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Harnessing trade and environmental policies to accelerate the green transition

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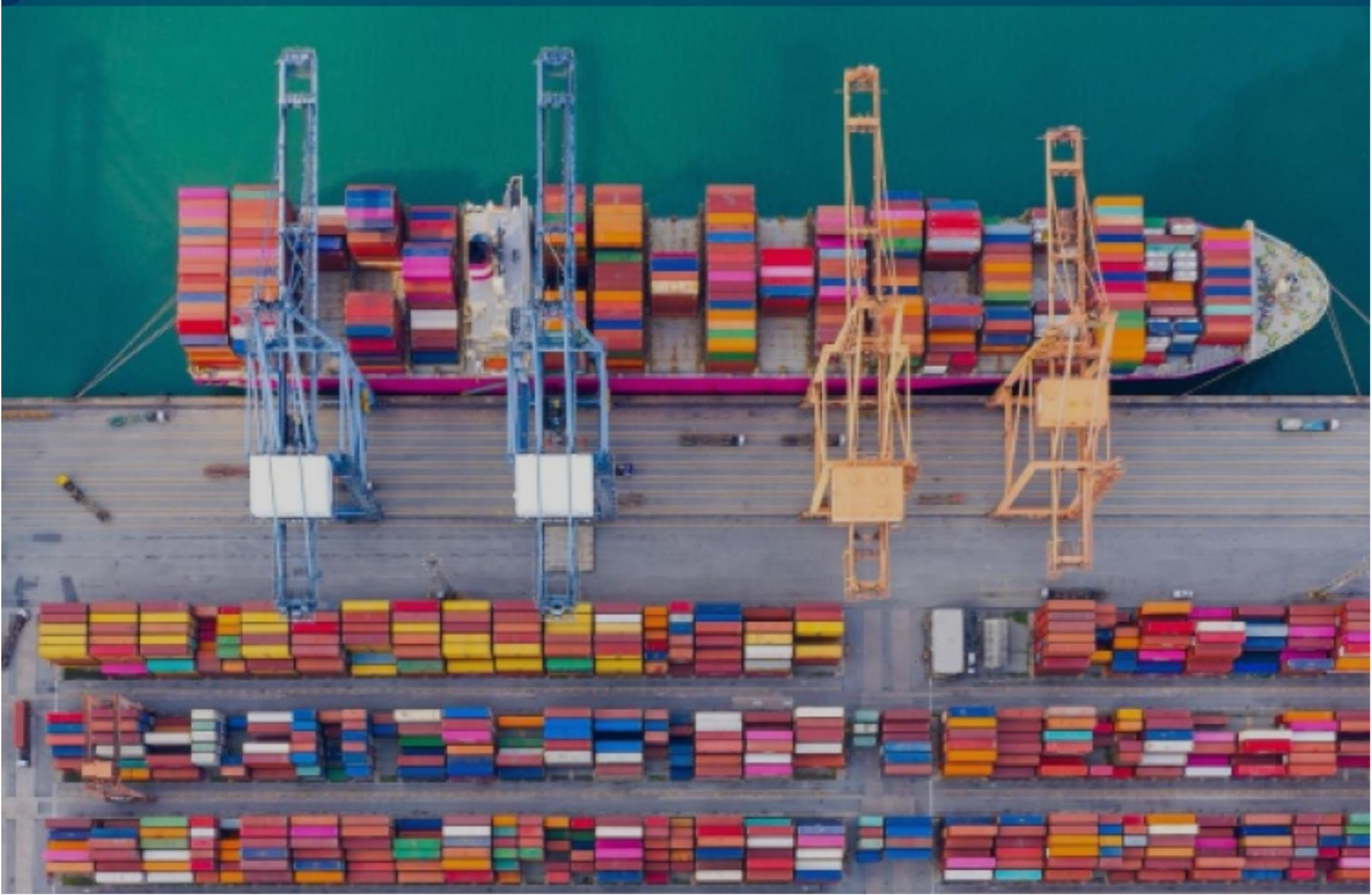

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Executive summary

This report has been prepared as a background document for the jointly held OECD Green Growth and Sustainable Development Forum and OECD Global Forum on Trade on “The role of international trade and investment for the green transition”, which is taking place on 10-11 October at the OECD headquarters in Paris.

This report explores the complex interplay between trade and environmental policies and discusses how these policies can be harnessed to address the "triple planetary crisis" of climate change, biodiversity loss, and pollution. The transboundary nature of this crisis requires integrated and internationally coordinated policy responses. Carefully designed policies can leverage synergies and mitigate challenges, for example by:

- Diffusing environmental technologies embedded in goods and services: Promoting the trade of environmental goods and services (EGS) is key for the transition to a low-carbon economy. However, challenges remain in defining and classifying EGS, which hampers negotiations and trade liberalization.
- Enabling the energy transition through access to critical raw materials: Critical raw materials (CRMs) are essential for the transformation of the energy sector to renewable sources. As the extraction and processing of these materials are concentrated in a few countries, international co-operation is necessary to ensure stable supplies.
- Transitioning to a circular economy: Trade plays a crucial role in supporting circular supply chains, but regulatory barriers and fragmented policies can hinder progress. International co-operation is essential to align trade and circular economy objectives.
- Creating more sustainable and resilient food systems: Trade policies can support sustainable agriculture by encouraging the adoption of environmentally friendly practices, while reforming agricultural subsidies that are most harmful for the environment.
- Forging solutions to the triple environmental crisis through Preferential Trade Agreements (PTAs): PTAs are increasingly used as complementary mechanisms to the multilateral trading system to pursue detailed environmental co-operation between trading parties.

Given the cross-border dimension of many environmental issues, there is a growing connection between trade and environmental policies, which have an increasing influence on one another. While this development demonstrates that governments are taking action, it also raises new challenges, including:

- Spillover effects: Differences in the ambition of environmental policies across countries can lead to unintended spillovers, such as carbon leakage and the concentration of polluting industries in regions with lax regulations.
- An increasingly complex regulatory landscape: The proliferation of trade-related environmental policies (TrEPs) – i.e. environmental policies with potential trade effects, for example because they put requirements on foreign producers that want to sell on the domestic market – without coordination increases compliance costs, creates a fragmented regulatory environment and risks further marginalizing low-income countries and small producers in global trade.

- Market-distorting and uncoordinated government support: Government support can distort markets if not carefully designed, leading to unfair competition and potentially undermining environmental goals.

These challenges can be addressed through enhanced international cooperation and coordination, which can be achieved through several key actions:

- Engaging in multilateral dialogue to harmonize or enhance interoperability of environmental standards and trade regulations to ensure that these policies are consistent and mutually supportive.
- Enhancing transparency and data sharing about trade policy measures, and in particular government support aimed at environmental objectives, to help build trust and facilitate co-operation among countries.
- Designing measures that take account of impacts on trading partners, are transparent and do not unnecessarily distort markets.
- Enhancing capacity-building and technical assistance to developing countries to enable them to meet global environmental standards and participate fully in the new trade opportunities from the green transition.
- Leveraging existing international frameworks – such as the WTO and trade and economic partnership agreements – as platforms for negotiating and implementing integrated policies that promote both trade and sustainability.

1. The cross-border dimension of the triple crisis of climate change, pollution and biodiversity loss

The triple crisis of climate change, pollution and biodiversity loss is essentially transboundary. Emissions in one country contribute to climate impacts in all countries, pollutants are carried across borders in the air and via rivers, and biodiversity is a global common good. These international environmental challenges are also linked to each other: pollution and climate change are two main drivers of loss in biodiversity; nature-based solutions can reduce greenhouse gas emissions, while also contributing to preserving biodiversity; some air pollutants act as climate warmers and others as coolants. Thus, climate change, pollution and biodiversity loss are increasingly recognised as a "triple crisis" of environmental challenges that requires an integrated and internationally coordinated policy response (OECD, Forthcoming[1]).

The complex relationship between trade and environmental issues defies a static interpretation – trade is not inherently good or bad for the environment, and the relationship can change over time. The linkages between trade and environmental policies are characterised by multiple channels and interactions, thereby creating opposing dynamics leading to varying net impacts across sectors and regions. The complexity of these linkages makes them prone to oversimplifications and misconceptions, hindering the design of coherent policies. On the one hand, production in biodiversity-rich countries to support consumption abroad has often been flagged as a driver of deforestation and biodiversity loss. In addition, transport of traded goods emits greenhouse gases and air pollutants. On the other hand, trade disseminates environmental technologies, enables economies of scale for the circular economy and contributes to resilience of economies faced with environmental impacts (e.g., from extreme weather events). Therefore, it will be critical to ensure that trade and environmental policies are mutually supportive and coherent..

Today, the interplay of trade and environmental policies is being revisited by policymakers to consider their complementarities. This represents an important shift from the conventional view, which often saw the intertwined objectives of raising environmental ambition and fostering prosperous trade relations as trade-offs. With political commitments to strengthen the synergies between environmental and trade policies being voiced in various policy fora, not least the World Trade Organization (WTO), the UN Framework Convention on Climate Change (UNFCCC), and Convention on Biodiversity (CBD) Conferences of Parties, there is a growing momentum to leverage trade for scaling up environmental action.

This report explores how trade and environmental policies can be mutually supportive to address the current triple planetary crisis of climate change, biodiversity loss, and pollution. By integrating trade and environmental considerations, countries can leverage synergies that generate economic prosperity while simultaneously enhancing environmental outcomes. For example, ambitious environmental policies can stimulate demand for clean technologies, which in turn expands international markets and trade. Equally, trade policies that facilitate access to these technologies can accelerate their global diffusion, thus contributing to a more sustainable global economy.

However, the nexus of trade and environmental policies presents several challenges. Diverging levels of ambition in environmental policies across countries can create spillover effects, such as carbon leakage, where emissions reductions in one country lead to increases in another. Additionally, the rapid increase in trade-related environmental policies (TrEPs) – i.e. environmental policies with potential trade effects, for example because they put requirements on foreign producers that want to sell on the domestic market – often implemented without coordination, adds complexity to the regulatory landscape, increasing compliance costs for businesses, notably in developing countries. Finally, existing trade rules on subsidies are the subject of ongoing debates raising numerous questions, from whether they fail to adequately address new forms of government support and subsidies that distort markets a to whether they should be reformed to allow greater flexibility to use subsidies aimed at environmental objectives.

To overcome these challenges, enhanced international coordination and cooperation should be pursued. Developing harmonized or interoperable standards and transparent approaches for environmental policies can reduce trade frictions and support a level playing field. The WTO and preferential trade agreements (PTAs)[1] offer frameworks for such collaboration, promoting mutual recognition of standards and the integration of environmental considerations into trade policies. Ultimately, cooperation is essential to ensure that trade policies support environmental sustainability and that environmental policies do not become barriers to trade.

This report has been prepared as a background document for the jointly held OECD Green Growth and Sustainable Development Forum and OECD Global Forum on Trade on "The role of international trade and investment for the green transition", which is taking place on 10-11 October at the OECD headquarters in Paris.

[1] The OECD has been using the term Preferential Trade Agreements (PTAs) and Regional Trade Agreements (RTAs) interchangeably, encompassing Bilateral Trade Agreements, Free Trade Agreements, Customs Unions, Economic Integration Agreements, and Economic Co-operation Agreements (OECD, 2007[89]).

2. Harnessing the nexus of trade and environmental policies to address the triple crisis.

Harnessing the nexus of trade and environmental policies should be part of the solution package to the triple crisis of climate change, biodiversity loss and pollution. Those policies should be underpinned by a rules-based multilateral trading system which can support the green transition. Here are some of the most important areas where synergies can be exploited.

2.1. Diffusing environmental technologies embedded in goods and services.

2.1.1. Identification of environmentally related goods

Pursuing improved identification of environmentally related goods is essential for facilitating their international trade. The development, adoption, and spread of technologies embedded in environmental goods (EGs) are crucial for transitioning to a low-carbon economy. Yet the lack of consensus on their definition and classification hampers negotiations on trade liberalization of EGs and complicates statistical measurement of trade flows.[2] A basic approach is to select goods the end-use of which directly serves an environmental purpose. However, many products have a dual use, meaning that they can serve an environmental purpose but also be part of polluting activities.[3] Additional limitations of this approach include the diverse environmental footprints that certain environmental goods and services (EGS) can have throughout their lifecycle. Moreover, some products might be classified as EGS merely because they are comparatively better for the environment than alternatives, even though they still have a considerable environmental impact.[4] Thus, efforts to refine the classification of environmental products and services are

[2] One definition is that Environmental goods and services are designed to reduce environmental risks, minimize pollution and resource use (OECD and Eurostat, 1999[84]). Several rounds of negotiations on environmental goods' (EGs) trade liberalization have taken place, starting with the Fourth WTO Ministerial Conference (MC4) in Doha, Qatar, in November 2001, with negotiations to create an Environmental Goods Agreement (EGA) collapsing in December 2016. The topic of trade liberalization in EGS has regained momentum in various forums like the WTO Trade and Environmental Sustainability Structured Discussions (TESSD).

[3] For instance, steam and vapour turbines are essential components for the production of geothermal energy. However, they can also be used for polluting activities such as production processes using coal. Moreover, steam electric power plants can discharge large volumes of wastewater, containing vast quantities of pollutants.

