Framework for industry's net-zero transition

Developing financing solutions in emerging and developing economies

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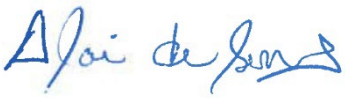
Preface

The manufacturing industry is a key engine of economic development. Countries have been reaping the social and economic benefits of industrial growth which provided the materials and products needed for the well-being of their growing populations. In the coming decades, more industrial production will shift to emerging and developing economies. At this crossroad, new investment decisions in the manufacturing industry will need to be guided by carefully crafted policies to ensure industry growth is sustainable, competitive and resilient.

Net-zero transition scenarios suggest that investments in low-carbon technologies in the manufacturing industries of emerging and developing economies will need to increase significantly. A majority of the needed technologies are at demonstration phase or early stages of commercialisation, and many of them are capital-intensive. The execution risk and the high costs associated with net-zero transition may slim industrial companies' profits. Therefore, developing mechanisms to share risks between governments and companies and scaling up finance from both public and private financial sources will be crucial to get low-carbon projects off the ground.

The OECD's new "Framework for Industry's net-zero Transition" is a step-by-step approach to assist emerging and developing economies in designing solutions for financing and to improve the enabling conditions that can accelerate industry's transition. Developed by the OECD Secretariat for the Working Party on Climate Investment and Development of the Environmental Policy Committee, this report builds on the OECD's body of work on clean energy finance in emerging economies.

The implementation of the Framework will provide two additional benefits to help countries thrive in the industry transition: the Framework outcomes will inform broader climate and finance policies on topics such as transition finance, carbon market design and industry supply chains. The Framework will contribute to facilitating international co-operation required for transition at scale to establish new trade routes and regional markets for green products, develop new standards, and support technology transfer and capacity building. I am confident that this collaborative effort will help emerging and developing economies to transition industries aligned with net-zero targets and ensure they do not miss just transition opportunities.



Alain de Serres
Acting Director, Environment Directorate

Foreword

The *Framework for Industry's net-zero Transition: Developing financing solutions to accelerate industry's net-zero transition in emerging and developing economies* is an output of the Clean Energy Finance and Investment Mobilisation (CEFIM) programme at the Environment Directorate of the Organisation for Economic Development and Co-operation (OECD). The CEFIM Programme aims to support governments in emerging economies to unlock finance and investment in renewable electricity and energy efficiency.

The Framework has been developed by the OECD's CEFIM team through extensive consultation processes that involved experts from international organisations, finance institutions, sector associations, industry, technology and climate initiatives, academia and OECD country delegations. The Framework has also benefitted from inputs and comments from various divisions and teams at the OECD, namely the OECD Centre on Green Finance and Investment, the OECD Steel Committee, the Private Finance for Sustainable Development team at the OECD Development Co-operation Directorate and the Sustainable Infrastructure team at the Green Growth and Global Relations team. Associação Latino-Americana do Aço (Alacero), the Breakthrough Energy, European Chemical Industry Council (CEFIC), the Global Cement and Concrete Association (GCCA), the Hydrogen Council, the International Aluminium Institute (IAI), the International Energy Agency (IEA), the International Finance Corporation (IFC), the International Renewable Energy Agency (IRENA), the Leadership Group for Industry Transition (LeadIT), the United Nations Development Programme (UNDP) in Indonesia, the United Nations Industrial Development Organisation (UNIDO) and the World Steel Association (worldsteel) have also provided crucial feedback that was collected through several bilateral meetings that were organised between January and February 2022. The valuable feedback received by OECD delegations during the Working Party on Climate, Investment and Development (WPCID) meeting on 16 February made significant contributions in the finalisation of the Framework. During the Framework kick-off meeting that took place on 13 April, speakers and participants provided valuable feedback that helped to shape the Framework into its final version.

This project is part of the OECD Sustainable Infrastructure Programme in Asia (SIPA). SIPA encourages Asia's transition towards cleaner and more resilient energy, transport and industry systems aligned with the Paris Agreement and the Sustainable Development Goals (SDGs). It is part of the International Climate Initiative (IKI) and benefits from the financial support of the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV).

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Abbreviations and acronyms

2DII	2° Investing Initiative
BIAC	Business at OECD
BMUV	German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
CBAM	Carbon Border Adjustment Mechanism
CCUS	Carbon Capture, Use and Storage
CDP	Carbon Disclosure Project
CEM	Clean Energy Ministerial
CEFIC	European Chemical Industry Council
CEFIM	Clean Energy Finance and Investment Mobilisation
CO_2	carbon dioxide
EJ	exajoule
ESG	Environment, Social and Governance
ETC	Energy Transitions Commission
EU	European Union
EUR	Euro
Eurofer	European Steel Association
GCCA	Global Cement and Concrete Association
GDP	gross domestic product
GHG	greenhouse gas
Gt	gigatonne
GW	gigawatt
IAI	International Aluminium Institute
IDDI	Industrial Deep Decarbonisation Initiative
IEA	International Energy Agency
IFA	International Fertilizer Association
IFC	International Finance Corporation
IIGCC	Institutional Investors Group on Climate Change
IKI	International Climate Initiative
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ISIC	International Standard Industrial Classification
KPI	key performance indicator
LeadIT	Leadership Group for Industry Transition
MPP	Mission Possible Partnership
MSME	micro, small and medium enterprise
NDC	Nationally Determined Contribution

OECD	Organisation for Economic Co-operation and Development
PV	photovoltaic
R&D	research and development
RMI	Rocky Mountain Institute
SBTi	Science-based Targets initiative
SDG	Sustainable Development Goals
SIPA	Sustainable Infrastructure Programme in Asia
SLB	Sustainability-Linked Bonds
SPT	Sustainability Performance Targets
TCFD	Task Force on Climate-related Financial Disclosures
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
WBCSD	World Business Council on Sustainable Development
WCA	World Cement Association
WEF	World Economic Forum
WPCID	Working Party on Climate, Investment and Development
worldsteel	World Steel Association

Executive Summary

Countries that have set net-zero targets cover around 90% of the total current global carbon dioxide (CO_2) emissions. This is a promising step to prevent a global climate disaster. The transition of the manufacturing industry with low-carbon technologies will be critical in achieving these targets since the sector is the single largest energy user and it is a major source of CO_2 emissions globally by accounting for 40% of the total. Globally, clean energy investments in the manufacturing industry need to increase fivefold by 2030 compared to today's level in a Paris Agreement aligned scenario. There are uncertainties about the technology options countries and companies will deploy, the enabling conditions that are critical for low-carbon investment decisions and the financing sources and instruments that can enable a net-zero transition. These are salient challenges for the manufacturing industry, particularly in emerging and developing economies where the sector plays an important role for economic growth.

It is clear that the transition to net-zero will come with additional costs. By acting today, it is possible to avoid slimming down industry profits. This requires the development of tailored solutions which address the factors that impact investment decisions. To facilitate this, the CEFIM team at the OECD has developed the *Framework for industry's net-zero transition: Developing financing solutions in emerging and developing economies* (referred to as "Framework" hereinafter) which is a methodological guide to help countries approach low-carbon transitions in their manufacturing industry.

The implementation of the Framework starts with a thorough assessment of the industry sector's interests and priorities considering national circumstances. It continues with the identification of financing needs and market barriers and leads to the development of actionable market and financing solutions that are matched with a pipeline of low-carbon projects that can contribute to industry's net zero transition.

The document explains how and by whom the Framework can be implemented for a selected industry sub-sector and/or low-carbon technology through five consecutive steps in a given country:

- Step 1: Engage stakeholders and agree on the Focus Area.
- Step 2: Undertake research on the current technology, policy and financing situation.
- Step 3: Assess the business case of a net-zero transition for the Focus Area and identify a pipeline of projects.
- Step 4: Develop market and financing solutions to close the transition gap.
- Step 5: Disseminate Framework outcomes.

In this document, each step is described along with its rationale, approach, outputs and enablers/risks. The milestones at the end of each step guide the implementation.

By using its convening power to bring together and create dialogue between government, private sector and financial sector actors, the OECD will support partner countries to develop actionable market and financing solutions for a net-zero industry through this Framework. While the Framework will address the national circumstances and priorities of the industry sector, it will also help in developing new modalities of international co-operation for industry's net-zero transition and draw important insights for policy making.

1 Introduction

The *Framework for industry's net-zero transition: Developing financing solutions in emerging and developing economies* outlines the rationale to decarbonise the industry sector and proposes practical steps to facilitate the development of market and financing solutions to accelerate the net-zero transition of the manufacturing industry at a country level. The ultimate objective of the Framework is to contribute to improving the enabling conditions that impact the investment decisions in low-carbon technologies[1] and enhancing the availability of finance for investments in the industry transition of emerging and developing economies.[2] Addressing the enabling conditions is necessary, yet they cover a broad range of issues. To maintain focus and develop actionable outcomes, the Framework will prioritise improving those conditions that are critical in industry's low-carbon investment decisions. Subsequently, the Framework will give equal emphasis to the financing needs that will be essential in closing the gap to the net-zero emission path.

In this context, the Framework will address policy makers and industry actors who are interested in participating in the range of actions needed to make industry's net-zero transition work in light of realities on the ground, to prepare the path and to finance that transition. Additionally, the Framework will address finance institutions who will be developing the instruments and models to finance this transition. The various actors involved in the industry transition have heterogeneous capacity, knowledge and different starting points. As these dissimilarities reflect the complexity to design a one-size-fits-all net-zero pathway for the industry, the Framework is designed to be a flexible guide to develop solutions.

Three different stakeholder groups which currently work or plan to participate in industry's net-zero transition are supported through the Framework, namely:

A. **Policy makers:** relevant government entities (including local governments) that deal with industry's energy demand and/or CO_2 emissions. This may include more than one government entity, since typically industry is not regulated by any single government authority, but its activities are covered by several government entities. There are only few countries and limited cases where the industry is entirely governed by a dedicated ministry.
B. **Industry:** depending on the choice of the scope and characteristics where the framework will be implemented, the relevant "industry" stakeholders will take part in the Framework. These will include companies (national and international) as well as sector associations, technology licensors and project developers.
C. **Finance institutions:** relevant entities that are traditionally involved or active in financing the manufacturing industry will be part of the framework such as commercial banks and capital market actors.

Flexibility is the cornerstone of the Framework. Its scope can be adapted, and it can be implemented independently in a given country's industry sub-sector and/or low-carbon technology. In its first cycle of implementation in a country, the OECD will co-ordinate the Framework implementation together with the government counterparts who already co-operate with the OECD's CEFIM programme through country collaborations,[3] yet the Framework will also be open to other countries and stakeholders that have an interest in implementing it together with the OECD. In the future, countries will also have the possibility to implement the Framework without the support of the OECD, building upon the experience of the first cycle of implementation. The OECD will facilitate the formation of the stakeholder groups. The consultations with policy makers and industry will help prioritise industry needs and areas the Framework should focus on.

Engagement of finance institutions will be crucial to develop market and financing solutions to accelerate low-carbon technology investments in the industry sector. The Framework is designed in a way that its implementation can be handed over to one or more of the stakeholder groups and/or other government- or industry-endorsed entities in further cycles of implementation.

The OECD brings comparative advantage in the design and implementation of this Framework that can complement the increasing number of ongoing private sector and government-led initiatives that cover industry's net-zero transition. The Framework can leverage a range of relevant analytical work through its experience of collaboration with emerging and developing economies to identify and support the development of clean energy finance solutions. This capacity is enhanced through the close collaboration with the International Energy Agency's (IEA) overarching work on decarbonising end-use sectors (IEA, 2022[1]). The OECD's Centre for Green Finance and Investment brings a wealth of knowledge on the policy and financing instrument needs as well as institutional capacity building to enable a transition to a green, low-emissions and climate-resilient economy (OECD, 2022[2]). The Business at OECD Secretariat's (BIAC) membership of more than seven million companies across the globe can significantly help to share insights into the private sector needs and disseminate the Framework's outcomes to wider business networks (OECD, 2022[3]). The OECD Steel Committee provides a unique forum for governments to convene for addressing the evolving challenges facing the steel industry and to identify political solutions that encourage open and transparent markets for steel (OECD, 2021[4]). The OECD will use its convening power and leverage its close collaboration with key ministries to bring together stakeholders and develop solutions to accelerate the financing of clean energy investments for low-carbon industry transition. Where relevant, the Framework implementation will also be closely aligned with the OECD CEFIM's clean energy finance and investment policy review and roadmaps where the industry sector is becoming an important component of the countries.

Additionally, while the growing number of initiatives with an overarching goal to decarbonise industry's emissions is positive, there are risks of overlap and conflicting requirements which may limit the impacts that can be gained from their implementation. Hence the Framework implementation will prioritise dialogue between various stakeholders, and it will build on the OECD's broader objective of economic co-operation which can ensure that policy initiatives in different countries remain aligned as far as possible and a level playing field is created in the net-zero transition process.

In this Framework, according to the International Standard Industrial Classification (ISIC) of All Economic Activities, Rev.4, industry refers to all manufacturing industry Divisions (i.e. 10-32) under section C, except for Divisions 33. Energy use related to Division 19 (manufacture of coke and refined petroleum products) is reported under the own use item of the transformation and energy sector (United Nations, 2008[5]).

2 Trends in the net-zero transition of the industry sector

This chapter examines industry sector's key trends related to its carbon dioxide (CO_2) emissions reductions with a focus on emerging and developing economies. It provides a brief overview of the policies, key technologies and initiatives that support the transition of the industry towards a net-zero one, highlighting the complexity of this sector. To this end, it analyses the conditions to create an enabling environment and to design bespoke financing solutions. The chapter also highlights how the *Framework for industry's net-zero transition* can help to overcome the current barriers to mobilising finance for a net-zero transition of the industry.

Industry is the largest source of carbon dioxide emissions

Policy makers have initially focused on decarbonising the power sector. With more countries announcing net-zero targets, there is an urgency to mitigate all CO_2 emissions, including those from end-use sectors. Among these sectors, the industry sector is the largest source of direct and indirect CO_2 emissions.

At the end of 2019, industry was responsible for 15 gigatonnes (Gt) of the total energy- and process-related CO_2 emissions, i.e. 40% of global CO_2 emissions. Direct emissions accounted for around 40% of these emissions (6.2 Gt). An additional 2.8 Gt process emissions came from the production of ammonia, cement, iron/steel and aluminium (scope 1).[4] Finally, another 40% came from indirect emissions in electricity and district heat generation (6.0 Gt) (scope 2). These exclude emissions from industrial product use (e.g. release of carbon from solvent use) and waste treatment (e.g. release of the carbon stored when plastics are combusted at the end of their lifetime) as well as other indirect emissions considered as scope 3 (IEA, 2021[6]).

About 62% of the sector's total final energy and feedstock consumption comes from fuels to generate process energy in the form of hot water, steam or direct heat and the use of district heating. Another 21% is consumed as electricity to run motor systems and for processes such as smelting, electrolysis and electric heating. The remaining 17% corresponds to the use of fossil fuels as feedstock in the production of chemicals and polymers.

Net-zero transition is more important for the industry sector than ever

The rapid growth of the sector's energy and feedstock demand predominantly relies on fossil fuels despite years of energy and resource efficiency policies. This has alarmed policy makers and caused them to expand their priorities to transition the sector towards a reduced energy footprint.

Climate policy interest has significantly expanded to cover industry sector emissions, thanks to increasing efforts from the Intergovernmental Panel on Climate Change (IPCC) (Masson-Delmotte et al., 2018[7]) and sparked by findings of the new net-zero emission scenarios developed by intergovernmental organisations such as the International Energy Agency (IEA, 2021[8]) and the International Renewable Energy Agency

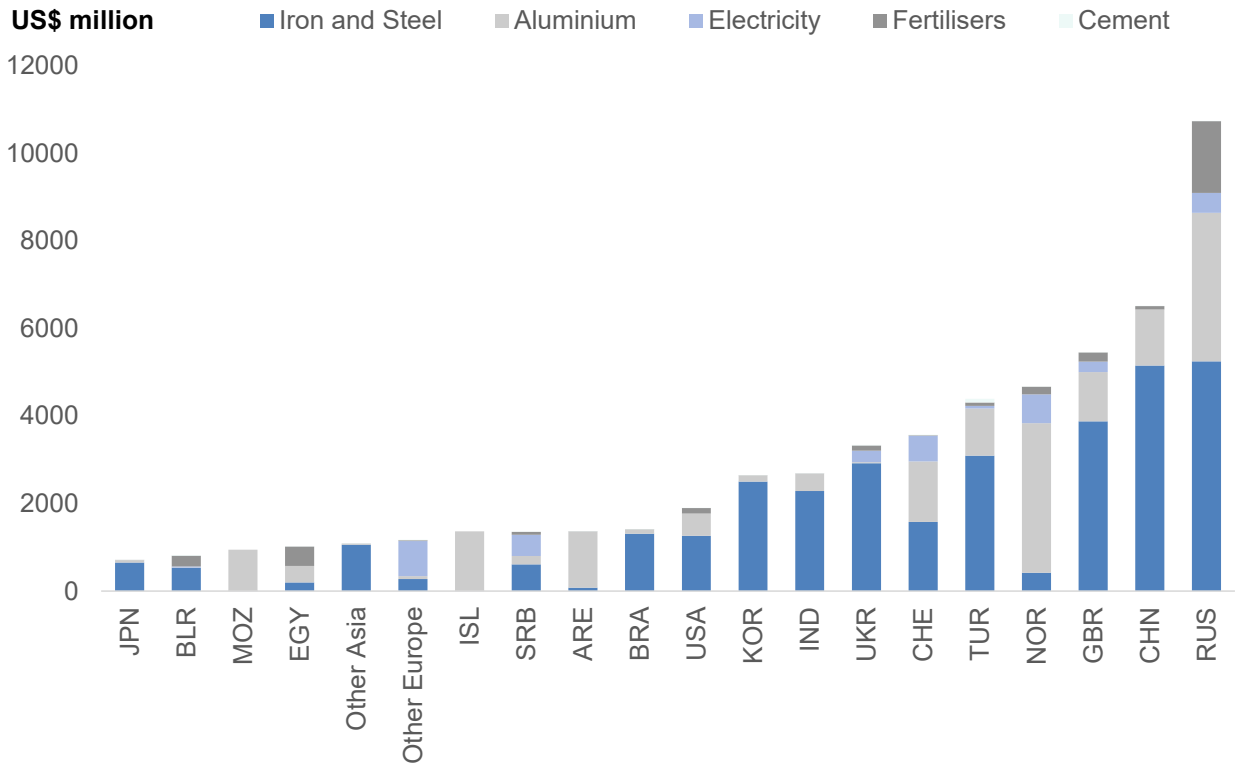
(IRENA) (IRENA, 2021[9]). The importance of industry transition has also become more prominent in the context of the Sustainable Development Goals as it creates positive interlinkages between the seventh Sustainable Development Goal on "energy" and other goals such as "decent work and economic growth" (Goal 8), "industry, innovation and infrastructure" (Goal 9), and "responsible production and consumption" (Goal 12).

