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TESS Forum on Trade, Environment, & the SDGs

Trends in Trade Flows Across the Life Cycle of Plastics: Preliminary Review

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TESS Forum on Trade, Environment, & the SDGs

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This paper draws on collaboration with UNCTAD and the UNCTAD Plastics Trade Database: https://stats.unctad.org/plastics.

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Abbreviations

IMO	International Maritime Organization
ISO	International Organization for Standardization
HS	Harmonized Commodity Description and Coding System
MC13	Thirteenth WTO Ministerial Conference
MSMEs	Micro, Small, and Medium-Sized Enterprises
SIDS	Small Island Developing State
UNEA	United Nations Environmental Assembly
UNEP	United Nations Environment Programme
UNCTAD	United Nations Conference on Trade and Development
WCO	World Customs Organization
WTO	World Trade Organization

Abstract

As governments and stakeholders work to bolster international cooperation on plastic pollution, there is growing recognition of the relevance of trade flows and policies to efforts to end plastic pollution and promote systems change in the global plastics economy. In the ongoing United Nations negotiations for a new global plastics treaty, the World Trade Organization Dialogue on Plastics Pollution, and the efforts to strengthen regulation of plastic waste trade through the Basel Convention, for instance, governments have noted the importance of improving the transparency of trade flows across the life cycle of plastics and of the material composition of products traded internationally.

To inform these discussions, this briefing note provides a preliminary review of trends in trade flows across the full life cycle of plastics, starting from trade in feedstocks, precursors, and chemical additives commonly used in plastics through to plastic products and plastic waste. It finds that in 2021, the value of global plastics trade was at least $1.2 trillion, representing around 5% of all trade. The paper also highlights that the way trade flows are currently classified for the purposes of official statistics limit the transparency of trade across the plastics life cycle, with important implications for policymaking in relation to global efforts to end plastic pollution. The authors conclude by highlighting steps governments could take to improve the transparency of trade flows across the life cycle of plastics.

1. Introduction

As governments and stakeholders work to bolster international cooperation on plastic pollution, there is growing recognition of the relevance of trade flows and policies to efforts to end plastic pollution and promote systems change in the global plastics economy. Trade and trade policies have been discussed for several years in the context of the Basel Convention on the transboundary movement of hazardous waste and the World Trade Organization (WTO) Dialogue on Plastics Pollution, and are emerging as an important topic for consideration in the ongoing negotiations for a new international legally binding instrument to end plastic pollution (Deere Birkbeck et al., 2022; UNEP, n.d.).

Trade flows are relevant to plastic pollution for several reasons. First, plastic pollution occurs across the life cycle of plastics and significant volumes of trade also occur across that life cycle. Second, trade in plastics and plastic waste adds to the pollution burden on importing countries and the associated leakage of plastics into the environment, especially in countries with inadequate capacity for environmentally sound waste management. Third, international trade flows play a central role in the international supply chains, production systems, and consumption trends that shape the global plastics economy. The transformation of international trade and supply chains will thus be key to ending plastic pollution.

To inform discussions among governments and stakeholders on the role of trade and trade policies in global efforts to tackle plastic pollution, this briefing note provides an overview of trends in trade flows across the life cycle of plastics, as well as within and between regions and countries. Notably, in both the negotiations for a new global plastics treaty and the WTO Dialogue on Plastics Pollution, governments have expressed interest in improving the transparency of trade flows across the life cycle of plastics and of their material composition.

In the 2021 ministerial statement launching the WTO Dialogue on Plastics Pollution, for instance, co-sponsors recognized the need to:

- "improve the understanding of global trade in plastics, including flows of plastics embedded in internationally traded goods or associated with them (such as plastic packaging);" and
- identify "actions needed to improve gathering of data on trade flows and supply chains, including by utilizing the Harmonized Commodity Description and Coding System (HS Convention) of the WCO [World Customs Organization] or other trade instruments or standards [...] and [to improve] the flow of information about the chemical and material characteristics of plastic products traded internationally." [1]

Building on work by Barrowclough et al. (2020), this paper responds to those needs. First, it identifies the main exporters and importers within categories across the life cycle of plastics, highlights the significance of trade flows, and sheds light on the size and geographic distribution of global markets for plastics.

The analysis in this paper covers the full life cycle of plastics, starting from trade in feedstocks and precursors, and additives, commonly used in plastics, through to plastic products and plastic waste. When the term "plastics trade" is used in this paper, its refers only to trade flows starting from primary plastics to plastics waste (but not trade in feedstocks, precursors, and additives). In 2021, the value of global plastics trade was at least $1.2 trillion or almost 5% of all global trade.

For each stage of the life cycle of plastics, the analysis draws on the categorization used in the United Nations Conference on Trade and

1. World Trade Organization, Ministerial Statement on Plastics Pollution and Environmentally Sustainable Plastics Trade, WTO Doc. WT/MIN(21)/8/Rev.2 (December 10, 2021).

Development (UNCTAD) "Plastics Trade Life Cycle" database, which, in turn, drew on granular analysis by Barrowclough et al. (2020) of HS codes to identify and assign goods to different categories across the life cycle of plastics. We encourage readers to consult the full list of HS codes included in each category, which is available on the web page of the UNCTAD database and used in this paper (UNCTADSTAT, n.d.).

Second, drawing on a policy brief by Vaca Eyzaguirre and Deere Birkbeck (2022), this paper also identifies the limitations in how trade flows are classified for the purposes of official statistics and monitoring and, in turn, how this impacts transparency of trade flows across the plastics life cycle. It is vital to be aware of these limitations—and potential options to address them—when considering trade and trade policy tools that could be used to support international efforts to end plastic pollution.

In this regard, a key point underlined in this paper is that official trade data provide limited information on trade flows in a vast diversity of products that contain embedded plastics or that have associated packaging, such as pre-packaged goods, or cross-border flows in plastic packaging used in the distribution and transportation of products. Official trade classifications and data are also only available at a granular level for a limited number of the range of single-use plastics that many governments are seeking to better regulate at the national and international (see Annex 2 for examples).

This paper begins with a general overview of challenges related to the measurement and transparency of trade flows across the life cycle of plastics. It then reviews general global trends in trade flows across the life cycle of plastics in section 3, followed by more granular analysis by life cycle stage in sections 4 and 5. In section 6, the paper presents data on trade flows related to a number of specific subcategories of plastic products of particular relevance to international efforts to end plastic pollution. The conclusion highlights steps that governments could take to improve the transparency of trade flows across the life cycle of plastics.

2. Challenges Related to the Measurement and Transparency of Trade Flows Across the Life Cycle of Plastics

Trade plays a role across the life cycle of plastics (see figure in Annex 3), including trade in:

- Fossil fuels and their derivatives—the key feedstocks that underpin the global plastics economy (e.g. naptha)
- Precursors used to produce plastics (e.g. ethylene and propylene)
- Chemical additives
- Primary plastics (e.g. resins pellets and fibres)
- Intermediate forms of plastics
- Final plastic products (including plastic packaging and synthetic textiles)
- Products containing embedded plastics
- Products pre-packaged in plastics
- Products transported in plastic packaging
- Plastic waste
- Secondary plastic waste products, including recyclates

In addition, there are trade flows associated with a range of plastic-related services, such as plastic distribution services, plastic waste transportation services, and waste management and clean-up technologies and services. While some data on trade in waste management services are available, this is not broken down to plastic-specific waste management services.

Shortfalls in the way products are classified for the purposes of international trade statistics make it challenging to properly quantify and monitor the volume and value of trade flows in plastics and in the many specific kinds of plastic products and products with associated plastics.

2.1 Transparency Challenges Arising from Trade Classifications

The collection of data on trade flows relies on a shared approach to classifying products traded internationally. At the international level, trade classifications are defined by the WCO's Harmonized Commodity Description and Coding System.

Many estimates of plastic trade flows simply combine all HS codes in Chapter 39 "Plastics and Articles Thereof," which comprise those designated by the HS as being plastics. In 2020, a joint UNCTAD and Geneva Graduate Institute study categorized trade flows across the life cycle of plastics, based on a full review of the entire list of HS codes (Barrowclough et al., 2020). That review identified a range of HS codes beyond those included in Chapter 39 that also cover different kinds of plastic products across their life cycle, as well as critical inputs such as plastic feedstocks, chemical precursors, and additives. Additional codes in the HS, outside Chapter 39, that cover plastics include those related to synthetic rubber products and textiles, as well as items such as nappies, sanitary towels, and fishing nets, which are almost entirely plastic. In addition, certain primary forms of plastics, such as synthetic textile fibres and synthetic rubber polymers, are not included in Chapter 39.

Building on Barrowclough et al. (2020), a TESS policy brief by Vaca Eyzaguirre and Deere Birkbeck (2022) provided the first synthesis of transparency-related challenges along with proposals for potential amendments to the HS classifications. It observed, for instance:

- Limited differentiation of primary plastics by polymer type and by feedstock (e.g. fossil fuel feedstocks and recycled feedstocks).
- Limited differentiation of persistent organic pollutants and other harmful chemical additives.
- Insufficient breakdown of single-use plastics of high environmental concern.
- Gaps in the range of products that are classified as plastics.
- Varying detail on the share of plastics embedded in products. While some plastic items in international trade have specific, dedicated classification HS codes (meaning that data on trade flows are readily available), a significant share of plastic that crosses international borders is embedded in products that contain some plastic but are not entirely plastic.
- Limited information on the material composition of plastic products and waste, including polymer types and the presence of harmful chemical substances of high environmental and health concern. There is also little differentiation of the diversity of intermediate or manufactured plastic products by polymer type, with some exceptions. Many different types of plastics are not distinctly specified under their own subheading but grouped under the catch-all category "Other." While there is an HS code for polyactic acid (PLA), which is one type of bio-based primary plastic, it does not differentiate

intermediate plastic goods or final plastic goods made of PLA from plastic goods made of other primary plastics, or from particular shares of recycled content.

- Missing information on plastic packaging that is an integral part of other traded products. The approach to classification of products used in the HS does not lend itself to capturing the enormous amount of plastic packaging that moves internationally through trade. While there are HS codes for a number of different types of "empty" plastic packaging, the HS does not capture the significant volumes of packaging used for pre-packaged foods, beverages, and personal hygiene products or packaging that is used in the distribution or transportation of products (such as business-to-business packaging and packaging used in shipping and distribution to online buyers).[2]
- Limited granularity in classifications of plastic waste (including poor alignment with the Basel Convention). Although HS codes differentiate some types of plastic waste by polymer type, they do not differentiate plastic waste on the grounds of whether it is hazardous, contaminated, mixed, or recyclable nor, as noted above, do they provide separate codes for secondary materials (e.g. recycled plastic resins).

2.2 Non-Hidden, Semi-Hidden, and Hidden Trade Flows in Plastics

Tracing plastic flows in the economy is a difficult task because plastic is present in a huge diversity of products traded internationally. To measure trade flows, three types of trade flows must be considered:

- Non-hidden trade flows: defined as products that are identified as plastics in international trade classifications (i.e. they are explicitly categorized under HS Chapter 39 on plastics) and thus can be easily tracked using official trade statistics. Non-hidden flows of plastics reached a volume of 257 million metric tonnes (Mmt) in 2018 (Figure 1).[3] These flows grew to 288 Mmt in 2021 (CEPII, n.d.).
- Semi-hidden trade flows: defined as products that are entirely or largely plastics for which trade classifications exist (e.g. synthetic rubber accounting for 39 Mmt and synthetic textiles accounting for 27 Mmt in 2018) but which are not explicitly categorized under HS Chapter 39 on plastics. Together, semi-hidden plastic trade flows reached 82 Mmt in 2018 (Figure 1). These flows grew to 86 Mmt in 2021 (CEPII, n.d.).
- Hidden trade flows: defined as other international trade flows in plastic packaging associated with products (pre-packaged food and beverages); packaging used in the distribution and transportation of products (including business-to-business); and plastics embedded in millions of products traded internationally, including cars, electronic appliances, and construction materials. The volume of hidden plastics that cross international borders is massive. However, neither official trade statistics nor the HS classifications that underpin them enable the volume or value of the plastic component of these trade flows to be easily identified or traced. A first preliminary effort to identify and quantify such hidden flows estimated at least a further 70 Mmt in hidden plastic trade flows in 2018 (Boucher at al., 2021).[4]