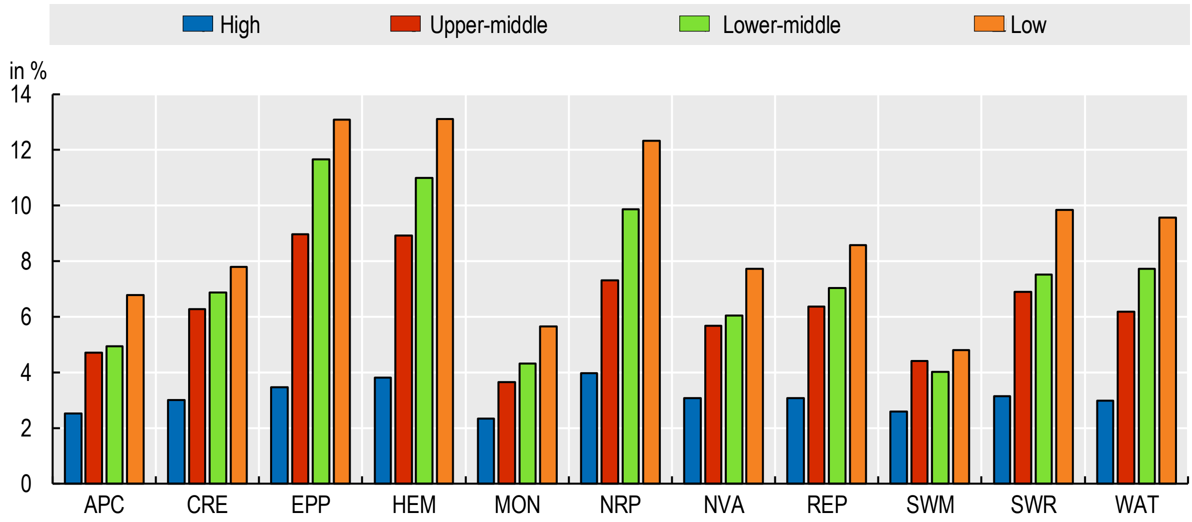
[4] To illustrate this, consider railway locomotives. While the electrification of rail supports clean energy compared to other alternatives, some of these locomotives still rely on fossil fuels, contributing to greenhouse gas emissions and air pollution.

needed. This has been the focus of recent Harmonized System (HS) classification discussions at the World Custom Organization (WCO).

2.1.2. Tariffs on environmental goods (EGs)

While tariffs are generally low for environmental goods (EGs), there is scope for further tariff liberalization, in particular in developing countries. Following several trade liberalization negotiation rounds and the increase in trade agreements over the years, tariffs have decreased substantially for all goods including EGs (WTO, 2022[2]). However, this trend appears to be predominantly observed in developed economies. Data using the Combined List on Environmental Goods (CLEG)[5] indicates that there remains significant potential for further trade liberalization of environmental goods in middle- and low-income countries (Figure 1). For instance, in 2019, applied tariffs were particularly high for low and lower-middle income countries for certain categories of EGs including environmentally preferable products[6], goods for environmental monitoring, analysis and assessment equipment and natural resources protection products (Sauvage, 2014[3]).

Figure 1. Tariffs on EGs per income group, 2019



Note: The environmental mediums are: APC = Air pollution control; technologies and products; EPP = Environmentally preferable products based on end use or disposal characteristics; HEM = Heat and energy management; MON = Environmental monitoring, analysis and assessment equipment; NRP = Natural resources protection; NVA = Noise and vibration abatement; REP =Renewable energy plant; SWM = Management of solid and hazardous waste and recycling systems; SWR = Clean up or remediation of soil and water; WAT = Waste water management and potable water treatment. Numbers expressed in thousands of dollars.
Source: Elaboration of (Moïsé and Tresa, Forthcoming[4]) using MAcMap database based on the CLEG list. Income groups are based on the World Bank classification.

2.1.3. Non-tariff barriers and trade facilitation for EGs

Non-tariff measures (NTMs) including technical barriers to trade (TBTs) are high for environmental goods. While the efforts for further tariff liberalization on EGs are important, analysing trade policies

[5] See (Garsous, 2019[88]) and (Sauvage, 2014[3]) for the list of environmental goods included in the analysis.

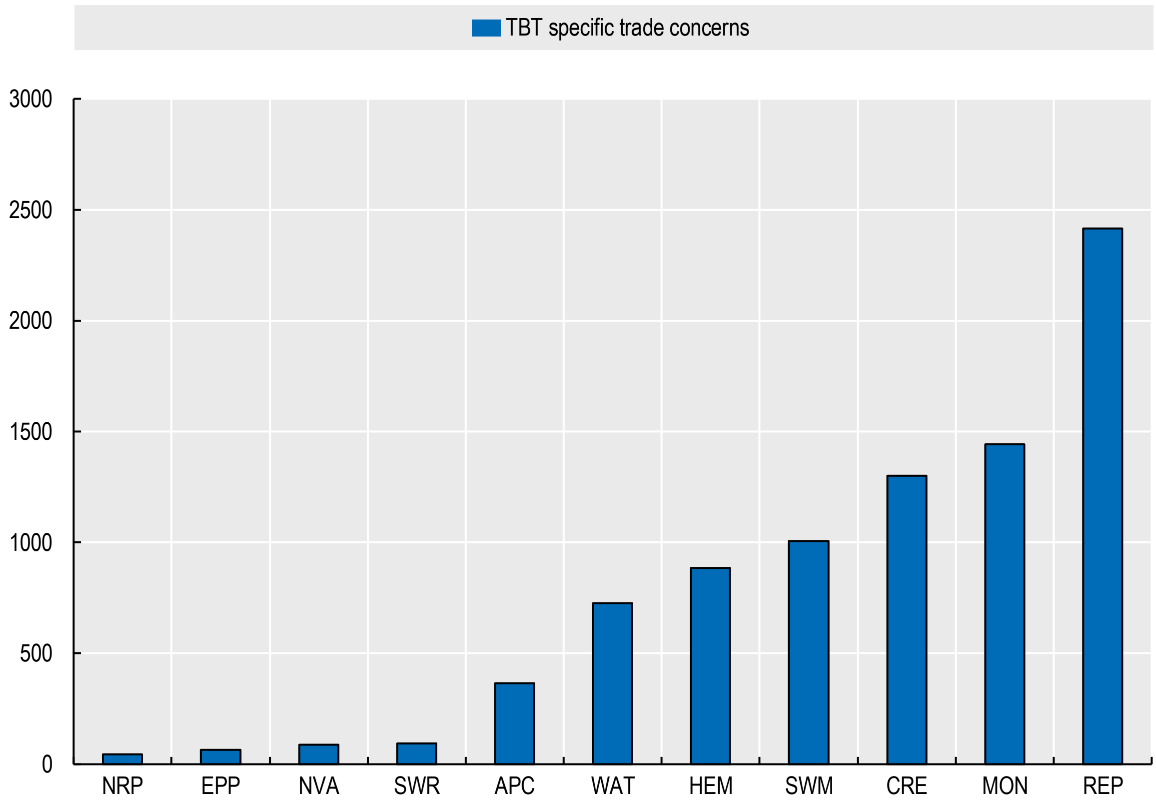
[6] Environmentally preferable products are defined as “products that cause significantly less ‘environmental harm’ at some stage of their ‘life cycle’ than alternative products that serve the same purpose” (UNCTAD, 2004[91]).

beyond tariffs is essential for a comprehensive understanding of trade restrictions on EGs. Between 1995 and 2022, the number of non-tariff measures on environmental goods steadily increased, with a particular rise in technical barriers to trade (TBTs) (Moïsé and Tresa, Forthcoming[4]). Trade-restrictive NTMs can have a greater impact on trade than tariffs alone (UNCTAD and The World Bank, 2018[5]), with NTMs potentially imposing protection levels up to ten times higher than tariffs (de Melo and Solleder, 2019[6]). Lessons from the non-conclusive Environmental Goods Agreement (EGA) negotiations indicate that NTMs can take different forms such as licensing, product standards, and testing procedures (CSIS, 2021[7]).

However, the presence of TBTs on environmental goods does not inherently suggest an intent to hinder trade. TBTs, the category of non-tariff measures (NTMs) that is most used on EGs, can be justified on safety or environmental grounds, and they are not necessarily discriminatory. Nonetheless, TBTs may affect trade costs through lack of transparency on associated procedural requirements or heterogenous standards, potentially making them more trade-restrictive than necessary. Raising trade concerns at the WTO can shed light on their restrictive aspects. Countries often bring up Specific Trade Concerns (STCs) in WTO SPS and TBT Committees, typically to request clarification and seek ways to address measures they consider to be trade barriers. From 1995 to 2022, the most STCs were raised on TBTs, particularly affecting renewable energy plant (REP) and cleaner renewable energy (CRE) products (Figure 2).

Trade costs of NTMs can be reduced with trade facilitation tools. Trade facilitation measures can significantly reduce costs stemming from the diversity of domestic regulations (Ruta and Ederington, 2016[8]) or lack of clarity around them, by streamlining processes such as conformity assessment procedures that products must undergo to enter a market. to reduce the complexity and cost of complying with different national standards. Trade Facilitation measures can help simplify compliance with regulatory requirements such as sanitary and phytosanitary (SPS) measures, technical barriers to trade, and import/export licensing by ensuring clear guidelines and transparency, lowering administrative burdens and reducing the time needed to trade environmental goods and services. Furthermore, establishing mutual recognition agreements or other regulatory collaborations for environmental certifications can facilitate market entry for environmentally friendly products (Aisbett et al., 2023[9]).

Figure 2. Cumulative stock of TBT specific trade concerns notified at the WTO on EGs (1995-2022)



Note: Authors' elaboration. One data point corresponds to a triplet importer-exporter-product covered by a specific trade concern. The environmental mediums are: APC = Air pollution control; technologies and products; EPP = Environmentally preferable products based on end use or disposal characteristics; HEM = Heat and energy management; MON = Environmental monitoring, analysis and assessment equipment; NRP = Natural resources protection; NVA = Noise and vibration abatement; REP =Renewable energy plant; SWM = Management of solid and hazardous waste and recycling systems; SWR = Clean up or remediation of soil and water; WAT = Waste water management and potable water treatment.
Source: Integrated Trade Intelligence Portal (I-TIP), WTO.

2.1.4. Trade liberalization of environmentally related services

The identification and trade liberalization of environmentally related services is equally important for the green transition. Services can support both the invention and adoption of green production methods, contributing to end-of-pipe pollution control, pollution prevention, and cleaner production. They can also facilitate the implementation of environmental projects and help in the production of environmental goods. Trade serves as a key channel for making services accessible globally and for spreading the knowledge and technology necessary for environmental sustainability. While traditional core environmental services (e.g., sewage, refuse disposal, sanitation) are recognized for their direct environmental benefits, a range of other services such as engineering, financial, and maintenance are essential to improve environmental performance of a wide range of economic activities.

Increased access to environmentally related services would result in improved environmental outcomes. Preliminary findings suggest that a rise in services trade driven by a decrease of the services trade restrictiveness index (STRI) is associated with improved environmental performance in areas like climate change, circular economy, and biodiversity protection. Notably, sectors such as telecommunications, maintenance, and financial services play a crucial role in driving these positive environmental outcomes (Beverelli, Fiorini and Tresa, Forthcoming[10]).

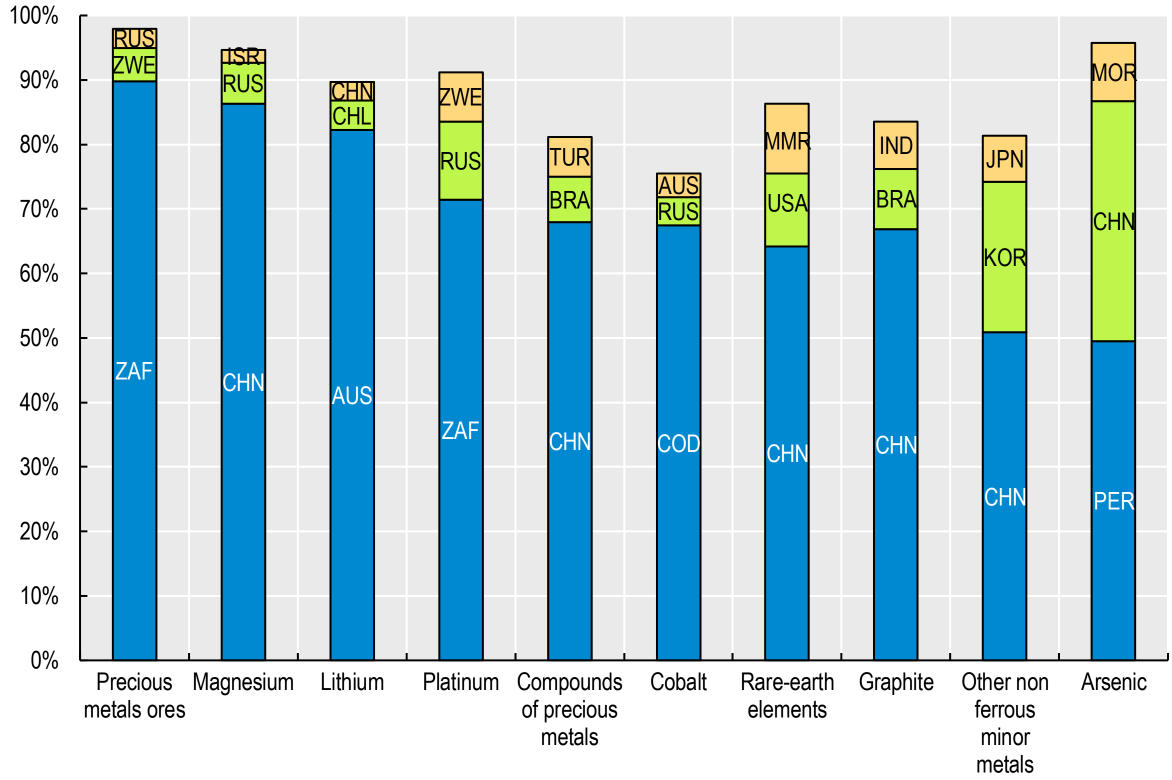
2.2. Enabling the energy transition through access to critical raw materials

Global demand has increased for a specific set of raw materials that are critical for the energy transition. Transitioning to fossil-free energy systems will require the deployment of renewable power generation, electrification, and electromobility. This systemic shift is driving demand for critical raw materials (CRMs) such as lithium, nickel, cobalt, manganese, and graphite (used for manufacturing li-ion batteries); rare earth elements (for wind turbines and electric vehicles); and copper and aluminium (for electricity networks) (IEA, 2021[11]). Despite significant increases in the production volumes of several materials, the projected demand for these materials in the green transition far exceeds current production rates. Lithium demand, in particular, is projected to grow over 40 times by 2040. Similarly, the expansion of electricity networks will more than double the demand for copper (IEA, 2021[11]).

