aim to retrofit existing industrial facilities to reduce greenhouse gas emissions by at least 20%.
- Funded by the Bipartisan Infrastructure Law and IRA, the Industrial Demonstrations Program (IDP) received a combined USD 6.3 billion to support the advancement of transformational technologies. The implementation agency is the Department of Energy's Office of Clean Energy Demonstrations which will fund up to 50 percent of the cost of each project.

Supported project(s)

- Under 48C Round 1 (March 2024), USD 500 million is allocated to diverse industrial decarbonisation projects, including ceramics, glass, iron and steel or pulp and paper.
- In 2024, the IDP has selected 33 early-of-a-kind commercial-scale projects and awarded 17 of them in various industrial sectors such as Aluminum and Metals, Cement and Concrete or Iron and Steel. The projects have a technological readiness level (TRL) of at least 7 and can include 1) Near-Net-Zero Facility Build Projects; 2) Facility-level Large Installations and Overhaul Retrofit Demonstrations; and 3) System Upgrades and Retrofits for Critical Unit Operations or Single Process Lines Within Existing Facilities.

Economic Instrument

Tax Credits

Inflation Reduction Act

US Department of Energy

Lessons Learnt

- Combining the IDP grants in tandem with policies like the 45X Advanced Manufacturing Tax Credit and the 48C Qualifying Advanced Energy Project Tax Credit can help low-carbon technologies' reach maturity and competitiveness and create quality jobs.
- The programmes increase confidence of project sponsors and investors. Accepted applicants receive credits, project support, a DOE-validated technology and project.

Replicability

- The tax credits under the IRA have proven to be successful for accelerating low-carbon technologies. 48C illustrates how the Investment Tax Credit first established in 2009 (for clean energy manufacturing/recycling) could be expanded to other sectors since 2022 (critical materials and industrial decarbonisation).
- IDP selected replicable projects that can be deployed in the short-term, as they will be best positioned to catalyse follow-on investments to yield the most significant carbon reductions across the industrial sector in the next few decades.

Impact

- The 48C and IDP programmes helped to expand US manufacturing capacity, create high-quality jobs, increase the resilience of domestic supply chains, enhance the competitiveness of the industry and reduce GHG emissions in the manufacturing sector.
- The awarded and selected projects under the IDP in 2024 anticipate to avoid the emission of 14 million tonnes of CO_2 equivalent annually, and to mobilise twice as much private investment

De-risking instrument

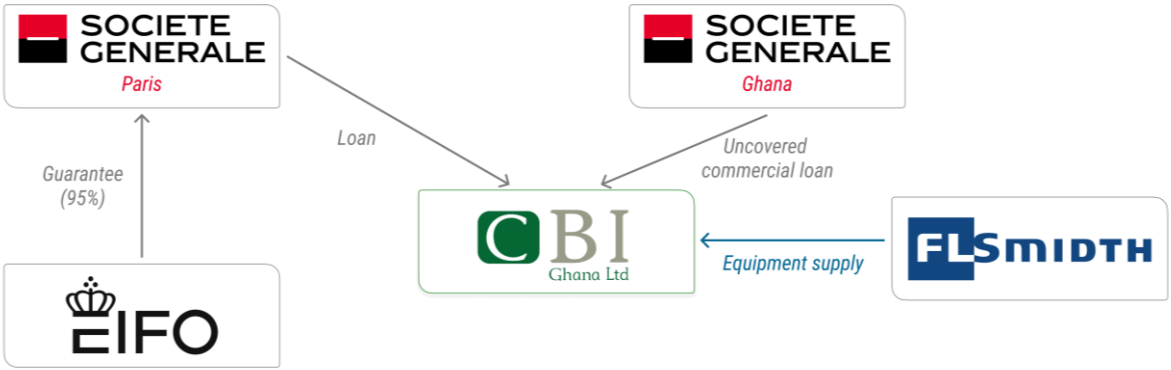
Buyer Credit Guarantee

Buyer Credit Guarantee

Export and Investment Fund of Denmark (EIFO)

Incentive description

- The Buyer Guarantee's are provided by EIFO to CBI Ghana, a cement manufacturer, to get access to long-term financing . This financing will help expand its existing grinding plant from 600 kilotonnes (kt) to 1.5 million tonnes (Mt) per year by establishing a new grinding mill and build a new clay calcination unit. The calcined clay will act as a supplement to the imported clinker (currently used for the manufacture of cement which is emission intensive).



Supported project(s)

- The project focuses on the cement sector in Ghana.
- The instruments helps to finance the purchase of a cement crusher, and clay calciner that creates calcined clay developed by FLSmidth.
- The project has attracted investments from Norfund, the Danish Investment Fund for Developing Countries (IFU). The total investment amounts to more than USD 80 million, funded by a combination of ECA-backed loan provided by Société Générale Paris and 95% guaranteed by EIFO, an untied commercial loan provided by Société Générale Ghana, and equity from the abovementioned investors.

De-risking instrument

Buyer Credit Guarantee

Buyer Credit Guarantee

Export and Investment Fund of Denmark (EIFO)

Lessons Learnt

- The Buyer Guarantee's structure enabled CBI Ghana and its shareholders to get access to attractive, long-term financing. Indeed, Ghana's country rating (from Standard and Poor's) was B- at the time of the transaction, limited the ability of CBI to obtain external international funding without an EIFO guarantee.

Replicability

- The instrument can be implemented in various geographies and industries to facilitate investment in decarbonisation projects.
- In countries with high-risk profiles, the Buyer Credit Guarantee unlocks financing to enable the foreign buyer to finance new and innovative technologies.

Impact

- The project resulted in a CO_2 footprint reduction of by up to 20%.
- The instrument creates market opportunities for innovative low-carbon technologies to foreign customers and supports Danish companies in gaining market shares in international markets.
- The financing mechanism structured by EIFO and Societé Générale made it possible for FLSmidth to sell its technology to CBI.
- The project contributes to closing the cement demand-supply gap in Ghana utilising local resources (kaolinitic clay) to reduce dependence on imported resources (clinker) and the cement sectors carbon footprint.

De-risking instrument

Energy Savings Insurance

Energy Savings Insurance

Green Climate Fund (GCF) / XacBank

Incentive description

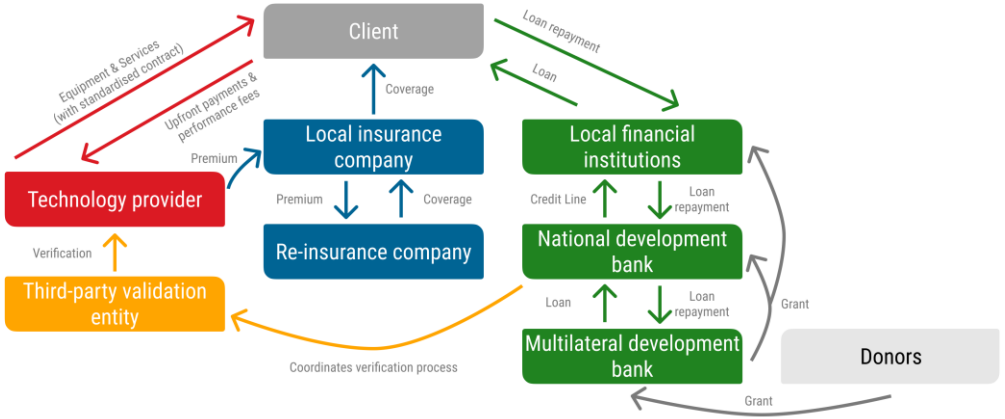
- Developed by the Inter-American Development Bank (IDB) with support from BASE Foundation to accelerate energy efficiency programs.

- A de-risking package consisting of financial and non-financial tools designed to increase investor confidence in energy efficiency projects:
  - A performance warranty provided by a supplier to a customer for committed savings under a duration set by a standardized contract.
  - An insurance company provides an insurance product that backs up the commitment of the supplier.
  - A third-party validation entity determines the amount of the compensation if savings are not met.

Supported project(s)

- 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.

- 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 Program to lower energy consumption.



De-risking instrument

Energy Savings Insurance

Energy Savings Insurance

Green Climate Fund (GCF) / XacBank

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.
- 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. This highlights the importance of public-private collaboration to develop legal frameworks within a reasonable timeframe.