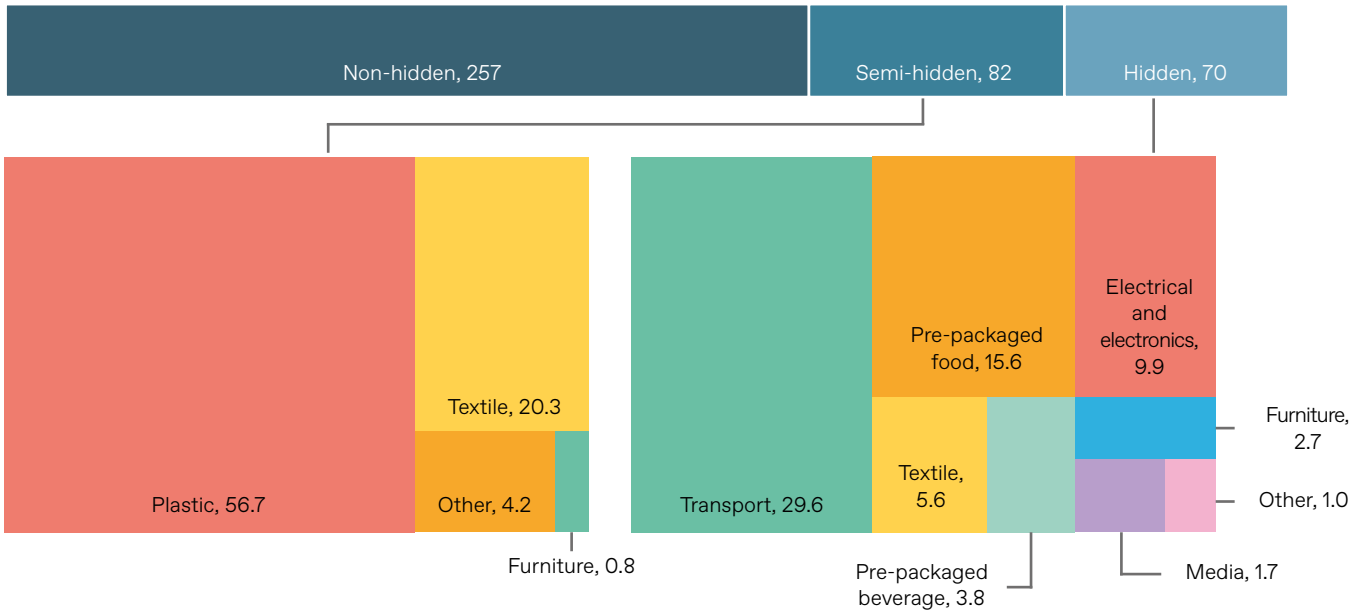
2. Here, the WCO's General Rules of Interpretation (GRIs) (a set of legal principles that govern the classification of goods under the HS) are relevant, especially for plastic packaging (WCO, n.d.-b). Principle 5 (a) of the GRIs, for instance, states that "(a) Camera cases, musical instrument cases, gun cases, drawing instrument cases, necklace cases and similar containers, specially shaped or fitted to contain a specific article or set of articles, suitable for long-term use and presented with the articles for which they are intended, shall be classified with such articles when of a kind normally sold therewith. This Rule does not, however, apply to containers which give the whole its essential character." Article 5 (b) further adds that "Subject to the provisions of Rule 5 (a) above, packing materials and packing containers presented with the goods therein shall be classified with the goods if they are of a kind normally used for packing such goods. However, this provision is not binding when such packing materials or packing containers are clearly suitable for repetitive use."
3. Throughout this briefing note, Mmt refers to million metric tonnes.
4. This 2018 estimate from Boucher et al. (2021) has not been updated since.

To estimate the volume of the hidden plastics trade in 2018, the methodology relied on estimates of the share of plastic in the material composition of products by sector, which were then applied to trade flows by sector.[5] The main sectors of trade containing hidden plastics either in the form of packaging or embedded plastic in final manufactured products were electrical and electronics, processed food, agriculture, and textiles (for products that are only partly composed of synthetic fibres).

Boucher at al. (2021) also revealed that hidden flows of plastic packaging exceeded trade flows in "empty" plastic packaging captured by official international classifications.

The challenge of knowing what portion of the value of a product could be attributed to different volumes and types of plastics embedded in a product meant that the preliminary analysis of hidden trade flows by Boucher et al. (2021) did not attempt to estimate value.

Figure 1. Preliminary Estimates of Hidden Plastics in World Trade: Overview by Sector (Mmt, 2018)



Note: Non-hidden flows refer to those products identified in HS Chapter 39 on "plastics." Semi-hidden flows are for flows in products clearly identifiable as plastics that are covered by other HS codes not included in Chapter 39. Hidden flows are those not visible in the HS system, including many products with embedded plastics as well as pre-packaged products. The hidden category does not, however, capture packaging associated with transportation and distribution of products across borders, including business-to-business packaging.
Source: Boucher et al. (2021).

In 2021, the total combined estimated value of exports of non-hidden plastics (estimated at $715 billion) and semi-hidden plastics trade in the form of exports ($401 billion) was $1.12 trillion. In terms of volume, non-hidden plastics exports in 2021 amounted to 288 Mmt alongside an estimated 86 Mmt of semi-hidden plastic exports, making a total of 374 Mmt. Further, adding the preliminary estimate of 70 Mmt of hidden plastic exports for 2018 (as a proxy for 2021, as no estimate for 2021 is currently available) would yield a total estimate of 444 Mmt of plastics crossing international borders in 2021.

5. The analysis for this section draws directly from Boucher et al. (2021).

3. Global Trends in Trade Flows Across the Life Cycle of Plastics

3.1 Snapshot of Trade Flows Across the Life Cycle of Plastics

Drawing on the UNCTAD database on trade flows across the life cycle of plastics, developed in collaboration with researchers at the Geneva Graduate Institute, Tables 1 and 2 provide a snapshot of export flows across the life cycle of plastics, including for inputs that are commonly used in production. For each stage of production, the UNCTAD database builds on Barrowclough et al. (2020) who identified and assigned relevant HS codes to specific categories across the life cycle of plastics.[6]

Table 1. Snapshot of Export Flows Across the Life Cycle of Plastics (2021)

Plastic Products	$ billion	Million metric tonnes
Primary forms of plastics	384.5	172.9
Intermediate forms of plastics	167.4	41.5
Intermediate manufactured plastic products	118.6	21.7
Final manufactured plastic products	510.1	127.1
Plastic waste	3.4	5.5

Source: Authors' elaboration based on UNCTADSTAT (n.d.) and Barrowclough et al. (2020).

Table 2. Export in Inputs Commonly Used in Plastic Production (2021)

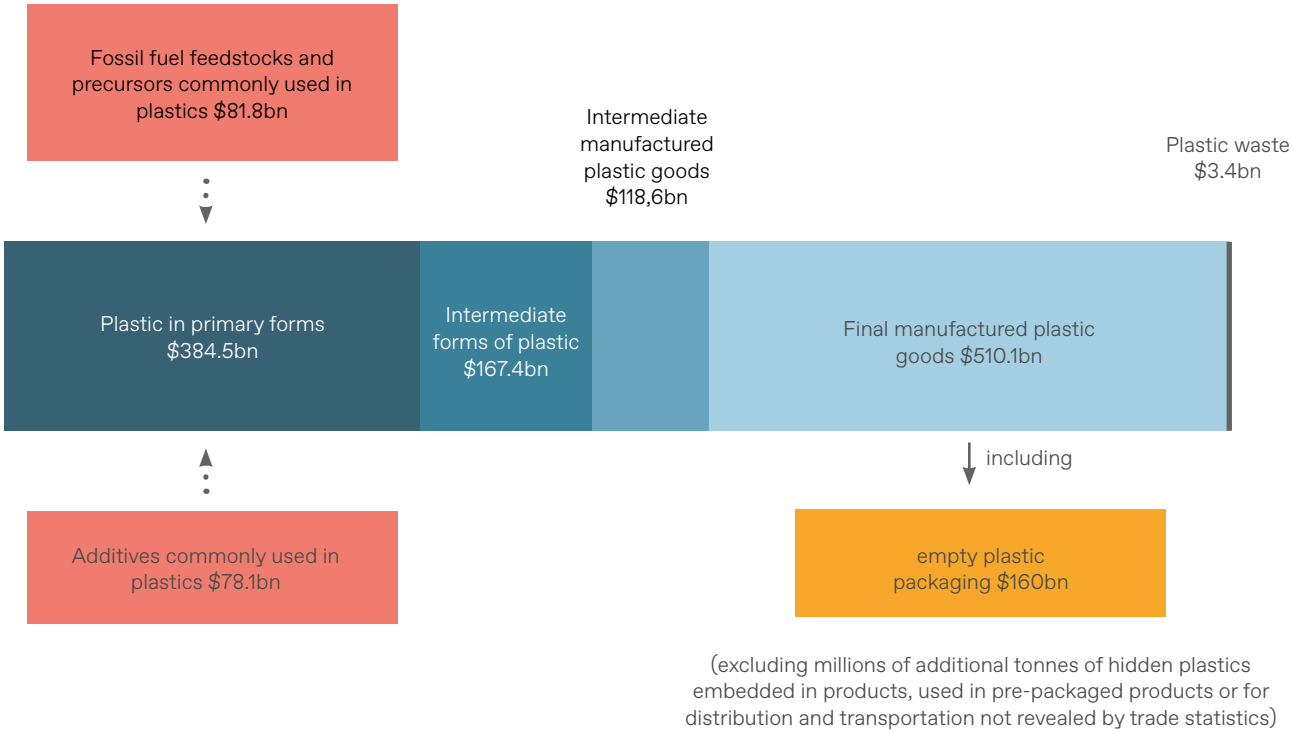
Plastic inputs	$ billion	Million metric tonnes
Additives	78.1	41.3
Feedstocks and precursors	81.8	75.9

Note: These values cover feedstocks, precursors, and additives commonly used in plastic production and processing. The values noted in this table are for the total amount of trade, recognizing that not all of the trade of all of the products included in those values will be destined for use in plastics.
Source: Authors' elaboration based on UNCTADSTAT (n.d.).

6. A full list of the HS codes by category is available on the database webpage. Notably, the database and subsequent analysis focus only on non-hidden and semi-hidden plastic trade flows that are readily identifiable in international trade classifications and official UN Comtrade statistics compiled using those classifications. It is these flows (and not hidden flows) that are the focus of the rest of this briefing note.

Figure 2 provides a breakdown of trade flows across different life cycle categories of plastics by value in 2021. It is clear from Figure 2 that final manufactured plastic goods, including empty plastic packaging, accounted for the largest share of trade flows by value in 2021 at around $510 billion, followed by plastics in primary forms at $384.5 billion. Exports of fossil fuel feedstocks, precursors, and chemical additives commonly used as inputs to plastic production and processing reached a value of nearly $160 billion in 2021 (while noting that this figure does not specify what share of trade in these products is specifically destined for use in plastics).

Figure 2. Export Flows Across the Life Cycle of Plastics (2021)