Yet the production of several critical raw materials is concentrated in a few countries. The extraction and availability of critical raw materials are driven by natural abundance, available technologies, and ownership of deposits (Kowalski and Legendre, 2023[12]). Over the past decade, global production of CRMs has become increasingly concentrated among producing (source and processing) countries, with the top producer accounting for more than 50% of global production in 9 out of 10 most production-concentrated CRMs (Figure 3). Countries such as China, South Africa, Australia and Russia are among the main producers of several of these CRMs. For instance, China, is one of the leading producers for six out of ten highly concentrated CRMs[7]. This concentration has led to concerns over market power and its potential exploitation.

[7] The data and material (on production, trade and export restrictions) referred to in this section, unless otherwise stated, are mainly based on (Kowalski and Legendre, 2023[12]). For a more detailed analysis on export restrictions on specific critical raw materials see (OECD, Forthcoming[94])).

Figure 3. Top 3 producers of the top 10 most production-concentrated critical raw materials



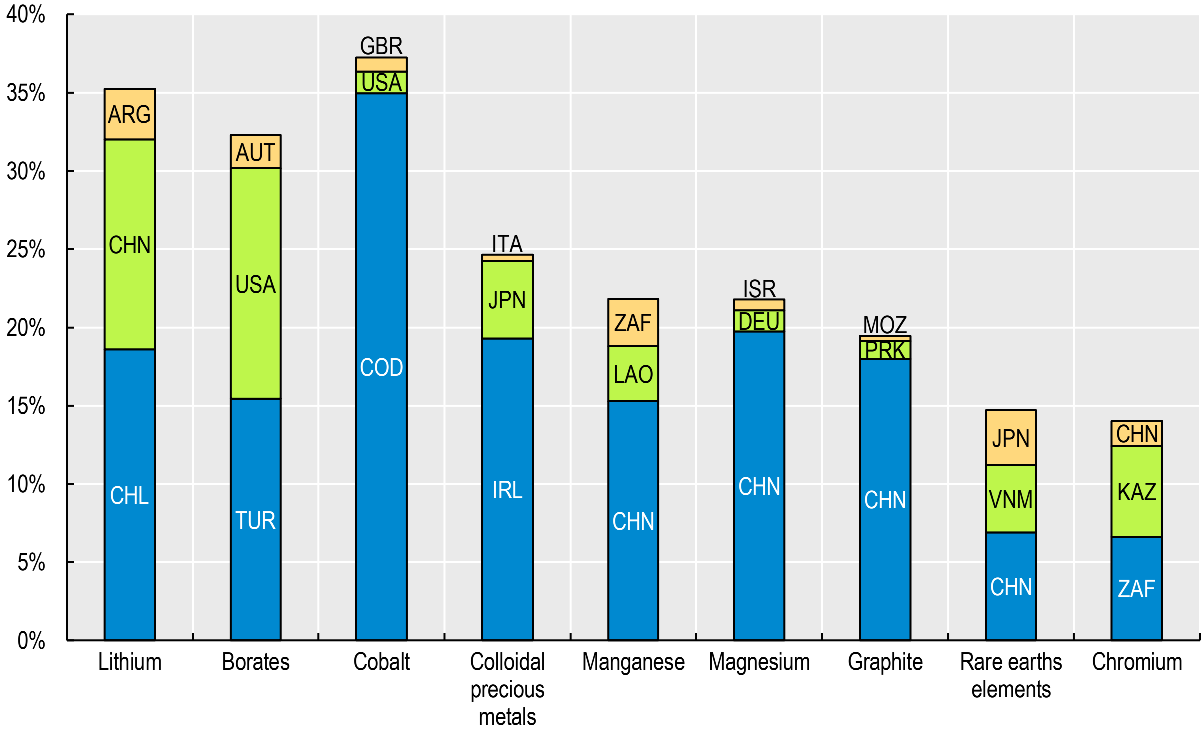
Note: Shares in global production, in percentage. AUS – Australia; BRA – Brazil; CHN - China; CHL – Chile; COD – Democratic Republic of Congo; ISR – Israel; KOR – Republic of Korea; MAR – Morocco; MMR – Myanmar; MOZ – Mozambique; PER – Peru; PRT – Portugal; TUR – Türkiye; RUS – Russian Federation; ZAF – South Africa; ZWE – Zimbabwe. Shares in global production based on gross weight of production.
Source: (Kowalski and Legendre, 2023[12]).

In response to increased demand, global trade in critical raw materials has expanded rapidly. The global trade value of CRMs has expanded faster than overall trade[8], experiencing a 38% increase between 2007-09 and 2017-19, compared to 31% for trade in all products.

Trade of certain critical raw materials has become increasingly concentrated. Exports of CRMs tend to be more concentrated than imports, highlighting the dependency on a limited number of suppliers. For instance, lithium, borates and cobalt stand out among the top 9 most export-concentrated CRMs, with the top 3 exporters accounting for more than 30% of the market (Figure 4). Global imports are also highly concentrated, reflecting the market power of a small number of buyers and concentration in the production of some downstream goods (Kowalski and Legendre, 2023[12]; IEA, 2021[11]). The top 3 importers of lithium, cadmium and rare-earth elements account for more than 50% of global imports (Figure 5).

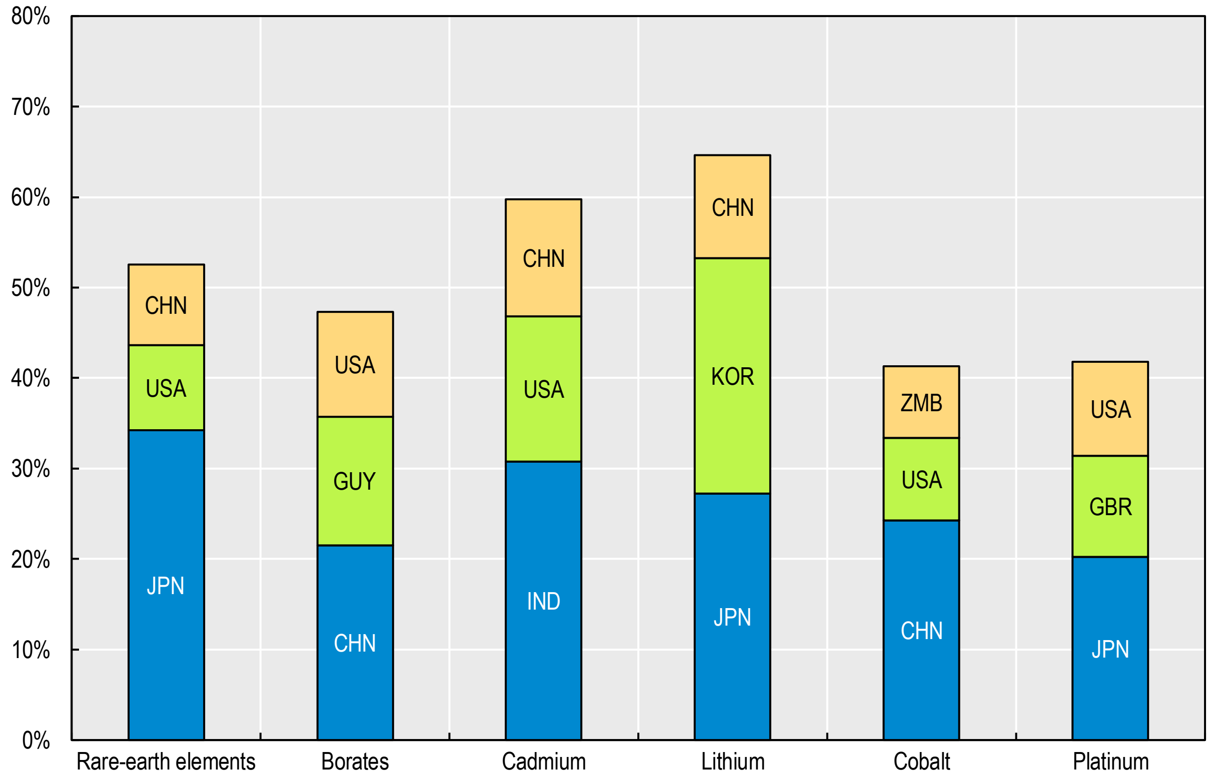
[8] Certain CRMs have experienced a significant larger increase. For instance, lithium increased by 438% between 2007-09 and 2017-19. However, trade in lithium starts from a very small base and still accounted for only 0.2% of the value of global trade in critical raw materials in 2017-19.

Figure 4. Top 3 exporters of selected most export-concentrated critical raw materials



Note: Shares in global exports, in percentage. ARG – Argentina; AUS – Australia; AUT- Austria; CHN - China; CHL – Chile; COD – Democratic Republic of Congo; DEU – Germany; GBR – United Kingdom; ITA - Italy; ISR – Israel; JPN – Japan; KAZ – Kazakhstan; LAO – Lap People's Democratic Republic; MAR – Morocco; MMR – Myanmar; MOZ – Mozambique; PER – Peru; PRT – Portugal; TUR – Türkiye; RUS - Russian Federation; USA – United States; VNM – Vietnam; ZAF – South Africa; ZWE – Zimbabwe.
Source: (Kowalski and Legendre, 2023[12]).

Figure 5. Top 3 importers of selected most import-concentrated critical raw materials



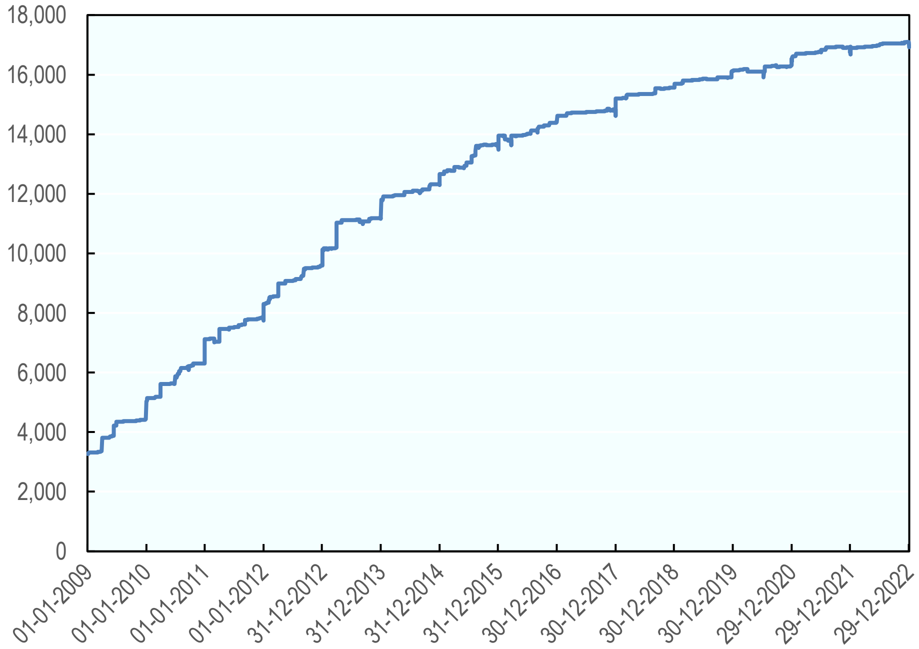
Note: Shares in global imports, in percentage. CHN - China; DEU– Germany; GBR – United Kingdom; GUY – Republic of Guyana; IND- India; JPN – Japan; KOR- Republic of Korea; LAO – Lap People's Democratic Republic; NLD – Netherlands; SGP – Singapore; SVK – Slovak Republic; USA – United States; ZMB – Republic of Zambia.
Source: (Kowalski and Legendre, 2023[12]).

Export restrictions on critical raw materials have significantly increased over the past decade, potentially impacting global availability and prices (Figure 6**).** These restrictions, often in the form of export taxes and licensing requirements[9], are motivated by a mix of economic and non-economic factors, including environmental and social objectives, supply chain security, the desire to attract foreign investment, and the promotion of domestic processing. However, they also raise world market prices, which may disadvantage foreign buyers, lead to similar restrictions in other countries, and hinder the development of CRM-based technologies where they are most needed (Kowalski and Legendre, 2023[12]). In addition, price volatility may undermine effort to develop alternative sources of supply by weakening incentives for private sector investment.