Replicability

- BASE is exploring with the support of the Energy Regulatory Commission of Mongolia the adaptation of the ESI model to public procurement processes
- 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.

Impact

- Examples of projects in Mongolia (non-industry):
  - *XacBank: A 20 kW PV system installed on the rooftop of XacBank's headquarters in Ulaanbaatar. 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.*
- The financial characteristics of the credit line is favorable 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.

De-risking instrument

Foreign Currency Guarantee

Eco-Invest Brazil Program

Inter-American Development Bank / Ministry of Finance of Brazil

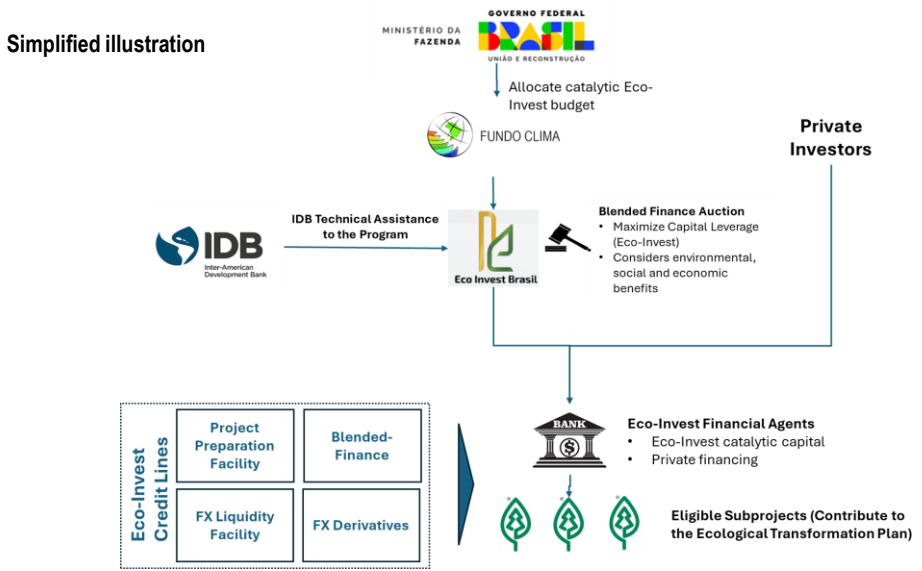
Description

- Eco-Invest is also known as The Brazilian Foreign Private Capital Mobilization and Currency Hedging Programme under Brazil's National Climate Change Fund.
- It leverages four credit lines: 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 and support Brazil's Ecological Transformation (ETP).
- The four credit lines complement each other tackling identified challenges and market failures: high cost of capital; incomplete FX markets; low supply of green projects.

Supported project(s)

- The goal is to advance sustainability projects which can entail the application of various low-carbon technologies, renewable energy or energy efficiency measures across several sectors.

Simplified illustration



De-risking instrument

Foreign Currency Guarantee

Eco-Invest Brazil Program

Inter-American Development Bank / Ministry of Finance of Brazil

Lessons Learnt

- High costs are associated with long-term hedging-is often prohibitive or not available. This creates challenges in foreign investing in green projects.
- Robust governance and transparent financial flows are necessary for programme success which can be executed via independent verification and regular impact reports to ensure accountability.

Replicability

- Eco-Invest has the potential to be replicable in countries with a clear Ecological Transformation Strategy, a FX derivatives market for a AAA counterparty, institutional support for reforms and implementation
- Blended finance programs can reduce the cost of capital for sustainable investments and mitigate the high costs of long-term hedging.

Impact

- Leverages public catalytic capital to mobilize private capital to projects that contribute to the Ecological Transformation Plan of Brazil (ETP). It may also foster dialogue across stakeholder groups to incentivise sustainability projects.
- The Programme fosters the development of sustainable projects by bridging Brazil's existing green project gap and increasing the attractiveness of green investments.
- It mobilizes the financial system aligning interests to finance green investments.

De-risking instrument

Partial Risk Guarantee

Partial Risk Sharing Facility

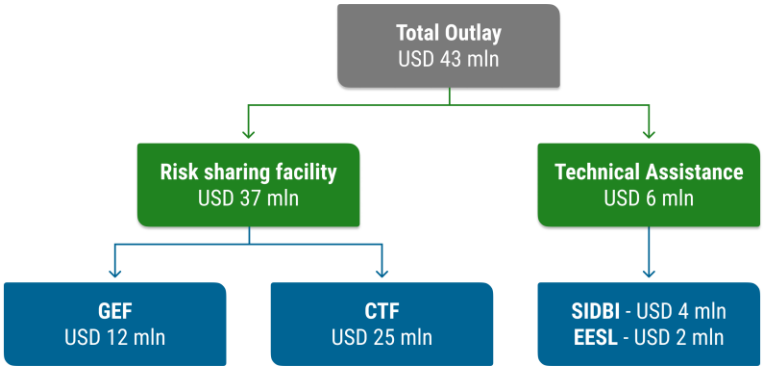
Energy Efficiency Services Limited. (EESL), SIDBI, World Bank

Description

- World Bank partnered with the Small Industries Development Bank of India (SIDBI) to set up the Partial Risk Sharing Facility for Energy Efficiency (PRSF) programme.
- The PRSF 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.
- The PRSF 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.
- 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.

Supported project(s)

- The number of projects supported by the PRSF has grown from 6 in 2016-17 to 75 in 2023-24.
- Projects focus on street lighting for non-industrial actors such as municipalities while industrial MSMEs are eligible for retrofits or greenfield projects.



Note: CTF: Clean Technology Fund; EESL: Energy Efficiency Services Limited; GEF: Global Environment Facility

De-risking instrument

Partial Risk Guarantee

Partial Risk Sharing Facility

EESL, SIDBI, World Bank

Lessons Learnt

- Addresses the vulnerabilities of the MSME ecosystem to climate change by reducing perceived risks associated with investments in ESCOs.
- Capacity building, both on the demand and supply side is instrumental and success factors of the instrument include the availability og technical assistance and financial incentives.

Replicability

- The PRSF risk mitigation model allows for the enhancement of private finance mobilisation and can trigger investment in areas where a traditional lending is insufficient.

Impact

- PRSF has provided partial default risk coverage to 15 participating financial institutions on loans for energy efficiency projects implemented by 40 ESCOs.
- Energy efficiency has increased via the replacement of inefficient machines or the implementation of material recovery practices via the use of waste heat recovery and solar energy.
- The result includes an annual energy savings of 371 GWh, including 100 GWh for industrial projects and enabled companies to leverage private finance of USD 120 million while industrial companies established their baseline energy consumption and identified areas of improvement.

IDB Sustainability Bonds

IDB and BBVA Colombia

Financing instrument

Bonds

Description

- IDB Invest provided support to 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): *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).*

- 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.

Supported project(s)

- IDBs funds will finance a variety of green projects which include sustainable construction, energy efficiency, agriculture, and circular economy.

- Projects will support access to financing for micro, small and medium sized enterprises (MSMEs) and contribute to climate change and equitable growth.

Sustainability Bonds

IDB and BBVA Colombia

Financing instrument

Bonds

Lessons Learnt

- Given the bond was disclosed in August 2024 and approved in October 2024, results from the use of the bonds have not been published as of yet.

Replicability

- 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.

Impact

- 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 .

Industry Decarbonisation Program

Climate Investment Funds (CIF)

Financing instrument

Concessional loans and Private and Public Equity

Description

- The Industry Decarbonisation Program by CIF provides a combination of climate finance instruments such a loans and guarantees and promotes private sector involvement to integrate sustainable practices in high-emitting industries in developing economies.
- Expressions of interest (EOIs) are currently open for the programme for eligible countries and partnering MDBs and closed on 17 January 2025.
- The Industry Decarbonisation Program Evaluation and Learning Toolkit complements the programme and is designed to support funding applications. It acts as a guide to inform the use of evaluation and learning approaches throughout the lifecycle of the Industry Decarbonisation Program, and associated projects to ensure a meaningful impact.

Supported project(s)

- 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.

Industry Decarbonisation Program

Climate Investment Funds (CIF)

Financing instrument

Concessional loans and Private and Public Equity

CLIMATE CLUB

Lessons Learnt

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

Replicability

- CIF's Industry Decarbonisation Program 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.*

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.