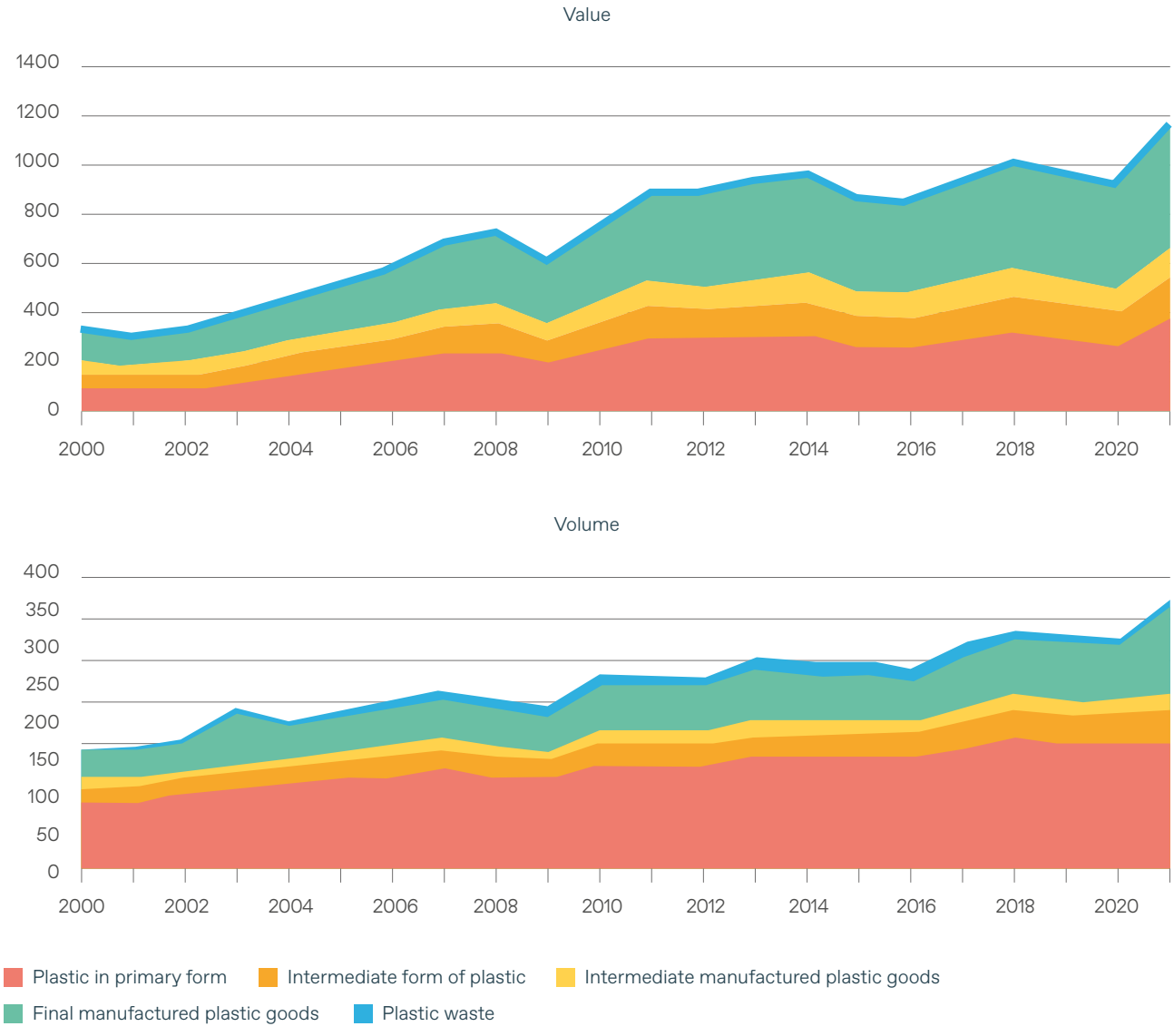
Note: Feedstocks, precursors, and additives are inputs used in plastic production and processing. The values noted in this figure are for the total amount of trade, recognizing that not all of the trade of all of the products included in those values will be destined for use in plastics. Empty plastic packaging is included in the value for final manufactured plastic goods.
Source: Authors' elaboration based on UNCTADSTAT (n.d.).

From 2000–21, global exports of plastics rose from around 164 Mmt to 369 Mmt in volume terms while export values increased from nearly $336 billion to $1184 billion over the same period (Figure 3). While the growth in exports show a steady increase, especially for primary and intermediate forms of plastics, export values appear more volatile and show a sharp increase in particular for manufactured plastic goods, especially from 2020 onward. Figure 4 further shows the average trade volume as values of plastic export flows over 2017–21 broken down

by life cycle category. While primary plastics represent the largest global export category in volume terms (172 Mmt), final manufactured plastic goods represent the biggest share of global exports by value ($439 billion).

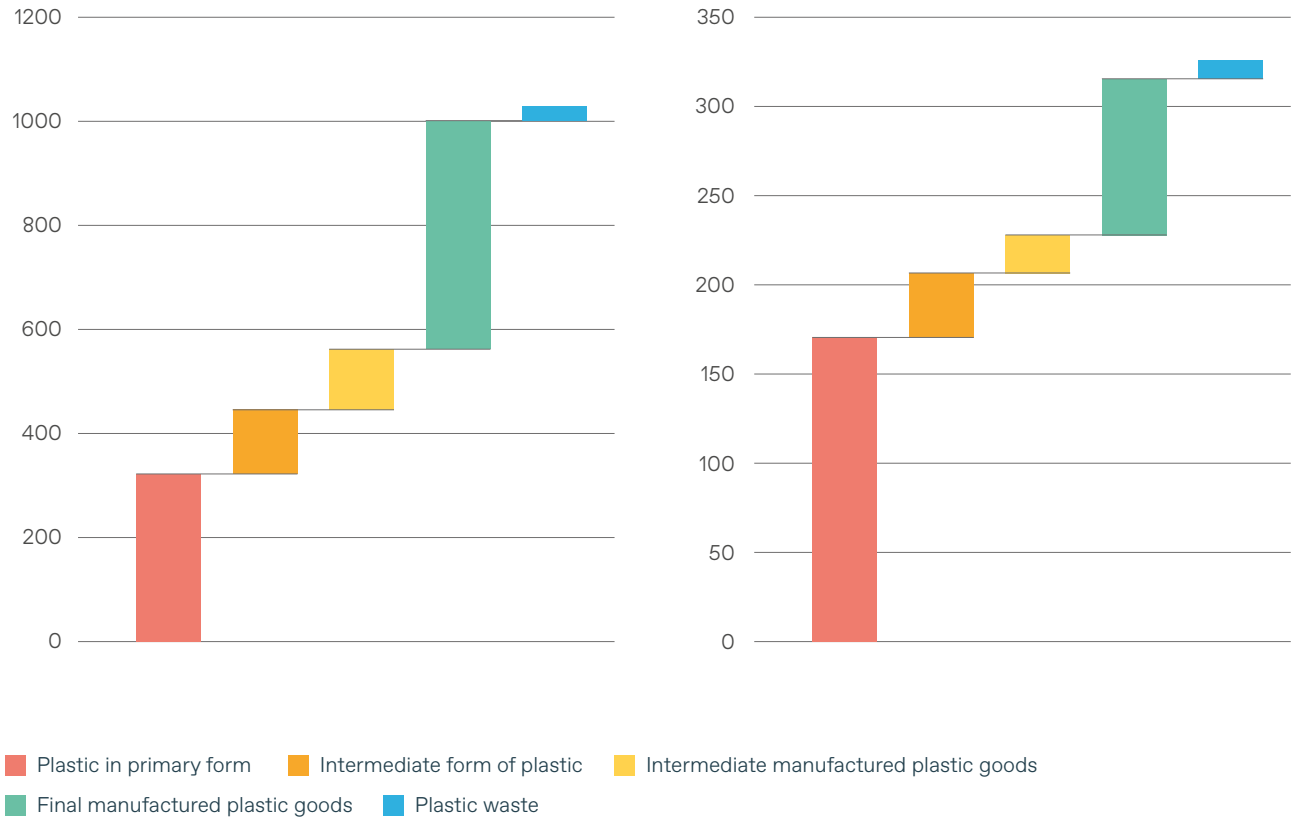
Importantly, the simple addition of the volume of trade across different stages of the plastic life cycle may overstate the total volume of plastics because a portion of final plastic products traded internationally will already have crossed borders at different stages of the life cycle for value addition. While it was beyond the scope of this briefing note to explore trends and dynamics in value addition along international supply chains, these first calculations nonetheless provide a useful guide and indication of the scale and value of plastics trade.

Figure 3. World Exports of Plastics by Value ($bn) and Volume (Mmt) (2000–21)



Source: Authors' elaboration based on UNCTADSTAT (n.d.).

Figure 4. World Exports of Plastics by Life Cycle Category by Value ($bn) and Volume (Mmt) (avg. 2017–21)



Source: Authors' elaboration based on UNCTADSTAT (n.d.).

3.2 Trade as a Share of Global Plastics Production

The significance of trade flows in the plastics sector is amplified by the fact that trade can represent a major share of overall production at key points along the plastics value chain. Calculating trade as a share of production is a difficult exercise due to the inconsistency in coding between trade and production data. One approach to overcome this difficulty is to compare trade flow data with production data using the International Standard Industrial Classification (UNDESA, 2008). For instance, according to 2019 data on global industrial output from the United Nations Industrial Development Organization (UNIDO), the production of primary "plastics and rubber" that year was 368 Mmt. In the same year, a reported 243 Mmt of primary plastics and rubber were exported, representing 66% of production.[7]

As noted, in some countries, domestic production at different stages of the plastics life cycle may be destined primarily for national consumption (such as for packaging or as inputs into other stages of production); that is, only a portion of production may be exported. As such, it should be borne in mind that while trade volumes are important, they are a subset of the larger plastics production.

7. At the time of publication, the latest published UNIDO data were for the 2019 fiscal year. More information can be found at UNIDO (n.d.).

3.3 Key Players in Trade Across the Life Cycle of Plastics

All countries are involved to some degree in trade across the life cycle of plastics. This fact reflects the extraordinary range of products traded internationally that contain plastics and the international nature of supply chains for plastics. Importantly, a country may be a major player in the plastics economy at particular points along the life cycle (e.g. as a producer of primary plastics or manufacturer of specific plastic products) but not a major exporter. Production may, for instance, be used domestically as an input to further manufacturing, which may or may not then be shipped internationally, or it may simply be produced directly for domestic consumption.

Tables 3 and 4 provide a snapshot of the countries that play the greatest role by volume of trade at various stages of the life cycle of plastics, starting with trade in feedstocks and precursors, as well as additives, that are commonly used in plastics. Annex 1 presents the top 10 exporters and importers by value.

Table 3. Top Exporters Across the Plastics Life Cycle by Volume (2021)

Rank	Feedstocks and Precursors	Additives	Primary forms of plastics	Intermediate forms of plastics	Intermediate manufactured plastic products	Final manufactured plastic products	Plastic waste
1	Korea	China	US	China	China	China	Germany
2	US	US	Korea	Germany	Turkey	Germany	USA
3	Japan	Indonesia	Saudi Arabia	Korea	Germany	USA	Netherlands
4	Netherlands	Taiwan	China	US	USA	Poland	United Kingdom
5	Saudi Arabia	Korea	Germany	Italy	Italy	Thailand	Japan
6	India	Malaysia	Taiwan	India	India	Turkey	Belgium
7	Germany	Saudi Arabia	Belgium	Turkey	Korea	Italy	France
8	Belgium	Belgium	Netherlands	Taiwan	Taiwan	Netherlands	Italy
9	Taiwan	Germany	Thailand	Belgium	Vietnam	France	Poland
10	Singapore	Singapore	Singapore	Thailand	Indonesia	Vietnam	Canada

Note: The plastic waste column in this table does not include trade in synthetic textiles waste.
Source: Authors' elaboration using 2021 data from BACI (Base pour l'Analyse du Commerce International) (CEPII, n.d.) drawing on the categorization used in UNCTAD plastics trade database and updating Barrowclough et al. (2020, p. 18).

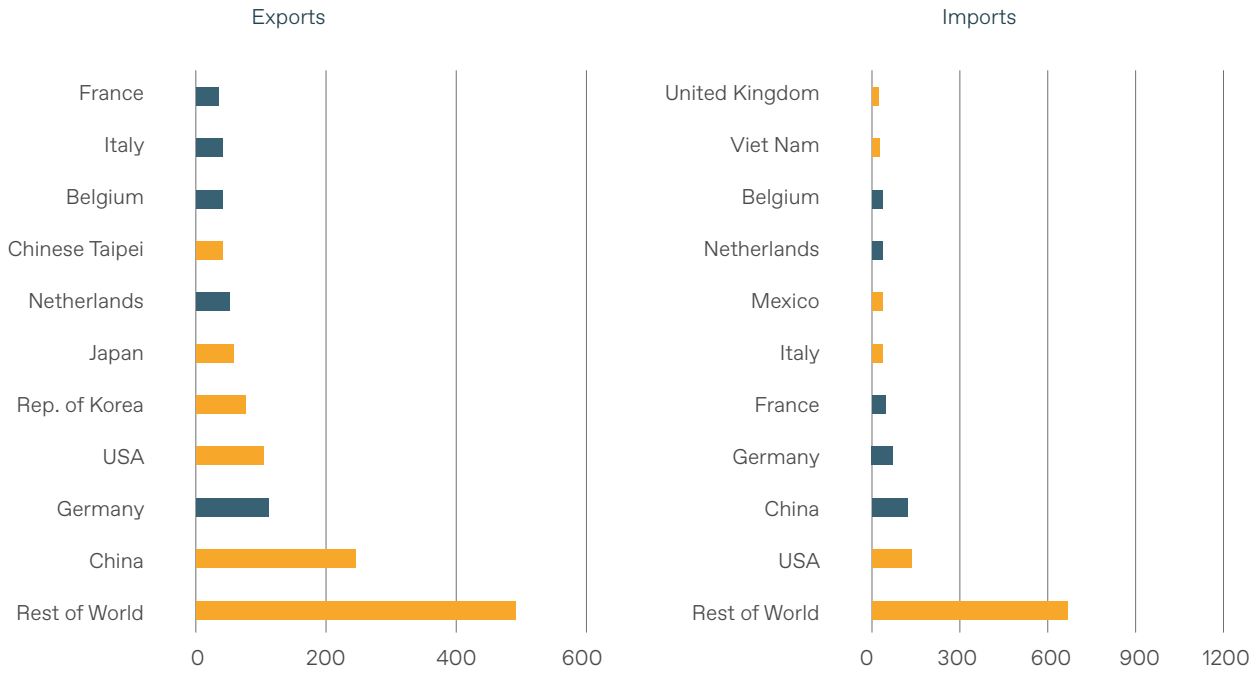
Table 4. Top Importers Across the Plastics Life Cycle by Volume (2021)

Rank	Feedstocks	Additives	Primary forms of plastics	Intermediate forms of plastics	Intermediate manufactured plastic products	Final manufactured plastic products	Plastic waste
1	China	China	China	US	US	US	Turkey
2	Belgium	India	Germany	Germany	Vietnam	Germany	Netherlands
3	Netherlands	Turkey	US	China	Bangladesh	France	Germany
4	US	Germany	Italy	Vietnam	Germany	United Kingdom	Malaysia
5	Taiwan	Netherlands	India	France	India	Mexico	US
6	Germany	US	Turkey	Italy	Mexico	Netherlands	Vietnam
7	India	Italy	Vietnam	Turkey	France	Canada	Taiwan
8	Korea	Korea	Belgium	India	Indonesia	Japan	Poland
9	France	Spain	Mexico	United Kingdom	Russian Federation	Belgium	Belgium
10	Indonesia	Vietnam	Poland	Poland	Nigeria	Italy	Spain

Note: The plastic waste column in this table does not include trade in synthetic textiles waste.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020, p. 18).