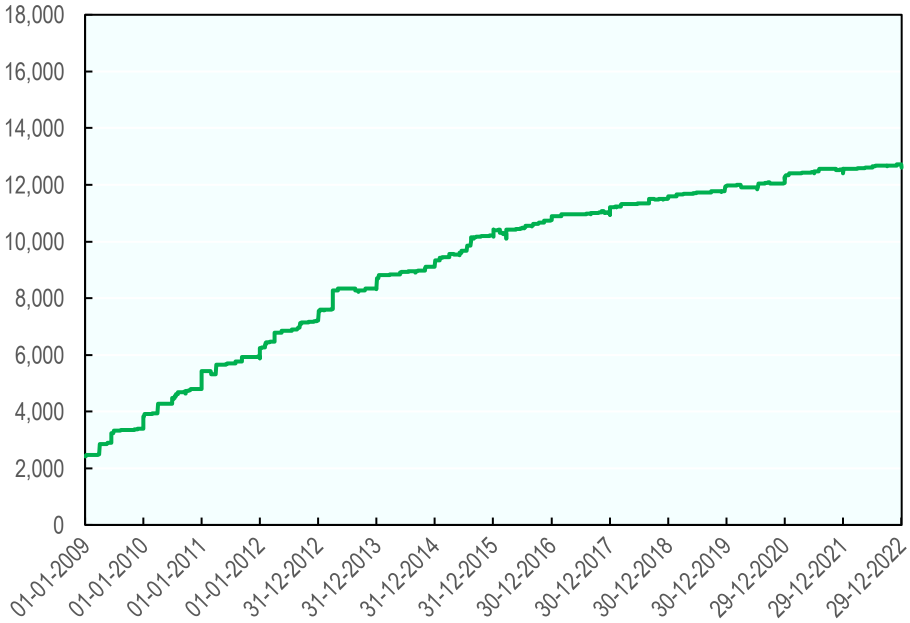
[9] While export taxes and licensing requirements are the most common measures, export bans were the most introduced measure in 2022 (OECD, 2024[87]).

Figure 6. The incidence of export restrictions has been increasing steadily over the last decade

All raw materials



Raw materials needed for the green transition



Note: The count of all types of measures in place across all covered raw materials and all implementing countries, taking into account the stock of measures in place at the beginning of the period, as well as new additions and eliminations.
Source: (Kowalski and Legendre, 2023[12]) OECD Inventory on Export Restrictions on Industrial Raw Materials.

Effective management of the global CRM supply and the energy transition relies on understanding the impact of policies and fostering international cooperation to address both domestic and global challenges. The global supply of CRMs depends on a few players and can therefore be disrupted by geopolitical factors and uncertainties in national policies. There is scope for collaboration between importing and exporting countries, and for finding win-wins between importing countries' desire for diversification and exporting countries' desire to capture enhanced value addition domestically and ensure development benefits from CRM projects. For example, initiatives, such as the Minerals Security Partnership (MSP)[10] are aimed at encouraging the development of secure and sustainable CRM supply chains, by enhancing CRM supply stability, promoting local value addition, and promoting adherence to high environmental, social and governance standards.

2.3. Ensuring a global transition to more circular and resource efficient economies

2.3.1. Circular economy can help reduce material use and associated environmental impacts

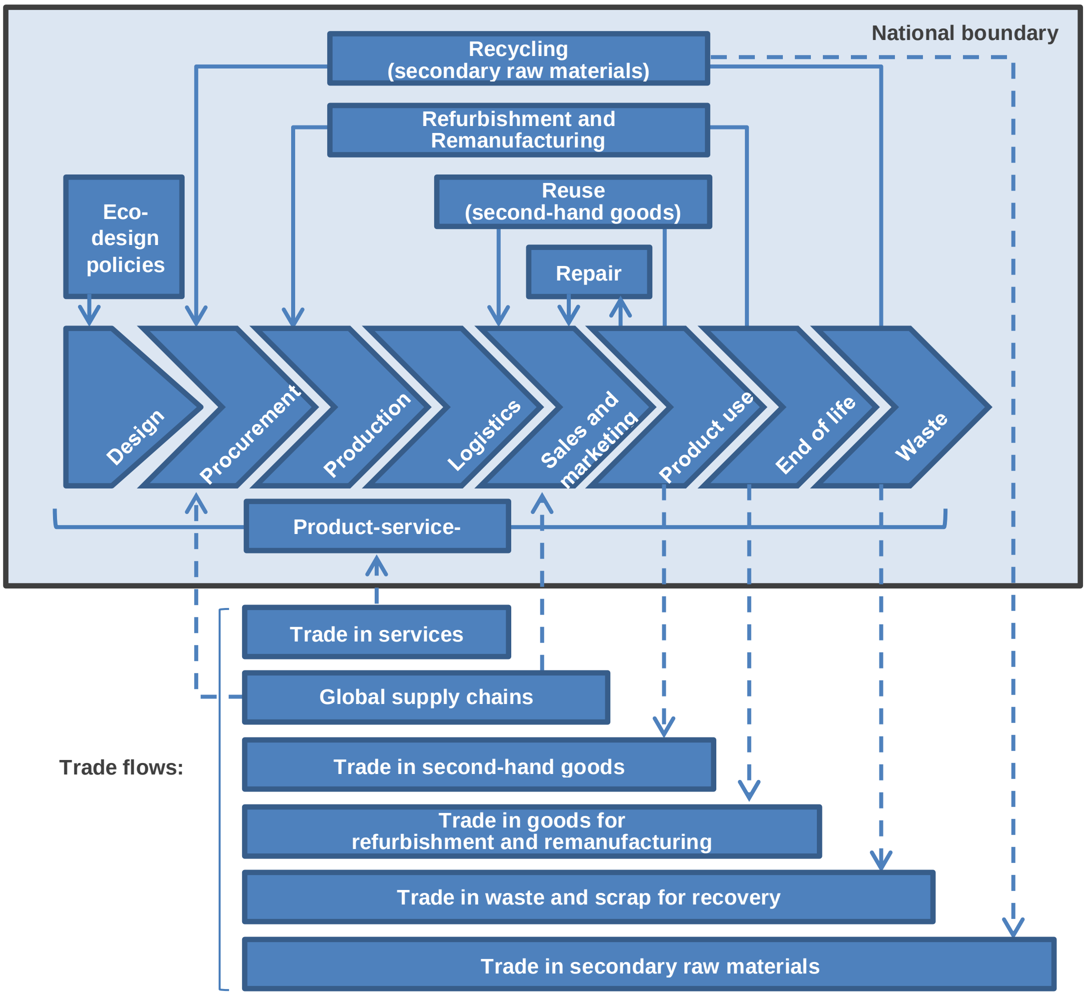
A circular economy transition can help use material resources more efficiently to sustain the global economy and alleviate associated environmental concerns. In the absence of new circular economy policies, the amount of material resources that are needed to sustain the global economy is projected to nearly double from 92 to 167 gigatonnes between 2017 and 2060 (OECD, 2019[13]). This increase in material production and consumption is expected to lead to a doubling of a range of environmental impacts including GHG emissions, land use change, and local pollution (ibid). Circular economy approaches, such as product reuse, repair, refurbishment and remanufacturing, and recycling, can help reduce these environmental pressures. They can also help alleviate concerns about concentration and security of supply of certain critical raw materials discussed in the previous sub-section.

2.3.2. Unpacking the trade linkages of a circular economy transition

While circular economy initiatives largely take place within national boundaries, they have important interlinkages with international trade (Yamaguchi, 2021[14]). This occurs through three main channels: (i) global circular supply chains of products and materials, (ii) trade in end-of-life value chains, such as trade in waste and scrap, secondary raw materials, second-hand goods and goods for refurbishment and remanufacturing, and (iii) trade in services (Figure 7).

[10] The MSP is a collaboration of 14 countries and the EU aimed at developing CRMs supply chains essential for technologies supporting the green energy transition through public and private investment and diplomatic support. The MSP is committed to supporting only those projects that meet high, internationally recognised ESG standards, promote local added value and improve communities, in recognition that all countries can benefit from the global transition to clean energy.

Figure 7. Linkages between international trade and circular economy



Source: (Yamaguchi, 2021[14]).

Trade can support a global circular economy by contributing to economies of scale in circular economy activities. A relevant example is reverse supply chains to collect end-of-life products and reutilise valuable materials in the economy. Modelling work under a stylised scenario for a circular economy transition shows that global material production will become more concentrated in regional hubs with a comparative advantage in these activities, and international trade will play a crucial role in connecting supply and demand (Dellink, 2020[15]). Trade allows for further integration of value chains to maximise value added at reduced resource use by exploiting the most efficient producers. It is projected to drive one-third of overall reductions in material use for aluminium and copper (Figure 8).[11] The effect is substantially larger for other non-ferrous metals but smaller for iron and steel, and for non-metallic minerals, where margins are smaller and fewer efficiency gains can be exploited.

[11] While large segments of aluminium trade are already in recycled or recovered aluminium, the modelling analysis by Dellink (2020[15]) does not make this distinction.

Figure 8. International trade can contribute to reduced material use

Note: Modelling projections for a circular economy transition and deviation from baseline by 2040. Results in deviation from baseline projection. Policy package: tax on raw materials, subsidy to recycled materials, labour tax reduction. The scale effect reflects the change in materials use resulting from a scale-down of global production of processed commodities; the efficiency effect reflects the change in materials use stemming from reduction in inputs of primary materials per unit of global production of processed commodities; the trade effect reflects the change in regional production of processed commodities plus the change in regional sourcing of primary materials inputs.
Source: (Dellink, 2020[15]).

A number of trade barriers are currently identified notably by the private sector as impediments to circular business models and need to be addressed. This refers to the lack of harmonised definitions of waste and scrap and secondary materials. While trade in waste and scrap is essential for a circular economy at scale, trade in goods containing hazardous substances or that are difficult to recycle can lead to negative environmental consequences, notably where they are exported to countries without the requisite processing capacity and needs to be avoided. Striking the right balance between these two aspects is necessary to make the circular economy both viable at scale and safe, while avoiding environmentally harmful trade in hazardous waste (Yamaguchi, 2021[14]).

2.3.3. Aligning trade and circular economy objectives through international co-operation

There are several opportunities to use trade policies to promote circular economy approaches. These include: (i) identifying goods and services that contribute to a circular economy and promoting their trade (e.g. secondary raw materials), (ii) scaling up cross-border reverse supply chains through trade policies including trade facilitation mechanisms (e.g. for critical raw materials embedded in used batteries) (Yamaguchi, 2022[16]; Moïsé and Rubínová, 2023[17]), and (iii) addressing regulatory fragmentation between countries by clarifying and aligning different definitions and classification systems of waste, secondary materials and end-of-life products, as well as facilitating interoperability of circular economy-related technical regulations and standards including through international regulatory co-operation (Yamaguchi, Forthcoming[18]).

These approaches can be considered at the multilateral, regional and bilateral, and domestic level. Important on-going dialogues that can address such issues include, *inter-alia*, those under the WTO

TESSD initiative, the OECD Joint Working Party on Trade and Environment (JWPTE), the United Nations Economic Commission for Europe (UNECE), the World Economic Forum (WEF), International Organization for Standardization (ISO). International Chamber of Commerce (ICC), and the World Business Council for Sustainable Development (WBCSD). In addition, a handful of preferential trade agreements already include explicit provisions to co-operate on trade and circular economy, which can act as a vehicle to advance some of the key issues listed above (see also Section 3.5).

2.4. Creating more sustainable and resilient food systems

2.4.1. Regulatory measures

Trade plays a key role in supporting sustainable and resilient food systems and agricultural practices. Exporting to markets with strong regulatory measures can incentivize producers to adopt environmentally friendly practices that comply with certifications and standards for highly traded commodities and contribute to sustainable transformation of agriculture and food systems. Agricultural products from developing countries, such as coffee, cocoa, tea, and cotton, can also benefit from voluntary sustainability standards (VSS)[12] promoting sustainability through potentially improved market access and price premiums, as certified products can potentially be sold at higher prices (UNCTAD, 2022[19]). Despite covering only a small fraction of global agricultural land, VSS are expanding and increasingly integrated into trade policies as criteria for evaluating compliance with environmental and social standards (UNCTAD, 2022[19])[13,14.]

However, meeting stringent sustainability criteria (either mandatory or voluntary) remains challenging because of the high implementation costs and in particular limited support for developing countries and smallholder farmers. The cost and infrastructure required for standard third-party verification systems often exclude small-scale farmers, who also face barriers like limited access to technical information (see below for a discussion on compliance challenges). This calls for capacity building and policy support to broaden participation (FAO, 2022[20]).

2.4.2. Reorienting potentially environmentally harmful subsidies to support environmental objectives

Reforming agricultural support policies by reorienting certain type of subsidies that can be harmful to the environment can help build more resilient agriculture and food systems. Certain types of agricultural subsidies that are linked to production outputs or the use of variable agricultural inputs without constraints create market distortions and can encourage additional production with negative externalities and the excessive use of inputs such as water or fertilizers in certain contexts (Henderson and Lankoski, 2019[21]; OECD, 2022[22]; DeBoe, 2020[23]). The OECD has recommended phasing out these subsidies which can contribute to increased impact, in particular via increased greenhouse gas emissions or nutrient

[12] VSS prescribe criteria that producers must meet, spanning environmental, social, and economic dimensions. Certifications bodies verify compliance, issuing labels that signal sustainable production practices (UNCTAD, 2022[19]).

[13] The State of Sustainable Markets 2020 annual report of the International Trade Centre (ITC), in collaboration with the Research Institute of Organic Agriculture (FiBL) and the International Institute for Sustainable Development (IISD) shows that there is still considerable potential for VSS to expand further. In terms of the share of certified production area in total production area, the report estimates that the area of production land certified by 12 of the major agricultural VSS represents only 1.94% of the world's total agricultural area (UNCTAD, 2022[19]).