Additionally, the carbon border adjustment mechanism (CBAM) that is planned to be introduced as part of the European Union's (EU) Green Deal by 2023 will potentially increase the prices of carbon-intensive goods imported to the EU (European Commission, 2021[10]). It will affect especially countries that produce commodities with a high carbon footprint and those that export large volumes to the EU and this balance may change in the future as exports from Russia to the EU will potentially decline due to ongoing sanctions (see Figure 2.1). This risk has put net-zero transition on the agenda of many industrial companies of non-EU countries that export goods to the EU and highlighted once more the importance for those countries that have already been designing decarbonisation strategies for many years already, such as China, Japan and the Republic of Korea. Companies are expanding their investigation of strategies to decarbonise their activities from low-hanging fruits such as energy efficiency towards switching fuel use with electricity, the use of green hydrogen and other breakthrough options and integration of production processes with carbon capture use and storage (CCUS). One way to reduce this risk for electricity-intensive operations is the relocation of production plants to areas with low-cost renewable power. Another is the self-generation or corporate sourcing of renewable power through long-term contracts that can help companies reduce their carbon footprint and increase resilience against price volatility. With the increased cost competitiveness of renewables and the development of markets for green products and solutions, this can also help companies to ensure a competitive edge (IRENA, 2018[11]).

Despite a growing understanding of low-carbon industry's importance, policies still do not sufficiently emphasise the urgent need for transition. According to the latest version of the nationally determined contributions (NDCs) synthesis report prepared by the United Nations Framework Convention on Climate Change (UNFCCC), only 39% of the countries refer specifically to industry as a priority area (primarily the mineral industry and cross-cutting technologies) among all domestic mitigation measures. Industry remains the sector that has been mentioned the least in the NDCs (UNFCCC, 2021[12]). However, the share could be higher if the focus would only be on industrialised countries.

The changing political economy is creating new drivers for industry's transition. The energy crisis the world has been facing since the beginning of 2022 has made the importance of improving energy security more pronounced (OECD, 2022[13]). Continuous and low-cost supply of energy is essential for industries to maintain their competitiveness and ensure material supply chains are maintained at least cost for society. At the same time, industry's transition with low-carbon technologies is becoming interlinked with the just transition debate in creating a better understanding of how this transition can benefit workers in the supply chain of industry sectors by providing higher skilled, more secure and safer jobs.

Figure 2.1. Breakdown of sources of imports by country and sector to the European Union, 2015-2019



Note: ARE: United Arab Emirates; BLR: Belarus; BRA: Brazil; CHE: Switzerland; CHN: China; EGY: Egypt; GBR: United Kingdom of Great Britain and Northern Ireland; IND: India; ISL: Iceland; JPN: Japan; KOR: Republic of Korea; MOZ: Mozambique; NOR: Norway; RUS: Russian Federation; SRB: Serbia; TUR: Türkiye; UKR: Ukraine; USA: United States of America.
Source: (Chatham House, 2021[14]).

Technology solutions for the industry transition are rather well identified, but many are not demonstrated at fully commercial scale yet

Collectively, 137 countries that are in the process of developing a net-zero target account for more than 90% of the global gross domestic product (GDP) and nearly 90% of the global CO_2 emissions today. As of January 2022, 13 countries have set net-zero targets in law and three others have proposed legislation. Another 46 countries have set net-zero visions in policy documents and many others are discussing their net zero targets (Tracker, 2022[15]). Additionally, more than 3,000 companies have made similar commitments to reach net zero as part of the United Nations "Race to Zero" campaign (McKinsey, 2021[16]). Globally 43% of the globally listed companies align their strategy to develop pathways consistent with limiting the global average surface temperature increase to 2°C. Less than 10% of listed companies align with a 1.5°C temperature rise measured according to the same methodology (MSCI, 2021[17]).

Development of these country and company level net-zero targets is a promising step to prevent a global climate disaster, but it is not very clear how countries and companies will manage this transition, which technology options they will deploy and which sources and instruments will finance this transition. The pathways should be technology-neutral and focused on climate impacts and social outcomes.

In light of the rapidly emerging net-zero targets in line with the Paris Agreement goals, the global industry sector can make use of numerous low-carbon technologies and business opportunities for its transition.

Five high-level technology solutions can put the sector on a net-zero emission pathway, wherein new technologies will play a critical role:

- improving energy efficiency of the production process by adopting best practices, operational strategies as well as breakthroughs
- substituting fossil fuel use for process heat generation with direct use of renewables, including renewables-based electrification and shifting the power supply to renewables
- switching to biomass and synthetic feedstocks based on low-carbon hydrogen and CO_2
- shifting to circular economy by increasing reuse and recycling and by reducing demand
- decarbonising production processes by carbon capture use and storage.

Box 2.1. Innovation for low-carbon industry transition

Technologies are currently at very different levels of market readiness, often lagging behind what is required to contribute to net-zero transition pathways. To avoid risks of technological lock-in and stranded technologies, research and development (R&D) will be crucial. However, in the private sector, only a small share of revenues is being spent on R&D including in sectors where transformation is needed urgently. Thus more efforts are needed to reduce the higher costs of investments of large-scale demonstration low-carbon projects (Schroeker et al., 2021[18]). Financing for technology transfer and for R&D for commercialisation are closely aligned. Countries' regulatory, business and skill ecosystems determine the environment for technology transfer and commercialisation. These are generally at different levels of deployment between developed and developing countries thus vary in opportunity and challenges (Pigato et al., 2020[19]). Research shows that enabling technology transfer and subsequently importing low-carbon products such as green iron from emerging economies to the EU can reduce the cost of the overall transition of the industry while increasing the competitiveness of steel product manufacturing. At the same time, it can create local value chains to benefit societies and economies and boost product demand (Trollip, McCall and Bataille, 2022[20]). It is also important to differentiate the areas where financing will be needed. Some technologies although small in scale and highly commercialised, could bring returns fast or may not need debt financing. Others may require a range of innovative and traditional financing to move from technical viability to commercial and large-scale deployment. In this sense, public funding will be instrumental for technologies that are at early stages of commercialisation in reducing the risks of first-of-a-kind projects and to leverage private investments (IEA, 2021[8]). It typically takes a decade or more for energy technologies to reach high technology readiness levels (Bataille, 2019[21]). Industry networks will play a role since transition cannot be achieved in isolation. In the same context, until the right balance between domestic technology commercialisation and foreign technology intake is found in developing countries, transition will require collaboration to facilitate technology transfers such as pilot projects, especially for costly technologies if opportunities exist. This balance will determine the level of financing needed for R&D and innovation.

The growing number of initiatives on reducing carbon emissions from industry is positive

An increasing number of governments, think tanks, international organisations and the private sector publish reports, analysis or guidance to address industry's net-zero transition. Table 2.1 provides a non-exhaustive list of such initiatives. It suggests that most of the current effort focuses on the available technologies and provides policy recommendations at a global level or for developed economies. While

some initiatives evaluate the industry transition as a whole, several actors provide sectoral focus, primarily for emissions-intensive industries. However, only a few initiatives tackle the enabling and financing conditions to facilitate industry decarbonisation and provide specific insights for emerging economies. Recent research suggests that available national roadmaps on industry transition also show similar results. Policy levers (non-financial incentives, regulations, permits, legislation and legal instruments) and technology demand are the most common topics covered by roadmaps. Additionally, international finance, redirecting investments, and carbon budget/carbon taxes are also overlooked topics (Johnson et al., 2021[22]).

Table 2.1. Various international organisations, think thanks and sector associations are engaging in industry decarbonisation

Name	Type of organisation	Mission	Key themes	Sector focus	Region
2° Investing Initiative (2DII)	Independent Think Tank	Align financial markets and regulations with the Paris Agreement goals.	Financing solutions Policy	Cement Fossil Fuels Mobility (Automotive, Aviation) Power Generation Steel	Global Special focus on emerging markets (Latin America, Asia, and Africa)
Agora Energiewende - Agora Industry	Independent Think Tank	Develop strategies and policy instruments for the transformation of industry across value-creation chains to realise the climate and energy targets set by Germany and the EU.	Policy Technology	Cement Chemicals Steel	Global - main focus on Europe
Ammonia Energy Association	Industry Association	Promote the use of ammonia in a sustainable energy economy.	Policy Standard and certification	Ammonia	Global
Breakthrough Energy	Network of entities and initiatives, including investment funds, non-profit and philanthropic programmes.	Accelerate innovation in sustainable energy and in other technologies to reduce greenhouse gas emissions.	Policy Innovation Investment Portfolio	All	Europe United States
Carbon Disclosure Project	Not-for-profit Charity	Run the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts.	Climate-related disclosures	All	Global
Center for Climate Aligned Finance Established by the Rocky Mountain Institute (RMI).	Financial Institutions Partnership.	Serve as an engine room for the financial sector to partner with corporate clients to identify practical solutions through deep partnerships with industry, civil society and policy makers to facilitate a transition in the global economy to net-zero emissions by mid-century.	Financing Solutions	Aluminium Cement and Concrete Mobility (Aviation, Shipping) Real Estate (planned) Steel	China "Global South" India United States
Clean Energy Ministerial (CEM): Industrial Deep Decarbonisation Initiative (IDDI) (co-ordinated by UNIDO)	Coalition of public and private organisations	Stimulate demand for low carbon industrial materials.	Procurement	Cement Steel	Canada Germany India United Kingdom
Energy Transitions	Coalition of energy	Inform the decisions of public	Policy	All	Australia

Commission (ETC)	producers, energy-intensive industries, technology providers, finance players and environmental NGOs.	and private decision makers and support the leaders at the forefront of climate action to speed up the deployment of low and zero-carbon solutions.			China Europe India United States
European Chemical Industry Council (CEFIC)	Industry Association	Engage, advocate and represent the industry in order to create the right support and policy frameworks in Europe and beyond.	Policy Statistics	Chemicals, plastics	Europe
European Steel Association (Eurofer)	Industry Association	Represents the entirety of steel production in the European Union.	Policy Statistics	Steel	Europe
Global CCS Institute	Think Tank	Accelerate the deployment of carbon capture and storage (CCS)	Policy Financing Solutions	Carbon Capture and Storage (CCS)	Global
Global Cement and Concrete Association (GCCA)	Industry Association	Position concrete to meet the world's needs for a material that can build and support growing, modern, sustainable and resilient communities.	Net-Zero Pathway Policy Statistics	Cement, concrete	Global
Hydrogen Council	CEO-led initiative of leading companies	Develop hydrogen solutions to accelerate the structural change in energy systems.	Pathways Policy	Hydrogen	Global
Institutional Investors Group on Climate Change (IIGCC)	Group of Investors	Support and enable the investment community in driving significant and real progress by 2030 towards a net zero and resilient future.	Policy Corporate and Asset-Owner guidance	All	Global - main focus on developed countries
International Aluminium Institute (IAI)	Industry Association	Promote the sustainable development of the aluminium industry and to increase demand for aluminium products.	Policy Statistics	Aluminium	Global
International Energy Agency (IEA)	Intergovernmental Organisation	Shape a secure and sustainable energy future for all.	Policy Scenarios Statistics Technology	All	Global Associated countries: Brazil, China, India, Indonesia, Morocco, Singapore, South Africa, Thailand
International Fertilizer Association (IFA)	Industry Association	Promote the efficient and responsible production, distribution and use of plant nutrients.	Policy Statistics	Fertilisers	Global
International Finance Corporation (IFC)	Financial Institution	Advance economic development by encouraging the growth of private enterprise in developing countries.	Financing Solutions Policies	All Focus on Cement, Glass, Plastics, Steel	Developing countries
International Renewable Energy Agency (IRENA)	Intergovernmental Organisation	Facilitate co-operation, advance knowledge, and promote the adoption and sustainable use of renewable energy.	Policy Scenarios Statistics Technology	All	Global
Leadership Group for Industry Transition (LeadIT)	Group of Countries and Companies	Provides an arena for public-private collaboration, and for sectoral and cross-sectoral learning.	Net-Zero Pathways Tracking Investment Tracking (Steel)	All	Several G20 and EU countries, Ethiopia and India
Methanol Institute	Industry Association	Protect existing markets for methanol while promoting the	Policy	Methanol	Global

		growth of emerging energy markets.			
Mission Innovation	Intergovernmental Platform	Catalyse action and investment in research, development and demonstration to make clean energy affordable, attractive and accessible to all this decade.	Innovation Platform Net-Zero Pathways (to deployment)	Cross-cutting Technologies (Hydrogen, CO_2 removal) Some sectoral focus: Shipping, biorefineries, biofuels.	Global initiative 22 countries (mainly G20 and EU) and the EU Non-G20 countries and non-European countries: Chile, Morocco, United Arab Emirates
Mission Possible Partnership (MPP) (led by ETC, RMI, We Mean Business, WEF)	Alliance of Climate Leaders	Propel a committed community of CEOs from carbon-intensive industries—together with their financiers, customers, and suppliers—to agree and act on decarbonising industry and transport in this decade.	Net-Zero Pathways Policy Financing Solutions	Aluminium Cement and Concrete Chemicals Mobility (Aviation, Shipping, Trucking) Steel	Global
Responsible Steel	Group of businesses, civil society groups, associations, and other organisations	Enhance the responsible sourcing, production, use and recycling of steel by developing standards, certification and related tools.	Standard and certification	Steel	Global
Science Based Targets initiative (SBTi)	Partnership between global non-profits and mission driven organisations	Mobilize the private sector to take the lead on urgent climate action by showing companies and financial institutions how much and how quickly they need to reduce their greenhouse gas emissions to prevent the worst effects of climate change.	Sector guidance	All Guidance finalised for Apparel and footwear, Aviation, Financial institutions, Information and Communication Technology, Power	Global
Task Force on Climate-related Financial Disclosures (TCFD)	Task Force of preparers and users of financial disclosures	Help companies provide better information to support informed capital allocation.	Climate-related disclosures	All	Global (mainly developed countries - G20)
Transition Pathway Initiative	Group of Asset Owners and Asset Managers	Assess companies' preparedness for the transition to a low-carbon economy.	Companies' preparedness for the transition to a low-carbon economy	All	Global
Under2 Coalition - The Climate Group - Industry Transition Platform	Coalition of subnational governments	Drive climate action by convincing, challenging and helping organisations to make commitments.	Financing solutions Policy Technology		Global
United Nations Framework Convention on Climate Change (UNFCCC) - Technology Mechanism	Group of National designated entities.	Analyses issues and provides policy recommendations that support country efforts to enhance climate technology development and transfer, and accelerates the development and transfer of technologies.	Policies Technology	Energy	Global
World Business Council for Sustainable Development (WBCSD)	CEO-led community	Work collectively to accelerate the system transformations needed for a net-zero, nature positive, and more equitable future.	Net-Zero Pathways Industry pledges	All Focus on Chemicals, Forest, Tyres	Global
World Cement Association (WCA)	Industry Association	Represent and promote the global cement industry.	Policy Statistics	Cement	Global
World Economic Forum (WEF): First Movers Coalition	Coalition of Private Companies	Build early demand for low-carbon goods and services across sectors.	Procurement	Mobility (Aviation, Shipping, Trucking) Steel	Global
World Economic	Group of Industrial	Accelerate the transition of	Industrial Clusters	Industrial clusters	Australia

Forum (WEF): Transitioning Industrial Clusters towards Net Zero (related to: WEF Climate Action Platform WEF Shaping the Future of Energy, Materials and Infrastructure Platform)	Clusters	industrial clusters globally toward net zero emissions			Spain United Kingdom
World Steel Association (worldsteel)	Industry Association	Act as the focal point for the steel industry providing global leadership on all major strategic issues impacting the industry, particularly focusing on economic, environmental and social sustainability.	Policy Statistics	Steel	Global

Note: The United Nations Industrial Development Organization (UNIDO) co-ordinates the CEM's IDDI. Mission Innovation work covers several non-G20, including Chile, Morocco and the United Arab Emirates. The Mission Possible Partnership is an initiative led by the ETC, the RMI, We Mean Business, and the WEF. SBTi Status as of 21 February 2022: guidance is finalised for Apparel and footwear, Aviation, Financial institutions, Information and Communication Technology and Power. The WEF: Transitioning Industrial Clusters towards Net Zero is related to other initiatives, namely the WEF Climate Action Platform and the WEF Shaping the Future of Energy, Materials and Infrastructure Platform. Sources: Companies' and organisations' websites.

Box 2.2. Manufacturing industry companies with net-zero goals – the case of the steel industry

According to the Green Steel Tracker, nine companies representing around 20% of global steel production have set varying ambitions of net-zero targets. These companies are based in either Europe or Asia. Thirty-eight out of 59 green steel production projects are based in Europe (including the United Kingdom). There are plans to build green steel plants in Australia, Canada, China, Japan, the Republic of Korea and the United States. Seven of the 10 largest steel producing countries have initiated at least one green steel project with different times of completion.[5]

Source: (Leadership Group for Industry Transition, 2021[23]).

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

Transition affects various industry issues and may disrupt the broader economy and industrial development policies. These relations need to be understood well to identify ways to improve the enabling conditions and develop financing solutions to transition to a low-carbon industry, while enabling societies to continue to grow and advance, especially in emerging and developing economies. Table 2.2 provides an overview of the considerations for developing market and financing solutions to transform industries of the emerging and developing economies.

Strong enabling environments and domestic policy contexts must be improved in order to facilitate the demand for industry transition financing. Indeed, these are often pre-requisite for finance institutions and industry to invest in low-carbon technologies in a given country.

There is no one-size-fits-all financing solution, given the large differences across industry sub-sectors and the progress made by countries in their net-zero transition. For instance, bespoke financing solutions are required depending on the progress made by the industry sector in low-carbon investments as well as by

the country's financial system and financing institutions with respect to financing conditions and availability of instruments. Today, there is a growing understanding about committing to the alignment of financing approaches and instruments that are required to meet the goals of the Paris Agreement. However, countries diverge how they finance specific technologies or industry sub-sectors for net-zero transition.