Looking across plastics trade as a whole, China is the largest exporting country, accounting for 19% of total exports before Germany and the United States (US), with 8% each (Figure 5). However, when individual European Union (EU) members are combined, the EU surpasses China as the largest exporter of plastics. In terms of imports, the US tops the charts with more than 11% of total plastic imports whereas China represents just over 9% of the total, with the EU as a grouping again exceeding these shares. Some countries feature as top 10 exporters by volume across all parts of the plastics life cycle (e.g. Germany) while others are prominent in certain parts of the life cycle or products (e.g. Turkey, which exports intermediate manufactured plastic products and synthetic textiles) (Barrowclough et al., 2020; CEPII, n.d.).

Figure 5. Total Value of Exports and Imports in Plastics ($ billion, 2021)

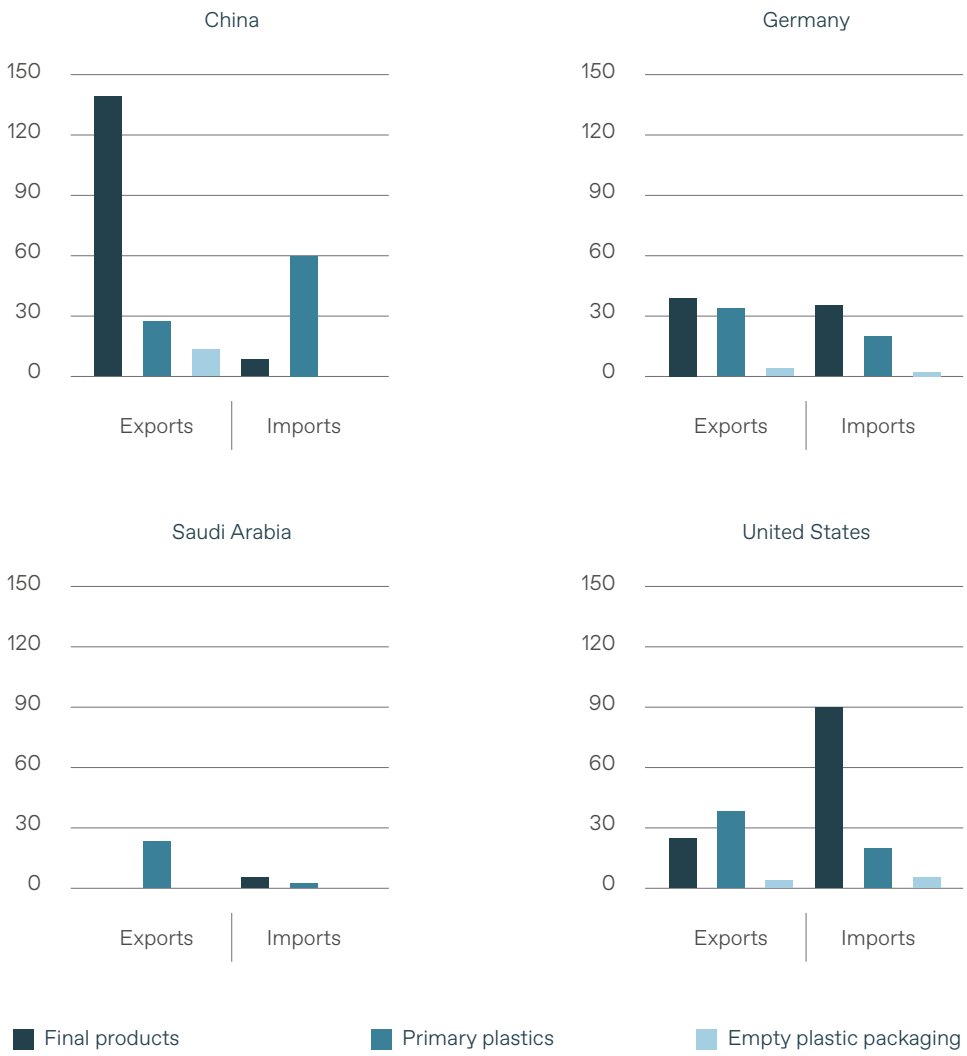


Note: This figure does not include trade in feedstocks, precursors, or additives.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

Notably, even for countries whose share of plastic exports is not significant on a global scale, plastics may generate sizeable export earnings and employment for the national economy. Indonesia, Thailand, and Vietnam, for example, are all top 10 exporters in at least two stages of the plastics life cycle (Table 3), and a range of countries generate important export earnings from fossil fuels, a growing portion of which is destined for plastics production (IEA, 2022).

Barrowclough at al. (2020) highlight that plastics trade is "multi-faced and multi-directional," noting that "[s]ome of the world's largest exporters of plastics products and inputs are at the same time among the world's largest importers" (Barrowclough et al., 2020). Figure 6 shows that Saudi Arabia features as one of the world's largest exporters of primary plastics, but does not figure as a key importer of plastic products. China, on other hand, is a major importer (and exporter) of primary plastics and also a major exporter of intermediate and final manufactured plastic products derived from primary products. The US and Germany, with significant interests in petrochemical and chemical production as well as plastics manufacturing, feature strongly as both importers and exporters across the life cycle of plastics (Barrowclough et al., 2020; CEPII, n.d.).

Figure 6. Snapshot of Key Player Plastic Exports at Different Points of the Plastics Life Cycle ($bn, 2021)



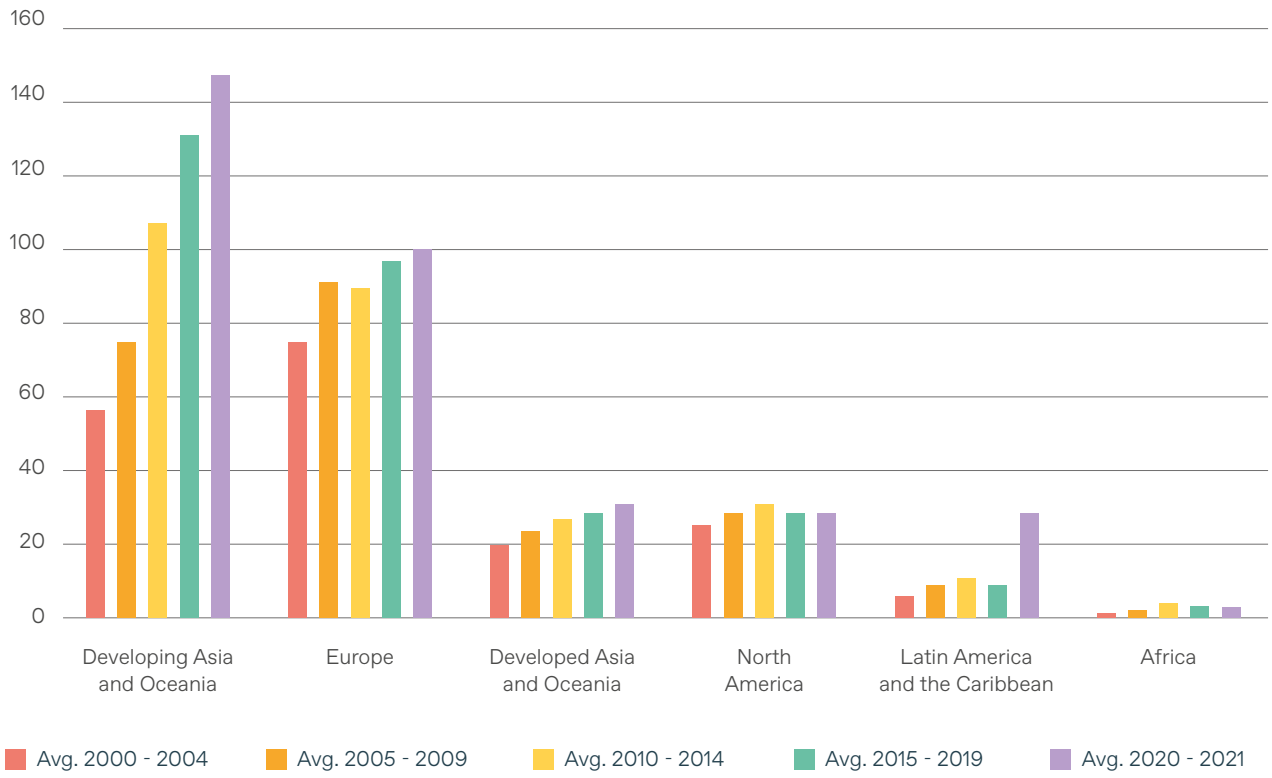
Note: The final products bars show trade in all final manufactured goods, which includes trade in empty plastic packaging. Given its relevance to plastic pollution, the graph also highlights trade in empty plastic packaging in its own right.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020).

3.4 Regional Dynamics

During the period 2000–21, there were important developments in the geographic composition of plastics trade. In terms of overall volume by region, a key development was the rise of the Asia-Pacific as the leading plastic exporter. Figure 7 presents regional data for plastics trade, comprising trade flows from primary plastics through to plastic waste. Led by the rise of China's plastics exports, the Asia-Pacific region's exports reached an average volume of 148 Mmt over 2000–21, overtaking Europe,

which averaged 100 Mmt of plastics exports during the same period. North America and developed Asia and Oceania (including Japan, Australia, and New Zealand) were the next leading export regions, but with markedly lower exports than developing Asia-Pacific. The Latin American share has been growing significantly, while plastic exports from Africa are far lower than for any other region.

Figure 7. Volume of Total Plastic Exports by Region (Mmt, 2000–2021)



Source: Authors' elaboration based on UNCTADSTAT (n.d.).

For the 2017–21 period, the dominant shares of plastics trade in all regions related to primary plastics (with exports averaging 172 Mmt) and final manufactured plastic products (with exports averaging 88 Mmt) (Figure 8). North America was notable for the volume of imported final manufactured plastic products, which exceeded imports of primary plastics. This profile is different to other regions, where imports of primary plastics were usually larger than those of manufactured plastics. Developed economies in Asia and Oceania showed relatively similar shares in terms of volume of exports of both primary plastics and manufactured plastic products.

There were important differences in export and import volumes among various regions, with the most notable trend being larger import volumes for all plastic categories in Africa and Latin

America compared to exports. For developing counties in the Asia-Pacific region, by contrast, export volumes in all categories are much larger than import volumes. The exceptions are primary plastics, where Asia-Pacific imports from 2017–21 (averaging nearly 84 Mmt) exceeded exports (averaging 72 Mmt), as well as plastic waste where imports from 2017–21 (averaging 4.16 Mmt) exceeded exports more than three-fold (averaging nearly 1.3 Mmt).[8]

Figure 8. Volume of Plastic Imports and Exports by Region Across Life Cycle Categories (Mmt, avg. 2017-21)

Source: Authors' elaboration based on UNCTADSTAT (n.d.).

8. The fact that countries are importing plastic waste does not, however, imply that they have adequate capacity for environmentally sound management of imported waste.