[14] The ITC Standards Map database offers information on 350 VSS, with 170 of them focused on agri-food. Of these, 160 include environmental requirements (ITC, 2024[85]; OECD, Forthcoming[93]).

surpluses, and hinder adaptation to climate change (OECD, 2023[24]; OECD, 2022[22])[15]. In contrast, targeted agri-environmental payments that are decoupled from production can enhance sustainability by encouraging environmentally friendly practices (OECD, 2023[24]).

Reform of agricultural subsidies requires care. Removing subsidies coupled to production can yield environmental gains but eliminating them may lead to adverse outcomes such as higher food costs and reduced farmer incomes, particularly affecting food security in developing countries (Guerrero et al., 2022[25]). To optimize outcomes, fiscal savings from subsidy reforms could be reinvested in sustainable agriculture initiatives, including cash transfer schemes for vulnerable populations. This approach promotes equitable, efficient, and environmentally sustainable agriculture, while also supporting the immediate needs of the poorest farmers and consumers (FAO, UNDP and UNEP, 2021[26]). Other options include reallocating funds to agri-environmental payments or to develop and disseminate emission-efficient technologies for crops and livestock (Valin, Henderson and Lankoski, 2023[27]). This approach could reduce agricultural emissions by over 40%, restore millions of hectares of land to natural habitats, and generate substantial economic benefits (Laborde et al., 2022[28]). Such investments in research and development (R&D) and infrastructure can promote sustainable agricultural practices and improve the overall environmental performance of the sector (Laborde et al., 2022[28]; OECD, 2022[22]).

2.4.3. International co-operation

Developed countries can help developing regions create more sustainable and resilient food systems through technical and financial support. This support includes assisting the reforms of environmentally harmful subsidies and facilitating access to technologies and finance needed for sustainable production (Bellman, 2022[29]). Other initiatives such as Aid for Trade, launched by the WTO in 2005, aim to help developing countries build the trade capacity and infrastructure needed to benefit from international trade. The Standards and Trade Development Facility (STDF) is a global partnership that aims to strengthen food safety, and animal and plant health capacities in developing countries by promoting the use of good practices—including digital technologies—to facilitate safe trade worldwide. More generally, high-income countries can aid emerging economies in adopting low-emission agricultural practices by providing financial assistance for climate projects that rely cutting-edge technologies. Such assistance can lead to economic benefits for farmers and countries by improving productivity, opening new markets, enhancing resilience to climate change, and ensuring long-term food security (Sutton, Lotsch and Ashesh, 2024[30]).

Greater investment and collaboration in agricultural R&D and technology adoption are necessary to boost productivity and sustainability in agriculture. Increased collaboration among governments, research institutions, NGOs, and the private sector is needed to promote research and stakeholder engagement in sustainable agriculture (OECD, 2019[31]). Despite high returns on investment, there is significant underinvestment in agricultural R&D and technology adoption. A comprehensive agenda involving revitalizing public research, incentivizing private R&D, and promoting technology adoption, especially for smallholders in developing countries, is essential to enhance productivity (Fuglie et al., 2020[32]; Laborde et al., 2022[28]), develop resilient crop varieties and sustainable farming techniques.

[15] Further work is currently being conducted by the OECD on the positive and negative environmental impacts of different types of agricultural support policies.

2.5. Forging solutions to the triple environmental crisis through Preferential Trade Agreements

2.5.1. Preferential trade agreements and the environment – state of play

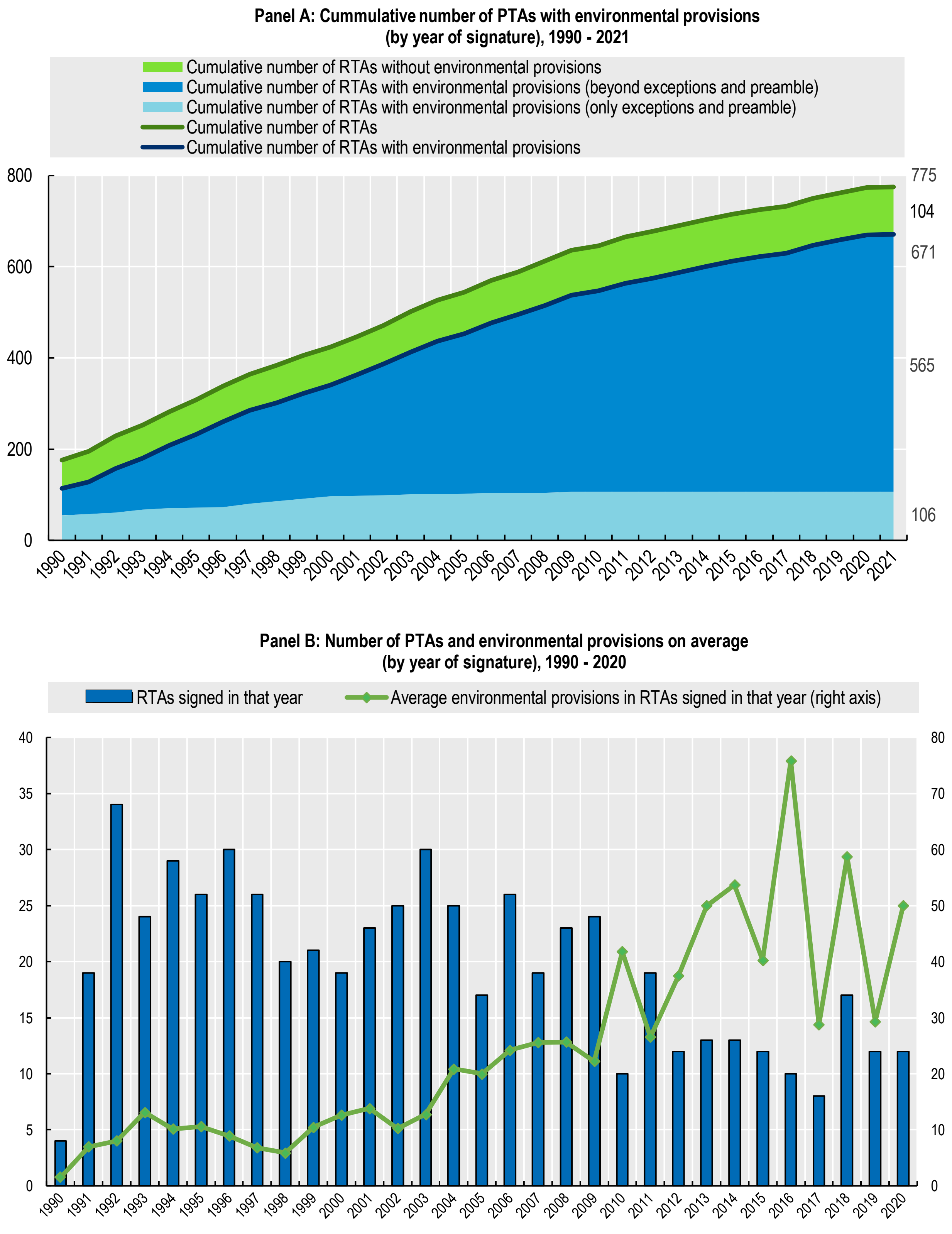
Preferential trade agreements (PTAs) can serve as complementary mechanisms to the multilateral trading system to promote free trade and economic integration, and to enhance environmental objectives between trading parties. Among the 775 PTAs recorded between 1947 and 2021, 671 PTAs (around 87%) include at least one type of environmental provision as a part of the agreement (Figure 9, Panel A). The average number of environmental provisions included in an agreement increased from around 8 provisions in the 1990s, to nearly 19 provisions in the 2000s, and to over 44 provisions in the 2010s (Figure 9, Panel B).

Parties to an PTA have incorporated different types of environmental provisions in PTAs. The ten types of environmental provisions are: (i) "exceptions" for environment objectives, (ii) Multilateral Environmental Agreements (MEAs) (iii) upholding environmental law, (iv) environmental co-operation, (v) specific environmental issues (e.g. climate change, biodiversity), (vi) the preamble to the agreement, (vii) implementation mechanisms, (viii) public participation, (ix) dispute settlement, and (x) impact assessments (Figure 10, Panel A). Parties increasingly use PTAs to foster environmental co-operation in specific areas such as climate change, biodiversity loss, and air pollution. References to specific environmental issues were included in 37% of all PTAs, targeting biodiversity, circular economy, oceans, land use, energy, climate change, chemicals, air pollution, the ozone layer, and other forms of pollution (Figure 10, Panel B).

PTAs can also act as an incubator to forge new governance frameworks to enhance the alignment of trade and environment policies among trading partners. Some modern examples include promoting trade that contributes to positive environmental outcomes, such as: (i) agreeing on a list of environmental goods and services and promoting their free and fair trade, (ii) enhancing environmental co-operation in emerging areas (such as critical raw materials and clean hydrogen),[16] (iii) facilitating the interoperability of technical regulations, standards and conformity assessment procedures in relation to environmental requirements through specific regulatory co-operation provisions as well as dedicated sectoral annexes, (iv) strengthening environmental governance through institutional mechanisms, public participation, and transparency provisions, and (v) supporting public and private sustainable initiatives, including through references to due diligence mechanisms.

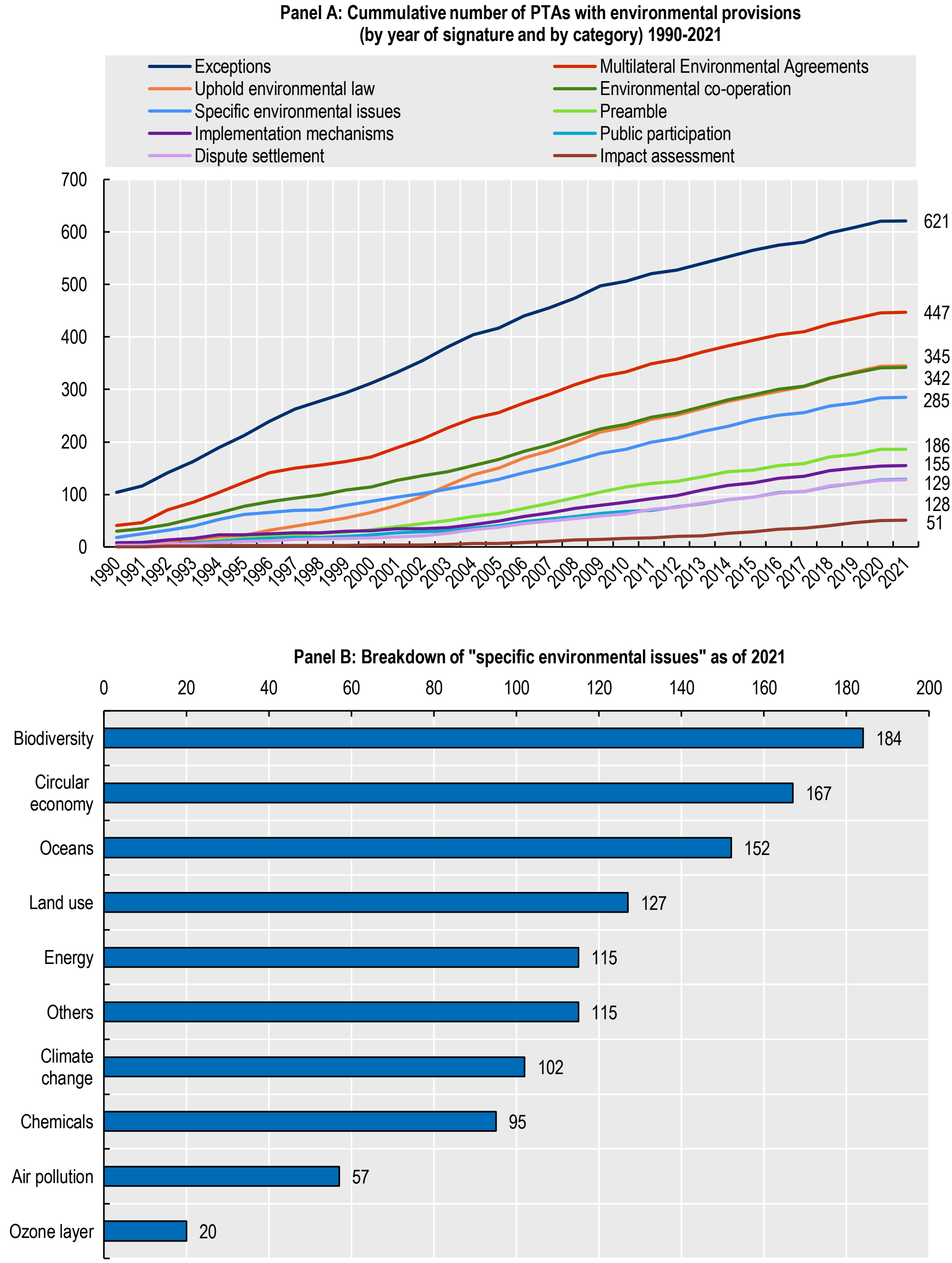
[16] Initiatives to promote trade in environmental goods and services include, for example, those by the Asia-Pacific Economic Cooperation (APEC), the United Kingdom – New Zealand Free Trade Agreement, and the Australia-Singapore Green Economy Agreement.

Figure 9. Environmental provisions are increasingly incorporated in preferential trade agreements



Source: Authors based on (Morin, Dür and Lechner, 2022[33]).

Figure 10. Different types of environmental provisions are incorporated in PTAs



Note: "Others" include other forms of pollution such as noise pollution.
Source: Authors based on (Morin, Dür and Lechner, 2022[33]).