Finally, the choices for low-carbon technologies and the changes triggered by the transition will bring benefits if the challenges are well-managed. These benefits will need to be accounted for when developing market and financing solutions. They may include the creation of new and local industries through manufacturing and licensing of low-carbon energy technologies, new and better jobs for all genders, more competitive industry sectors with higher exports and a lower import dependency, and the introduction of new, more value-added and low-carbon products. Risks are equally present if the transition is not well managed. Therefore, achieving the net-zero transition of the industry requires a good understanding of risks and opportunities while shaping and planning the measures for a low-carbon industry.

Table 2.2. Considerations for developing industry transition solutions for emerging and developing economies

Consideration	Description
Low-carbon technology portfolio for transition and its differentiation by country and sector	Technology mix and investment needs to reach net zero vary by country and are specific to the characteristics of individual industry sub-sectors. While more traditional practices such as energy efficiency are widely used by industry, there is still large untapped potential for energy savings, yet even achieving this potential will not be sufficient for a net-zero emission industry. Technologies needed for the net-zero effort are known but not fully commercial. There is also a need to consider technology needs between retrofits versus green field investments
Industry's competitiveness needs	Emerging and developing economies have economic growth priorities with industry sector playing a central role. Growth in local production capacity is not necessarily aligned with sustainable development strategies and it may result in overcapacity that may also impact regional trade dynamics. Low-carbon technologies can increase production costs by 20%-100% against industry's priority to maximise profits, where the impacts of the cost increase on the capital and operational and maintenance costs need to be understood separately. Profits are particularly at stake for sectors producing global commodities and tradable products like steel and aluminium. Impact of low-carbon alternatives on business value as well as the benefits and risks they can create on factors such as productivity, better product quality, job creation, better trade balance need to be understood.
Location choices of industry to ensure low-cost production (including energy) for competitiveness	Domestic subsidies and advantages provided to fossil fuels remain in some countries. Some locations offer natural advantages such as low-cost renewable energy resources, potential CO_2 storage facilities and water availability whereas others have access to infrastructure like seaports. Access to raw material reserves, which is critical for the mining industry and other processing activities down the value chain which is becoming important in the context of energy transition. Carbon prices currently cover a small share of the total global greenhouse gas (GHG) emissions, but carbon markets are expanding to include the industry sectors in more countries.

	Carbon border adjustment mechanisms are expected to impact costs of exports based on the embedded carbon in end products.
System implications of transition and planning for the enabling infrastructure	Transition will require infrastructure such as to supply and transmit the additional electricity demand and recycling and waste management. A systemic approach will be needed to understand the logistics of biomass, green hydrogen and CO_2 capture and use and nexus/resource competition issues and actor's responsibilities in realising these investments.
Asset stranding	In emerging and developing economies, although most assets are new, they do not necessarily employ the best available technologies. Transition of existing assets will be crucial. Promoting the adoption of best available technologies at the time of investment decision is important but designing/retrofitting plants with a near-zero emission technology even if not commercially available yet is preferable from an asset stranding perspective. Most investments in new production capacity are outside the developed countries, potentially locking in carbon for many more years when conventional technologies are used. Delaying action could make transition more costly.
Industry structure and ownership	Heavy industry sectors have different ownership structures ranging from privately-owned or publicly listed multinational corporations, state-owned enterprises to national conglomerates and they are covered globally by at least 4,000 plants that intensively use energy. Millions of micro, small and medium enterprises are generally owned by families and individuals who typically have low access to capital. Financial and technical capacity may differ from one company to another and therefore require different approaches to transition. Production plants are grouped in organised regions or zones, clustered in industry regions of cities or scattered across the countries.
Technology transfer, research and development and commercialisation of low-carbon technologies	Some low-carbon technologies have small emissions reduction impact but have faster returns on investment whereas others may have high estimated transition impact but are at early stages of commercialisation because their deployment potential is not yet fully proven or they do not have a business case under the current conditions. Private finance will be needed to enable local deployment of technologies through scalability and replicability. The regulatory, business and skill ecosystems for domestic commercialisation of technologies will determine technology transfer needs.
Demand creation and supply chain impacts	Costs of industry transition with low-carbon technologies will largely accumulate in the final products that are at the end of the supply chains, which are currently often covered through premiums above the prices of conventional products such as in bio-based products. New approaches may be needed to foster demand for carbon-neutral and/or green products that can develop market for investments in low-carbon technologies in the industry. Labelling and premiums as well as green procurement initiatives are becoming more common to create a market for carbon-neutral and/or green. Some raw materials and feedstocks as well as energy- and emission-intensive materials

	could be replaced by sustainable and low-carbon alternatives that provide the same function and service (e.g. replacing plastics with wood-based packaging solutions) and material lifetime can be extended with circular economy approaches, thus reducing demand whilst requiring the entire supply chain and industry ecosystems to change.
Beyond technology needs of transition	Technical assistance may be needed for scalability through skills development and knowledge transfer and for developing human and institutional capacity to transition and manage a low-carbon industry system, development of methodologies and tools (e.g. benchmarking) to understand opportunities, particularly for SMEs. Effectiveness of existing business and financing models such as energy service companies, leasing models and insurance systems can be enhanced, and new business models and approaches can help integrate a low-carbon industry with the rest of the energy system through digitalisation and information and communication technologies.
Collaboration across borders	Past experiences show industry networks and sector co-operation can help for data collection, sharing best practices and lessons learned, and engaging emitters from countries with limited ambition in climate policies. Many government and industry coalitions are being built for industry transition that can help to facilitate large-scale investments in industry.

The Framework responds to the urgency of action to improve enabling conditions and develop financing solutions for a net-zero transition in emerging and developing economies

The transition challenge is becoming a reality in emerging and developing economies. According to Figure 2.2, the production of steel and cement, which has shifted from today's developed economies to China in the past decades, will now shift to India and to other emerging economies, mainly in developing Asia, Africa, Latin America and the Caribbean. The first driver of the industrial production increase is the economic growth of countries that need to produce steel, cement and other materials for their development. Moreover, for internationally traded goods, such as steel, global trade can create economic opportunities to shift production from industrialised to developing countries and emerging economies with less stringent business regulations, cheap labour, low-cost fuel and feedstock availability (Nilsson et al., 2021[24]). However, the relocation of industries to countries with more lenient policy frameworks, referred to as carbon leakage, can have a global negative impact on carbon emissions. These impacts need to be understood on a case-by-case basis since best performing levels are being increasingly achieved in emerging and developing economies as their assets tend to be younger. For example, India's cement industry and primary aluminium smelters in China are among the most efficient globally . At the same time, it is important to consider the possible differences in the policy ambition between sectors in a given country. While industry relocation from one country to another due to strict climate policies may be expected to decrease the overall emissions in that country, the overall balance could remain unchanged if there are less strict climate policies in non-industry sectors such as power and transport.

This shift driven by growth and global trade dynamics creates an opportunity for global industry transition. Promoting the best available technologies already offers significant energy saving opportunities in existing production plants (UNIDO, 2010[25]). Moreover, as new production capacity builds up in emerging and developing economies, an opportunity lies to change the trend and invest in cleaner production technologies for new investments. The ample availability of renewable energy resources, such as solar and a sustainable supply of biomass and geothermal energy could drive the net-zero transition further, through their direct use to generate process heat, integrated with CCUS processes or as a feedstock for the production of green hydrogen (Bataille, Nilsson and Jotzo, 2021[26]). Indeed, industrial processes and the required low-carbon technologies for net-zero emissions have different characteristics across countries, including for reasons due to ownership of companies, investment environment and the policy

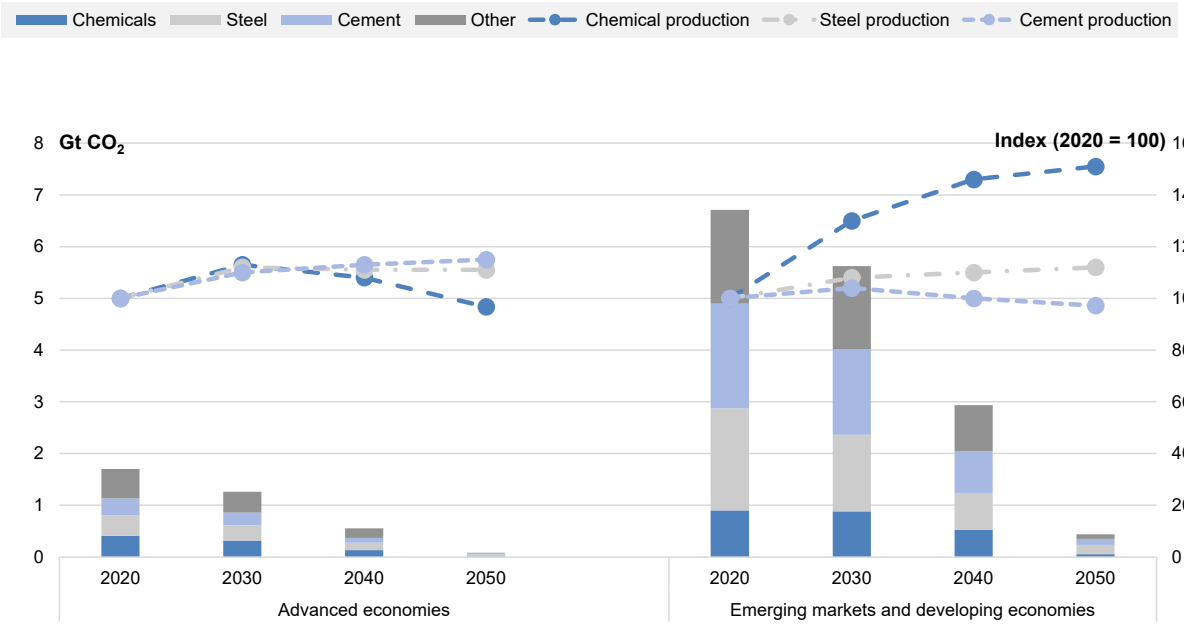
drivers that differ considerably. As a result there is a need to better understand the implications of these differences while charting transition pathways.

Location choices will also determine new optimal solutions for the global supply chains. For instance, more emissions intensive semi-products and intermediates could be produced in regions with suitable geological characteristics for carbon capture and storage or the availability of cheap renewable power. The next stage of processing could be in different locations that offer other production benefits to low-carbon industry transition (Bataille, Nilsson and Jotzo, 2021[26]).

A transition from a linear to a circular economy enabled by recycling, reuse and design of more efficient materials use will be critical for industry's transition (Pennington, 2022[27]). Similar concepts of dematerialisation and industrial ecology have been used in the past to define this concept (Gielen and Saygin, 2019[28]). Eliminating product waste and the need for virgin materials can significantly save on industry's energy demand and CO_2 emissions (OECD, 2019[29])whilst it will require significant investments and planning for infrastructure and enabling logistics.

An increased reliance on biomass as feedstock and as fuel for process heat generation could lead to environmental impacts and increased land use if supply is unsustainable (Saygin et al., 2014[30]). Energy conservation can lead to rebound effects that may partly offset energy savings and the subsequent avoided CO_2 emissions because of new energy use on additional industrial output (Antal and Van den Bergh, 2014[31]). Such possible trade-offs between low-carbon technologies will need to be accounted for.

Figure 2.2. Global Material Production and CO_2 emissions from industry by sub-sector in the Net Zero Emissions scenario from IEA



Source: (IEA, 2021[8]).

There is an urgent need to assist emerging and developing economies to accelerate the transition to net-zero by understanding their strategic priorities and to outline robust clean energy investment patterns and affordable financing solutions. To answer this, the OECD has developed this Framework that can be applied jointly with policy makers, industry sub-sectors and finance institutions to help accelerate net-zero transition at country level in emerging and developing economies.

3 Five Steps to implement the Framework

This chapter positions the objectives and scope of the Framework within a wider landscape of industry's net-zero transition and country considerations in developing and implementing market and financing solutions. It assesses the role of key stakeholder groups and proposes a step-by-step approach to identify a Focus Area for the Framework implementation, build an enabling environment and develop financing solutions for a pipeline of bankable projects. In addition, this chapter highlights the importance of developing an evaluation and monitoring mechanism of the Framework implementation and its solutions, as well as disseminating the main outcomes to better understand the benefits and risks of the industry's net-zero transition.

Objective and scope of the Framework

The **objective of the Framework is to contribute to accelerating the net-zero transition of the industry sector at a country level. The Framework is a step-by-step guide on how to approach transition of the industry sector through the deployment of low-carbon technologies, identification of their financing needs and development of market and financing solutions by jointly working with governments, industry actors and finance institutions**. Specifically, the framework provides a process to:

- **Agree** with stakeholders where the Framework will be implemented by selecting industry sub-sectors/technologies, industry scope and its priority characteristics (*Focus Area*).
- **Assess** the investment and financing needs to 2030/2050 for the *Focus Area* in contributing to the country's net-zero pathway by the end of this mid-century. Technology and other data inputs that will be used in this assessment will be collected from available transition/low-carbon scenario literature (e.g. from the IEA, local/regional research organisations), including the enabling infrastructure needs and system implications in the rest of the energy sector, and **understand** the business case by considering the benefits and risks of industry's net-zero transition (*Implementation outcomes*).
- **Develop** (i) market solutions to improve the enabling conditions in creating a viable business case for low-carbon investments, and (ii) financing solutions, which can both be used to deploy investable projects in the industry sector over the next 5-10 years (*Implementation outcomes*).
- **Contribute** to the national and international energy, climate and financing policy dialogue from the perspective of low-carbon industry transition based on the implementation outcomes of the Framework (*Framework benefits*).

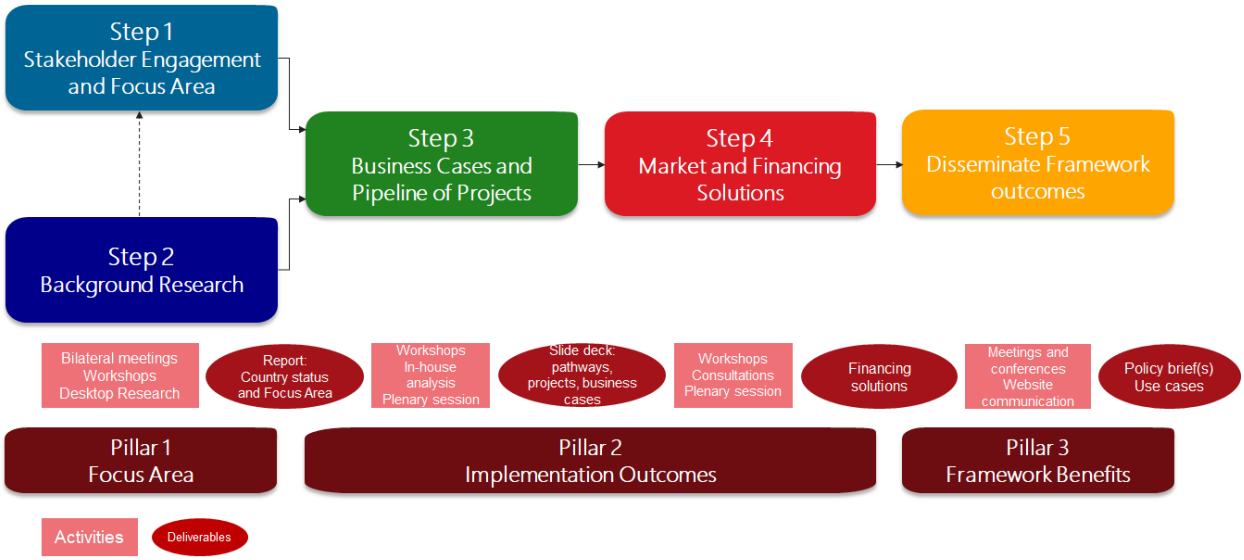
The rest of this section briefly describes the framework based on its *three pillars (Focus Area Implementation outcomes and Framework benefits)* and its *five Steps* for implementation. Figure 3.1 highlights the core of the Framework and identifies in its outer circle several related topics that will be considered, even though they are out of the Framework boundaries. The Framework implementation aims to design solutions that will have an impact at project-level, rather than to propose an economy-wide

overview of what transition would imply for the industry sector. Nonetheless, the Framework will capitalise on such existing high-level initiatives. The successful implementation of the Framework will require the establishment and co-ordination of a consensus-driven and effective relationship between the key stakeholders who will be engaged in net-zero transition of the industry as summarised in Figure 3.3. This will also ensure that the Framework can deliver the right solutions to create impact in the countries as the stakeholders take ownership to realise its outcomes.

Figure 3.1. Framework boundaries

Note: Each pillar relates to the various Steps of the Framework implementation. Four interlinked Steps (from 1 to 4) are core in the implementation of the Framework, followed by an additional Step (5) that aims to disseminate the Implementation outcomes as well as the best practices and learnings gained and collected during the Framework implementation (see Figure 3.2).

Figure 3.2. Overview of the five Steps of the Framework



Pillar 1: Focus Area (Steps 1 and 2)

The Framework is not a one-size fits all methodology, and its implementation will be tailored for a given industry scope and the characteristics and priorities that relate to it. When the Focus Area is being decided, the following will be considered:

- Industry scope: focus on an industry sub-sector (e.g. a heavy industry such as cement production) or group of actors (e.g. micro, small, and medium enterprises (MSMEs) of various industries),
- Industry characteristics: focus on cross-sectoral energy use areas (e.g. cooling, electrolysis) or cross-cutting technologies that can be applied in multiple sub-sectors (e.g. green hydrogen for steel and ammonia production, efficient motor systems),
- Industry value chain priorities: technology transfer, R&D, demand creation for new products and supply chain impacts of industry's net-zero transition.

Pillar 2: Implementation Outcomes (Steps 3 and 4)

During the implementation, dialogue and stakeholder consultations will be prioritised, thus the Framework implementation will prioritise dialogue to empower transition of the industry sector. Practical aspects and solutions for a net-zero transition will be maximised over theoretical exercises. The implementation outcomes of the Framework are the market and financing solutions. They will be developed to transition the industry to move to a path that is consistent with net-zero emissions. The low-carbon technologies that can take the industry from current policies to a net-zero aligned path will be selected based on publicly available data or data from other regional and international sources. During the Framework implementation, using existing analysis and literature as inputs will be preferred over energy and emission scenario development. Therefore, the OECD will rely as much as possible on the availability of external data and analysis and, only if needed, in-house technology assessments will be undertaken to complement available information. Each low-carbon technology will be quantitatively evaluated based on its costs and benefits to 2030/2050 (including those benefits that relate to the well-being of the society and the overall economy). While developing transition pathways that combine technology deployment with production growth, issues around trade and competitiveness will be considered.