High-Impact Programme

EBRD / Green Climate Fund

Financing instrument

Concessional Loans

Description

- 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.*

- HIP is a partnership between the Green Climate Fund (GCF) and the European Bank for Reconstruction and Development (EBRD). Itis structured into three components:
  - USD 5.42 million in grants to develop low-carbon strategies and prepare investments through the development of corporate low-carbon gender-responsive strategies.
  - USD 1.01 billion investment programme for high climate impact projects in targeted industrial sectors, where loans rate have a discount if certain predefined milestones are met, with an interest rate floor of 1%.
  - USD 1.45 million in grants to develop low-carbon sectorial roadmaps and knowledge sharing.

Supported project(s)

- 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 behavioural change at the corporate governance and management level.

List of eligible sectors and indicative sub-sectors of the High Impact Programme for the Corporate Sector

Manufacturing industries	Agribusiness and agriculture value chains	(non-fossil energy) Mining
• Construction materials: cement, lime, ceramic • Fertiliser • Chemicals • Iron and Steel • Aluminum • Pulp and paper • Glass	• Food retail/distribution and logistics • Dairy production/processing • Juice and beverage production • Packaging and food industry • Other food-processing industries	• Metals and Minerals mining (from exploration phase to closure)

High-Impact Programme

EBRD / Green Climate Fund

Financing instrument

Concessional Loans

CLIMATE CLUB

Lessons Learnt

- The programme is under implementation with results focusing on buildings, cities, industries and appliances alongside energy generation and access.
- By setting climate change mitigation targets via low-carbon investments and promoting climate governance principles in decision-making, corporates can support sectoral and country specific transition pathways.

Replicability

- 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.
- The main financing component of the programme is structured with a performance-based climate financing element, linking the accomplishment of climate related metrics with financial benefits.
- The program is designed to ensure the possibility of replication and to continuously scale up financing in the targeted sectors and regions.

Impact

- The HIP highlights the possibility to boost the commercial viability of low-carbon investments in industry through its multi-component approach.
- 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.

RAC Nama Fund

Mitigation Action Facility

Financing instrument

Concessional Loans

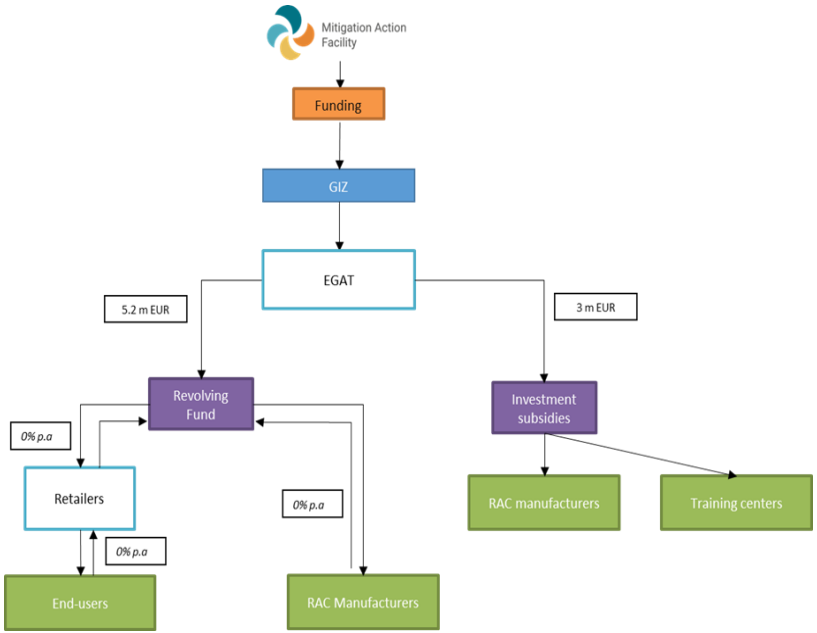
Description

- The RAC Nama Support Project, implemented by GIZ between 2016 and 2021 had three project components: policy, technology and financial assistance.
- 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).
- The Electricity Generating Authority of Thailand (EGAT) created the RAC NAMA Fund as Thailand's first climate finance project.

Supported project(s)

- 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.
- The project targeted three market segments of refrigeration and air-conditioning (RAC) technologies: residential air-conditioners, commercial refrigeration appliances and chillers.

Structure of the RAC NAMA Fund



RAC Nama Fund project

Mitigation Action Facility

Financing instrument

Concessional Loans

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.
- 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.

Replicability

- The combination of grants and concessional loans can be useful for supporting local manufactures.
- Grants and loans with environmental-mitigation and intersectional elements can help boost sustainable and social development.
- 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.

Impact

- In total the project received EUR 143 million of private contributions.
- The GHG mitigation of the project resulted in 1.05 Mt_CO_2eq.
- The fund resulted in 270 900 units of green cooling technology sold while 10 RAC technologies manufacturers in Thailand were supported.

Eco Invest Brazil Program

Inter-American Development Bank / Ministry of Finance of Brazil

Financing instrument

Local Currency Loans and Facilities

Description

- Eco-Invest's FX liquidity facility will provide financial support to companies with foreign currency debts and revenues in BRL.
- Tail risk protection will be offered through partnering with IDB via the purchase of FX derivatives on the foreign market that can be passed on to the Brazilian Central Bank that will internalise it to local financial institutions that will offer the protection to beneficiaries of the program. The protection will be beneficial for short-term needs linked to FX volatility.
- Objectives of Eco-invest's hedge solutions include:
  - *Foster and incentivise sustainable investments in projects that promote ecological transformation*
  - *Attract foreign investment for sustainable projects*
  - *Enable transactions in capital markets to raise funds for Brazilian companies and investors to finance sustainable projects*
  - *Support the development, liquidity, and efficiency of the long-term foreign currency hedging market.*

Supported project(s)

- The Eco Invest Brazil Program focuses on attracting private capital to launch and support sustainable projects as part of Brazil's Ecological Transformation Plan (ETP), involving low-carbon technologies, renewable energy or energy efficiency measures across several sectors in Brazil among others.

Eco Invest Brazil Program

Inter-American Development Bank / Ministry of Finance of Brazil

Financing instrument

Local Currency Loans and Facilities

Lessons Learnt

- FX hedging has been a deterrent of foreign investments in emerging markets
- Scarce availability of long-term FX hedge in the local markets make a case for an intervention.
- A long-term FX liquidity facility complemented by a FX tail-risk and derivatives solution offers a solution for local green projects to manage FX risks.

Replicability

- Economies with solid macroeconomic foundations and an FX market available for high grade counterparties make favorable conditions for replicability.
- For volatile economies instruments such as FX derivatives and FX liquidity facilities can mitigate FX risks, making long-term investments more stable and attractive.

Impact

- Eco Invest Brazil Program has the potential to mobilise FX coverage of up to USD 3.4 billion across variety of sectors such as infrastructure or renewable energy, e.g. storm-resilient infrastructure in cities, reforestation, hydrogen development.
- Companies can secure funds more easily and at lower costs, encouraging sustainable development, and growth in Brazil's green economy.

For more information on Eco-Invest Brasil, visit: https://www.gov.br/tesouronacional/en/sustainable-finance/eco-invest-brasil

Financing instrument

Results-based financing instruments

Results-based Loans

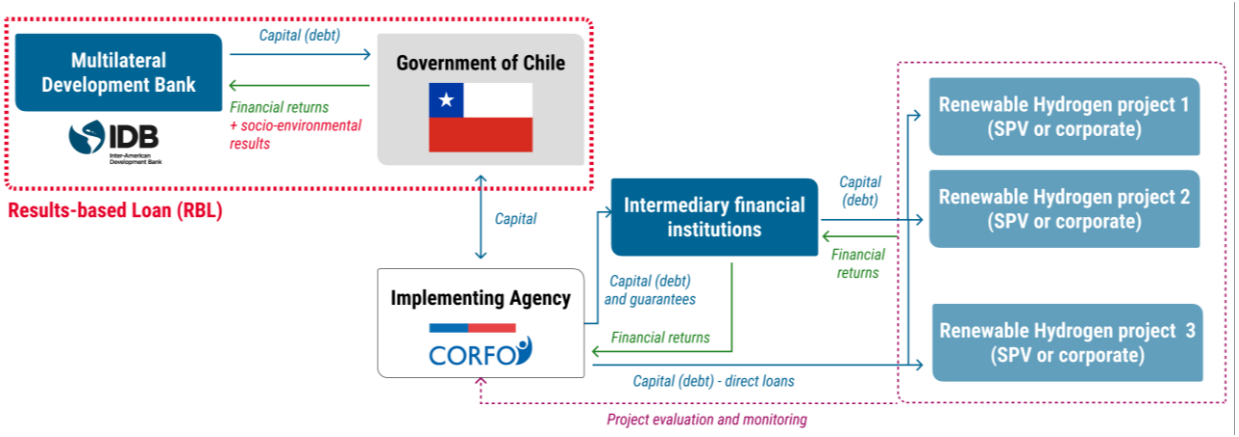
Inter-American Development Bank

Description

- "Loan based on results" are 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.
- The loan is structured and capitalised 100% by the IDB through ordinary capital, utilising a Flexible Financing Facility (FFF) of up to USD 400 million, with a disbursement period of 6 years, and a total amortisation period of 24 years including a 6.5-year grace period on repayments.