2.5.2. Environmental and sustainable impact assessments of PTAs

Ex-ante sustainability impact assessments and environmental impact assessments are increasingly becoming a common practice in the negotiation phase of PTAs. While trade negotiations are frequently accompanied by sustainability impact assessment (SIA), approaches – including economic modelling, qualitative causal chain analysis and stakeholder consultations – each have their strengths, challenges and limitations (Moïsé and Rubínová, 2021[34]).

Environmental impact assessments can highlight in advance the environmental risks identified in the screening process (Moïsé and Rubínová, 2021[34]). They can also help introduce safeguards that are normally applied during the preparation and negotiation phase of PTAs. Different approaches are applied to whether these ex-ante assessments primarily cover environmental impacts in the home country (e.g. those involving the US), or cover impacts in both the home and host country (e.g. those involving the EU) (OECD, 2023[35]).

Ex-post assessments remain limited so far. One of the weaknesses of PTAs and the environment is that the effectiveness of environmental provisions in PTAs is scarcely documented and supported by empirical analysis. While ex-post assessments are scarce, these are made available for several agreements concerning Canada, the EU, and the United States, and have been conducted in different ways, such as by an independent office, dedicated secretariats, or outsourced to a third party (OECD, 2023[35]). There are examples where the ex-post analysis was conducted by an independent office, dedicated secretariats, or outsourced to a third party. Anecdotal evidence available today suggest that some PTAs with environmental provisions have led to positive environmental outcomes (George and Yamaguchi, 2018[36]). Some of these channels include: (i) strengthening environmental laws and regulations, (ii) introducing new institutional arrangements, (iii) providing co-operation on improving environmental law and enforcement, and (iv) improving environmental awareness, among the parties to the agreements. More work is needed in this area to have a better understanding of the effectiveness of environmental provisions in PTAs.

2.5.3. Towards addressing the triple planetary crisis through PTAs

PTAs can be tailored to explicitly address the triple planetary crisis of climate change, biodiversity loss, and pollution.

Climate change - While explicit provisions to climate change in PTAs appear to be limited (**Error! Reference source not found.**, Panel B), climate-related references are found more broadly. These include references to climate-related Multilateral Environmental Agreements (e.g. Paris Agreement), promotion of environmental goods and services (e.g. renewable energy technologies), encouraging the phase out of fossil fuel subsidies, and addressing deforestation. Taking this broad approach, climate-related provisions are found in at least 212 PTAs out of 775 PTAs signed between 1947 and 2021 (OECD, 2023[35]). These include references: (i) to address climate change and to enhance climate-related co-operation; (ii) to reaffirm multilateral commitments such as the Paris Agreement; (iii) to liberalise trade in environmental goods and services; (iv) to promote mutual recognition or harmonisation of regulatory standards related to climate action; (v) to encourage the phase out of fossil fuel subsidies; and (vi) to act against deforestation. Dedicated trade agreements are being forged in this direction, such as the Agreement on Climate Change, Trade and Sustainability (ACCTS), which concluded negotiations in July 2024.[17]

Biodiversity - Between 1947 and 2021, 184 agreements have included provisions that either address endangered species, invasive species, migratory species, protected areas, genetic

[17] The Agreement on Climate Change, Trade and Sustainability (ACCTS) involves the four Parties of Costa Rica, Iceland, New Zealand and Switzerland.

resources, biosafety or genetically modified organisms (OECD, 2023[35]). The US-Peru Agreement, signed in 2006, is often cited as a successful example in promoting biodiversity by strengthening legislations on forestry and wildlife and bringing trading partners' policies aligned with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) provisions (Yamaguchi, 2023[37]). Provisions to safeguard biodiversity-related concerns in trade agreements are also relevant for least developed countries. For example, the Common Market for Eastern and Southern Africa (COMESA) agreement expanded in 2015 includes references to CITES.

Circular economy - Explicit references to a circular economy in PTAs remain scarce but are emerging quickly. Many existing circular economy related provisions focus on natural resources, waste management, and references to the Basel Convention (OECD, 2023[35]). More recently, some PTAs have incorporated specific provisions related to a circular economy (e.g. EU-UK Trade and Cooperation Agreement signed in 2020 and enforce since 2021, and the UK-New Zealand Free Trade Agreement signed in 2022). In 2021, an OECD workshop on PTAs and the environment identified approaches to incorporate circular economy related provisions in PTAs (OECD, 2021[38]). These include: (i) promoting trade in goods and services that contribute to a circular economy; (ii) clarifying different definitions and classifications of waste, secondary materials, second-hand goods, goods for refurbishment and remanufacturing, and its relationship with trade classifications; and (iii) working towards the development, harmonisation or mutual acceptance of circular economy related standards.

3. Navigating the challenges at the trade and environmental policy nexus

3.1. Differences in the ambition of environmental policies can create international spillovers

Governments are adopting a variety of environmental policies diverging on instrument choices and approaches and on policy stringency, which can create international spillovers. For example, one potential manifestation of an uneven climate policy landscape is carbon leakage: the increase in foreign emissions as a result of domestic mitigation actions. This can undermine the effectiveness of ambitious climate policies. Carbon leakage is also intertwined with heightened concerns that the difference in climate policy stringency may add to sources of competitive (dis)advantage. Another example is related to deforestation, where domestic policies to save natural areas can increase international demand in biodiversity hotpots for timber products, leading to deforestation and biodiversity losses.

In theory there are two types of spillover effects of moving ahead unilaterally with more ambitious environmental policy. On the one hand, it can create first-mover incentives, for instance by stimulating domestic innovation or by building up a domestic industry for environmental goods that can be exported once other countries raise their environmental ambitions. An oft-cited example is wind turbines (Garsous and Worack, 2021[39]). On the other hand, situations where the benefits of environmental policies are felt globally but the costs are supported only domestically can create a free-rider incentive to reap the benefits of other countries' actions while limiting domestic policies (Barrett, 2005[40]). The latter is one of the major hurdles of international climate mitigation policy, as greenhouse gases uniformly mix in the atmosphere and thus the benefits of policy action are felt globally.

Additional spillovers include a risk that polluting industry concentrates in jurisdiction with lax environmental policies, leading to pollution hotspots. Sometimes, such hotspots are in jurisdictions with governance challenges and a fragile environment. Other times, geographic conditions affect environmental impacts, e.g. when plastic pollution floats down rivers and ends up on downstream beaches and in the ocean (OECD, 2022[41]).

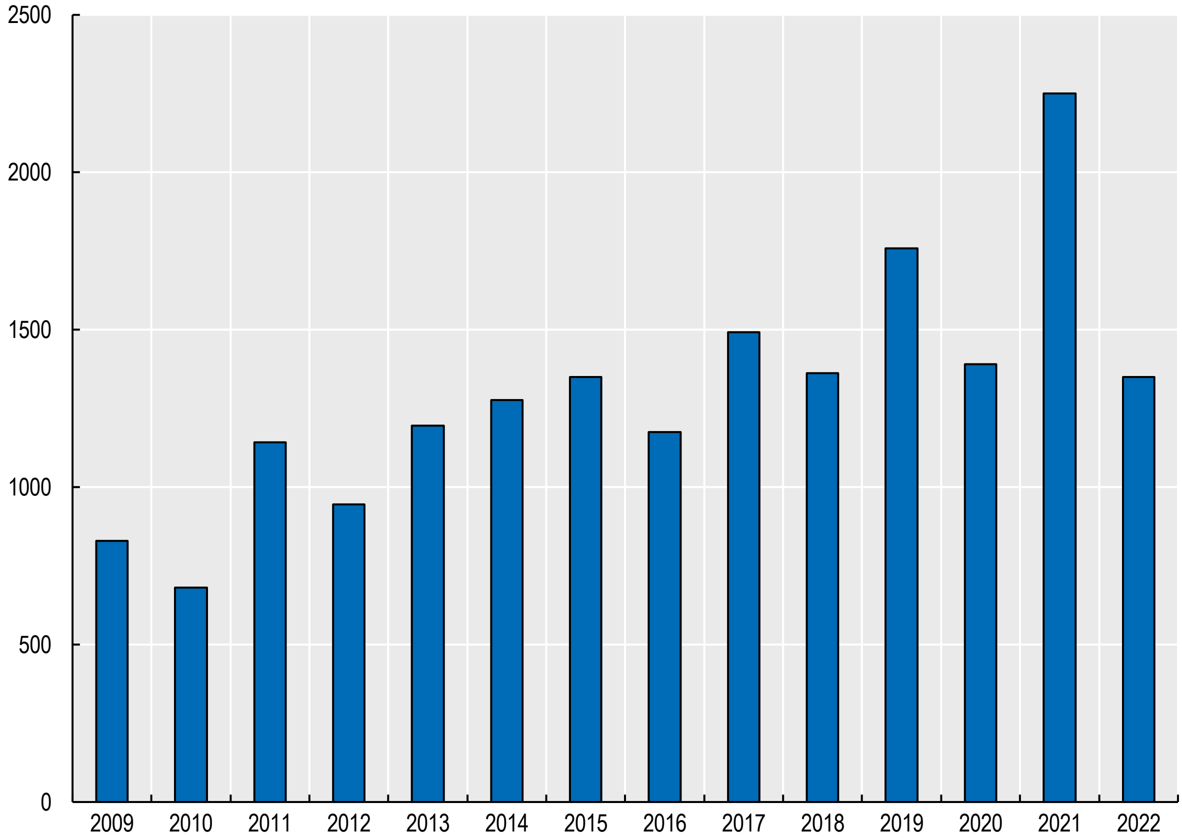
Finally, environmental policy can lead to the emergence of new environmental pressures. For example, the demand for critical raw materials used to manufacture renewable energy equipment, such as solar panels and wind turbines, can induce increased mining of such materials. Even in a transition to more circular, resource-efficient, economies, demand for critical raw materials is projected to increase drastically (Section 2.2), leading to pressures on mining of these materials and exploration of potential new mining areas.

3.2. The use of new trade-related environmental policies is accelerating in a non-coordinated fashion

Given the cross-border dimension of current environmental issues, governments are increasingly extending their domestic sustainability requirements to imported products. This approach aims to ensure global effectiveness or political acceptability of domestic policies. For example, some governments are currently exploring various policy options to ensure that domestic climate mitigation action is not undone by increases in emissions elsewhere – i.e., carbon leakage effects – including Border Carbon Adjustment (BCA) measures (OECD, 2020[42]).

Over the past few years, WTO Members have been notifying WTO committees thousands of trade-related environmental policies (TrEPs). They cover a wide range of areas including climate change mitigation (e.g., BCAs and similar measures) and adaptation, and environmental protection such as ozone layer protection and the protection of forests (Communication from the U.S. to the WTO, 2024[43]). Notwithstanding year-on-year fluctuations, the overall trend suggests a steady increase in TrEPs notified by members of the WTO (Figure 11). In 2022 for instance, there were 1,349 TrEPs drawn from environment-related notifications at the WTO, which accounted for 12.9% of all notifications to the WTO against 8.1% in 2009 (WTO, 2024[44]).

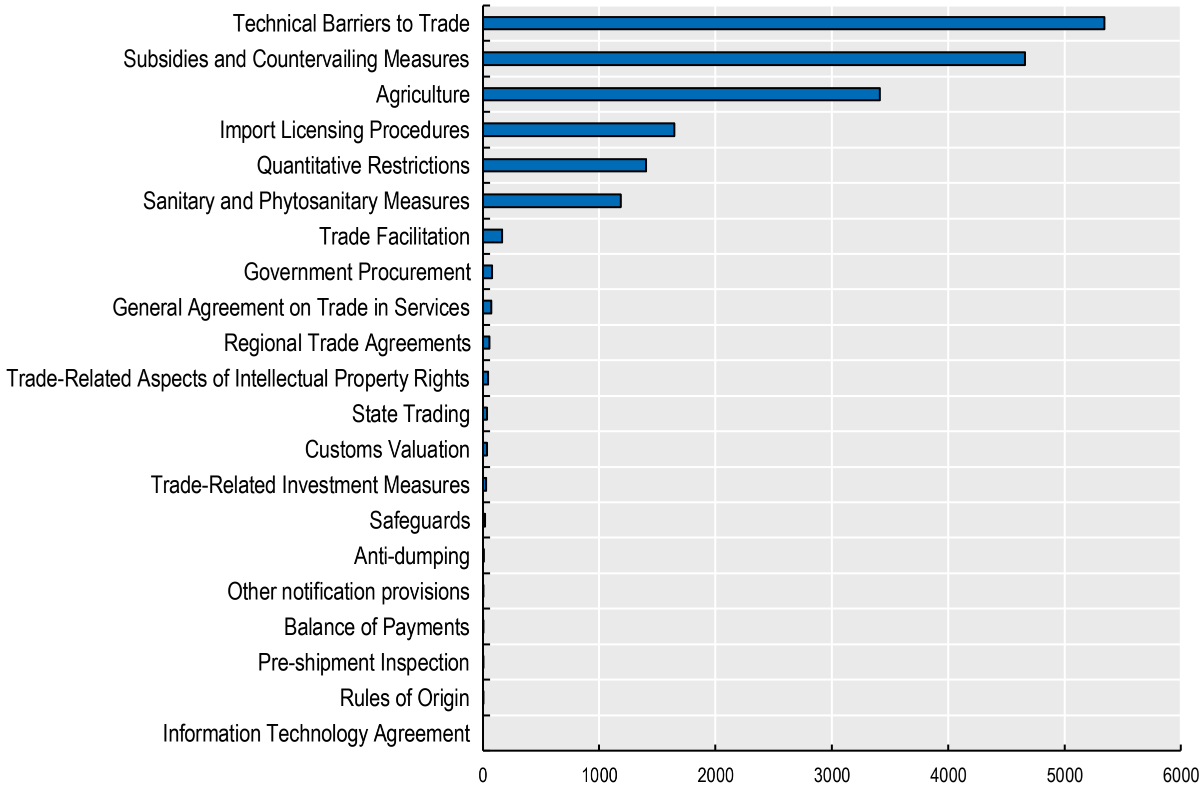
Figure 11. Number of trade-related environmental policies (TrEPs) notified by WTO members



Note: Total number of trade-related environmental policies included in environment-related notifications submitted by WTO members.
Source: WTO's Environmental Database (EDB): https://edb.wto.org/.