The Framework will build on these insights into the mix of various low-carbon technologies and their investment needs for decarbonising the selected Focus Area. Based on these insights, the Framework

implementation will yield two specific types of solutions: (i) *market solutions* to improve the enabling conditions that can facilitate investments in low-carbon technologies, and provided that these are insufficient to enable a net-zero transition, (ii) *financing solutions*. Both areas that pertain to these solutions cover a wide range of issues, thus it will be critical to define the Focus Area clearly and develop solutions only for those enabling conditions that are essential for reversing investment decisions towards low-carbon technologies. These solutions will be complemented with a pipeline of low-carbon projects that can close the transition gap to the extent possible in achieving the net-zero path. These projects will primarily include commercial projects, but they can also include demonstration and pilot projects that may be needed to close the transition gap. Country-level mechanisms for monitoring and evaluation of the solutions towards realising these projects will be developed.

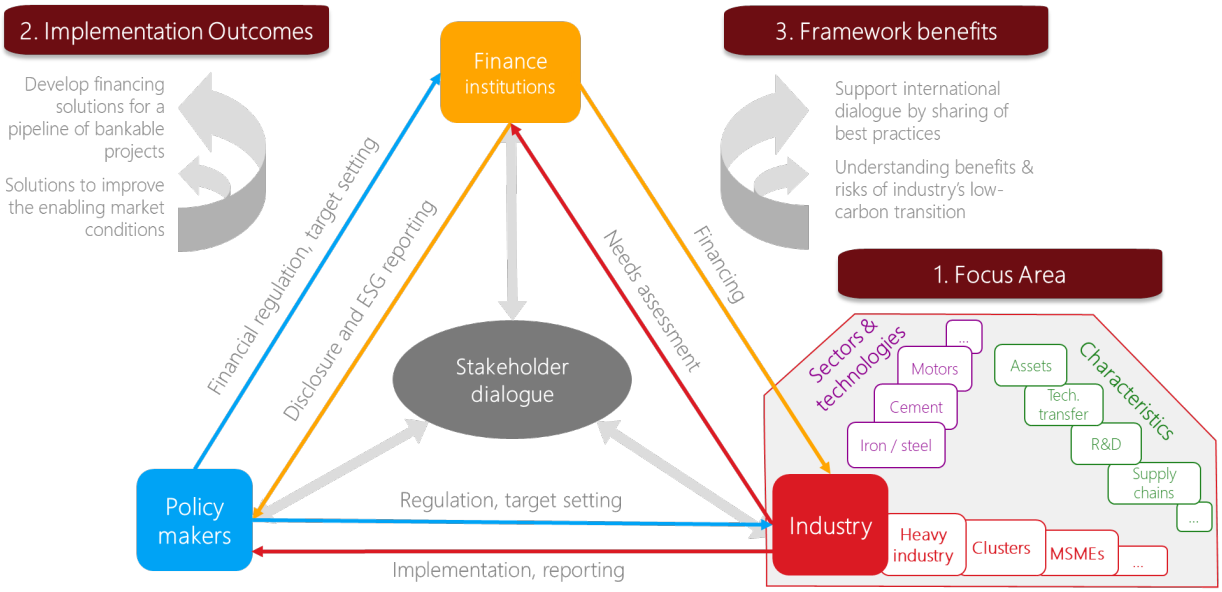
Pillar 3: Framework Benefits (Step 5)

The Framework will help stakeholders to gain insights to the benefits and mitigate the risks of industry transition. Best practices and business opportunities that emerge from transition will be highlighted as part of a dissemination effort of the Framework outcomes. This will also help to display solutions and their impacts with the objective to contribute to national and international dialogue on energy, climate and finance policies.

Stakeholder groups and the role of CEFIM

The OECD will co-ordinate the first cycle of the implementation of the Framework in countries. The implementation process will be initiated by the OECD together with the government counterparts such as ministries and other government entities that work on industry transition. The Framework implementation will be based on dialogue. The OECD will engage and consult relevant stakeholder groups, namely policy makers, industry, and finance institutions. This is particularly important since unlike in the energy sector transition, lightly-linked industry stakeholder dialogue requires a strong push to understand net-zero transition needs and work towards addressing them. In light of this, Figure 3.3 depicts the stakeholder groups and their relationships. The consultations with policy makers and industry actors will help with the prioritisation of industry needs and determine the Focus Area. These stakeholder groups are expected to benefit from the Framework outcomes in different ways. Policy makers will gain insight into the potential, cost and benefits of industry transition as well as the related solutions for its operationalisation. This can contribute to a better-informed national energy and climate policy making process that utilises the limited government resources more efficiently. Industry will benefit from solutions that can help to improve the enabling conditions for investing in low-carbon technologies through which competitiveness can be enhanced among other benefits. Finance institutions will have better insight into the financing instruments needed for industry transition, which will help them to prioritise and expand their markets. An additional benefit concerns the climate transition risks within their portfolios as finance institutions support their clients in the transition. To develop solutions, the Framework will follow an iterative process of consultation among the three stakeholder groups. Leading civil society organisations and academia experts in countries, as well as relevant regional partners, will also be involved to share data and provide inputs during the implementation process.

Figure 3.3. Stakeholder groups that are relevant to the Framework and their relationships

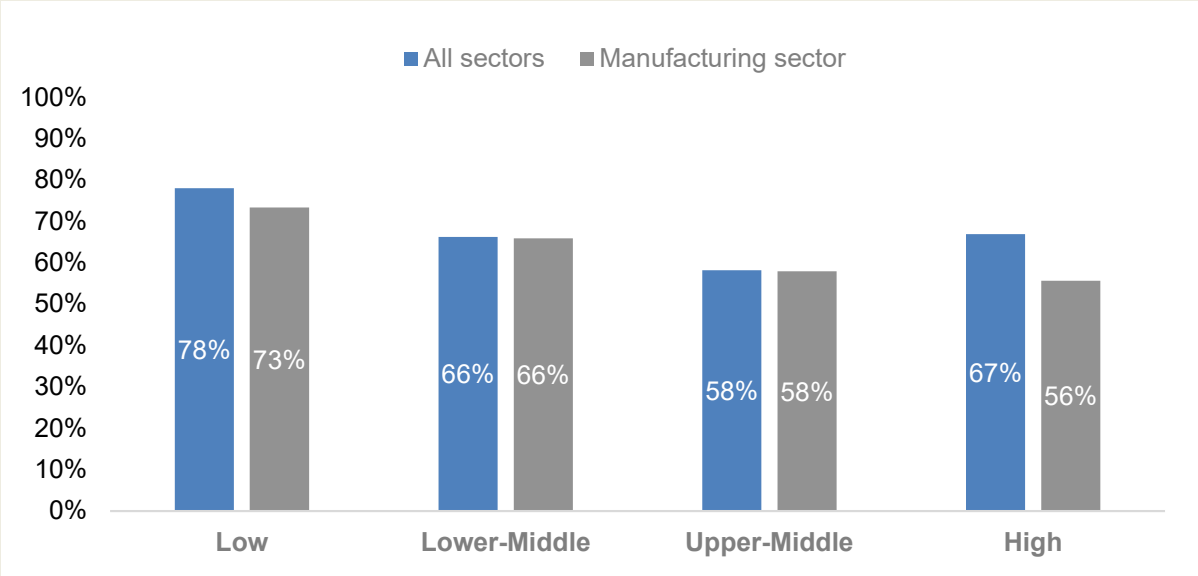


Box 3.1. Influence of the size of industrial companies on their access to capital

The industry structure with respect to plant size and consumption differs. Energy-intensive sectors are represented by a few thousand plants; there are in total at least 4,000 integrated steel plants, steam cracking installations, ammonia plants, aluminium smelters, and large cement kilns in operation worldwide (UNIDO, 2010[25]). Typically multinational corporations, state-owned enterprises as well as national conglomerates own heavy industry sectors that produce bulk materials in these few plants. Companies in these sectors compete with low profit margins. Therefore, industry's net-zero transition will need to address global trade and competition issues. Additionally, the upfront investment costs of large heavy industry plants are significant and given the stagnation in demand, new plants are rarely built in developed countries where less costly retrofits are implemented. By contrast, in developing countries new plants are built provided that there are long-term business cases (Bataille, 2019[21]). Business structures may change with the industry transition. For instance, iron and steel or cement are produced by the same company in the same location. With industry transition, this may change as new supply chain structures can result in the choice of new locations for the production of different components with trade linking them (Bataille, Nilsson and Jotzo, 2021[26]).

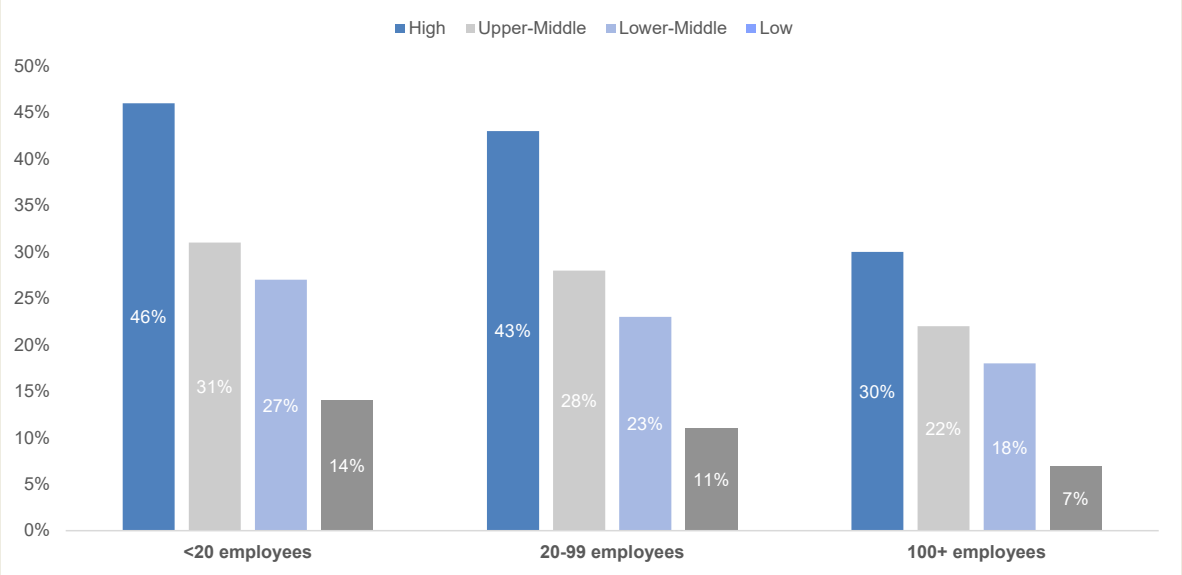
For other sectors, however, especially those dominated by MSMEs, the number of plants are substantially higher and these companies have an important contribution to the economy (Saleem, 2010[32]) and employment (see Figure 3.4). These plants are much smaller in consumption and they are clustered in organised industrial zones, grouped in industry regions of cities or scattered geographically. They are typically owned by families or individuals with low access to capital (see Figure 3.5). According to bottom-up estimates, their combined total energy demand could account for nearly one-third of the total final industrial energy use (Banerjee et al., 2012[33]). At the same time, MSMEs bring the advantage of scaling up cross-cutting low-carbon technologies across a huge number of plants, thus also easing financing needs through aggregating multiple projects.

Figure 3.4. SME contribution to employment (median values across income groups)



Source: Based on (Ayyagari, Demirguc-Kunt and Maksimovic, 2014[34]).

Figure 3.5. Average percentage of firms citing access to/cost of finance as major constraint to current operations



Source: (IFC, 2010[35]).

Gender equality considerations during the Framework implementation

The Framework recognises that promoting gender equality in the industrial workforce can effectively contribute to the advancement of society's well-being and fostering human dignity. Women are currently underrepresented in the global manufacturing industry, occupying less than one third of the total jobs in the sector (World Manufacturing Foundation, 2020[36]). Efforts will be made at every possible level during

the Framework implementation to promote gender equality and the solutions defined to address where the rate of participation of women is particularly unsatisfactory.

To maintain the participation rate of women during the Framework implementation, specific measures will be implemented such as:

- Consideration will be given to maintain an appropriate gender balance in the Framework Steering Committee, working groups, dissemination and outreach activities and other stakeholder consultation activities (throughout all Steps).
- Providing gender specific statistics related to the Focus Area of the Framework in understanding the current situation (Steps 1 and 2).
- Opportunities will be identified that can employ more women in the manufacturing industry through industrial low-carbon technologies and the market and financing solutions (Steps 3 and 4) by including gender equality as an indicator of the benefits and risk assessment of the industry's net-zero transition.
- Framework outcomes will pay attention to increasing society's awareness and understanding of industry's net-zero transition and they will aim to be equally useful for all genders, therefore they will have a special focus on the benefits for gender equality and they will raise interest among young women workers to increase their participation in the industrial workforce (Step 4).
- Establishing a system for monitoring gender equality in mobility schemes such as equality of access and participation and subsequent impact on professional careers in the manufacturing industry (Step 5).

Wherever there is unequal access due to gender differences, the Framework will target the involvement of women with its gender-sensitive approach and outcomes. The responsibility to act in this respect is given to the Steering Committee. The responsibility to ensure gender equality in all actions is distributed to all Framework stakeholders. The reporting on the actions and results, however, is appointed to the OECD.

Five Steps to implement the Framework

Step 1: Engage Stakeholders and agree on the Focus Area

Rationale

A successful process for designing effective policies builds on consensus. This process must be informed by data-driven and fact-based analyses. The implementation of this Framework takes these two principals

at its heart to develop solutions for industry transition. Thus, the Framework seeks to ensure its solutions are coherent with the national energy and climate policies by balancing the government strategies set by policy makers with the interests of diverse industry groups and finance actors through an iterative consultation process, and benefitting from available literature to turn policy recommendations into action (IEA, 2022[37]).

The manufacturing industry's complexity is not only bound to the material and energy flows across its sub-sectors, but it expands to who governs its growth strategies and the integration of these strategies with the broader national energy and climate policies. Multiple line ministries and government entities cover different parts of industrial policy making that relate to issues of economic growth, employment, trade, competitiveness, sustainability and environment. These competing issues are equally important, yet exclusively sensitive, especially for emerging and developing economies as they strive for economic growth with industry expansion while being responsible for designing policies that adhere to the global climate change mitigation efforts. Industry policies are also closely linked with the broader infrastructure policies as industry provides the needed materials for built environment and transport and water infrastructure that serve the quality, safety, welfare and health of citizens (McKinsey, 2022[38]). Additionally, industry transition will have unforeseen implications on infrastructure needs since a low-carbon manufacturing industry and its operations are significantly different from today's traditional practices.

The industry players are spread across this complex value chain, including those who are responsible for the supply of raw materials, manufacturers, processors, storage and logistics companies, and actors of the wholesale and retail markets that trade final products nationally and across borders. Indeed, a holistic policy approach that addresses all different players simultaneously is meaningful. In reality, such policy management may not be practical given the diverse interests and needs of the various industry actors. Additionally, there are major differences in their contribution to the total industry value added, energy use and CO_2 emissions. Therefore, they need different market interventions and financing solutions. The complex value chain and actor diversity require a good understanding of which finance institutions have so far provided financing to boost manufacturing industry's growth and who can do so for its net-zero transition in the future.

Approach

Country engagement is the cornerstone of the OECD's CEFIM programme. As of June 2022, seven countries that represent more than 16% of the total non-OECD primary energy supply are part of the CEFIM programme, namely Colombia, Egypt, India, Indonesia, the Philippines, Thailand and Viet Nam (or 10% of the total global primary energy supply). A wide network of national experts from the public and private sectors as well as the finance institutions engage with the various CEFIM programme's activities.

Country engagement experience built in the CEFIM programme since its creation in 2019 will be the starting point of this first Step to form the *Framework stakeholder group* (Step 1.1). Initially, responsible ministries and/or the government entities (including local governments) which work on or can benefit from industry transition will be identified. Mapping government actors is challenging yet crucial since they will form the "policy maker" stakeholder group. In some countries, there are already specific manufacturing industry dedicated ministries such as the Ministry of Steel in India. Policy maker stakeholders can include departments, directorates, divisions or endorsed non-government partners of the line ministries and other government entities that deal with industry transition.

Subsequently, all the relevant stakeholders along the manufacturing industry value chain such as manufacturers, technology licensors (e.g. industry motor producers, electrolyser developers), industry and sector associations and business groups (e.g. industry federations) will form the "industry" stakeholder group.

"Finance institutions" stakeholder group will comprise those who finance the various segments (e.g. capacity modernisation and expansion, technology productivity, on-site energy supply/demand) of

industry's transition today and in the future. These may include international and domestic public and commercial banks, international and regional finance and development institutions and other non-bank financial institutions.

The Framework stakeholder group will also benefit from the ongoing programmatic activities, research and engagement of the national civil society organisations, think tanks, academia, and other ongoing projects in the country.

The Framework stakeholder group will be instrumental to identify priorities of the country from the perspectives of the energy, climate and industry policies as well as from the manufacturing industry's needs, thus during the Framework implementation dialogue will be facilitated among the stakeholder group (Step 1.2).

The Framework stakeholder group's first output will be the decision of the Focus Area (Step 1.3). This is crucial, as it will determine the rollout of the Steps in the rest of the Framework implementation. As depicted in Figure 3.3, the Focus Area can address the various characteristics, sectors and technologies of the industry and it will be decided based on consultation with stakeholders' group, supported with background research. In making this decision, various qualitative and quantitative criteria will be considered such as country's strategic priorities, industry's role for the economy and society and sector's environmental impacts. These criteria will be determined with the (Step 2). It will be important to arrive at a common understanding of the extent the value chain of the Focus Area will be covered. This can be limited to the system boundaries of a production plant, or it can cover the entire value chain of a low-carbon technology, for instance from the generation of renewable power to the production of green hydrogen-based ammonia. In identifying the Focus Area, consultations will benefit from the data collection and current situation assessment that will be undertaken in parallel in Step 2.