Supported project(s)

- The Government of Chile and the Inter-American Development Bank (IDB) have the strategic objective of contributing to the development of the green hydrogen and derivatives in Chile.
- A loan of USD 350 million will promote private investment in green hydrogen and derivatives projects while a loan of USD 50 million is used to expand the supply of public inputs for the green hydrogen and derivatives industry and foster domestic demand for such products.



Results based loans

Inter-American Development Bank

Financing instrument

Results-based financing instruments

Lessons Learnt

- Technical assistance programmes can have multiple impacts such as validating technologies and business models to further promote the adoption of other financing programmes.
- Private investments can be supported by concessional financing and other types of interventions to maximise socio-economic and environmental impacts.
- Blended finance and the support from MDBs and other international institutions are crucial for programme design and capital allocation.

Replicability

- Credit lines and guarantee funds backed by public institutions, and sovereign-guaranteed loans from MDBs, are currently utilised in different countries of the Latin-American (LAC) region to accelerate renewable hydrogen and derivative projects, such as: *Colombia, Ecuador, Uruguay, and Trinidad and Tobago.*

Impact

- The programme targets the main financial barriers faced by renewable hydrogen generation projects in Chile, because of the risks and uncertainties inherent to an industry in its early stages.
- Lower-cost financing specifically targeted to pilot projects can accelerate project deployment, increase operational track record and lower risk perception by investors.

Pull Finance

Instiglio

Financing instrument

Pull Finance

Description

- Markets in low and middle-income countries (LMICs) are often stuck in highly emission-intensive cycles due to barriers to adopting clean tech, like weak incentives, missing policies, underdeveloped supply chains, and high upfront innovation costs.
- Pull finance provides economic incentives and ensure demand for the innovation and scaling of low-carbon technologies. By reducing the market risks associated with adopting these innovations, they can also drive private investment in the process.
- Pull finance instruments include Advanced Market Commitments (AMCs), Buyers Clubs, Carbon contracts for Difference, and Prize Challenges, among others.

Supported project(s)

- **Cement decarbonisation:** Pull finance can reduce emissions in hard-to-abate industries like cement, which is responsible for 7% of global CO_2 emissions. An AMC could provide premium payments to producers per tonne of CO_2 reduced. Instiglio has explored this application in markets such as Nigeria, India, and Indonesia.
- **Other promising and explored technologies:** These include electric two-wheelers, behind-the-meter solar batteries, sustainable cooling, biogas, and clean cookstoves.
- **Donor interest:** Instiglio has supported the UK government since 2023 in exploring the use of pull finance to achieve its climate and development goals, enabling commitments to launch a GBP185m Climate Innovation Pull Facility in 2025.

Pull Finance

Instiglio

Lessons Learnt

- Pull finance is an important missing piece to address market failures. However, complementary strategies are critical. These include technical assistance, enabling policies and standards, and communication and demonstration campaigns.
- Pull finance in the climate space is still nascent and needs more piloting and demonstration to attract donor interest. However, it has significant potential in achieving climate mitigation and adaptation results.

Replicability

Replicable in contexts where:

- A solution is needed but does not exist in its ideal form.
- Those who can deliver the solution lack economic incentives.
- The best combination of technologies to achieve the solution remains uncertain.

Impact

- Potential to attract additional resources and reduce the risk of funding nascent technologies by disbursing funds only when pre-defined outcomes are achieved.
- Play a role in reversing current CO_2 trends by providing incentives to set high-emitting industries on a virtuous cycle toward the demand and scale-up of low-carbon technologies.

Financing instrument

Results—based Financing Instruments

Results-based Climate Finance

Instiglio

Description

- **Results-based Climate Finance (RBCF) provides payments based on verified climate outcomes.** In RBCF, results are milestones indicating progress in reducing greenhouse emissions (GHG), including emission reduction credits (ERCs), which are used for Nationally Determined Contribution (NDC) compliance.

- The following RBCF key parameters are crucial to they establish the framework for how funding is structured, monitored, and disbursed:
  - **Outcome payer:** Entity responsible for providing the financial resources contingent on the achievement of specific climate outcomes
  - **Payment metrics:** Metrics and conditions under which funds are released.
  - **Size of the program:** Scale of financial commitment, which directly influences the potential impact and scope of climate initiatives.
  - **Timing:** structured timeline to disburse payments based on verified emission reductions and aligning with the outcome payer practices.

Supported project(s)

- Instiglio collaborated with the World Bank to strengthen its use of RBF, supporting country engagement with RBCF and carbon markets, developing materials to support targeted training, and improving access to climate finance

- Instiglio co-authored a guidebook for the World Bank's Transformative Carbon Asset Facility (TCAF) on the use of RBCF as a tool for the Bank's efforts to combat climate change.

Financing instrument

Results-based Financing Instruments

Results-based Climate Finance

Instiglio

Lessons Learnt

Contextual factors needed for RBCF to maximise its value add:

- **Political support:** Strong government buy-in aligned with the emission reduction project/policy.
- **Governance:** A basic level of administrative capacity for program management and robust MRV systems.
- **Technical:** Context supports the development and measurement of suitable RBCF interventions *(e.g., understanding implementation cost, defining a pricing structure that reflects costs while incentivising action).*

Replicability

- Replicable in countries with specific climate targets/ policies that require financing for their implementation.

Impact

RBCF can advance climate action in various manners to monetise meaningful emission reductions and build country capacity:

- Offers an additional funding sources to support climate action.
- Builds preparedness, technical capacity, infrastructure, and systems (e.g., MRV) that support transparency, accountability, and carbon market preparation.
- Incentivises climate action by tying payments to measurable results, fostering ownership, flexibility, and innovation in project delivery.
- Supports climate policy reform by creating accountability and frameworks to strengthen policy and program implementation.

Sustainability-linked Bonds

Indorama Ventures, JSW Steel Ltd

Description

- Sustainability-Linked Bonds (SLBs)' financial and structural 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.
- JSW Steel Ltd is a multinational steel company based in Mumbai, and flagship company of the JSW Group. JSW Steel is India's second largest private steel company and the largest steel exporter, shipping to over 100 countries across five continents. In 2021, the company issued USD 1 billion SLB with maturity of 5 and 10 years.
- Indorama Ventures Limited is a producer of a wide range of plastic polymers, chemicals, and fibres. In 2021, the company issued THB 10 billion (USD 292 million) SLB with a 5 to 10.5-year maturity.

Supported project(s)

- JSW Steel's SLB aims to advance CO_2 emission reduction, linking corporate financing with sustainability objectives. The defined SPT included a reduction of carbon emission intensity of 23% for steel products in the 2020-2030 period.
- Indorama Ventures' SLB issuance was the largest in Thailand. As part of the company's Sustainability Strategy for 2025, IVL has set three SPTs, including a 10% reduction of GHG emissions intensity in the period 2020-25; a 3.5x increase in recycled PET input in production process; and a 25% renewable electricity consumption by 2030.

Sustainability-linked Bonds

Indorama Ventures, JSW Steel Ltd

Lessons Learnt

- Can effectively link corporate financing with sustainability objectives.
- A long track record of verified sustainability performance and data disclosure is a major facilitator to engage investors.
- SLB are a flexible tool for debt raising that can be used for general corporate purposes at convenient financial cost (lenders are increasingly willing to reduce interest rates in exchange for supporting corporate sustainability commitments).