A notable finding is that even though developing countries in Latin America and Africa may not be big net importers of plastic waste, they are overall net importers of plastics in other life cycle categories, with the exception of final manufactured plastic goods in Latin America where the average volume of exports (nearly 11 Mmt) exceeded that of imports (nearly 6 Mmt). In relative terms, plastic waste imports are smaller than for other categories in developing Asia and Oceania, Latin America, and Africa. Notably, however, plastic waste imports are not the only category of plastic imports relevant to plastic waste; at the end of their respective product life spans, a vast range of imported manufactured plastic products along with plastic associated with imports of pre-packaged products and plastics embedded in products ranging from electronic equipment, clothes, shoes, and cars eventually become part of the plastic waste stream confronting developing countries.

4. Trade Flows in Plastics by Stage of the Life Cycle

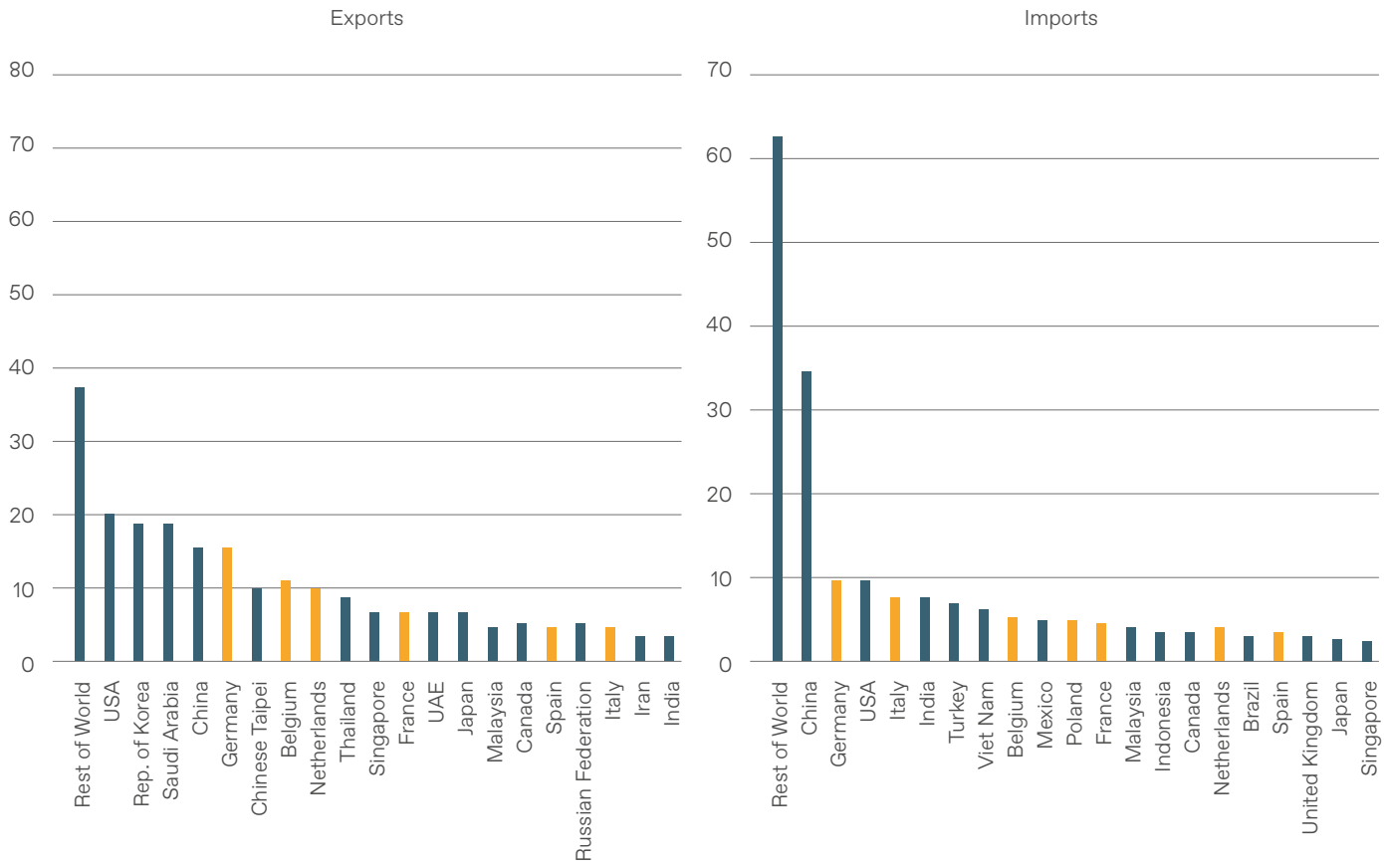
This section presents data on trade flows at five stages of plastics trade: from trade in primary plastics and intermediate forms of plastics through to intermediate and final manufactured goods and finally plastic waste. For each stage, it presents information on trade volumes and values, as well as the top 20 importers and exporters.[9] As noted above, for each of these stages, the analysis draws on the categorization used in the UNCTAD plastics trade database, which in turn drew on a granular analysis of HS codes relevant to plastics to identify and assign goods to different categories across the life cycle. We encourage readers to consult the full list of HS codes included in each category, which is available on the web page of the UNCTAD Plastics Trade Database (UNCTADSTAT, n.d.).

4.1 Trade in Primary Plastics

In 2021, the total value of exports in primary forms of plastics was $384 billion, representing 34% of the total value of plastics trade that year (but not including hidden plastic trade flows) (Figure 3). Nearly 173 Mmt of primary plastics were exported (Table 1). The EU as a bloc led the world's top 20 exporters of plastics in primary forms, with Germany, Belgium, the Netherlands, France, Spain, and Italy the main exporters in the region. The US, the Republic of Korea, Saudi Arabia, China, Taiwan, and Thailand were also in the top 20 (Figure 9). The major importers of primary plastics for use in plastic conversion and manufacture were China, the EU, and the US, followed by India, Turkey, Vietnam, Mexico, and Malaysia.

9. This approach draws on Barrowclough et al. (2020), which also provided maps of key bilateral trade flows as well for each stage of the life cycle in the Annex as well.

Figure 9. Volume of Exports and Imports in Primary Forms of Plastics (Mmt, 2021)



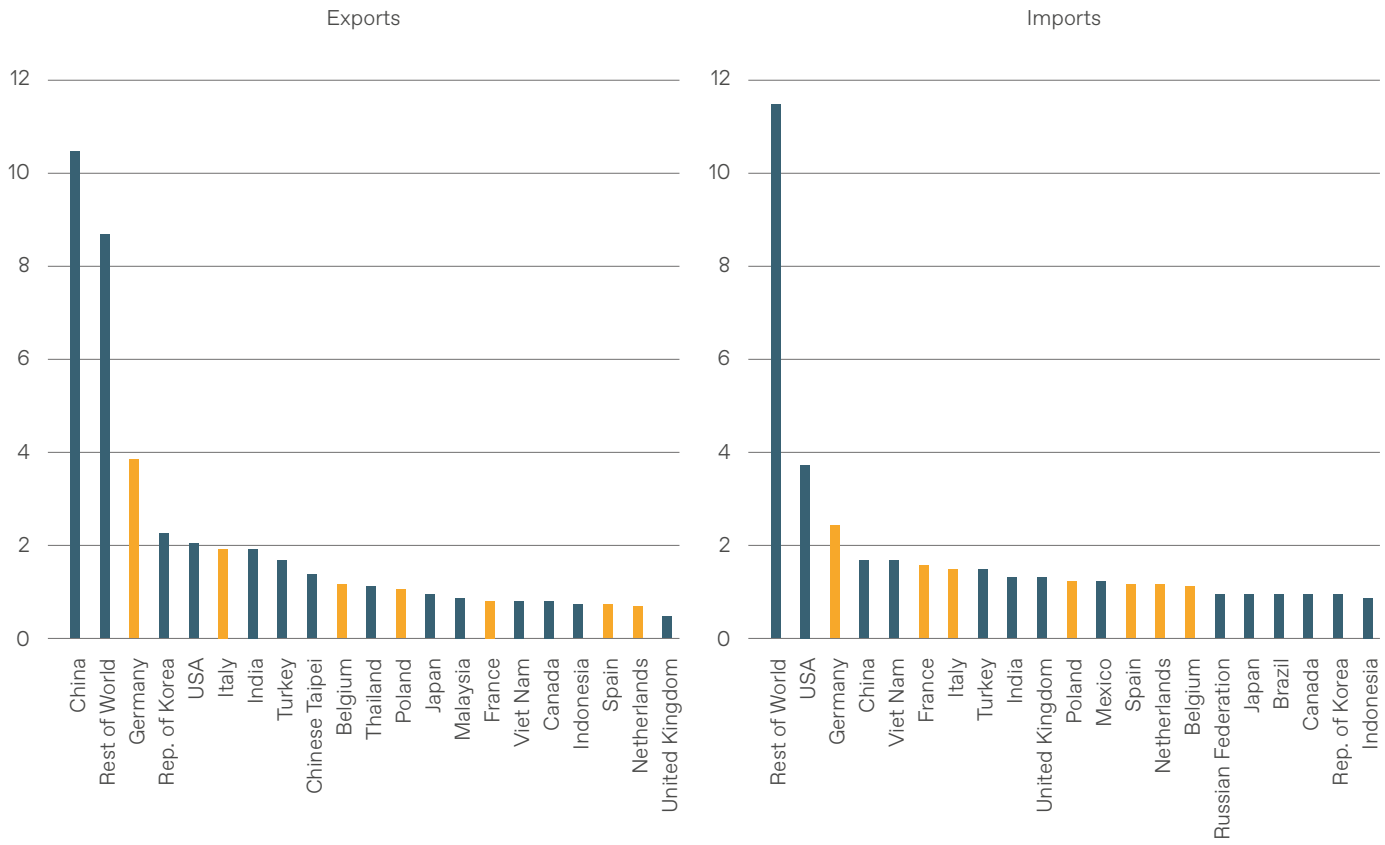
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

4.2 Trade in Intermediate Forms of Plastics and Intermediate Manufactured Plastic Products

Between primary plastics and final plastic products, a broad array of plastics in intermediate forms are traded—in the form of primary plastics that have been converted into plastic sheets, films, plates, and yarns that are then often used to manufacture products.[10] The total value of exports of plastics in intermediate forms in 2021 was $167.4 billion, representing 14% of the total value of plastics trade that year and a volume of 41.5 Mmt (Table 1 and Figure 10).

10. In some instances, these may be used directly such as for bulk packaging in the case of plastic films.

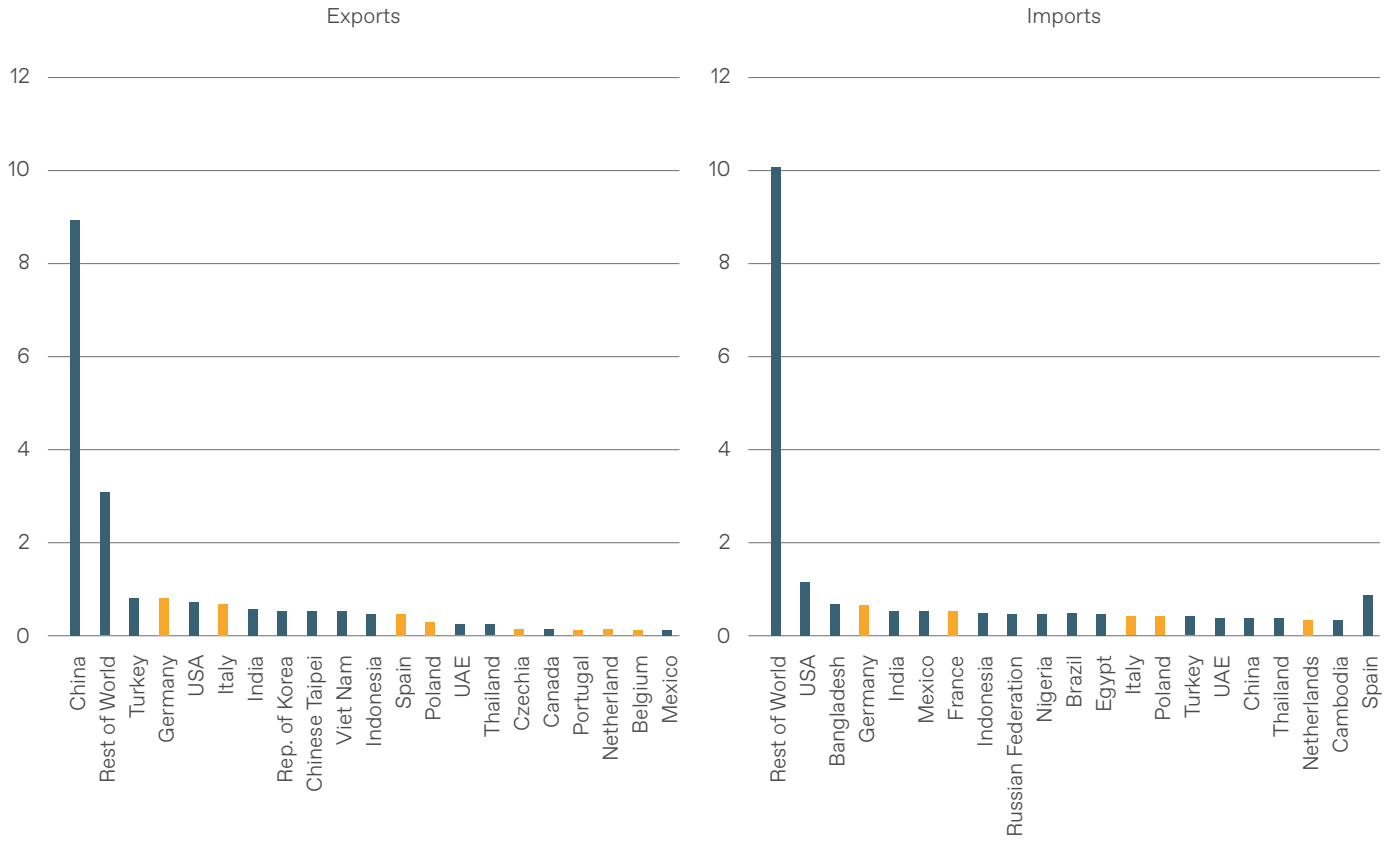
Figure 10. Volume of Exports and Imports in Intermediate Forms of Plastics (Mmt, 2021)