The Framework will benefit from a Steering Committee responsible for the governance/management structure of the Framework implementation (Step 1.4). The Steering Committee will oversee the activities and outcomes of the Framework implementation. This will be instrumental to foster co-operation between the stakeholder groups towards facilitating the Framework implementation. The Steering Committee will be led by the relevant government entity of the countries, and it will comprise members from policy makers, industry and finance institutions, as well as other relevant stakeholders. The Steering Committee will also be responsible for setting the work and time plan of the Framework implementation (Step 1.5). Activities in Step 1 will be carried out in parallel with Step 2.

Outputs

1. Identification of actors from each group of the Framework stakeholder group, mapping of additional stakeholders outside the main stakeholder groups, and introduction of the Framework
2. Engagement activities with the Framework stakeholder group through workshops, roundtable meetings, webinars and bilateral meetings
3. Short report about the stakeholder priorities and investment decision factors for industry transition and the current activities of the individual stakeholder groups
4. Governance definition:
    - Formation of a Steering Committee aiming to co-ordinate the Framework stakeholder group activities, provide guidance and monitor progress towards Framework implementation steps. The Steering Committee makes the final decisions where relevant.
    - Preparation of a brief terms of reference that define roles and responsibilities of the Framework stakeholder group, that guide how coordination will be done, depict the main work streams/working groups/activities and timelines around the Framework and show the key steps where decisions will need to be taken and by whom
5. Work and time plan for the Framework implementation

Enablers and risks

Step 1 is instrumental in the successful implementation of the Framework as decisions taken in this Step determine which areas and solutions will be developed whilst ensuring a clear focus of the Framework to arrive at actionable outcomes. In this regard, it is crucial to identify and engage the right government partners in the country to the Framework at the very early stages of its implementation. The government partners represent the policy makers and they would be leading the implementation of the Framework implementation outcomes. Additionally, they can endorse the Framework implementation process by engaging other main stakeholder groups and play a role in the governance of the Framework implementation. Equally important would be the engagement of industry actors and finance institutions. Their participation is necessary to identify the Focus Area and an accurate understanding of the industry needs and priorities and the current financing landscape that will be essential in the development of market and financing solutions. Managing the process will be impossible without the formation of a Steering Committee and agreeing on the Framework governance definition.

Milestones

1. List of the stakeholder groups to engage with
2. Development of a strategy to engage with the Framework stakeholder group
3. Decision on the Focus Area
4. Formation of the Steering Committee and the Framework implementation rules

Step 2: Undertake research on the current technology, policy and financing situation

Rationale

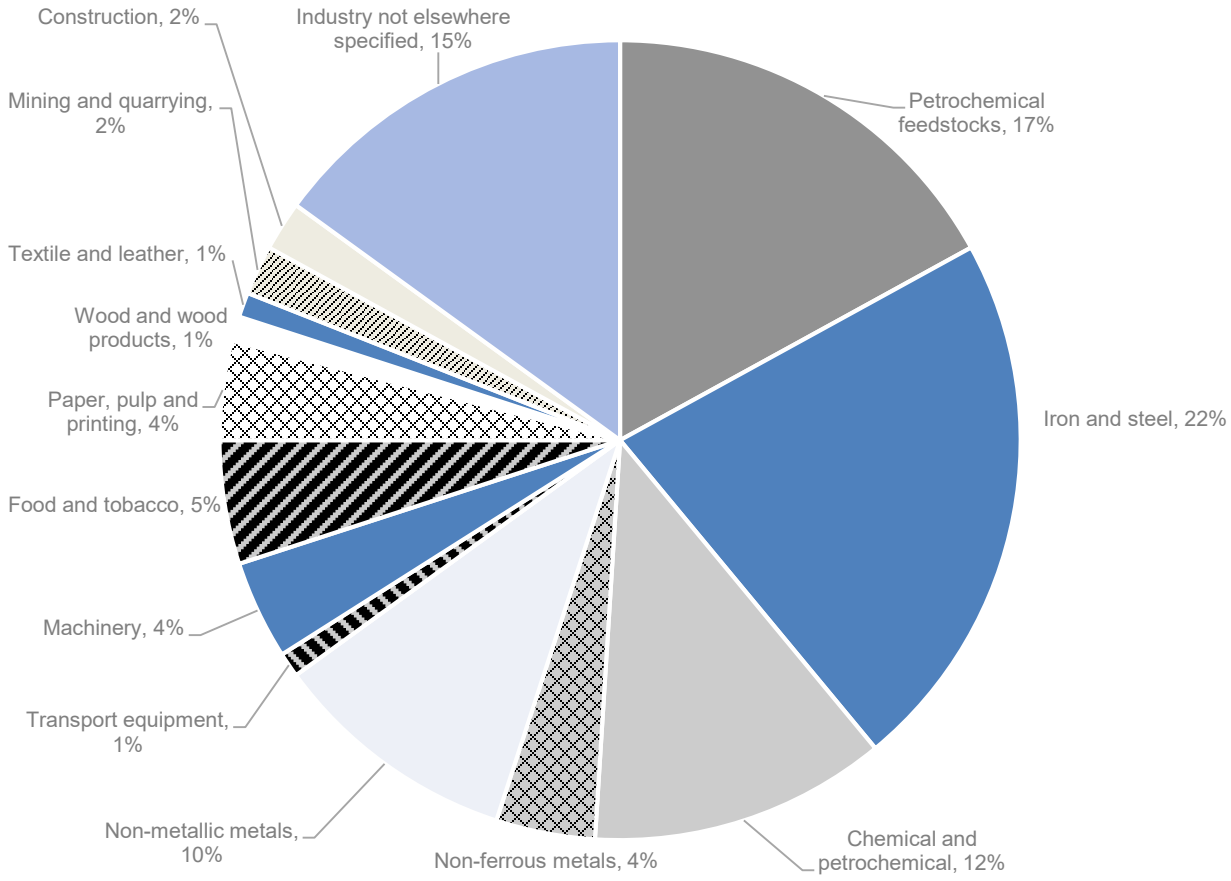
Defining the scope, objective and ambition level of the policy solutions will require a current state or as-is analysis. The progress industry sub-sectors and the finance sector of countries have made towards industry transition differs significantly from each other. An as-is assessment of the energy use (and emissions) at sub-sector level, policy and regulatory framework, financing instruments and sector projections would help to identify the Focus Area and outline the opportunities and barriers that are both crucial for arriving at suitable market and financing solutions.

Progress in industry's low-carbon transition can be measured through different indicators. As an indicator of energy efficiency improvements, take energy intensity of the manufacturing industry. According to the IEA, between 2000 and 2018, different countries have reduced their energy intensity from between 10% and 70% (IEA, 2020[39]). A similar conclusion can be made for the renewable energy share. Several countries representing different geographies beat the average renewables' share in the total global

industrial energy demand which was at about 10% in 2019. Examples are Colombia (25%), India (30%), Thailand (39%) and Nigeria (59%) (IRENA, 2021[40]).

One of the underlying reasons for the differences in the clean energy progress made by countries is the sub-sector structure of the manufacturing industry and the available commercial technology solutions and their potential for a net-zero transition of the industry sector. Including the use of fossil fuels and biomass as a feedstock for chemicals and plastics production, the chemical and petrochemical sector is the single largest consumer with a share of 29% of the total global industrial energy and non-energy use of 162 exajoules (EJ) per year. Metal industry, non-metallic minerals production and pulp and paper making collectively account for another 39% (see Figure 3.6). The remaining 32% is accounted by various light industry sub-sectors. This breakdown differs significantly across countries driven by factors such as raw material availability and its costs, demand/export/import needs and industry strategies. Some countries have established manufacturing industry that focus only on the production of bulk materials whereas others are dominated by small-scale industries (IEA, 2021[41]).

Figure 3.6. Breakdown of the total global industrial energy and non-energy use by sector, 2019

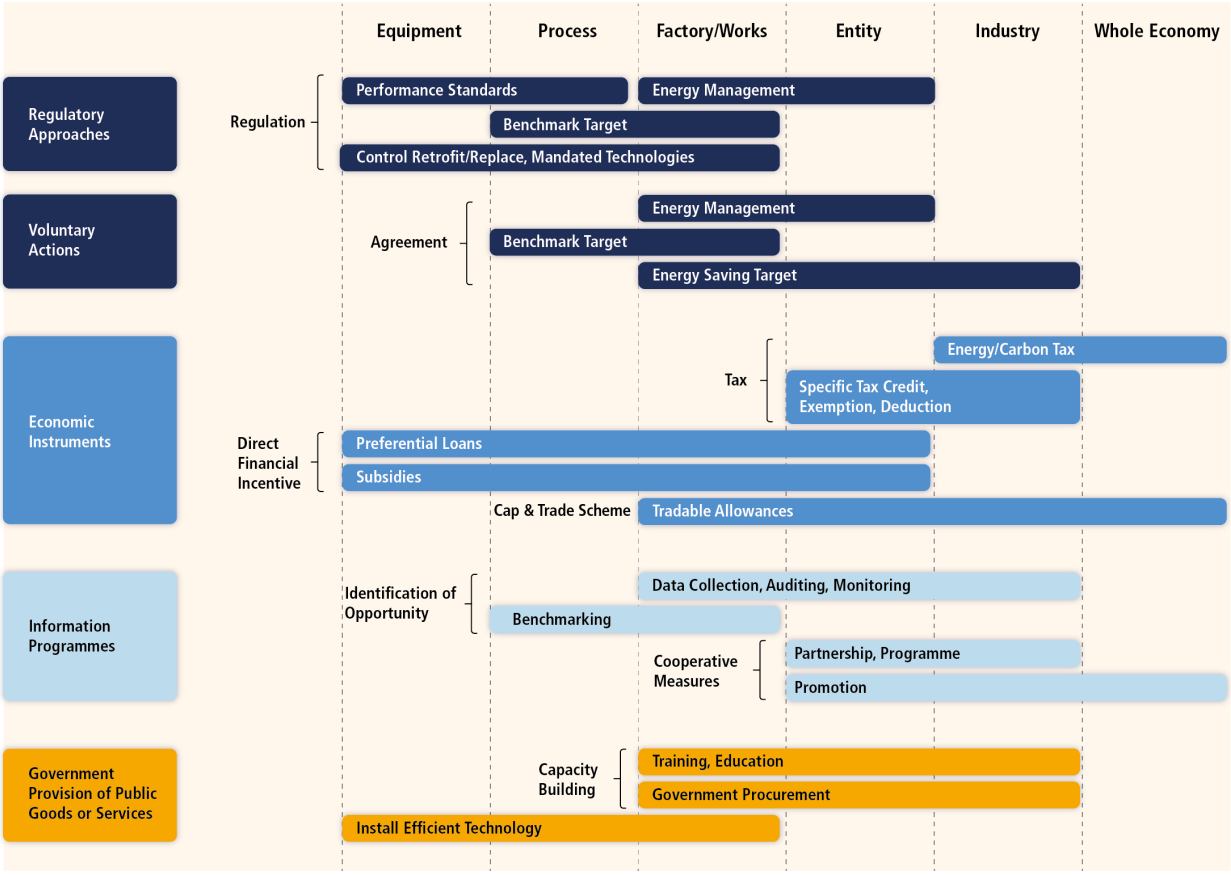


Source: (IEA, 2021[41]).

The varying progress made in industry transition is also explained by the differences in the present policy framework. In the manufacturing industry, policies come with significantly different scope and objectives and the policy approaches range from regulation to voluntary actions. Economic instrument options are

also very different (see Figure 3.7). Besides their availability, the extent they cover industrial energy use and their success in implementation play a role. The overview provided in the figure addresses energy efficiency improvements, which is one of the main contributors to the industry decarbonisation.

Figure 3.7. Selected policies for energy efficiency in industry and their coverage



Source: (Fischedick et al., 2014[42]).

Recent OECD analysis reveals important insights to the extent growing sustainable finance efforts from different countries cover the manufacturing industry (Tandon, 2021[43]). The analysis has reviewed more than 50 transition relevant taxonomies, guidance, principles and financing instruments by public and private actors. The findings show that the ambition of national and international climate targets have driven sustainable finance taxonomies and standards. However, more emphasis is provided to renewable energy for electricity generation as opposed to options for emission-intensives heavy industries.

Approach

This Step builds on a combination of desktop research and stakeholder consultations. Desktop research will start by identifying the right sources of information to collect data and processing of this data to understand better the country's industry energy use and CO_2 emissions by sub-sector and fuel type, industry sector technology performance (e.g. efficiency) and costs (capital, operational and maintenance), energy prices, industry and technology strategies (e.g. focusing on exports, hydrogen strategy, steel industry transformation strategy), and the energy and emission scenarios to 2030 and 2050 (Step 2.1).

In consultation with the Framework stakeholder group, the regulatory (e.g. standards, energy audits/energy management systems), policy (e.g. specific energy consumption reduction targets), legal (e.g. obligations), financial (e.g. available financing instruments) and business aspects of industry transition will be assessed. The objective is to understand the available tools, success stories, existing gaps and barriers in the countries. The local definition and sustainable finance taxonomies of low-carbon technologies and investments will be considered where available. A list of major low-carbon investments in the country in recent years that indicates their current deployment rates will complement this exercise. This assessment will help in depicting how clean energy technology investments in the industry sector are currently being financed (Step 2.2).

The outputs of Step 2 will continuously inform the Framework stakeholder group's discussions in identifying the Focus Area as it provides priority sectors where action would be needed for transition from a net-zero perspective. A preliminary high-level diagnosis can be carried out to better inform the stakeholders ahead of the selection of the Focus Area. Data collected will also be used when the costs and benefits of low-carbon technologies are estimated. Its outputs around the success stories, barriers and gaps will help in shaping the design of market and financing solutions in the subsequent steps. The activities in Step 2 will be carried out in parallel to Step 1. (Step 2.3).

Outputs

1. A policy-maker friendly slide deck that provides in-depth insights into the country's industry situation and that provides answers to the following questions:
   a. Which sectors contribute most to the energy use and CO_2 emissions of the industry?
   b. What are the available energy and emissions scenarios and their scope for industry's net-zero transition?
   c. What are the available regulations, policies, financing instruments and business models that enable industry's low-carbon transition?
   d. What are the latest low-carbon investments in the industry and how have they been financed?
   e. What are priorities, critical issues and barriers to industry's net-zero transition and what factors affect the investment decisions?
   f. With which international fora do the government and/or country's industry sectors actively engage with?
2. Formation of a dataset to inform the further steps of the Framework implementation

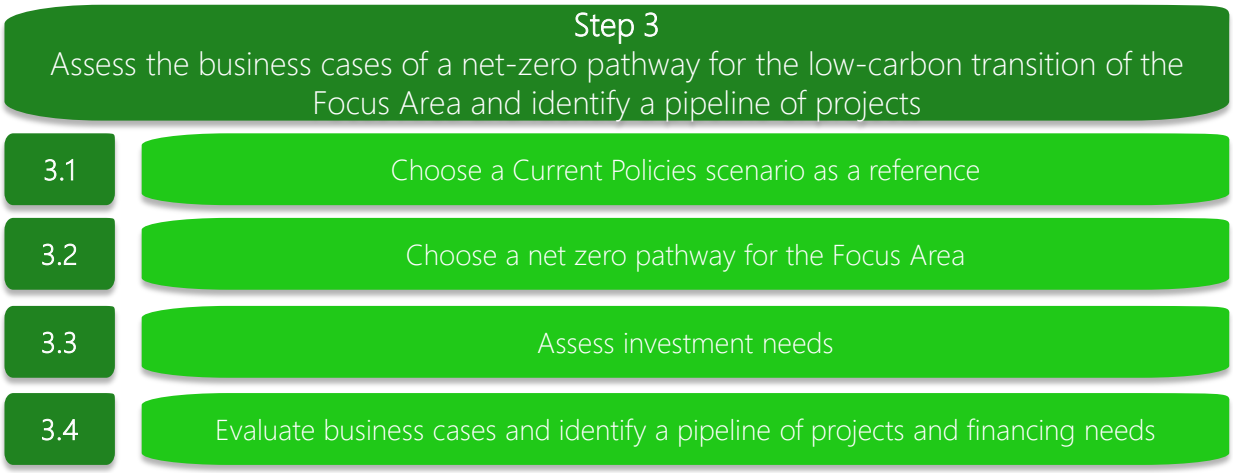
Enablers and risks

Publicly available data from country sources, national statistics offices and national industry associations are needed to prepare a complete dataset that can inform the next Implementation steps. Data gaps can be closed with international data sources, but comparability needs to be ensured with national data sources. A good understanding of the industry priorities, critical issues and barriers needs close engagement with the stakeholders, therefore the value of the Framework must be communicated clearly to ensure their contribution.

Milestones

1. Complete dataset on the energy use, emissions and other energy and production related data
2. Clear understanding of the priorities, critical issues and barriers to industry transition and investment decisions

Step 3: Assess the business cases of a net-zero pathway for the low-carbon transition of the Focus Area and identify a pipeline of projects



Rationale

Understanding the implications of transition requires an assessment of the effort needed to diverge from a country's current policies path. Current policies include today's government plans as well as non-state actor and sector-specific targets and could consider industry and business priorities. The current policies path is considered as a starting point to analyse any energy system and it serves as a reference point in policymaking since it allows for the development and comparison of alternative paths that consider different policy assumptions. Based on a set of assumptions, the current policies path provides a conservative projection of the future, sometimes up to 50 years based on today's perspective. Current policies paths are available at country level. Examples are the "Reference case" of the United States' Annual Energy Outlook (U.S. Energy Information Administration, 2021[44]) or previously the national energy efficiency and renewable energy action plans of the EU countries (EU, 2021[45]).