Replicability

- The use of SLBs can be replicable and applicable to other hard-to-abate sectors so long as there are corporate commitments to sustainability or emission reduction.
- The credibility and robustness of the defined KPIs and SPTs, and the ability of companies to successfully track and monitor its performance are key factors for replicability.

Impact

- The issuance of sustainability-linked instruments contributes to mainstreaming sustainability objectives across all functions of a business and to creating synergies across teams within a company, including but not limited to operations, sustainability, corporate finance and purchasing departments.

Financing instrument

Sustainability-linked Instruments

Sustainability-linked Bonds

Natura & Co

Description

- Sustainability-Linked Bonds (SLBs)' financial and structural 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.

- Natura & Co Holding S.A. is a Brazilian global personal care cosmetics group headquartered in São Paulo. In 2024, IFC committed BRL 300 million in an SLB issued by Natura in the form of debentures. This is the first SLB with sustainability performance targets linked to Amazon sourcing in Brazil, and Natura's 13th debenture issuance, closing with the total amount of BRL 1.32 billion.

Supported project(s)

- IFC's investment will support Natura in the development and sourcing of bioingredients from the Amazon, in enhancements to manufacturing and distribution infrastructure in its operations, and in the purchase of equipment for product line updates and growth.

Financing instrument

Sustainability-linked instruments

Sustainability-linked Bonds

Natura &Co

Lessons Learnt

- Can effectively link corporate financing with sustainability objectives.
- A long track record of verified sustainability performance and data disclosure is a major facilitator to engage investors.
- SLB are a flexible tool for debt raising that can be used for general corporate purposes at convenient financial cost (lenders are increasingly willing to reduce interest rates in exchange for supporting corporate sustainability commitments).

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Impact

- The issuance of sustainability-linked instruments contributes to mainstreaming sustainability objectives across all functions of a business and to creating synergies across teams within a company, including but not limited to operations, sustainability, corporate finance and purchasing departments.

Sustainability-linked Loans

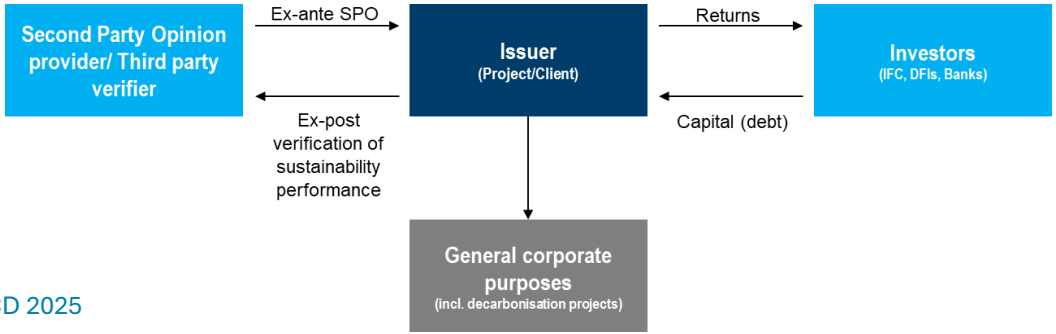
Votorantim Cimentos (Brazil)

Description

- To support the low-carbon transition in the cement industry in Brazil, IFC committed in 2023, USD 150 million in Votorantim Cimentos, a leading Brazilian cement-producing company.
- The loan was structured as a Sustainability Linked Loan (SLL) aligned to the SLL Principles. IFC's investment will incentivise the company towards its goal to reduce greenhouse gas (GHG) emissions by fostering the use of alternative fuels

Supported project(s)

- The loan will help increase Votorantim Cimentos' co-processing capacity through the upgrade of its Salto de Pirapora plant, located in the state of São Paulo, allowing the plant to process a range of solid waste materials, and to double the site's capacity to use alternative fuel. instead of fossil fuels.
- In addition to the investment, IFC will work with Votorantim Cimentos to help the company with its sourcing strategy of alternative fuels, and will assist the company in aligning its emission reduction targets with the Paris Agreement



Sustainability-linked Loans

Votorantim Cimentos

Lessons Learnt

- Aligns with the company's sustainability goals and helps catalyse sustainability standards within the industry.
- A cost-effective option for companies with predefined sustainability targets.

Replicability

- The use of SLLs can be replicable and applicable to other hard-to-abate sectors.
- Credible, robust KPIs and SPTs, along with effective performance tracking, ensure replicability.

Impact

- The cement plant will double its use of alternative fuels will lead to reduction of CO_2 emissions.
- IFC financing supports company's aim to reduce emissions and align with its global corporate target by 2030, and with Paris Agreement goal to limit global warming to well below 2 degrees Celsius .

Outline

1. Context and background
2. Economic, de-risking and financing instruments
3. Case studies
4. **Economic assessment of selected sector and technologies**
    - 4.1. Cement
    - 4.2. Iron and Steel
    - 4.3. Petrochemicals and Plastics

Economic assessment

Overview of covered sectors and low-carbon technologies

Cement

- **Cross-cutting** for a "reference cement plant" in the United States and sensitivities reflecting conditions in other regions
- Technologies:
  - CCS
  - Limestone Calcined Clay Cement (LC3)

Iron and Steel

- Based on economic assessment in Indonesia and South Africa
- Technologies:
  - Renewable hydrogen-based direct reduction
  - Blast Furnace revamping with CCUS

Petrochemicals and Plastics

- Based on economic assessment of **Thailand**
- Technologies:
  - Biomass to bio-ethanol to bio-olefins
  - Biomass to bio-based and biodegradable plastics
  - CCS

- > The economic assessment covers only a subset of technologies to decarbonise each sector.
- > The technologies have been selected based on their relevance for the country/sector's decarbonisation, technology readiness levels and the need to benefit from policy and financing solutions to stimulate investment.

Note: the calculations presented in this version are work in progress, based on the technologies selected under the implementation of the OECD Framework for industry's net-zero transition in 2023-2025. Future versions of the Toolkit will include the final calculations and impact of several instruments. They will provide similar graphs for each of the sectors/technologies, where possible.

Economic assessment

Overview of the assessment approach

Selection of technologies

- The selection only covers a subset of technologies needed to decarbonise each sector in line with a net-zero path.
- The technologies focus on the manufacturing process and have a significant emission reduction potential.
- The selected technologies are technically implementable in the short to medium-term, with examples of deployment or ongoing projects at international level.
- The selected technologies are not mainstreamed yet and require policy of financing solutions.

Policy and financial levers

- Accelerated depreciation
- Carbon pricing
- Contracts for Difference
- Grants and Subsidies
- Loans
- Result-based Loans and Sustainability-Linked Financing
- Tax Credits
- Etc.

Outputs

Energy and Emissions intensity (vs. baseline)

Levelised cost of products
Net Present Value,
Internal Rate of Return,
Payback period

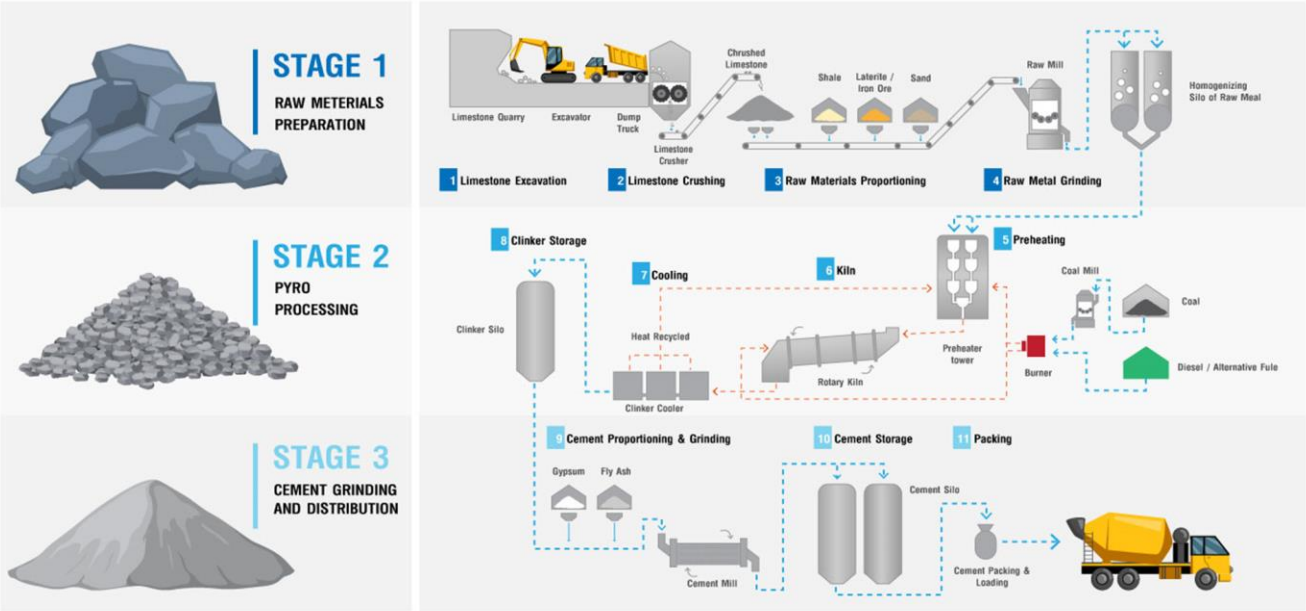
Sensitivity analyses on policy and financial levers