Note: This figure amends the Barrowclough et al. (2020) categorization by including in the intermediate forms category a number of HS codes for synthetic fibres that were categorized as intermediate manufactured goods.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

A range of plastics in intermediate forms are then further transformed into "intermediate manufactured goods" that are generally not sold as "final products" in their own right, but are used as inputs into other final manufactured products or by other sectors. This includes, for example, plastic parts for the automobile industry and construction materials (e.g. pipes, insulation). In 2021, exports of intermediate manufactured plastic goods reached a value of $118.6 billion and a volume of nearly 22 Mmt (Table 1 and Figure 11).

Figure 11. Volume of Exports and Imports in Intermediate Manufactured Plastic Goods (Mmt, 2021)



Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the classification used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

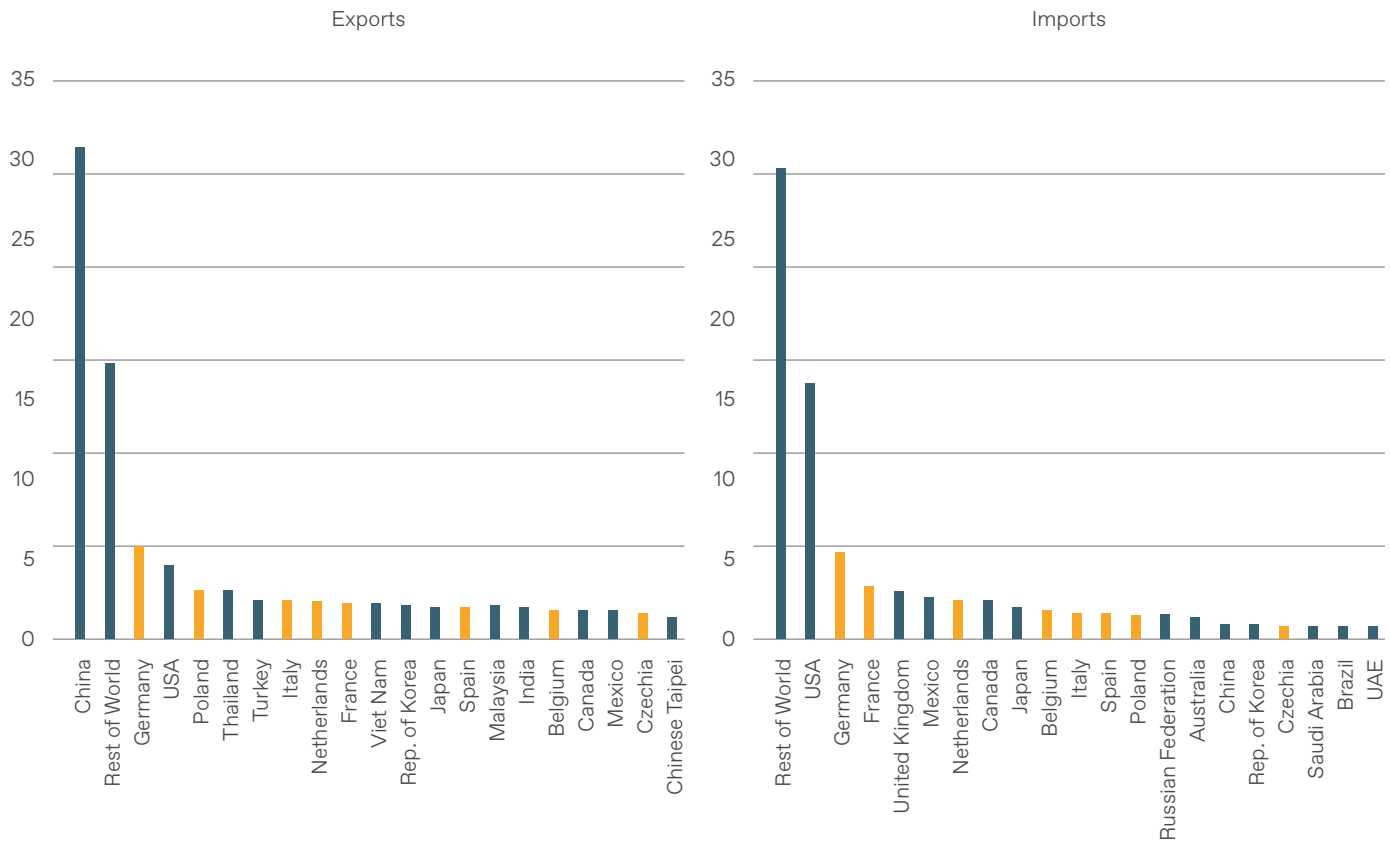
4.3 Trade in Final Manufactured Plastic Products

In 2021, the total value of exports in final manufactured plastic products was around $510 billion, representing 43% of the total value of trade in all plastics that year. The volume of final manufactured plastic products exported was 127 Mmt, representing 34% of overall plastics trade (Table 1 and Figure 12).

A diverse range of final plastic products are included in this category, from plastic household items (e.g. furniture and toys) and synthetic clothes to plastic fishing nets and golf balls as well as some types of empty plastic packaging (noting that some forms of bulk packaging, such as films, feature in the category on intermediate plastic goods). The HS codes used to compile the trade flows data for this category of the plastics life cycle include those for final products that are listed in HS Chapter 39, as well as those for many semi-hidden trade flows such as synthetic clothes and fishing nets that are not included in Chapter 39 but for which the volume and value can be readily traced using HS codes in other chapters. Fishing nets, for instance, fall under Chapter 56 (HS 560811) and items like

golf balls, the vast majority of which are recognized as being made of plastic, fall under Chapter 95. This category does not, however, include the wide array of final products that have plastics embedded (such as electronic equipment, household appliances, and cars) or pre-packaged final products (preliminary estimates of the volume of these hidden plastic trade flows are noted in Section 3).

Figure 12. Volume of Exports and Imports in Final Manufactured Plastic Products (Mmt, 2021)



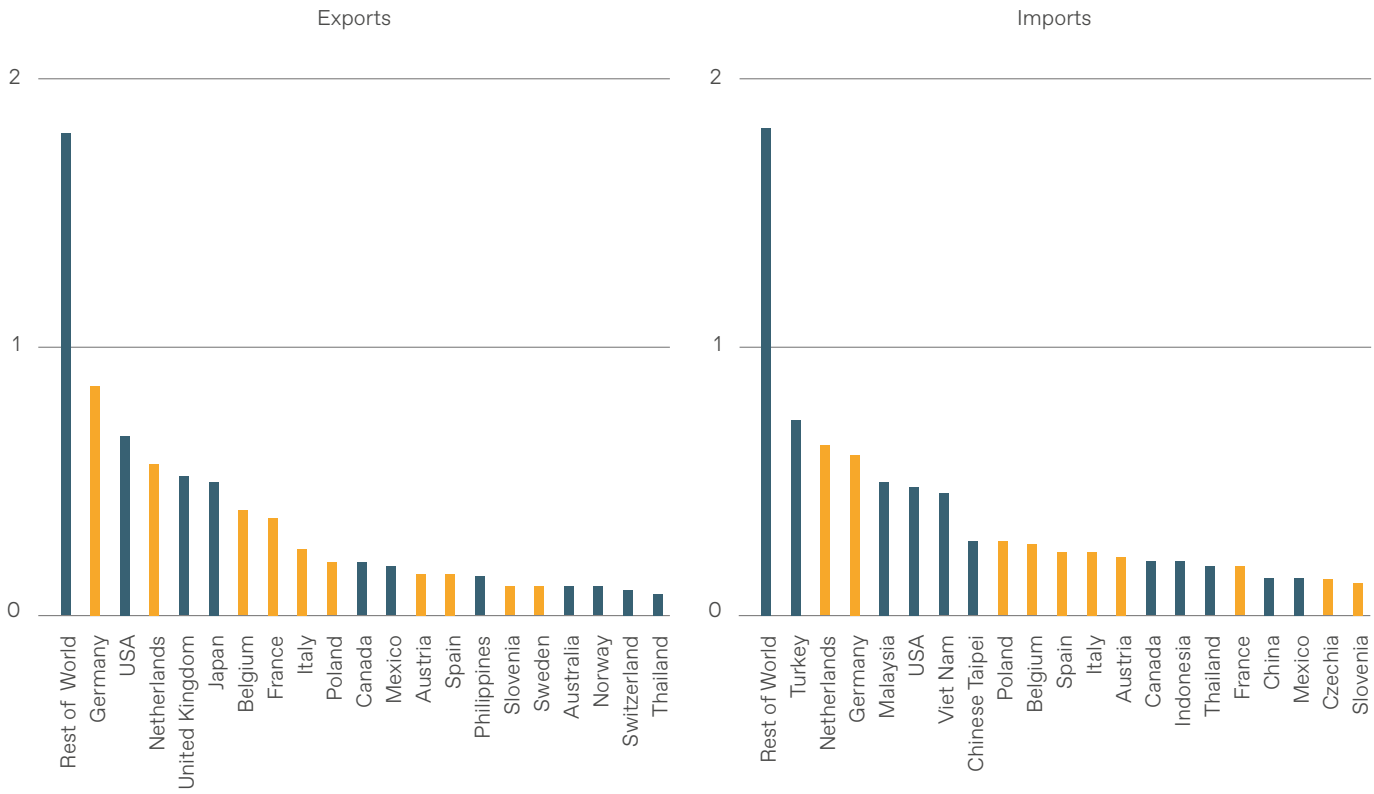
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

4.4 Trade in Plastic Waste

As the volume of global plastic waste has grown over the past decades, so too has international trade in plastic waste, primarily flowing from developed to developing countries (GRID-Arendal, 2019; Brook et al., 2018).

In 2021, the total value of plastics waste exports was $3.4 billion (including synthetic textile waste) with a combined volume of 5.5 Mmt (Table 1). Figure 13 shows a breakdown of the key plastic waste importers and exports by volume in 2021.

Figure 13. Volumes of Exports and Imports in Plastic Waste (Mmt, 2021)



Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

Notably, Figure 13 does not include plastic waste that is misclassified, often intentionally in order to avoid regulation at the border, and so does not appear in official trade statistics for plastic waste. It also does not include "illegal" trade in plastic waste that is not formally processed by customs authorities. Although data on illegal activity remain scarce, recent assessments are that an important share of trade in plastic waste occurs illegally, and that plastics are one of the most common types of waste detected in transport violations (Ruceskva et al., 2017; Interpol, 2020). Interpol, for instance, has highlighted the significance of illegal waste trade across borders, along with emerging trafficking routes, where illegal activity can include various forms of misdeclaration, such as the declaration of contaminated plastic waste as non-hazardous plastic waste (Interpol, 2020). Interpol observes variation in the significance of illegal activities linked to types of plastic waste (e.g. the market value of recyclable plastic waste such as PET waste means that illegal recycling represents a greater business opportunity than illegal disposal) (Interpol, 2020).

While the relative volume of internationally traded plastic waste may seem small compared to the overall volume of plastics trade, it remains highly significant to plastic pollution because a key share of exported waste is destined for countries irrespective of whether they have adequate capacity to manage that waste in an environmentally sound and safe manner.