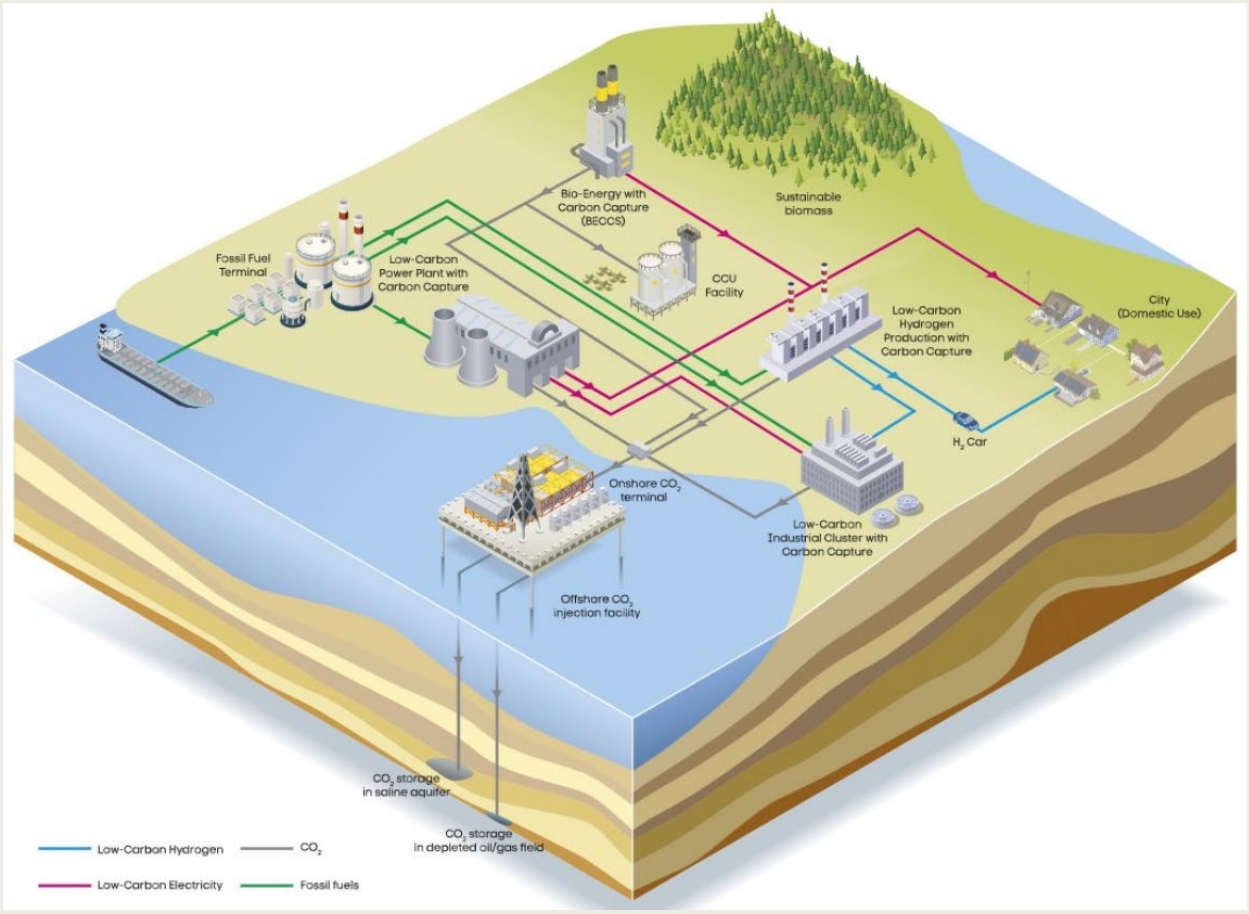
In order to provide a robust reference point, however, current policies paths need to be continuously updated as technology availability, performance and costs change rapidly. This is especially valid for low-carbon technologies and approaches. However, the current policies typically rely on today's technology and policy norms and they only to some extent consider the rapid transformation and uptake of new technologies in the energy sector. For instance, evidence for solar photovoltaic (PV) has shown that most current policies projections prepared over the past decade have captured only to limited extent its actual pace of deployment (Carrington and Stephenson, 2018[46]).

Transition paths can show how and to which extent a country can reap the rewards of an individual or a suite of new technologies and approaches. Such paths may consider availability of resources, access to finance, human-resource needs and supply, manufacturing capacity, costs development and the age of the capital stock that can help transition to go beyond the current policies path. Transition paths can target a policy goal to be achieved by a given year such as realising a certain share of local energy resources or renewable energy in the energy system by 2030 (IRENA, 2016[47]) or achieving carbon neutrality by mid-century (IEA, 2021[48]). In addition to such global paths, numerous assessments are available at the level of countries, regions and individual energy sectors. These paths provide a clear understanding of the opportunities to the policy makers and how to get there by quantifying the changes in the energy system, air pollutant and GHG emissions, system costs/savings, investment and financing needs etc. They also help to compare and put countries in perspective of the political feasibility and challenges to implement net-zero transition in view of their national circumstances. Only with such vision, new policy solutions can be developed to abandon current policy paths.

Box 3.2. Energy system-wide and infrastructure implications of the net-zero transition

Energy system wide implications of industry's transition also need to be accounted for. Transport, storage and processing to enable the logistics of hydrogen, CO_2 and material waste that require additional infrastructure and additional renewable power capacity and grid infrastructure will accrue unforeseen investments (see Figure 3.8). This means investments will be higher than just for low-carbon technologies to reduce emissions, and the competition for renewable energy resources between industry and other sectors of the energy system will need to be addressed. For instance, electrification will require additional renewable power capacity; a gigawatt (GW) size electrolyser capacity may need up to three times more GW-equivalent renewable power capacity. These strategic bets will redefine how and where solutions should be prioritised in countries.

Figure 3.8. Example of infrastructure needs to produce low-carbon hydrogen with carbon capture and storage



Source: (Zero Emissions Platform, 2020[49]).

Box 3.3. Asset stranding risks and investment cycles

As carbon markets expand, industry may face even higher costs if it delays action to replace inefficient and conventional technologies with low-carbon equivalents (Altenburg and Assman, 2017[50]). The risks of delaying action have been pointed out for the upstream fossil fuel and power sectors for already many years. Similarly, the need for early action cannot be overemphasised for industry, as it would mitigate the chance of having stranded assets (IRENA, 2017[51]). Asset stranding is a major issue for the industry sector in the context of industry's net-zero transition, given the long lifetime of production plants, which is generally between 20 and 40 years. Building new plants with polluting and inefficient technologies where carbon is locked in could lead to a costly early decommissioning (Saygin et al., 2019[52]). Such plants can be retrofitted, their aging equipment with shorter economic lifetimes can be immediately replaced or they can be decommissioned before they reach the end of their lifetimes. Any action can be delayed until they retire. The least-cost options are investing in best available technologies and facilitating enabling infrastructure for low-carbon technologies as part of a long-term planning for industry's net-zero transition. Thus, solutions will be needed for companies, policy makers and asset managers to minimise the impacts of stranding and to avoid delaying action that will increase costs. Analysis suggests that cumulative industrial stranded assets may more than triple from USD 240 billion to USD 740 billion between 2015 and 2050 if action is delayed (IRENA, 2017[51]). It is also important to consider investment cycles to match when today's breakthrough technologies may be ready or already commercialised when existing assets will need major retrofits or replacement (IEA, 2021[8]).

Approach

This Step will use the outputs of Steps 1 and 2 as a starting point. Step 1 provides the Focus Area and its value chain. Based on this, several key indicators and metrics will be developed to assess the energy, emission, low-carbon technology and investment needs of transition and the implications to infrastructure and the overall energy system.

A simple path to describe the development of CO_2 emissions of the Focus Area under the current policies will be chosen for the period until 2030/2050. This path will rely on the data collection in Step 2 and on additional insights specific to the Focus Area (Step 3.1).

Low-carbon technologies that are needed for industry transition in line with a net-zero path by the end of this mid-century will be characterised based on a simple assessment to 2030/2050 whilst the timeline can be aligned with the specific target year of different countries net-zero emission targets. In principle, data collected in Step 2 should provide the necessary inputs whilst the OECD will provide analysis in the development of the path. The potential of each low-carbon technology and its relevant projects beyond the current policies path will be assessed in realising this transition (Step 3.2). For the Focus Area, the current policies and the net-zero paths should provide insights into the following:

- Total energy demand with a breakdown by fuel type
- CO_2 emissions
- Breakdown of the conventional and low-carbon technologies deployment by unit/capacity
- Infrastructure needs and implications on the overall energy system (based on the choice of the Stakeholder framework group)

The gap in low-carbon technologies between the current policies and the net-zero paths is where investments need to be scaled up and where market and financing solutions will be needed. This gap will be further outlined with an assessment of the investment needs by accounting for the expected

developments in technology and costs between today and 2030/2050 that will include both commercial projects as well as large-scale pilot and demonstration projects. Depending on data availability and country interest, these investments can be at the level of technology/sector (depending on the Focus Area), production plant (and location) or product type. If it is of interest for the countries, depending on the value chain selection, required infrastructure (e.g. renewable electricity generation) to enable this transition will be included in the investment analysis. Depending on country interest and industry characteristics, additional considerations where financing may be needed such as technology transfer needs, stranded assets, or waste generation can be addressed. These should be reflected when the indicators and metrics are proposed at the start of this step (Step 3.3).

The business case of the low-carbon technologies identified for transition will be assessed. This is critical to understand the benefit that can be gained by improving the market situation to create enabling conditions and the policy framework over current conditions. This assessment will include an analysis of the costs and benefits of these low-carbon technologies within the value chain of the Focus Area. Indicators for assessment may include the changes in production costs, upfront investment, or the marginal cost of avoiding one tonne of CO_2 emission. Society and economy-wide impacts of the low-carbon technologies will be included if it is of interest to the Framework stakeholder group and this will rely on qualitative metrics. Based on this assessment, a pipeline of low-carbon projects will be developed that can close the transition gap. In principle, selection of projects will follow a holistic approach without being limited to only those with the least costs of mitigation or those with the highest impact in emissions reductions since all options will be needed for transitioning industry's emissions intensive and hard to abate production processes (Step 3.4).

Outputs

1. A policy-maker friendly slide deck that provides:
    a. Two paths, based on external analysis and data, that characterise the Focus Area energy/emissions growth and investment needs to 2030/2050 based on current policies and net-zero paths
    b. Investment needs of the low-carbon technologies to close the gap from the current policies to the net-zero path
    c. Business case assessment of the low-carbon technologies
    d. A pipeline of low-carbon projects that can close the net-zero transition gap

Enablers and risks

A successful undertaking of this Step will depend on the careful choice of the Focus Area and its value chain. Additionally, data collection efforts in Step 2 will be instrumental. Complete datasets available from government or related sources to construct the current policies and net-zero paths will be ideal, yet such data is often unavailable at country level, especially in emerging and developing economies. Additionally, performance and cost data for low-carbon technologies may be scarce at the country level. Most countries have yet to establish industry transition pathways and available country assessments of the required low-carbon technology solutions and measures are limited. Often, industry sectors' growth is projected in terms of physical and/or economic output as part of development plans, but these are not always linked with net-zero transition strategies. Completing gaps will require data collection from academia, consultancies and other national/regional/international sources or through in-house assessment by the OECD. It will be important to plan for sufficient time to allow for discussion within the Framework stakeholder group to agree on their suitability and how they can be used to close the data gaps. Additionally, close collaboration, including deep involvement of the private sector will be needed within the Framework stakeholder group through the OECD support in choosing the current policies path and the low-carbon technology breakdown

of the net-zero path since the market and financing solutions that will be determined in Step 4 will rely on these choices.

Milestones

1. Complete dataset:
   a. to develop the current policies and the net-zero paths
   b. to assess the investments and the business case of the low-carbon technologies

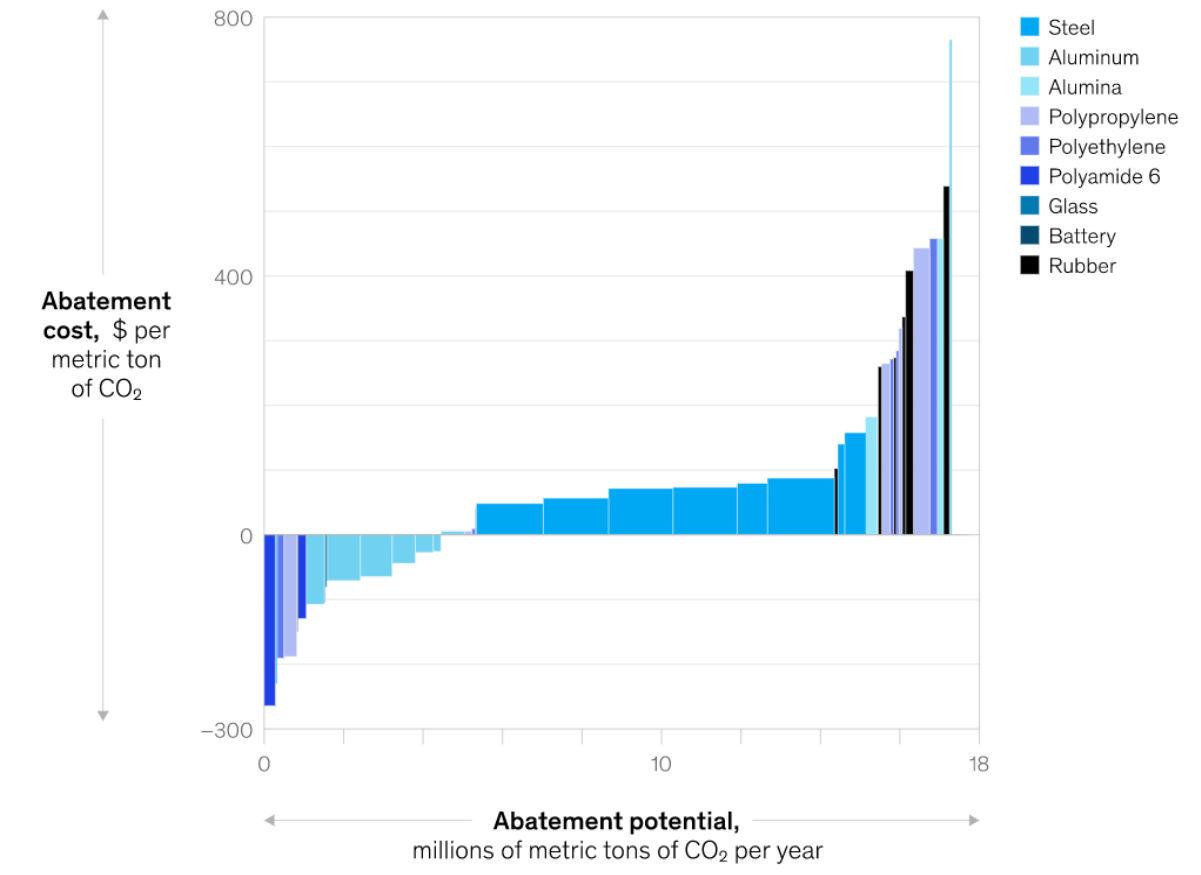
Box 3.4. The cost of net-zero transition and the competitiveness challenge

The industry sector typically has an objective to create and maintain profits since the majority of the industry actors are private entities. Global trade requires being resilient to risks and ensuring competitive production costs. Thus, right incentives are needed to steer investment decisions towards deploying low-carbon technologies.

Potentially higher costs of low-carbon technologies raise concerns of competitiveness. This applies both to the costs of production with the existing production process and when a new investment decision is made. Available analysis suggests that for each tonne of CO_2 avoided, the additional cost to the industry could go up by several hundred dollars. For instance, a near zero-emission route enabled via renewable hydrogen-based iron production could raise production costs by more than 10%, and this difference could be much higher depending on the local conditions (Gielen et al., 2020[53]). Similarly, a full technology portfolio to decarbonise the chemical industry could cost from a few dollars to as high as USD 500 per tonne of mitigated CO_2 until 2050, which prevents profit-making entities from investing (Saygin and Gielen, 2021[54]). An example marginal abatement cost curve provides the range of costs for different industry sectors (see Figure 3.9). For the production of different types of bulk materials, low-CO_2 production routes would increase today's costs of production from as low as 20% to as high as more than 100% (Material Economics, 2019[55]). This compares with the impact of today's carbon prices in the EU's emission trading scheme. Based on the current production costs of cement that range between EUR 46 and 58 per tonne, at a clinker to cement ratio of 74% and average emissions of 600 kilogram CO_2 per tonne of cement, the carbon price of EUR 90 per tonne CO_2, close to the levels seen in the EU Emissions Trading System in the first half of 2022, would increase production costs by up to 15% (Cembureau, 2021[56]). Ten years ago, the price in the EU Emission Trading System was 15 times less at only around EUR 9 per tonne. Therefore, more expensive technologies, such as green hydrogen, may require new business and financing models to overcome investment barriers whereas existing regulations and business models may suffice for other low-carbon technologies such as energy efficiency and demand-side measures.

In order to maintain the business' competitiveness, the net-zero transition needs to be supported with new types of business models and financing mechanisms. Industry sectors' openness to change and transition dynamism differ; while some sectors sought to retain existing practices for many years, others focused on sustainability and adopted new technologies and business models for manufacturing new products from renewable or recycled feedstocks. Another question is how to address the impact throughout the value chain since industry's net-zero transition costs are expected to accumulate in the final products that are at the end of the supply chains whilst the profit margins tend to be higher downstream in value chains.

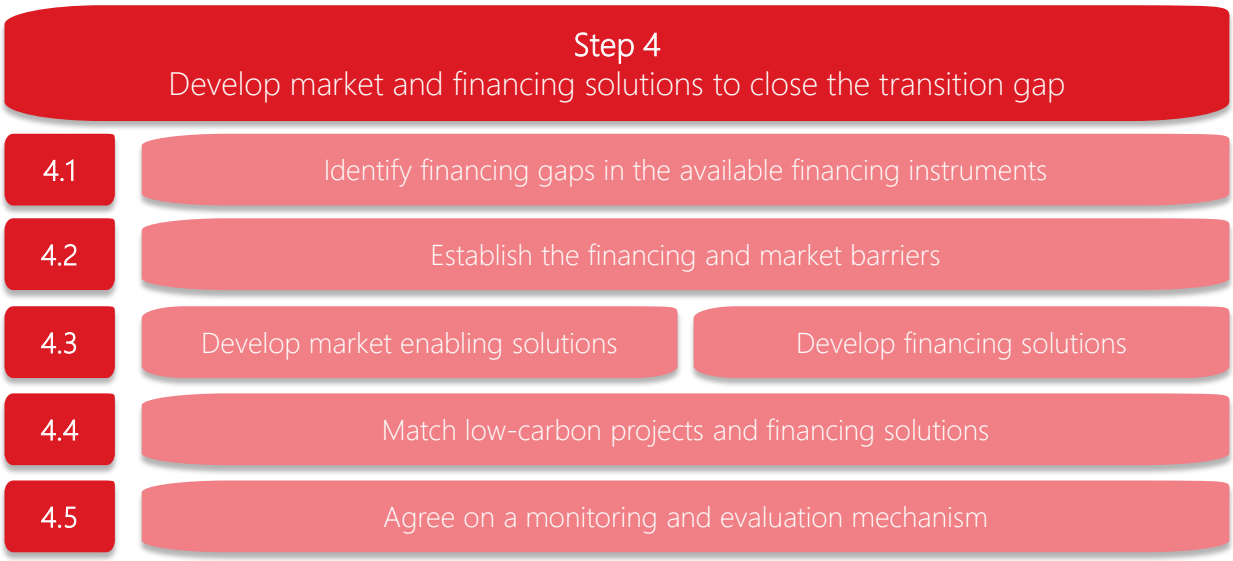
Figure 3.9. Example of a marginal cost abatement curve for selected industry sub-sectors



Source: (McKinsey, 2021[57]).