Most TrEPs are technical barriers to trade or some form of government support (Figure 12**).** Over 2009-22, 5,343 TrEPs have been identified as technical barriers to trade (TBTs). Certain aim to limit international spillovers, in particular carbon leakage but other policies directly promote clean energy production and consumption. Many countries have, for instance, introduced sustainability standards for biofuels to comply with domestic regulations mandating the use of specific volumes of sustainable biofuels (Moïsé and Steenblik, 2011[45]). More recently, the EU has banned the importation of certain products, such as cattle, cocoa, coffee, or soya, in the absence of certain types of specified proof that they are not linked to deforestation (a driver of climate change and biodiversity loss). Over the same period, 4,661 TrEPs have been notified under the WTO's Agreement on Subsidies and Countervailing Measures. These policies include grants, direct payments, and tax concessions provided by governments mainly to firms for achieving specific environmental goals such as emission reduction via the deployment of renewable energy, or biodiversity protection via better natural resources management practices.

Figure 12. Number of trade-related environmental policies notified by WTO members since 2009, by WTO Agreement



Note: Cumulative number of trade-related environmental policies included in environment-related notifications submitted by WTO members since 2009.
Source: WTO's Environmental Database (EDB): https://edb.wto.org/.

While this development demonstrates that governments are taking action to address pressing environmental issues, TrEPs also raise new challenges.

3.2.1. Complying with these new regulations generally imply additional trade costs for businesses navigating in an increasingly complex set of trade rules

Regulations requiring the reporting of product-level environmental footprints can lead to increased trade costs. Product-level environmental regulations such as BCAs often compel exporters to hand over very detailed information covering their entire value chains. For instance, companies can be required to calculate their Scope 3 emissions, which include indirect upstream emissions from purchased goods and services, and indirect downstream emissions from sold goods and services (Stenzel and Waichman, 2023[46]). Calculating Scope 3 emissions is a complex and resource-intensive process because it requires data from firms and consumers that are outside the reporting company's control (Patchell, 2018[47]). As an indication of the magnitude of such costs, internal accounting activities account for 1% and 3% of revenues for large and small firms, respectively (Patchell, 2018[47]; Financial Executives Research Foundation, 2014[48]).

Verifying reported data at the product level is also a complex and costly process. Once collected, the data reported by exporters will have to be verified through processes called conformity assessment procedures[18]. These processes are particularly challenging for product-level environmental footprints because they involve verifying information that cannot be physically checked on products at the border (Jansen, 2024[49]) – i.e., in WTO terminology, information related to "non-product-related processes and production methods" (NPR-PPMs)[19]. Therefore, a very robust system of data verification is necessary, including regular on-site inspections with the participation of accredited third-party verifiers (Pauwelyn, 2024[50]). This thorough procedure is likely to add to the costs of complying with new sustainability requirements. By one estimate for U.S. firms, for example, verifying data used for Corporate Social Responsibility reports would account for 5-10% of financial statement audit fees (Casey and Grenier, 2014[51]), amounting to USD 75,000-175,000 (SEC, 2022[52]).

3.2.2. A fragmented regulatory landscape exacerbates compliance costs.

Currently, there are no common standards for measuring, reporting, and certifying product-level environmental footprints (Deconinck, Jansen and Barisone, 2023[53]). Complying with fragmented and inconsistent regulations based on different measurement and verification standards would only exacerbate already high compliance costs as it would compel exporters to adapt to various methodologies and approaches, which ultimately imposes burdensome costs on them (WTO, 2022[54]; OECD-BIAC-WEF, 2023[55]; Deconinck, Jansen and Barisone, 2023[53]).

Regulatory divergences also matter for circular economy objectives. There is a fragmentation of definitions of waste, scrap, end-of-life products, second-hand goods, and goods for refurbishment and remanufacturing that create barriers to trade in these products (Yamaguchi, 2021[14]). A survey of firms in circular business activities shows that over 25% of respondents identify divergent regulations on secondary raw materials and waste trade, including inconsistent implementation of common standards and regulations, as a barrier to trade (IISD/SITRA, 2020[56]). More particularly, inconsistencies in transport and storage safety regulations for end-of-life Li-ion batteries discourage the development of cross-border circular value chains, which are essential because domestic waste streams alone are insufficient to achieve the scale needed for economic viability (Moïsé and Rubínová, 2023[17]).

[18] Based on the definition of the WTO's Technical Barriers to Trade Agreement, a conformity assessment procedure is a procedure to determine that relevant requirements in technical regulations or standards are fulfilled (WTO, 2022[54]).

[19] Non-product related processes and production methods are production methods that do not affect the physical characteristics of the resulting products (Moïsé and Steenblik, 2011[45]).

3.3. Existing multilateral trade agreements and frameworks offer principles to minimize trade frictions from new TrEPs

New TrEPs largely fall within the scope of Agreement on Technical Barriers to Trade (TBT Agreement) (Figure 12). WTO members have a long history of managing TBTs across a wide range of sectors. The WTO's TBT Agreement offers guidance on reducing trade frictions stemming from the implementation of technical regulations. In relation to TrEPs, the TBT Agreement is particularly relevant in at least two key areas (WTO, 2022[54]).

Internationally aligned standards could be used in new TrEPs to measure and report product-level environmental performance – e.g. product-level carbon metrics. The TBT Agreement encourages the use of international standards when enacting technical regulations including sustainability-related ones (WTO, 2022[54]). The TBT Committee also highlights the importance of the elaboration process of such international standards to ensure they provide a harmonized framework for the implementation of technical regulations. In this regard, the Committee has formulated the "Six Principles for the Development of International Standards, Guides, and Recommendations", which include (WTO, 2022[54]):

1. **Transparency**: Ensuring that information on work programs and standards is accessible to all interested parties, especially those from WTO members, and allowing adequate time for comments.
2. **Openness**: Membership in international standardizing bodies should be non-discriminatory and open to relevant bodies from all WTO members.
3. **Impartiality and consensus**: All relevant WTO member bodies should have opportunities to contribute to standards without bias towards specific suppliers, countries, or regions.
4. **Effectiveness and relevance**: Standards should be relevant, address market and regulatory needs, and adapt to scientific and technological changes without harming market fairness, competition, or innovation. They should ideally be performance-based rather than based on design or descriptive characteristics.
5. **Coherence**: Standardizing bodies should coordinate to avoid redundant efforts and overlap, ensuring cooperation with other international standard-setter bodies.
6. **Development dimension**: Recognizing the challenges faced by developing countries, it is crucial to facilitate their participation in the development of international standards through capacity building and technical assistance.

Aligned standards for conformity assessment are also essential to reduce unnecessary trade barriers. WTO guidelines also advocate for the use of international standards in verification procedures to ensure compliance with TrEPs – i.e., conformity assessment procedures. Standardizing these procedures can reduce trade frictions and improve the quality of verification by reducing differences in the competences and approaches of verifiers (WTO, 2022[54]). The WTO also encourages members to accept the results of conformity assessment procedures performed by other members, even if these procedures differ from their own. The TBT Committee has developed an "Indicative List of Approaches" that members may adopt to facilitate the recognition of other members conformity assessment results, which include (WTO, 2022[54]):

1. Mutual recognition agreements for conformity assessment to specific regulations.
2. Cooperative (voluntary) arrangements between domestic and foreign conformity assessment bodies.
3. Use of accreditation to qualify (or recognize) conformity assessment bodies.
4. Designation by governments of specific conformity assessment bodies, including bodies located outside their territories, to undertake conformity assessment.

5. Government's unilateral recognition of results of foreign conformity assessment.
6. Relying on manufacturers' or suppliers' declaration of conformity (SDoC) to the specified requirements.

These guidelines are in line with the OECD work on International Regulatory Co-operation. The OECD International Regulatory Co-operation (IRC) is an initiative that promotes collaboration among countries to harmonize regulatory frameworks. OECD research shows that IRC can lead to a reduction in trade costs related to gathering information on regulatory requirements in target markets, adjusting the specification of goods and services to meet different regulations, and undertaking various conformity assessment procedures (OECD, 2017[57]). One example of a successful co-operation of governments on reducing costs from conformity assessment procedures is the OECD Mutual Acceptance of Data (MAD) System.[20] The MAD System allows chemicals safety test results from one country to be accepted by over 40 others, thereby eliminating redundant testing, as participating governments trust the reliability of data that meets OECD standards for testing and quality. Another example is the OECD Codes and Schemes, which facilitate trade by setting standards and harmonising certification procedures for seeds, forests, tractors, fruits, and vegetables.[21] The OECD (2022[58]) Council Recommendation on International Regulatory Co-operation to Tackle Global Challenges, can serve as a reference for countries undertaking regulatory co-operation through guiding principles that can be applied domestically as well as through co-operation with other countries.

In the absence of harmonization, environmental standards used in new TrEPs should be interoperable. Interoperability[22] has been identified by certain trade policy makers as a key feature to improve TrEPs' effectiveness in addressing environmental issues, while also reducing unnecessary costs and trade tensions (Communication from the U.S. to the WTO, 2024[43]). More specifically, new TrEPs should be designed to achieve interoperability at two levels (OECD, 2024[59]; Stenzel and Waichman, 2023[46]; OECD, 2024[60]):

1. Regulatory interoperability: Although countries employ different standards for measuring sustainability requirements – such as GHG emissions across a product's value chain – the information and data to meet one standard can be harmonized to facilitate their use in meeting the various standards applied by different trading partners.
2. Technical interoperability: Even if countries agreed to adopt the same measurement standards, they would still need interoperability between digital tools and IT infrastructure to facilitate the exchange of the data that need to be reported and verified.

Moving from paper-based trade to trade based on digitised information and processes can help enhance technical interoperability (OECD, 2024[60])**.** Several private sector initiatives are focused on developing digital tools for the sharing of such sustainability-related information across value chains, with the aim to address the issue of technical interoperability, while accounting for countries' and firms' concerns over data sovereignty and confidentiality.[23] Various mandatory sustainability requirements also rely on the development of specific information systems and platforms for the reporting and verification of the information submitted by firms. The platforms are at varying stages of development but collectively, their objective is to contribute to a more transparent and interconnected approach to managing sustainability requirements in global value chains (OECD, 2024[60]). Where the verification of the information compiled

[20] https://www.oecd.org/en/topics/sub-issues/testing-of-chemicals/mutual-acceptance-of-data-system.html.

[21] https://www.oecd.org/en/topics/policy-issues/oecd-standards-for-agriculture.html.

[22] Interoperability can be defined as "a measure of the degree to which diverse systems, organizations, [and] individuals are able to work together to achieve a common goal" (Ide and Pustejovsky, 2010[78]).

[23] Such initiatives include PACT Pathfinder Network, Catena-X, and TfS Data Exchange Platform. See (OECD, 2024[60]) for more details.

is required at the border, the development of such platforms can further benefit from their integration with trade facilitation tools such as single window systems for the submission of documentation and data requirements or information exchange systems between border agencies spearheaded by the implementation of the WTO's Trade Facilitation Agreement (International Trade Centre, 2013[61]).

3.4. Uncoordinated, non-transparent and market-distorting industrial subsidies can unlevel the playing field.

Another substantial category of TrEPs are those that have been notified under the Agreement of Subsidies and Countervailing Measures (Figure 12**).** This has initiated a new debate about whether subsidies aimed at environmental objectives should be treated differently under WTO rules[24]. Some scholars propose to move away from the current emphasis on whether subsidies distort trade and instead support a system allowing subsidies that contribute to the Sustainable Development Goals (Villars Institute, 2023[62]). Others caution that subsidies, even when motivated by noble intentions, often come with significant costs and can fail to achieve their stated objectives. Domestically, subsidies can strain fiscal resources and divert funds from urgent priorities, while in non-subsidizing economies, they can distort trade and investment, create a sense of unfair competition, and foster risks of rent-seeking and protectionism (Gonzalez, 2023[63]).

In theory, subsidies and other forms of government support can be a solution to overcome so-called environmental technology market failures in industrial sectors. Firms investing in technologies incur R&D costs but do not always fully capture the benefits of their innovation efforts, as other firms can also gain from these advancements. As a result, firms underinvest in environmental technologies that would otherwise provide alternatives to environmentally harmful production processes. In the context of climate change for instance, this issue can be addressed by government support – e.g., subsidies – designed to foster innovation in low-carbon technologies, along with another policy instrument to reduce emissions – e.g., carbon pricing (Jaffe, Newell and Stavins, 2005[64]). That said, the design of such support matters in terms of its impacts (e.g., whether it is attached to local content requirements, restricted to national suppliers, or whether it encourages new entrants or favours incumbents). Additionally, it is important to consider whether it delivers genuine additional benefits over investments that firms would have made anyway.