- Total CAPEX and CAPEX subsidy
- Carbon pricing
- Electricity and Hydrogen prices

Note: the low-carbon technologies meeting the 4 criteria for selection are *not limited to the ones presented in this Toolkit*. This section mainly aims to *illustrate*, with relevant examples, how some of the instruments presented in the Toolkit could improve the competitiveness of low-carbon technologies.

Cement

Overview



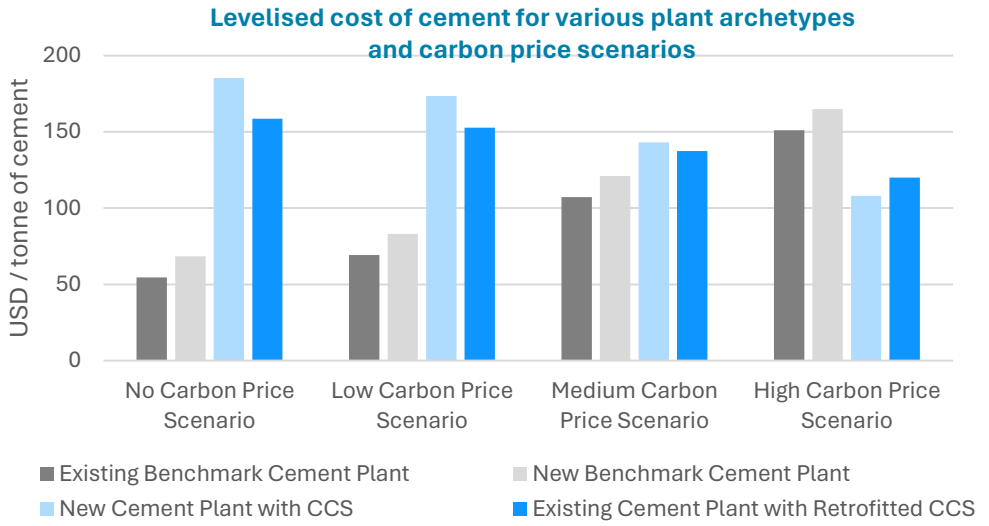
> **The total annual CO_2 emissions of the cement sector amount to 2.4 Gt**, i.e. 8% of total CO_2 emissions worldwide.

> **More than 80% of cement production emissions come from clinker production**

Cement

Carbon Capture and Storage

- There are multiple CCS technologies, enabling to capture CO_2 from the flue gas of the cement kiln and transport and store it in a long-term storage location, typically in underground geological formation.
- The analysis considers amine-based post-combustion carbon capture, which has the highest technology readiness level among CCS technologies in the cement industry.
- CCS projects for industrial plants are usually designed to capture around 90% of the CO_2 from the flue gas.
- Carbon Capture is an additional cost, driven by CAPEX, fixed OPEX and energy.
- Carbon pricing or revenue streams for the captured CO_2 are often not sufficiently developed to ensure competitiveness vs conventional production.

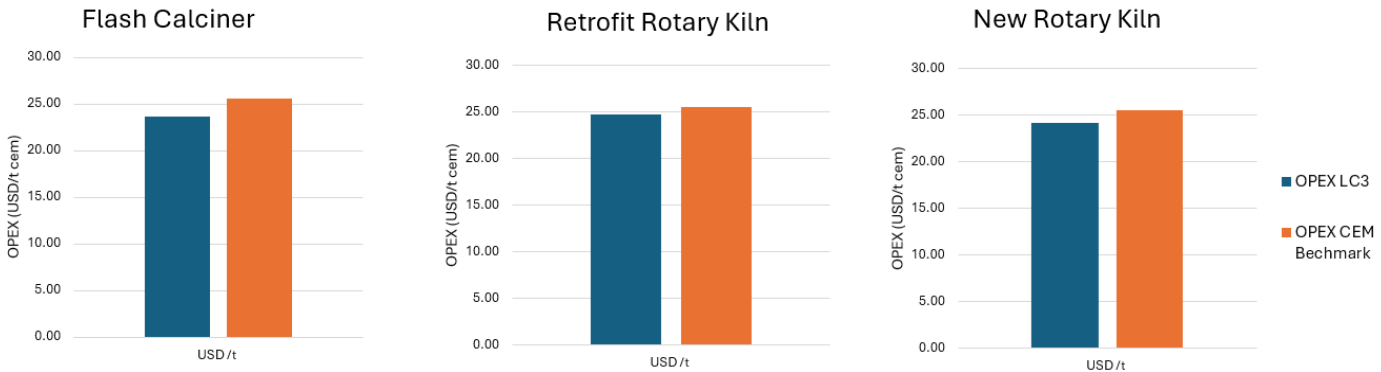


Key assumptions for a plant of 1 million tonne cement production capacity in the United States:
CAPEX: USD 250 million for the cement plant, USD 450-600 million for CCS
Energy consumption: 4 GJ per tonne of cement, 4-5 GJ per tonne of CO_2
Carbon price: from USD 10/t_CO_2 in 2030 to USD 60/t_CO_2 in 2050 for the low carbon price scenario;
from USD 50/t_CO_2 in 2030 to USD 200/t_CO_2 in 2050 for the medium carbon price scenario;
from USD 100/t_CO_2 in 2030 to USD 300/t_CO_2 in 2050 for the high-carbon price scenario.
The benchmark is a Portland Limestone Cement (PLC) plant; the Existing Benchmark considers a plant which has already been fully amortised; the New Benchmark considers a newly-built PLC plant.

Cement

Limestone Calcined Clay Cement (LC3)

- LC3 is an innovative and low-carbon cement produced via a blend of limestone and calcined clay (using a flash calciner or a retrofitted or new rotary kiln). It can reduce 20-30% of emissions in conventional cement production, as less clinker is required.
- Several LC3 plants are operational across the globe, including at full scale. LC3 performs equally well as Portland cement.
- Assuming a carbon price of USD 30 per tonne of CO_2, the internal rate of return for LC3 is expected to be highly favorable, with a payback period estimated below 3 years.



Figures: OPEX for LC3 vs. benchmark cement **per ton of cement**

Key assumptions for a plant of 1 million tonne cement production capacity in the United States:
Clinker cost USD 24/t; Limestone cost USD 3/t; Clay cost USD 4/t; Energy mix for a cement kiln in the United States includes coal (52%), Alternarive fuels (18%), Petcoke (17%) and Natural Gas (13%).