Note: In many countries, state-owned enterprises remain key players, especially in markets where there are high entry barriers and externalities. These entities may favour other dimensions (such as providing services of general interest) over profit maximisation (Thi Minh Phi et al., 2019[58]) (Keating, 2022[59]) (Gielen, Thioye and Boshell, 2021[60]).

Step 4: Develop market and financing solutions to close the transition gap



Rationale

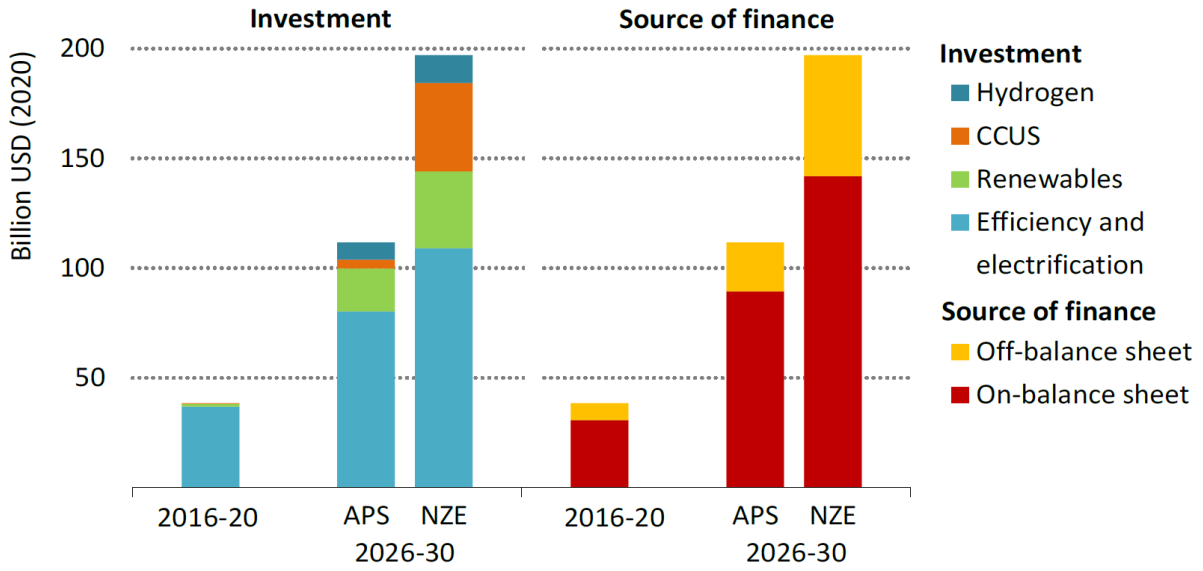
While policy change generally refers to incremental change in existing polices or the design of additional policies, policy reform refers to major changes in the existing policy framework (Cerna, 2013[61]). Depending on the characteristics and needs of the net-zero transition gap, new policy solutions may range from addressing incremental changes to fundamental policy reforms to align with the radical differences of a net-zero industry. Irrespective of the policy change spectrum, the solutions should help to overcome specific barriers and be applicable for the long term instead of settling on issues for a limited time. Fulfilling both conditions is essential since this Step attempts to answer how to get the transition right.

Today, a major share of the energy transition investments is attributed to the power and transport sectors and they dwarf investments in technologies that pertain to industry's net-zero transition (BloombergNEF, 2022[62]). It is necessary to understand how investment decisions are made in the manufacturing industry, which market factors play a prominent role in the decision-making process, and how they are currently being financed. The investment challenge of the global industry transition is shown in Figure 3.10. Globally, on average less than USD 50 billion per year was invested between 2016 and 2020 with much of the financing done through balance sheet financing. Annual average investments need to increase by a factor of five by 2030. Additionally, investments need to significantly expand beyond energy efficiency to cover breakthrough technologies such as green hydrogen and CCUS that are only at early stages of commercialisation and deployment. Industry experience shows that current transaction sizes of these technologies are small. This makes it challenging for banks and non-bank finance institutions to provide project finance to these investments.

Breakthrough technologies will require new forms of financing and approaches. Public funds can help with project development and to increase the technology readiness levels of the breakthrough technologies. It will be important to identify the cases where investment would not be possible without government intervention to ensure limited public funds are spent in the most effective way. Blended finance, viability gap funding for first movers and pilot projects and other innovative financing instruments can increase the share of financing made available by development finance institutions, which are essential for emerging and developing economies where production of materials is growing rapidly. Financing for infrastructure investments will need to be planned for. Some of this infrastructure can be shared with multiple industry

sub-sectors and other energy sectors, thus the risks and burden can be shared. Industry clusters and regions can provide a sound environment to test such models.

Figure 3.10. Average annual clean energy investment in industry by type and source, 2016-2020, and by scenario, 2026-2030

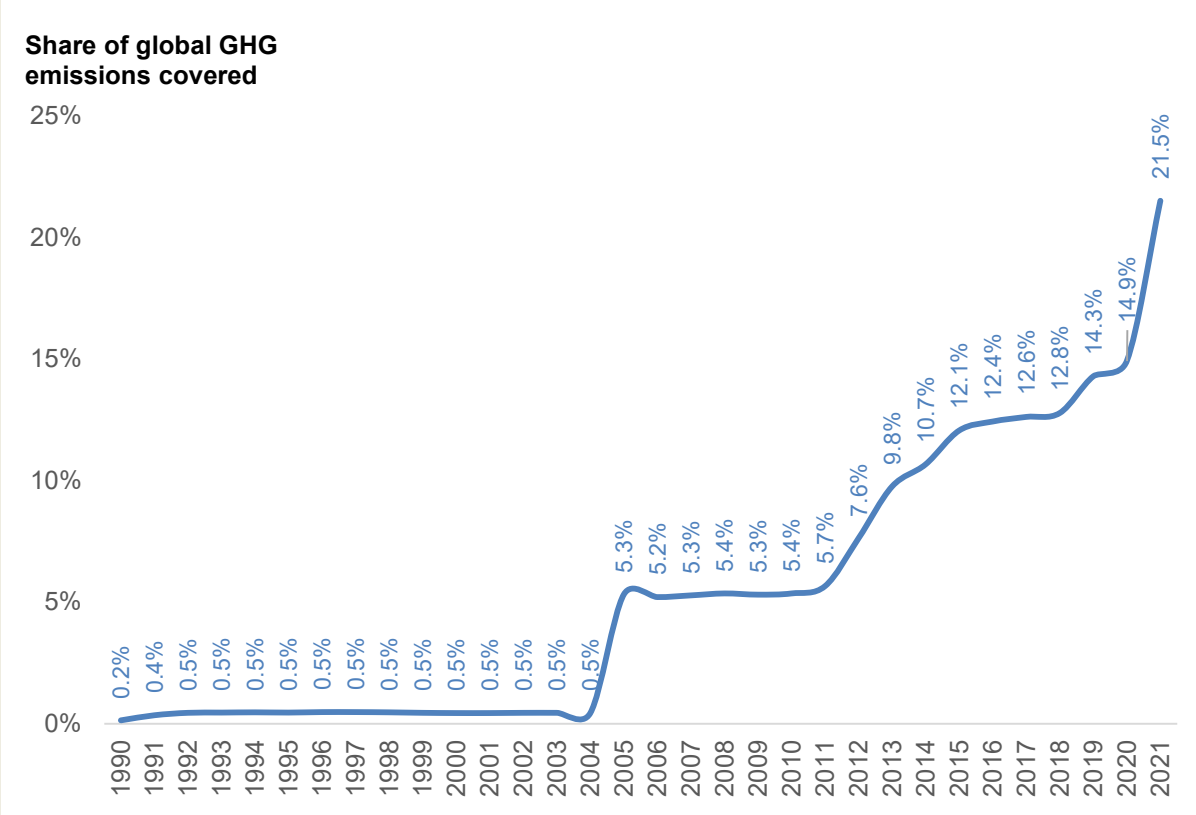


Note: APS: Announced Pledges Scenario; NZE: Net Zero Emissions by 2050 Scenario.
Source: (IEA, 2021[48]).

Box 3.5. The role of carbon markets for transition – an example of market-based solution

Traditional stand-alone market solutions and regulations may be insufficient to enable a full transition of the industry sector. This highlights the importance of introducing solutions and instruments to foster early action from the industry for a transition to low-carbon technologies. Today, carbon pricing and other initiatives cover more than one-fifth of the total GHG emissions worldwide (see Figure 3.11), predominantly focusing on electricity generation and only to some extent on industrial emissions (The World Bank, 2021[63]). As climate policies expand, they will increase the energy costs of polluting manufacturers in more sectors. Industries in climate-ambitious countries could thereby become less competitive compared to industries in regions with less ambitious climate policies. Domestic subsidies and other advantages offered to traditional fossil fuels also curb the transition. Their impact is especially strong in sectors that will continue to use fossil fuels and where energy costs account for a large share of the total production costs, such as ammonia, cement, steel, and aluminium production.

Figure 3.11. Share of annual global greenhouse gas emissions covered by emissions trading schemes or carbon pricing mechanisms, 1990-2021



Source: Based on (The World Bank, 2021[63]), status: 1 April 2021.

Approach

The outputs of Step 2 and Step 3 will serve as starting points for Step 4. In view of today's financing practices, available financing instruments for low-carbon technology investment in the Focus Area will be initially identified. These instruments could already be used by the manufacturing industry for the purpose of a net-zero transition or for financing other types of industry and/or energy sector investments. Subsequently, the gaps and barriers in financing low-carbon technology investments and the available financing instruments to supply the investment needs will be identified. Attention will be paid to issues around capital markets and how capital (stocks, bonds, etc.) is raised in different countries (Step 4.1). This assessment will be repeated to verify the issues and barriers in the enabling conditions and market factors that limit low-carbon technology investments for closing the net-zero transition gap (Step 4.2).

Narrowing down the broader assessment undertaken in Step 2 about the critical issues and barriers in enabling conditions and financing situation will be essential to develop actionable and appropriate solutions for the Focus Area, in particular because these areas touch upon a wide range of topics. Ahead of identifying solutions, the needs in policy landscape, infrastructure and other factors to create the required enabling conditions for investments in low-carbon technologies will be identified. Additionally total financing that should be mobilised as well as the sources/origins (e.g. multilateral financing, climate funds, commercial banks) of financing will be assessed. Insights will be collected about the available sources of capital in a country, whether domestic or international.

Initially, solutions will be developed to improve a selection of enabling conditions that are most critical to the investment decisions. These solutions will aim to close the net-zero transition gap and may range from policies and country strategies and could address a number of issues such as how to reduce the impact of net-zero transition on operational costs of companies, the creation of carbon markets to increase the level playing field of low-carbon technologies, increase technology availability through local deployment or technology transfer and deployment and supply of infrastructure needs.

While market solutions should make a major effort in closing the transition gap, for certain sectors and technologies they will be sufficient. Thus, in parallel to the financing solutions, financing instruments (e.g. balance sheet financing, project finance, grants for low technology readiness level low-carbon technologies) will be identified that can put the industry on a path aligned with net zero. Morevover, there will be a need to highlight risk mitigation measures. The financing solutions will be prepared in the form of a matrix by distinguishing the role of development finance, the role of sustainable/climate finance (e.g. sustainability-linked products, green bonds), the role of specific finance products (e.g. corporate loan, equity, mezzanine) and other innovative instruments such as blended finance. Solutions will differ based on the country context and the type and size of the selected industry sub-sectors. If relevant, financing solutions will distinguish between the commercialisation and deployment levels of the required low-carbon technologies. Co-operation for technology transfer will be crucial but financing solutions will need to put special emphasis to competition issues when considering how to bring technologies to emerging and developing economies.

Both the market and financing solutions will be matched against the specific barriers that limit the development of low-carbon technologies. Design of tangible and actionable solutions that address the priority and specific barriers to industry's net-zero transition will increase their chance of implementation. To facilitate this, guidance of the Steering Committee and the consultations within the Framework stakeholder group will be crucial to lead action and commitment of the industry. Where relevant, external expert inputs to enhance the design of solutions will be sought. Considerations will be given to testing the implementation of the proposed solutions before they are finalised. Additionally, training options for their implementation will be made available to stakeholders. Solutions will be accompanied with a guidance document to help stakeholders with their implementation. Most of the industry sub-sectors are exposed to international trade, thus country specific solutions will also be put into perspective to understand how they can ensure a level playing field internationally (Step 4.3).

The developed solutions will be matched with a pipeline of low-carbon projects that can be implemented in the next five to 10 years in closing the net-zero transition gap. These projects may cover different needs, for instance deploying a certain number of motor drives or a certain number of new low-carbon steel plants. They will include both commercial projects as well as large-scale demonstration and pilot projects. The objective of the development of a pipeline of projects is to demonstrate the availability of realisable investment examples for closing the net-zero transition gap and a way forward is provided to the stakeholders for the implementation of the market and financing solutions. The projects will be selected based on several criteria including for instance higher capital intensity, need for government co-ordination, impact on emissions reductions, lower technology maturity, and risk categories etc. (Step 4.4).

A separate mechanism will be developed to monitor and evaluate the implementation of the Framework. Based on the implementation learnings and evaluation outcomes, feedback will be provided to the individual Steps for a more effective implementation in future cycles and in other countries. The mechanism will be country specific given the potential differences in the Framework Focus and the country priorities (Step 4.5).

Outputs

1. A specific strategy to enable stakeholder consultations within and beyond the Framework stakeholder group in identifying the critical issues and barriers and developing solutions

2. A slide deck that provides:
    a. A consolidated list of specific critical issues and barriers to financing and investments to low-carbon technologies relevant to the Focus Area
    b. Financing origins and sources to close the financing gap of the net-zero path
    c. Market and financing solutions to close the net-zero transition gap which are matched with the specific barriers they can overcome
    d. A pipeline of low-carbon projects towards realising the net-zero path
3. A brief document that accompanies the solutions to guide how stakeholders can implement them supported with use cases
4. Policy briefs that summarise the Framework implementation outcomes to help Framework stakeholder groups in identifying the priority action areas
5. A brief document that describes the scope and the pillars of a country-specific monitoring and evaluation mechanism and how it can be implemented in the country

Enablers and risks

It is crucial to ensure that the solutions are tangible and actionable by the Framework stakeholder group. To ensure this, solutions must be gaged against the stakeholder's interests and needs. Narrowing the broad list of critical issues and barriers to the Focus Area and verifying their current viability in the industry sector will help. Arriving at a pipeline of low-carbon projects will be essential to make the link between solutions and where and how they can be implemented. A strategy for implementing the solutions could facilitate. Additionally, engagement and close collaboration with stakeholders will be needed in the design of market and financing solutions that provide ways to overcome these barriers. Typically, finance institutions consider availability of quality data and reporting standards as a major barrier to financing, thus it will be important that financing solutions address these issues.

Milestones

1. clear understanding of the critical issues and barriers that pertain to low-carbon technology investments in the Focus Area
2. development of a brief document to guide implementation of solutions
3. implementation of the monitoring and evaluation mechanism.

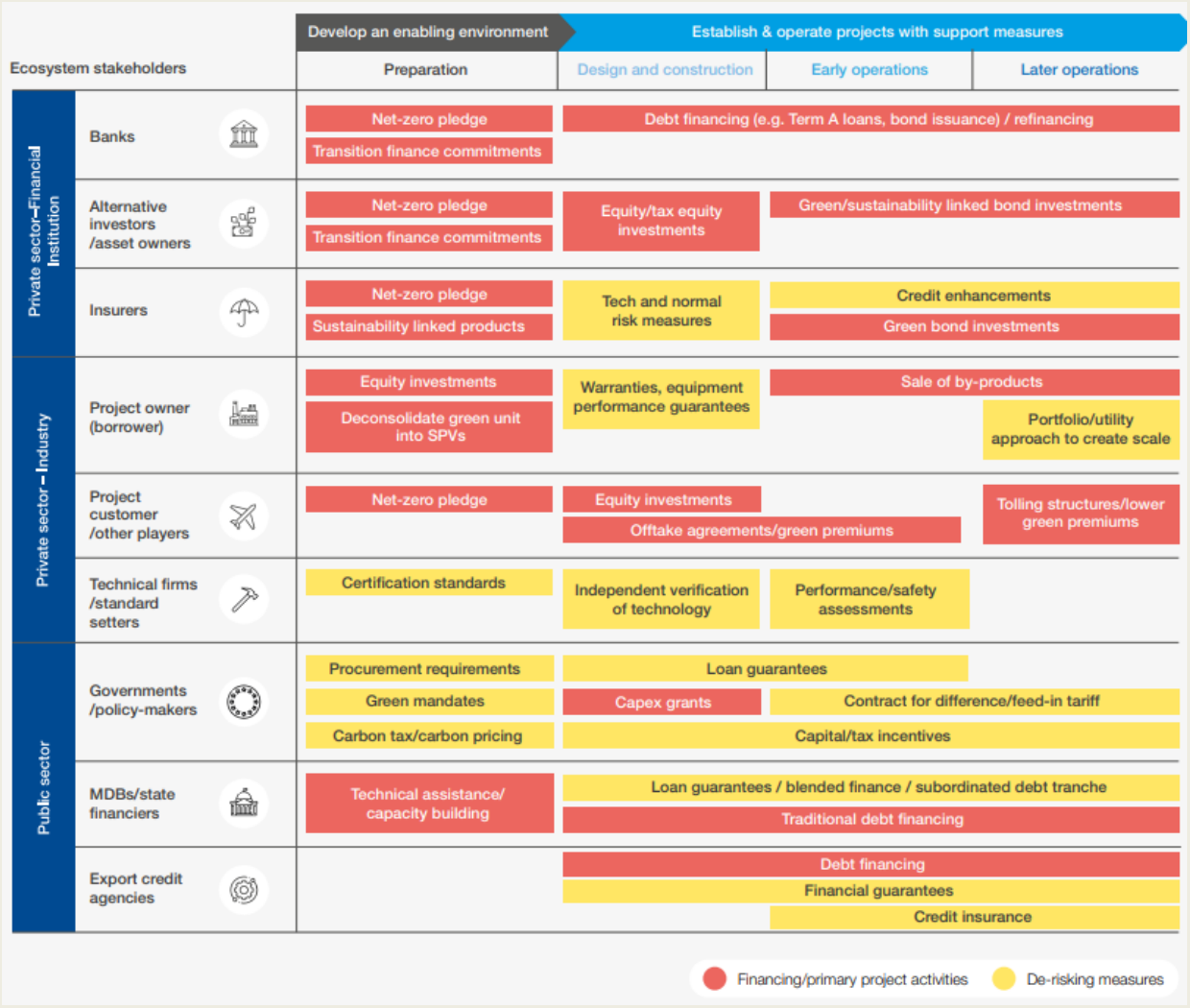
Box 3.6. Financing solutions for net-zero industry transition

Industry owners, investors, banks and other project developers are deeply involved in the process of developing production facilities that can produce at lower costs. This is more pronounced especially for companies that are under shareholder pressure to optimise costs to increase profits. Environment, social and governance (ESG) standards are now emerging and help raise awareness among company owners and investors of the importance of sustainability. It should help to increase the number of investments for mitigating the industry sector's emissions.