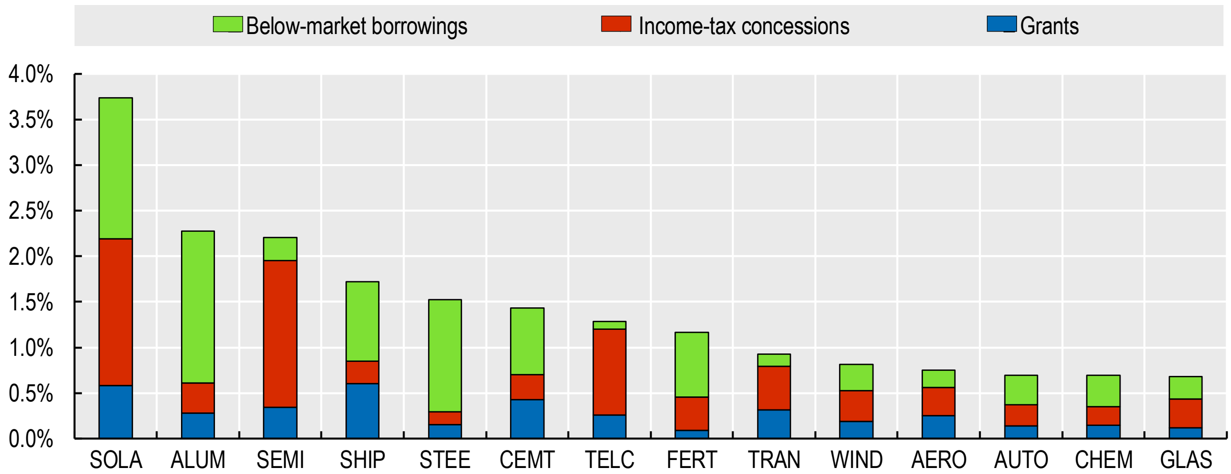
Current global government support is however directed at both environmental innovations and polluting activities, and takes a variety of forms with varying impacts on domestic and global markets. Producers of solar photovoltaics panels are found to be the largest beneficiaries of government support since 2005 (in percentage of firms' annual revenue), with emissions-intensive sectors such as aluminium[25], steel, and cement close behind (Figure 13). There is limited evidence to date on the precise environmental effects of government support because of a persisting lack of transparency on industrial subsidies (OECD, 2023[65]). By one estimate, government support has contributed to increased emissions

[24] While this section focusses on industrial subsidies aimed at environmental objectives, it is worth noting that discussions on other types of potentially environmentally harmful subsidies are ongoing. Section 2.4 has highlighted the benefits of reforming potentially harmful agricultural subsidies. Additionally, the WTO has recently concluded an Agreement on Fisheries Subsidies, aimed at prohibiting harmful subsidies to prevent the depletion of the global fish stocks. The WTO's Fossil Fuel Subsidy Reform initiative also provides a platform to discuss the phase-out of inefficient fossil fuel subsidies, encouraging WTO members to share information and experiences. The OECD is actively supporting these efforts by providing evidence-based analyses using high-quality updated data such as the Agricultural Policy Monitoring and Evaluation (OECD, 2023[24]), the OECD Review of Fisheries (OECD, 2022[92]), and the OECD Inventory of support measures for fossil fuels (OECD, 2023[90]).

[25] Aluminium is also a key input in solar photovoltaics panels, electric vehicles, and other environmental goods.

from aluminium and steelmaking activities mainly by incentivizing the expansion of production capacity, notably in more emissions-intensive locations, while it has not contributed to the development of techniques enabling firms' environmental performance (Garsous, Smith and Bourny, 2023[66]). Furthermore, even where subsidies are increasing production of environmental goods, they may lead to concentration of production and market dominance, potentially affecting supply chain resilience. To the extent that government support has forced more innovative or efficient firms out of the market, it could also hinder future efforts to combat climate change.

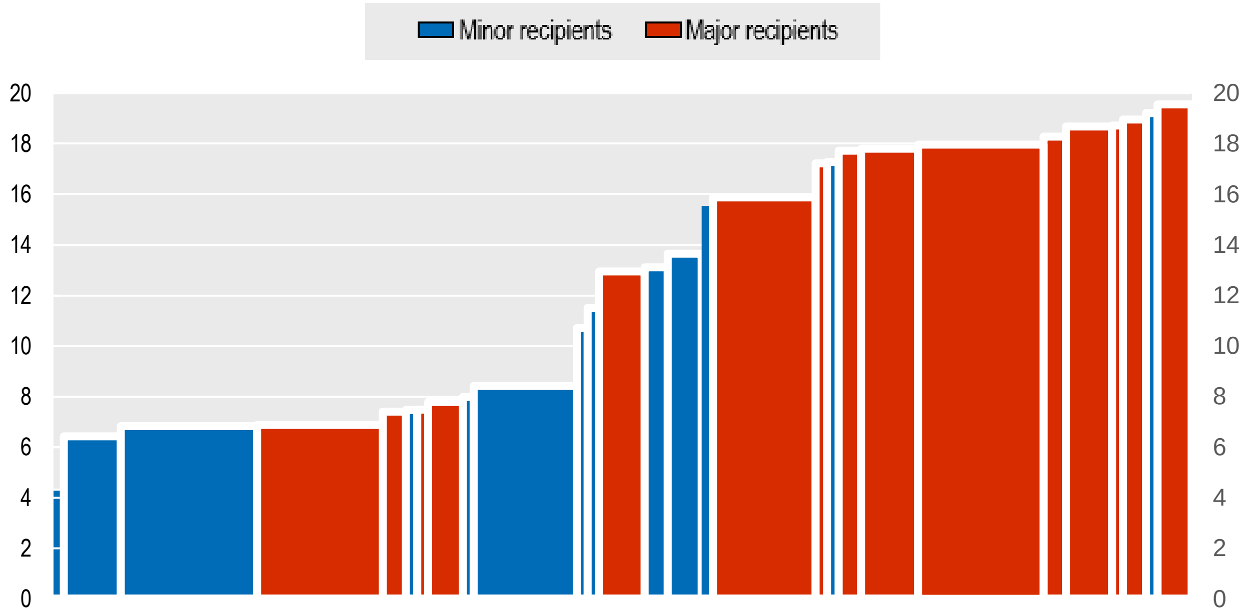
Figure 13. Industrial subsidies by sector (average for 2005-22, % of annual firm revenue)



Note: Data are expressed relative to the sales revenue of the firms covered in (OECD, 2021[67]) over the period 2005-19.
Source: (OECD, 2023[65]), (OECD, 2021[67]), and OECD's MAnufacturing Groups and Industrial Corporations (MAGIC) database.

Indeed, the proliferation of industrial subsidies are raising concerns about fair competition in the multilateral rule-based trading system (OECD, 2023[65]; OECD, 2023[68]; OECD, 2024[69]). Subsidies and other forms of support used by governments can prevent firms from competing on a level playing field, allowing less innovative, efficient, or competitive companies to crowd out firms with a better environmental performance. In the aluminum industry for instance, government support benefited the most emission-intensive firms (Figure 14), which consequently took over market shares at the expense of least emission-intensive firms (Garsous, Smith and Bourny, 2023[66]). Given that manufacturing solar PVs is also an emission-intensive process (especially in the upstream stages of production when producing polysilicon), the same effect may be at play in this sector, thereby partly offsetting the environmental benefits from PV's renewable energy generation – a topic on which the OECD will conduct future research.

Figure 14. Emissions intensity of firms in the aluminium industry (major vs minor recipients of government support)



Note: Emissions intensity (emissions-to-production ratio) calculated for 31 firms included in the government support dataset from OECD (OECD, 2021[67]) based on data from the CRU emissions analysis tool. Average annual government support received between 2006 and 2021 is calculated for each firm. The median of obtained values is then used as a threshold to separate major and minor recipients of government support – i.e. major recipients of government support are the half sample of firms with the largest average annual government support. The width of the columns represents the production of each firm.
Source: (Garsous, Smith and Bourny, 2023[66]).

In sum, while the debate on the role of subsidies aimed at environmental objectives is open, a few key points are to be considered for (ongoing) discussions:

- **There is a persisting lack of transparency around industrial subsidies.** National-led efforts have been carried out (including the EU *State Aid Transparency Public Search* or the *USAspending* online databases) but they fall short of achieving a multilateral instrument harmonising reporting rules across countries (OECD, 2023[65]). Despite their obligation to notify their subsidies under the system of WTO's notifications, members' overall compliance has remained limited in quantity and quality (OECD, 2023[65]).
- **There is no agreement on what should be considered a subsidy.** For instance, a government-issued "cheap" loan – i.e., with favourable conditions compared to market terms – can only be considered a subsidy if it is established that a "benefit" is conferred to the recipient by comparing it against a market benchmark. This comparison is challenging because there are no agreed methodologies for such assessments, which further exacerbates the lack of transparency around industrial subsidies (OECD, 2021[67]; OECD, 2023[65]). Furthermore, under the WTO's Agreement on Subsidies and Countervailing Measures, a subsidy must be provided by a "public body". However, there is no consensus on whether government-invested firms – often both providers (e.g., state-owned banks) and recipients (e.g., industrial producers) of support through below-market finance – should be considered as "public bodies" (OECD, 2023[65]).
- **Current trade rules do not fully capture many types of government support, especially when provided through the financial system** (OECD, 2021[67])**.** In particular, current trade rules may not consider the possibility that, after becoming investors, governments may not behave as typical shareholders and instead tolerate below-market returns.

- **Concerns regarding fiscal and policy spaces for industrial policies arise for developing countries.** With subsidies that aimed at environmental objectives concentrated in the world's biggest trading economies, developing countries face growing concerns as a significant share of their trade and production could be affected by trade-distorting subsidies (World Bank, 2023[70]). This poses a challenge as many developing countries lack the fiscal resources and the policy space to engage in a subsidy race (Gonzalez, 2023[63]).

3.5. Challenges at the intersection of trade and environmental policies are even more acute for developing countries

New TrEPs can also pose significant risks by disproportionally penalizing small producers in developing countries. Complying with specific guidelines to gather emissions and ensure consistent, transparent, and accurate calculations of product-level carbon footprint often requires hiring additional staff, investing in training, and adopting new software to track and report carbon emissions throughout production stages. Independent verification further increases the burden. Small and medium-sized enterprises (SMEs) in developing countries typically lack the resources needed to meet these requirements. As a result, they may be excluded from global value chains and broader markets, as buyers shift towards less risky suppliers (which can more easily comply with new TrEPs) or shorten their supply chains to improve traceability and control (Standard Chartered, 2021[71]). These producers may be driven to markets with less stringent controls, which could lead to a race to the bottom in environmental standards. Certain developing countries even argue that environmental policies are being used as new protectionism to keep out cheaper imports (Hancock, 2022[72]).

Developing countries are concerned that new TrEPs could violate internationally agreed principles, such as the common but differentiated responsibility and respective capabilities (CBDR-RC). In the context of climate change mitigation, the CBDR–RC principle of the Paris agreement allows each country to set their own individual climate objectives (called "nationally determined contributions") depending on their historical contribution to climate change as well as the level of economic development (OECD, 2020[42]; Mehling et al., 2019[73]). By incentivizing (or potentially compelling) emission reductions in production processes within exporting countries, new TrEPs could disrupt the balance of such differentiated obligations (Marin Duran and Scott, 2024[74]). Many developing countries have voiced these concerns on many occasions, including at the meetings of the WTO's Committed on Trade and Environment (WTO, 2021[75]).

In a context of proliferation new environmental requirements, trade development co-operation mechanisms, such as Aid for Trade, can help develop the necessary capacity and infrastructure to enable compliance. As environmental requirements emerge in different markets, it is also crucial to develop the necessary infrastructure and skills to ensure compliance and carry out conformity assessment procedures such as testing, accreditation, and certification. These are commonly referred to as "quality infrastructure" (World Bank, 2019[76]), and have important implications for co-operation and capacity building, particularly for developing countries (OECD/WTO, 2019[77]). In this respect, there can be an important role for Aid for Trade initiatives to develop "quality infrastructure" and the capacity to ensure compliance with new requirements and carry out conformity assessment procedures to access different markets.

4. Concluding remarks

This report demonstrates the importance of harnessing the nexus of trade and environmental policies to address the triple planetary crisis of climate change, biodiversity loss, and pollution. By aligning objectives in these policy areas, countries can take advantage of significant synergies supporting both economic growth and environmental sustainability. The integration of trade policies with environmental objectives has the potential to facilitate the global diffusion of green technologies and circular economy practices, thereby accelerating the transition to a more sustainable global economy.

However, challenges at the nexus of trade and environmental policies include the risk of spillover effects stemming from cross-country difference in the levels of ambition in environmental policies, and the unintended consequences of uncoordinated trade policies. To mitigate these challenges, it is essential to foster greater collaboration among governments, international organizations, and the private sector to create a coherent and effective framework that aligns trade and environmental policies for the benefit of the global community. This coordinated effort will be crucial in overcoming the complexities and challenges of managing trade-environment linkages, paving the way for a more resilient and sustainable future.

Considering the insights from this report, such a high degree of coordination can be achieved through several key actions, including:

- Engaging in multilateral dialogue to harmonize or enhance interoperability of environmental standards and trade regulations to ensure that these policies are consistent and mutually supportive.
- Enhancing transparency and data sharing about trade policies, and in particular government support for environmental objectives, to help build trust and facilitate co-operation among countries.
- Proposing capacity-building programs and providing technical assistance to developing countries – in particular, develop “quality infrastructure” and the capacity to carry out conformity assessment procedures –to enable them to meet global environmental standards and participate fully in green trade initiatives.
- Leveraging existing international frameworks – such as the WTO and preferential trade agreements – as platforms for negotiating and implementing integrated policies that promote both trade and sustainability.

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