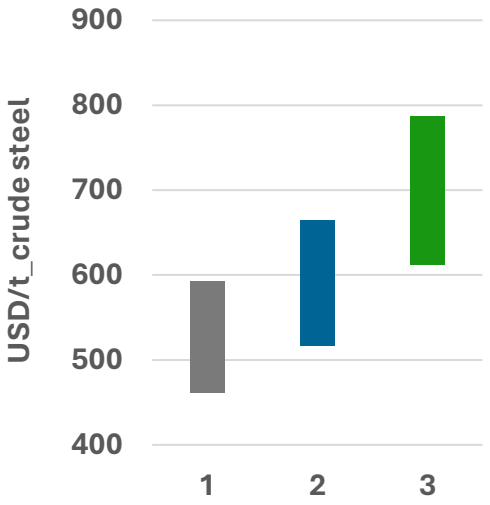
Iron and Steel

Overview

Inputs	Iron & Steel making		Downstream processing	Downstream value chain
Upstream transport	Coke making	Oxygen plant	Hot rolling	Emissions from exported off-gases
Iron and steel scrap collection and sorting	Sintering	Lime production	Cold rolling	Export of heat and power (credits)
Iron ore mining	Blast furnace	Pelletisation	Coating	Export of BF slag (credits)
Coal mining	Basic oxygen furnace	Boilers and Power Plant (surplus gas)		Downstream transport
Extraction of natural gas	Casting	Smelting reduction		Fabrication
Power production (imported)	DRI	Electric arc furnace		
Production of H2/Syngas	Flaring			
Extraction of other petroleum products		Secondary metallurgy		
Production of biomass and biogas				
Limestone mining				
Non-ferrous ore mining				
Ferroalloys production				

BF-BOF: Blast Furnace – Basic Oxygen Furnace
CCS: Carbon Capture and Storage
H2-DRI-EAF: Hydrogen-based Direct Reduced Iron and Electric Arc Furnace

Levelised cost of production for several steel production routes



> **The total annual CO_2 emissions of the steel sector amount to 2.6 Gt**, i.e. 8% of total CO_2 emissions worldwide.

> **Emissions mostly take place during ironmaking and vary greatly by production route**, from around 2.0 t_CO_2 per t_steel in blast furnaces-based route, to around 1.0 t_CO_2 per t_steel in natural gas-based direct reduction iron (DRI) route, and around 0.4 t_CO_2 per t_steel in electric arc furnace (EAF) based route.

Iron and Steel

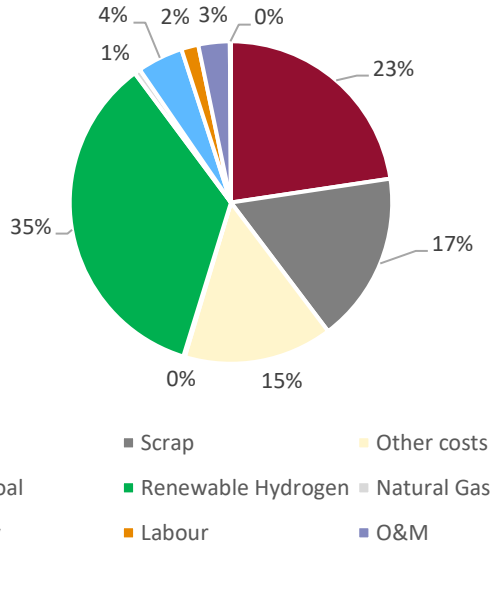
Renewable hydrogen-based direct reduction (H2-DRI)

Preliminary results, work in progress (for publication in 2025)

- Renewable H2-DRI relies on green hydrogen and electricity as energy inputs, with raw material inputs being iron ore (mostly pellets, possibly lump) for DRI production. The DRI is then mixed with scrap to produce steel in an Electric Arc Furnace.
- Renewable H2-DRI can reduce more than 90% of emissions compared to the conventional blast furnace route, thus providing an opportunity to produce steel with nearly no emissions.
- While natural gas-based DRI is a well-known technology, the first large-scale DRI projects that will run almost fully on renewable hydrogen are still under construction *(as of December 2024)*. The existing plants, which have operated for several decades, can already use up to 70% hydrogen.
- Key enabling conditions for the technology success include low-carbon electricity, hydrogen and high-quality iron ore. Barriers to technology competitiveness include the high cost of hydrogen (production and infrastructure development) in comparison to low fossil fuels.

Breakdown - cost of good solds for H2-DRI-EAF

(excluding Depreciation & Amortisation)



Key assumptions: renewable electricity cost of USD 30-55/MWh, renewable hydrogen cost of USD 2.5-4.0/kg; CO_2 price of USD 10-35/t; balanced metallic mix in the EAF between scrap and DRI.

Iron and Steel

Blast Furnace revamping with CC(U)S

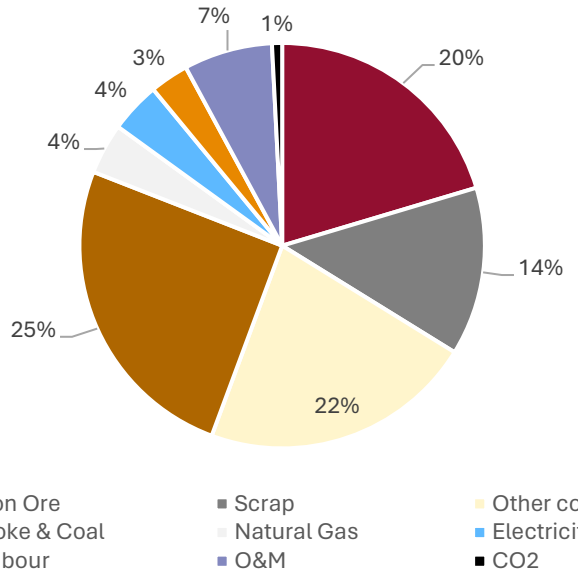
Preliminary results, work in progress (for publication in 2025)

CLIMATE CLUB

- As around 70% of steel is currently produced via blast furnaces, and as these assets have very long lifetime, carbon capture technology can help to decarbonise the sector, in particular for retrofitting existing plants.
- While CCS projects have been developed globally across various sectors, this remain a nascent technology in the steel industry, with a very limited number of operational projects; however, the technology is gaining attention with nearly 10 industrial projects are under construction or advanced development.
- A key enabling condition is the availability of supporting infrastructure and CO_2 storage. CC(U)S hubs that can play a key role to reduce the infrastructure risk.
- Implementing CCS increases the cost of steel production. For this reason, some steelmakers are also exploring the possibility to produce "e-fuels" by combining renewable hydrogen and captured CO_2 from their operations to develop a new revenue stream.

Breakdown - cost of good solds for BF-CCS-BOF

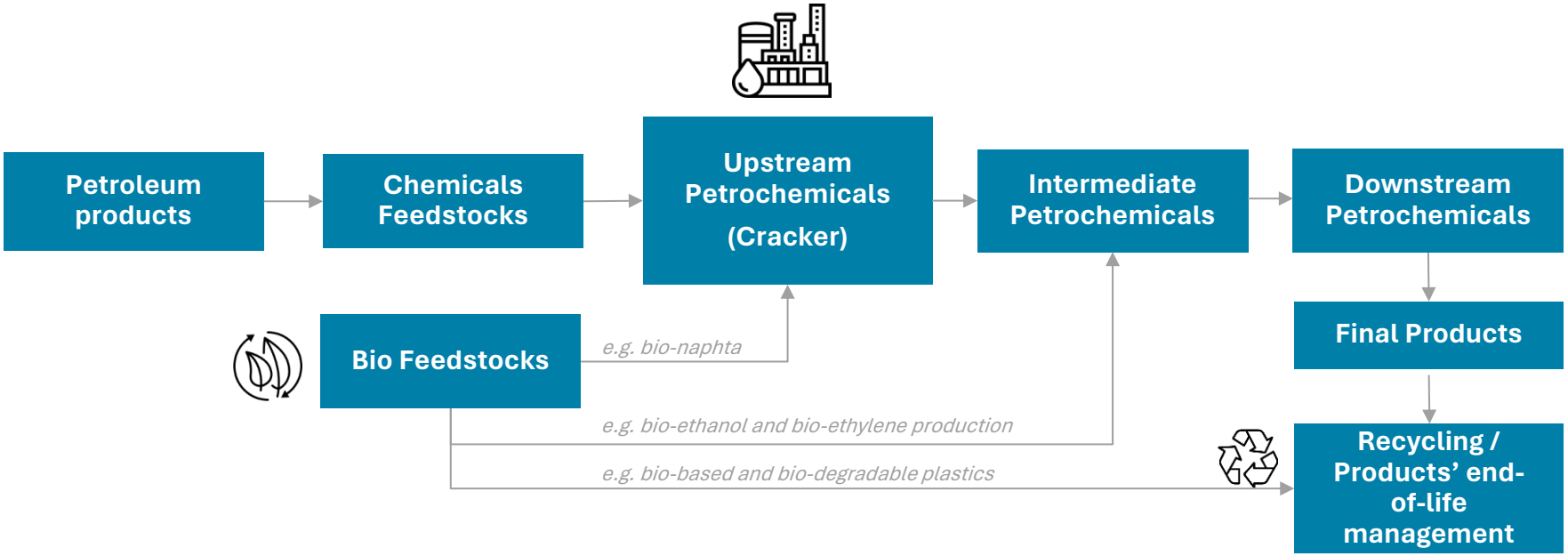
(excluding Depreciation & Amortisation)



Key assumptions: the operational costs of CCS in a steel plant are primarily driven by the additional energy consumption. CO_2 transportation and storage costs are considered outside the boundaries of the steel plant and are not included.