Following the introduction of restrictions on plastic waste imports in major destination countries, export flows of plastic waste captured by official statistics declined by nearly 57% in volume terms between 2016–21, although the decline in value terms was smaller at around 37% (Figure 14).

Figure 14. Exports of Plastic Waste (2000–21)

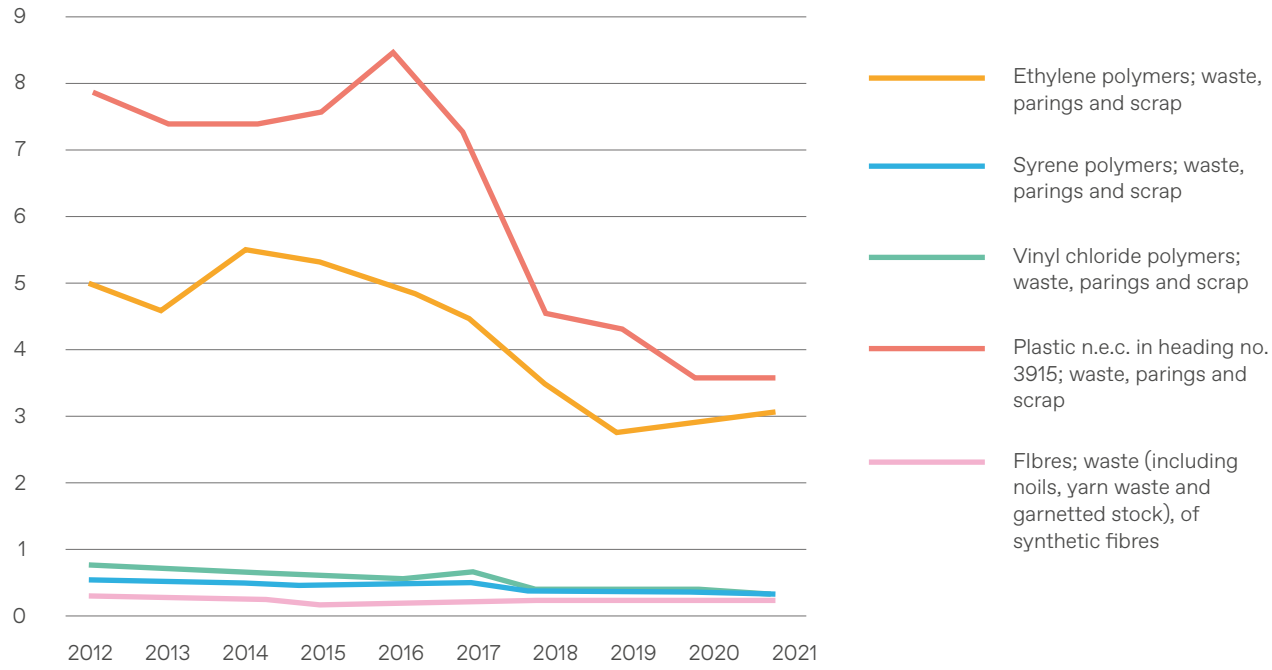
Note: This figure does not capture illegal or misclassified trade in plastic waste that does not appear in official trade statistics for plastic waste.
Source: Authors' elaboration based on UNCTADSTAT (n.d.).

Figure 15 charts trends in the volume of plastic waste trade between 2012 and 2021 using the relevant HS codes. Importantly, the HS system differentiates four core subcategories of plastic waste: waste from ethylene, styrene, or vinyl chloride polymer groups, along with one group that gathers all waste that cannot be classified in one of these polymer groups. In addition, Figure 15 notes waste from synthetic fibres. Figure 16 provides the total value and volume of plastic waste trade in 2021, again broken down by subcategories.

Importantly, the geographic distribution of plastic waste trade is evolving. The introduction by China of restrictions on plastic waste imports, for instance, spurred significant changes in global plastic waste trade, including of waste intended for recycling (about half of which was previously exported, mostly to China) (GRID-Arendal, 2019). China's moves shifted trade flows in plastic waste towards Indonesia, Turkey, India, Malaysia, and Vietnam. Unprepared for the volumes of incoming plastic waste, some of these countries are also implementing import bans and, in some instances, sending plastic waste back (Ananthalakshmi and Chow, 2019). On the heels of China's ban, implementation of the 2019 Plastic Waste Amendments to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, which entered into force in 2021, are expected to further reorganize the plastic waste trade (BRS Conventions, 2019).

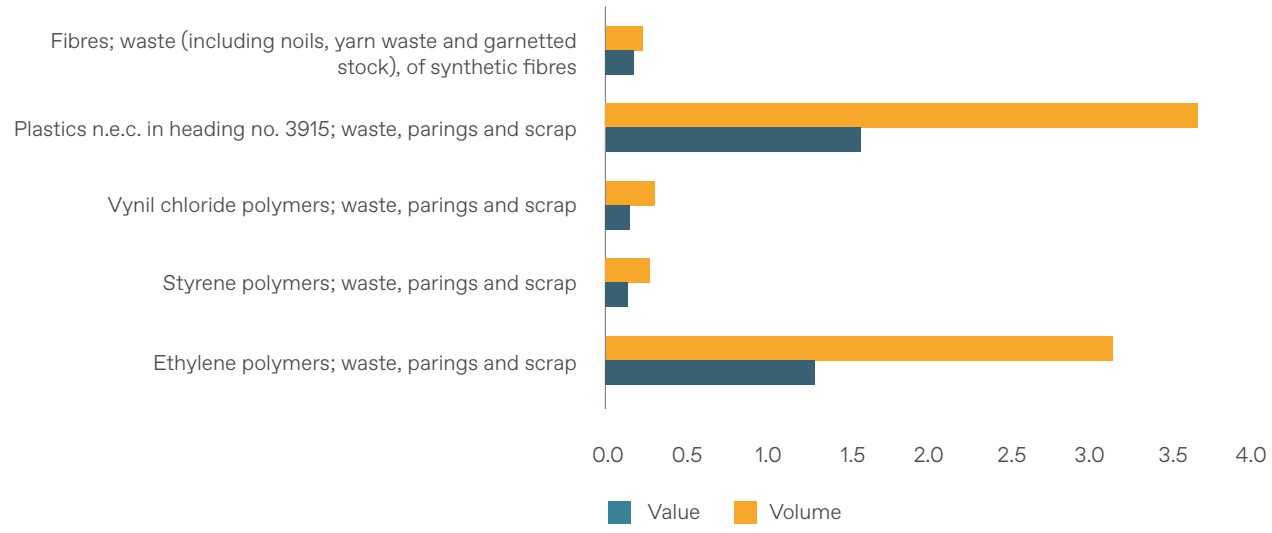
Table 5 zooms in on plastic waste trade for one polymer, illustrating the top 10 bilateral flows of ethylene polymer waste, while Table 6 provides a sample of 2021 bilateral flows in "other" plastic waste including PLA. Significant North-South bilateral flows in ethylene polymer waste included flows from the Netherlands to Indonesia, the US to Malaysia, Germany to Turkey, and Japan to Vietnam. For "other plastic waste," the most important North-South bilateral trade flows included Japan to Taiwan and Vietnam.

Figure 15. Trade in Plastic Waste Differentiated by Type (Mmt, 2012–21)



Note: n.e.c. = not elsewhere classified
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.).

Figure 16. Total Value and Volume of Plastic Waste Trade Differentiated by Type ($ billion, Mmt, 2021)



Note: n.e.c. = not elsewhere classified.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.).

Table 5. Top Bilateral Flows of Waste, Parings, and Scrap of Ethylene Polymers (2021)

Value ($ thousand)	Volume (thousand metric tonnes)	Exporter	Importer
64	121	Germany	Netherlands
47	43	Philippines	China
32	64	Netherlands	Indonesia
28	85	US	Malaysia
24	57	Netherlands	Malaysia
24	65	Japan	Vietnam
24	85	Germany	Turkey
23	43	Canada	US
23	18	Mexico	US
23	59	United Kingdom	Netherlands

Source: Authors' elaboration using 2021 data from BACI for HS 391510 – waste, parings, and scrap of ethylene polymers (CEPII, n.d.).

Table 6. Top Bilateral Flows of Waste, Parings, and Scrap of "Other plastics" (including PLA) (2021)

Value ($ thousand)	Volume (thousand metric tonnes)	Exporter	Importer
79	115	Mexico	US
62	123	USA	Canada
55	102	Canada	US
48	83	Japan	Taiwan
39	89	US	Mexico
37	78	Japan	Vietnam
30	65	Belgium	Netherlands
30	70	Japan	Malaysia
26	48	Netherlands	Germany
25	75	Germany	Netherlands

Source: Authors' elaboration using 2021 data from BACI for HS 391590 – waste, parings, and scrap of "other plastics" (CEPII, n.d.).

5. Trade Flows in Plastic Feedstocks, Precursors, and Additives

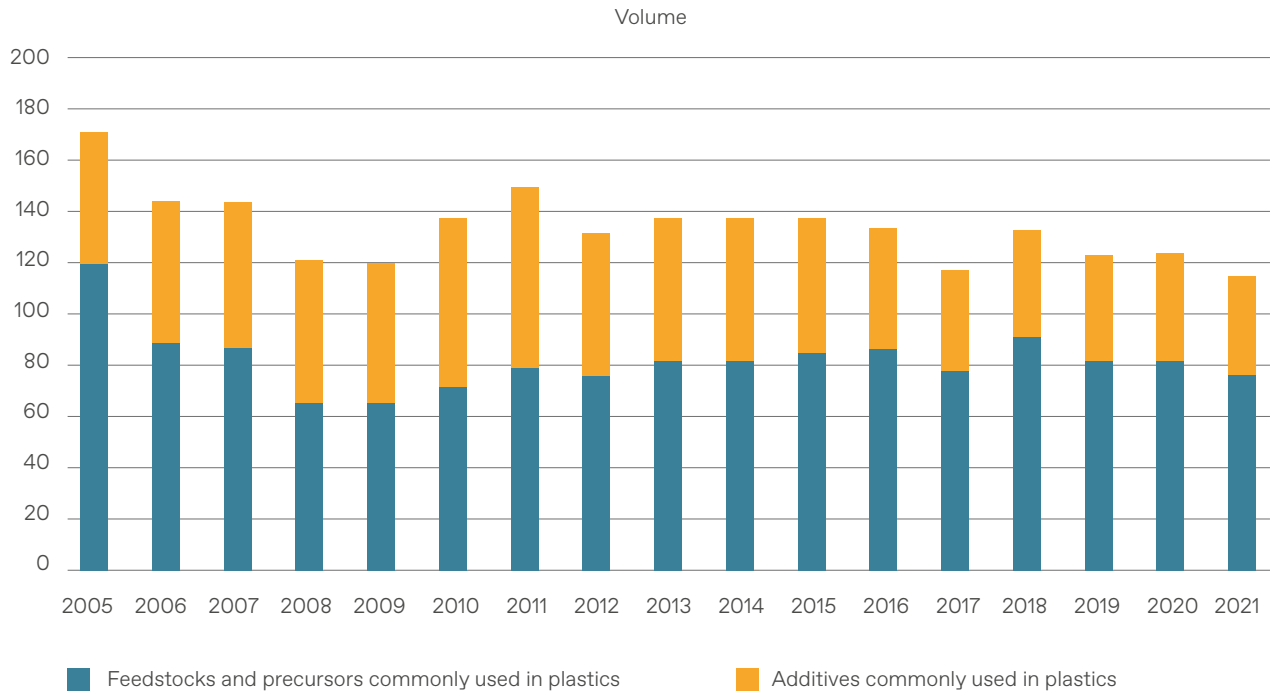
Trade in plastic feedstocks, precursors, and chemical additives is integral to the production of plastics and is also associated with many aspects of pollution across the life cycle of plastics.

Figure 17 gathers data on trade flows for a range of feedstocks (such as naptha), precursors (such as ethylene and propylene), and chemical additives known to be used in plastics. In 2021, the combined volume of global exports of feedstocks and precursors that can be used in plastics was around 76 Mmt with a value of nearly $82 billion, with the important caveat that not all the trade flows captured in the figure are necessarily destined for plastic production. Further research is needed to determine the share of trade in specific feedstocks, such as naptha, that are specifically destined for use in the plastics sector. For some precursors, such as ethylene, which is the major precursor for plastics, most production (more than 70%) is destined for plastics, but the precise share of trade in ethylene that is destined for use in plastics was not analysed for this paper (IEEFA, 2022).