Different finance institutions offer different possibilities to contribute to the industry's transition. Public funding can address initial project risks, while the financing contribution from commercial banks that have limited leeway to finance high risk projects can increase for more mature low-carbon projects. With the right financing instruments and improved enabling conditions (see Figure 3.12), industry sub-sectors can invest and build back in ways that better position their business models and workers for decarbonising their activities. So far, only limited climate and public financing was provided to transform the industry with low-carbon technologies (Warren, 2020[64]). Finance institutions are expanding their scope, but this requires time and new sources of funding. Governments can play a certain role to provide additional funding support for crucial technologies. Nevertheless, the main challenge will be to develop new financing that understands the technology and applications in practice. Various smart and flexible financing solutions and new business models are emerging which can enable this transition such as blended finance and financing facilities. For small-scale investments such as energy efficiency improvements through management or optimisation, financing agreements based on leasing structures are available. These agreements can be adjusted to the company's cash-flow needs and do not cause significant burden on operational costs. Similarly, energy as a service type business models are also emerging for larger-scale investments. These models bring easy returns for achieving energy and emission reductions by utilising the potential of feasible technology options. For instance, energy performance contract or energy savings insurance have an increased energy efficiency project implementation rate, even when such projects were not an investment priority for the businesses. It guarantees energy savings, and therefore lower operational costs for customers and a reliable source of revenue to energy service companies. Financing structure is flexible, and the end-consumer does not necessarily support any upfront capital cost (IEA, 2018[65]).

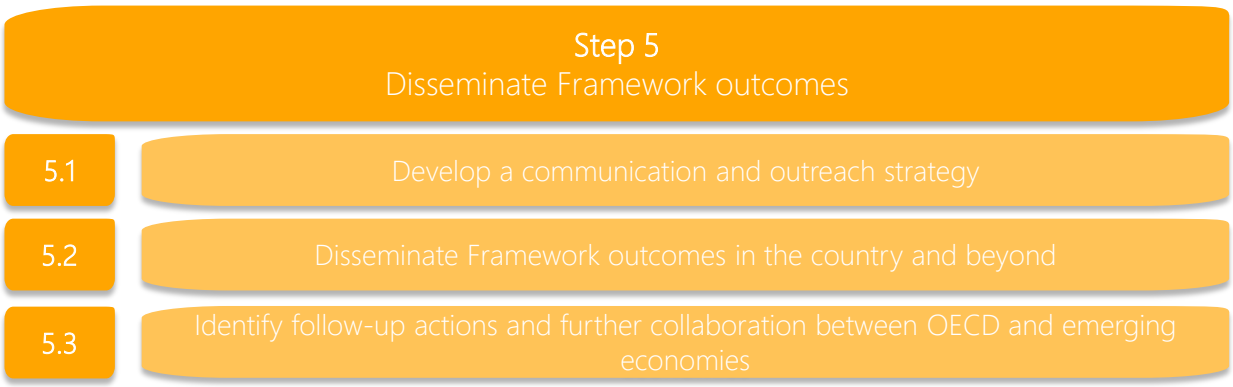
The development of financing solutions for more expensive and transformative technologies is more complex. These solutions will be needed to overcome the challenge of gradually reducing the risk of new and expensive technologies against the stranded asset risk of the existing conventional technology. Long-term debt in local currency at low interest rates can be needed. Financing solutions will also need to be aligned with the available carbon policies since typically financial incentives for investing in new technologies are low whereas the risks for individual companies are high.

Figure 3.12. Matrix of financing solutions



Source: (World Economic Forum, 2021[66]).

Step 5: Disseminate Framework outcomes



Rationale

The Framework implementation outcomes will already add clear value to the various areas covered by the many ongoing industry's net-zero transition initiatives. Thus, it will be necessary to develop strategic communication tactics to identify the key messages and disseminate outcomes to diverse audiences.

Approach

Initially the Steering Committee, together with the Framework stakeholder group, will identify the key messages and help develop a sustained and targeted communication strategy to underpin the strength of the Framework outcomes. It would also leverage the learnings across countries and create a best practice compendium of technologies and solutions that can be tailored to local circumstances in further cycles of implementation. This will benefit from the Framework's flexibility and the OECD's international dialogue strength capable of comparing different approaches and benchmarking the viability and impacts of the solutions selected by the countries. The transition to a net-zero emissions industry is a dynamic look across different sectors, countries and technical and commercial viability (Step 5.1).

Based on this communication strategy, during and after the framework implementation, interim and final outputs will be disseminated at country, regional and sector level dialogues and engagement will be created with international initiatives, sectoral association and groups that work on industry transition. Best practices that emerge from the framework implementation will be shared in these international platforms and with other countries (Step 5.2).

After the Framework implementation, further actions in the country can be developed with the support of the OECD. This can include trainings, events, reports or platform creation addressing significant information issues that the market faces, or facilitating broader and deeper exchanges between policy makers, industry and finance institutions (Step 5.3).

Outputs

1. Development of a communication and outreach strategy
2. Dissemination activities in the country and beyond
3. Engagement activities with the stakeholders to identify follow-up activities for expanding collaboration between the OECD and the governments on industry transition

Enablers and risks

Continued stakeholder engagement to go beyond the Framework implementation will be needed to identify the relevant policy areas the Framework outcomes can contribute to in countries. To ensure continued interest to the Framework, a strong buy-in of the stakeholders need to be ensured.

Milestones

1. Identification of key messages
2. Development of policy briefs, use cases and communication materials

4 Contribution of the Framework to the broader policy dialogue

This chapter assesses how the Framework can contribute to the broader policy dialogue. It highlights the potential role of the Framework as an enabler for international dialogue on the economy-wide implications of the industry's net-zero transition and on climate finance development, once the Framework implementation is complete. This chapter also examines how the Framework can help to link the design of national policies with the regional and global integration of the manufacturing industry.

Importance of international dialogue after the Framework implementation

The Framework outcomes will yield important insights for the policy making process in the fields of energy, climate and financing which will be determined by the national circumstances and priorities of the industry sector. To support a better understanding of where the Framework can help new policies, through the ongoing dialogue with the Steering Committee and Framework stakeholder group, the benefits and risks of industry net-zero transition and its economy-wide implications, on climate finance and infrastructure will be identified once the Framework implementation is complete.

These are elaborated below along with the potential role of the Framework as an enabler for international co-operation. Indeed, while the Framework will be implemented at the national level to develop market and financing solutions in creating an investment environment and market for low-carbon technology deployment and development, the outcomes could help in developing new modalities of international co-operation for industry's net-zero transition. This is especially true for the manufacturing industry where its activities go beyond national borders where most sectors are exposed to international activity in both raw material supply and trade of final products. Thus, the country-specific solutions will be discussed with the perspective of how they can strengthen industry's net-zero transition at the regional and international level.

Contribution to national energy and climate policies

The Framework outcomes on the transition gap and how low-carbon technologies can be closed could provide clear inputs to countries' energy transition and climate change policies and guide them to enhance industry growth strategies towards net-zero transition. While the objective of the Framework will not be to carry out a technology analysis, it will highlight and specify the low-carbon technologies and approaches that may be needed to transition a specific industry sub-sector or energy use area. This will provide critical inputs for both energy policies and inform investors, plant owners and operators about the role of bankable technologies provided that the right market policies and financing conditions are present. Additionally, the Framework implementation outcomes can contribute to increase the ambitions of NDCs which are better aligned with the Paris Agreement.

Transition goes beyond technology solutions and it involves changes in the society and the economy. Thus new national policies and strategies must embrace the non-energy *or* co-benefits of industry transition needed to address in designing net-zero emission policies. These strategies include job creation, new economic activity, indirect impacts on the business operations, product quality as well as other impacts such as spillover benefits to other industry sub-sectors.

There could also be potential risks that are technology specific (e.g. feedstock availability for continuous supply of biomass-based process heat), which concern the related infrastructure (e.g. lack of availability of infrastructure for CO_2 logistics), and which could impact competitiveness, trade and just transition dimensions of transition. These areas need a better understanding since net-zero transition will require the deployment of unforeseen measures that go beyond the scope of this Framework. For instance, just transition policies will need to be specifically designed for industry based on how and to which extent fossil fuel use can be phased out for industrial production processes and what type of transition finance may be needed in the coming decades. The Ministry of Economy, Trade and Industry of Japan has released in 2021 sectoral technology roadmaps formulated for transition finance in the Iron and Steel and Chemical sectors (METI, 2021[67]; METI, 2021[68]). From a general planning perspective, equally important will be the system-wide implications of industry transition on the economy and the rest of the energy system. These policy discussions will benefit from the Framework as the business case of low-carbon technologies are assessed along with their benefits and risks.

Outcomes will inform the growing efforts of countries in creating carbon markets. Large companies that are measuring Scope 3 emissions (all indirect emission in the value chain besides those stemming from electricity and heat supply and including upstream and downstream emissions) can also benefit from the Framework outcomes to understand the opportunities for emissions and cost reductions that lie outside their operations.

Box 4.1. Private sector initiatives to develop Sustainability-Linked Finance Framework

There is a growing number of manufacturing companies that are taking independent initiatives to embrace the sustainability principles in their activities (see examples in Table 4.1). Most of the available frameworks led by the manufacturing companies refer to the International Capital Markets Association (ICMA) Green Bond Principles or Sustainability-Linked Bond principles. This includes among other things the allocation of proceeds to the eligible green projects/activities. Some frameworks also abide by the Sustainability Linked Loan Principles issued by the Loan Market Association and the Loan Syndications and Trading Association. Second party opinions prepared by consulting firms (Sustainalytics, Vigeo Eiris or ISS Corporate Solutions) are sometimes available. Many companies have ESG criteria, sustainable development criteria, CO_2 emission reduction targets, but no financing framework. Carbon Disclosure Project (CDP) provides the most complete assessment. Financial actors have also formed networks to promote sustainable and transition finance, both in the public and private sectors. For example, the Glasgow Financial Alliance for Net Zero (GFANZ) was launched in April 2021 in partnership with the COP26 Presidency. It brings together existing and new net-zero finance initiatives such as the Net-Zero Banking Alliance, the Net-Zero Asset Managers initiative and the Net-Zero Asset Owner Alliance.

Table 4.1. Examples of private sector initiatives to develop sustainability-linked finance frameworks

Actor	Industry	Type	Date	Comments
CEMEX	Cement	SLFF	Aug. 2021	Covers sustainability-linked components in public bonds, private placements, loans, derivatives, working capital solutions and other financing instruments, linked with CO_2 emissions, clean power use, and alternative fuels) and 3 quantitative Sustainability Performance Targets.
Faurecia	Automotive	SLFF	Oct. 2021	Designed as an umbrella platform allowing the company to issue sustainability-linked financing instruments with a focus on GHG Scopes 1 and 2 and "controllable Scope 3".
SSAB	Steel	SLFF	May 2021	Displays the material aspects identified for the company with a focus on GHG emission reduction (SBTi Verified), and a timeline to achieve the sustainability performance targets (SPT) is provided and covers securities, including but not limited to bonds with a sustainability-linkage.
Mitsubishi Heavy Industries	Manufacturing	GBF	May 2020	Focus on the proceeds of the green bond. They will be allocated towards new or existing eligible businesses and/or projects, i.e. Hydrogen, Geothermal power, investment in businesses generating at least 90% of their sales from clean energy-related business.
Hyundai Heavy Industries	Manufacturing	GFF	Apr. 2020	Include bonds, loans and other debt or financing structures tailored to contribute to sustainable development and eligibility criteria associated with sustainability objectives and SDGs.
Constellium	Aluminium	SLFF	Feb. 2021	Selection of key performance indicators, calibration of SPTs, sustainability-linked securities characteristics, reporting and verification with a focus on GHG emissions intensity reduction and increased recycled aluminium input.
BASF	Chemicals	GFF	May 2020	Include bonds, loans, promissory notes and any other green finance instruments, to finance and/or refinance sustainable products or projects with eligibility for (i) eco-efficient and/or circular economy adapted products, production technologies and processes or (ii) renewable energy linked to SDG and EU Environmental Objectives as per the taxonomy regulation proposal.
Braskem Idesa	Ethylene	SLFF	Oct. 2021	Focus on the reduction of absolute GHG emissions with clear targets, pipeline, and an indicative list of projects with instruments to result in a coupon adjustment; the proceeds are intended to be used for general purposes.

Note: GBF: Green Bond Framework; GFF: Green Financing Framework; SLFF: Sustainability-Linked Financing Framework.
Source: Companies' websites.

Contribution to national finance policy

The Framework implementation outcomes can yield important insights for the financing community as well. Thus, attention should be paid to requirements around alignment with taxonomies and other relevant

sustainable and green finance tools that will help to ensure the Framework outcomes are made in parallel to the discussions in various countries on how and to which extent sustainable/green finance uses taxonomies to determine the sustainability of underlying investments and alignment with net-zero emissions targets. The outcomes can provide crucial inputs in the development of metrics and indicators to advance on sustainable finance efforts for industry's net-zero transition, potentially assisting banks to support clients in financing transactions.

As will also be reflected in the OECD's forthcoming "Guidance on Transition Finance", notably the debate on transition finance can benefit from the Framework outcomes as this field is of particular relevance for emission-intensive sectors like manufacturing whilst ensuring the development finance flows are consistent with net-zero pathways and climate-resilient development. In order to increase comparability for global investors, an area of particular importance is to minimise divergences and close definition gaps on transition finance in the emission-intensive industry sectors since transition finance is typically intended for emissions-intensive activities which are important for social and economic development and for cases when there are no or few viable low-carbon substitutes. Additionally, some countries have started preparing industry low-carbon technology roadmaps that are aligned with their own definitions of transition finance. When donor countries provide finance to countries, there may be issues around seeking comparability between their own and others' transition finance strategies, which when limited could hamper international financing. In this sense, the Framework outcomes could also help in building knowledge and capacity in this growing field, particularly in countries that work on their sustainable finance taxonomies and related tools.

The role of the Framework in facilitating international co-operation for transition at scale

While the Framework will be implemented at the national level to develop market and financing solutions in creating an investment environment and market for low-carbon technology deployment and development, the outcomes could help in developing new modalities of international co-operation for industry's net-zero transition. This is especially true for the manufacturing industry where its activities go beyond national borders where most sectors are exposed to international raw material supply and trade of final products. Thus, the country-specific solutions will be discussed in terms of how they can strengthen the industry's net-zero transition at the regional and international level. Countries' climate policies will impact technology choices in other countries as expected when more countries and regions implement carbon border adjustment mechanisms. Net-zero transition in one country will have consequences in another as low-carbon technologies prove their competitiveness, altering market shares in material production and supply. By supporting emissions-intensive industries to transition towards low-carbon pathways in various countries, the Framework could contribute to support a level playing field in global trade. International co-operation will be vital to advance the transition and deployment of solutions. Co-operation may take different forms from technical assistance and capacity building to development finance and simply the exchange of best practices. It will also include possible ways of creating markets for green industrial products through green procurement programmes and technology transfer. This will require the development of international product standards, guidelines and definitions which are already common across many internationally traded goods. However, their importance will be further pronounced as low-carbon products gain a higher market share. In their development, internationally acknowledged new carbon and emission accounting methodologies and reporting protocols will be needed that also address the new product supply chains. The Framework outcomes will highlight the areas where priority must be placed and impacts could be the highest. This will also provide inputs to the discussions between countries and the OECD to identify future areas of collaboration in assisting countries to achieve their net-zero targets.

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Notes

[1] In this Framework, “low-carbon technology” refers to all technologies that offer a lower or near-zero emission solution to traditional production processes that emit CO_2. While during the implementation of the Framework carbon stored in some materials such as steel, methanol and plastics will be accounted for, the development of specific solutions to reduce these will depend on the country interests.

[2] In this Framework, “enabling conditions” refer to the conditions that enhance the feasibility of investing in low-carbon technologies for industry decarbonisation. They include topics such as technological innovation, strengthening policy instruments and institutional capacity.

[3] As of June 2022, seven countries participate in the CEFIM programme: Colombia, Egypt, India, Indonesia, the Philippines, Thailand and Viet Nam.

[4] As defined by the Greenhouse Gas Protocol (https://ghgprotocol.org/).

[5] In this dataset, low-carbon investments that are linked to ambitious climate targets in line with the goals of the Paris Agreement are covered. Only ambitious investments targets with a clear and transparent commitment plan are covered whereas incremental improvements and process optimisation in current steel mills are excluded if they do not enable deep emission reductions.

Framework for industry's net-zero transition

The manufacturing industry is a major source of global carbon dioxide emissions. Industrial production will continue to shift to emerging and developing economies. New investments are needed in low-carbon technologies to align industry's growth with countries' net-zero emission targets. In order to reduce the risks associated with the high cost and low maturity of the many needed low-carbon technologies, scaling up finance from both public and private financial sources will be crucial. OECD's new "Framework for industry's net-zero transition" is a step-by-step approach to assist emerging and developing economies in designing solutions for financing and to improve the enabling conditions that can accelerate industry's transition. Outcomes of the Framework implementation in emerging and developing economies will contribute to the broader climate and finance policies and it can help to facilitate international co-operation for transition at scale.

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