Petrochemicals and Plastics

Sector overview



> **The total annual CO_2 emissions of the petrochemicals sector amount to 1.7 Gt**, i.e. 6% of total CO_2 emissions worldwide.

> **Upstream petrochemicals form the bulk of GHG emissions, most of which from olefins production.**

Petrochemicals and Plastics

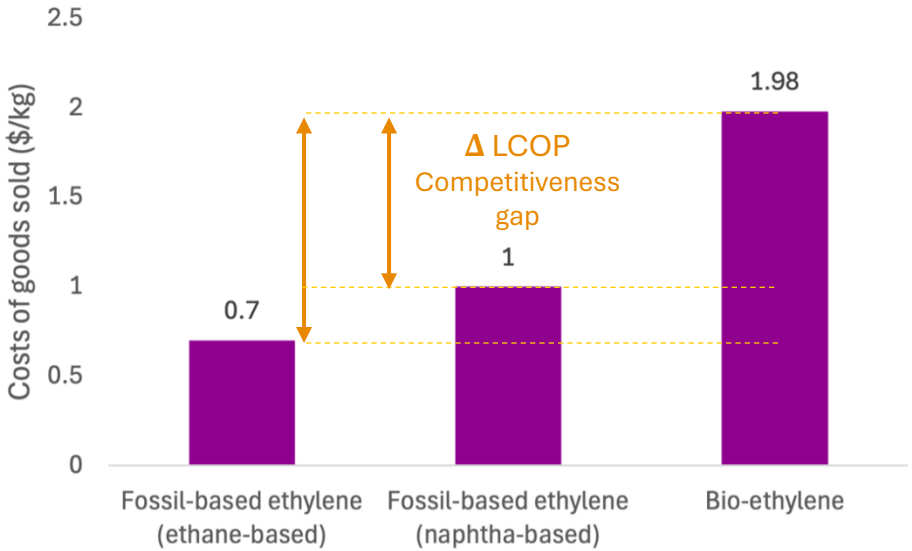
Biomass to bio-ethanol to bio-olefins

Preliminary results, work in progress (for publication in 2025)

CLIMATE CLUB

- Bio-polyethylene (BioPE) can reduce GHG emissions by at least 70% (cradle-to-gate) compared to fossil-based ethylene.
- The cost of producing bio-ethylene is primarily driven by the price of bio-ethanol: thus, the price of bio-ethanol leads to an increase in the levelised cost of production (LCOP) of bio-ethylene. This creates a significant competitiveness gap between bio-ethylene versus fossil-based ethylene
- Providing a CAPEX grant results in a minor decrease in LCOP but can improve the project's net present value. Carbon incentives (e.g. carbon credits) could provide revenue, but this depends on the value of carbon sold, ease of the transactions, and demand in the market.

Competitiveness gap of bio-ethylene versus fossil-based ethylene



Petrochemicals and Plastics

Biomass to bio-based and biodegradable plastics

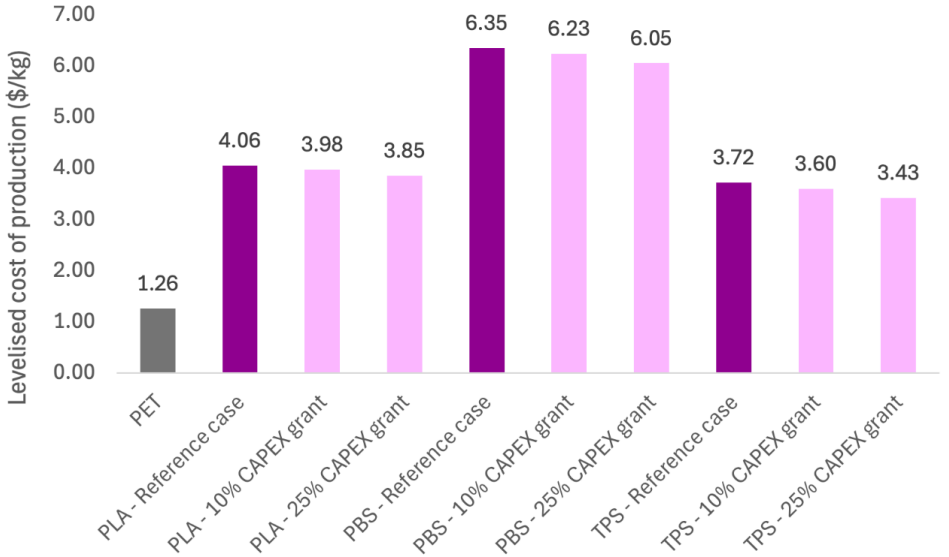
Preliminary results, work in progress (for publication in 2025)

CLIMATE CLUB

- Biopolymers such as PLA, PBS and TPS can be used to produce bio-based and biodegradable plastics, by opposition to virgin fossil-based plastics (e.g. PET).
- GHG benefits of biodegradable plastics include an emissions reduction of at least 70% (cradle-to-gate) compared to fossil-based virgin plastics (e.g. PET).
- There is currently a large competitiveness gap between biodegradable plastics and virgin plastics.
- Each type of biodegradable plastic has different cost drivers and price levels.

PET: Polyethylene terephthalate
PLA: Polylactic acid (biodegradable)
PBS: Polybutylene succinate (biodegradable)
TPS: Thermoplastic starch (biodegradable)

Levelised cost of production of PLA, PBS, TPS with and without CAPEX grant



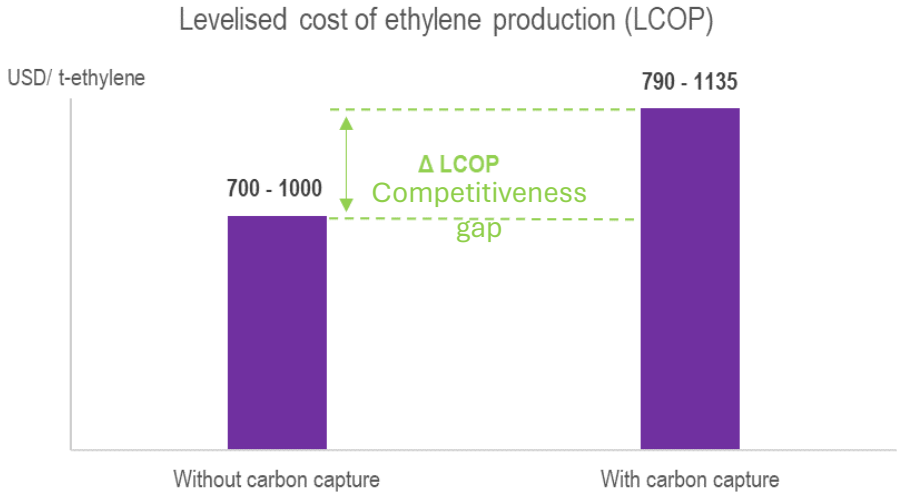
Petrochemicals and Plastics

Carbon capture use and storage (CCS)

Preliminary results, work in progress (for publication in 2025)

- CCS can be added an existing facility via retrofit to reduce emissions associated with steam crackers by around 90%, for instance via post-combustion capture process through chemical absorption.
- Carbon capture involves additional costs for olefins production, driven by extra energy costs and capital expenditures of the carbon capture technology.
- Affordability of energy inputs is a pre-requisite to close the competitiveness gap.
- Carbon pricing schemes (increasing the cost of production of conventional olefins production) or carbon incentives (providing additional revenues for low-carbon olefins production) can help to close the competitiveness gap of CCS-based olefins production.

Illustration for ethylene production from ethane & naphtha-based steam cracker



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