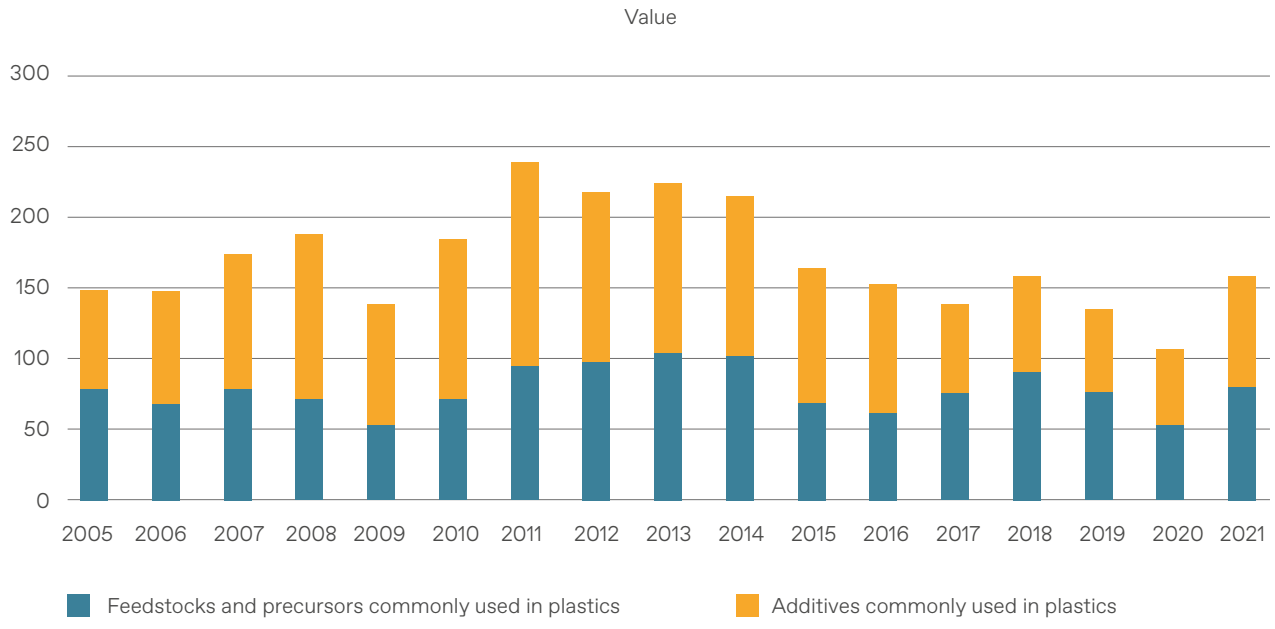
Chemical additives are also critical ingredients for the plastics sector, making possible the diversity of colours, textures, characteristics, properties, and features of plastics. At the same time, the health and environmental risks linked to a broad range of additives used in plastics means they are subject to increasing scrutiny, including through enhanced international cooperation to reduce and in some instances eliminate certain chemicals of concern.

Global exports of additives that are relevant to the plastics sector declined by volume from about 52 Mmt in 2005 to around 41 Mmt in 2021 (Figure 17). Export values have risen and then fallen over time, leading to a slight increase in the same period from nearly $76 billion in 2005 to about $78 billion in 2021 and a peak value of $145 billion in 2011. Notably, here again the list of product HS codes used for additives in the UNCTAD database includes additives that may not be exclusively used for plastics (Barrowclough et al., 2020).

Figure 17. Exports of Feedstocks, Precursors, and Additives Commonly Used in Plastics by Volume (Mmt) and Value ($ billion) (2005–2021)



Source: Authors' elaboration based on UNCTADSTAT (n.d.).



Source: Authors' elaboration based on UNCTADSTAT (n.d.).

6. Trade Flows in Selected Subcategories of Plastic Products

6.1 Trade in Plastic Packaging

In 2019, the last year for which global industrial output data are available, the plastic packaging sector accounted for more than 30% of the global market for plastics, with an estimated value of $234.14 billion. More than half of that plastic packaging (51%) was destined for packaging food and beverages. Tens of millions of tonnes of plastic packaging are integral to thousands of products traded internationally each year, including electronic appliances, bottled water, and a diversity of pre-packaged foods and confectionery products. Alongside, a growing volume of empty plastic packaging is traded internationally.

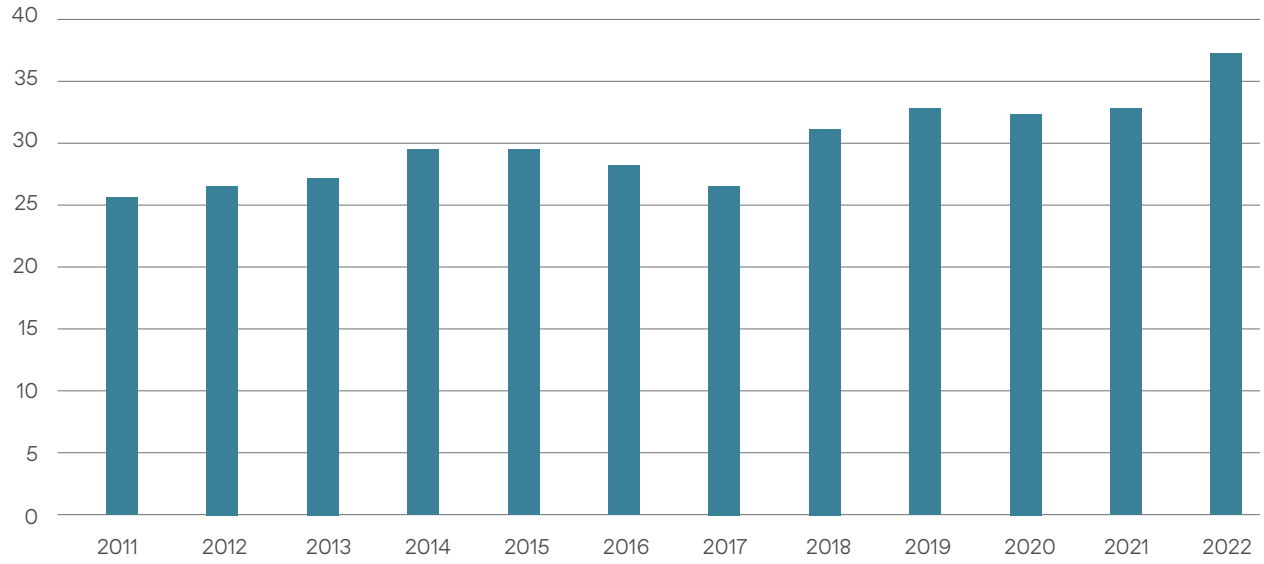
Figures 18 and 18 illustrate the extent to which this latter category of empty plastic packaging is traded internationally. Importantly, the data in Figures 17 and 18 underestimate the total flows of plastic packaging across borders, because the only official trade statistics available for trade in plastic packaging relate to trade in empty plastic packaging. This reflects the fact that specific HS codes cover only empty plastic packaging. The HS does not provide classifications that enable differentiation or tracking of the hidden trade flows of packaging associated with goods (such as pre-packaged products) or with their transportation (packaging used for distribution which accompanies goods traded internationally).[11]

Focusing then just on HS codes that cover empty plastic packaging, Figure 18 shows that export flows grew over the period 2011–21, rising from just over 25 Mmt in 2011 to nearly 37 Mmt in 2021, with periodic small declines in the intervening years. Although in terms of magnitude, the volume of trade in empty plastic packaging is quite a bit smaller than for trade in categories such as primary plastics (213 Mmt), it is nonetheless a high-value sector, with the total value of exports of empty plastic packaging alone reaching $160 billion in 2021.

Figure 19 presents a breakdown of trade in empty plastic packaging at a more granular level using a sample of specific HS codes that are relevant to empty plastic packaging, such as those on empty sacks, bags, bottles, boxes, crates, and lids. Notably, in addition to the categories, Figure 18 covers a number of other HS codes related to plates, films, and sheets of plastic, a significant share of which is used for plastic packaging.

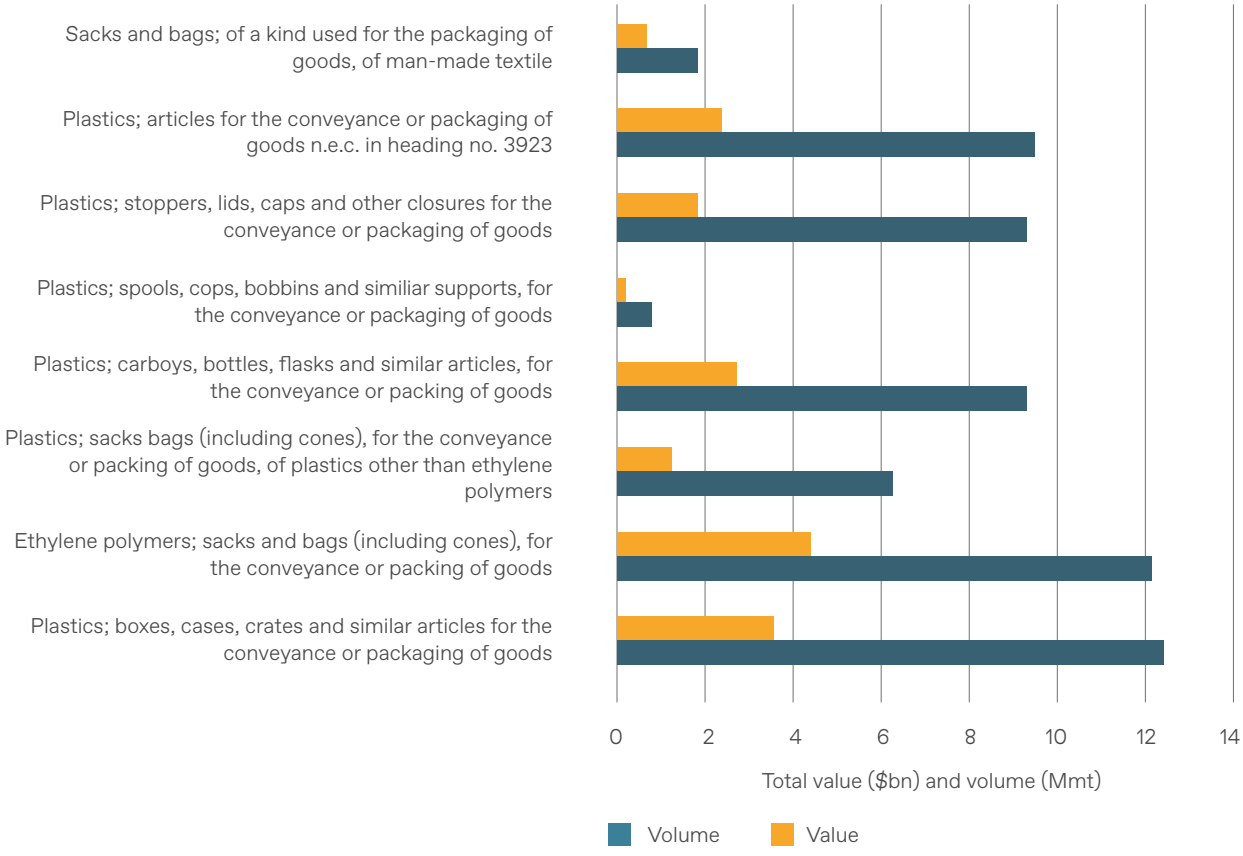
11. Notably, some packaging may be traded twice—once as empty packaging and later as business-to-business packaging used in boxes to protect goods in transport.

Figure 18. Exports of Empty Plastic Packaging (Mmt, 2011–21)



Source: Authors' elaboration based on UNCTADSTAT (n.d.).

Figure 19. Trade in a Sample of Types of Empty Plastic Packaging Covered by Specific HS Codes (2021)



Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.).

The total volume of plastic packaging that is traded internationally is more significant if we add preliminary estimates of hidden trade in plastic packaging. Adding just the 19 Mmt of packaging estimated in 2018 for food and beverage packaging alone (see section 3), for instance, brings the total estimated volume of trade in plastic packaging to at least 56 Mmt for 2021. Indeed, preliminary estimates suggest that hidden trade flows in plastic packaging already surpass those of trade flows in empty plastic packaging revealed through official statistics that rely on HS codes. The 19 Mmt of hidden plastic packaging flows noted above, for instance, relates only to plastic packaging for food and beverages and does not count packaging for many other products (industrial packaging, personal and household care, pharmaceuticals) nor business-to-business plastic packaging used for international transportation and the distribution of products.

Figure 20. Volume of Exports and Imports in Empty Plastic Packaging (Mmt, 2021)

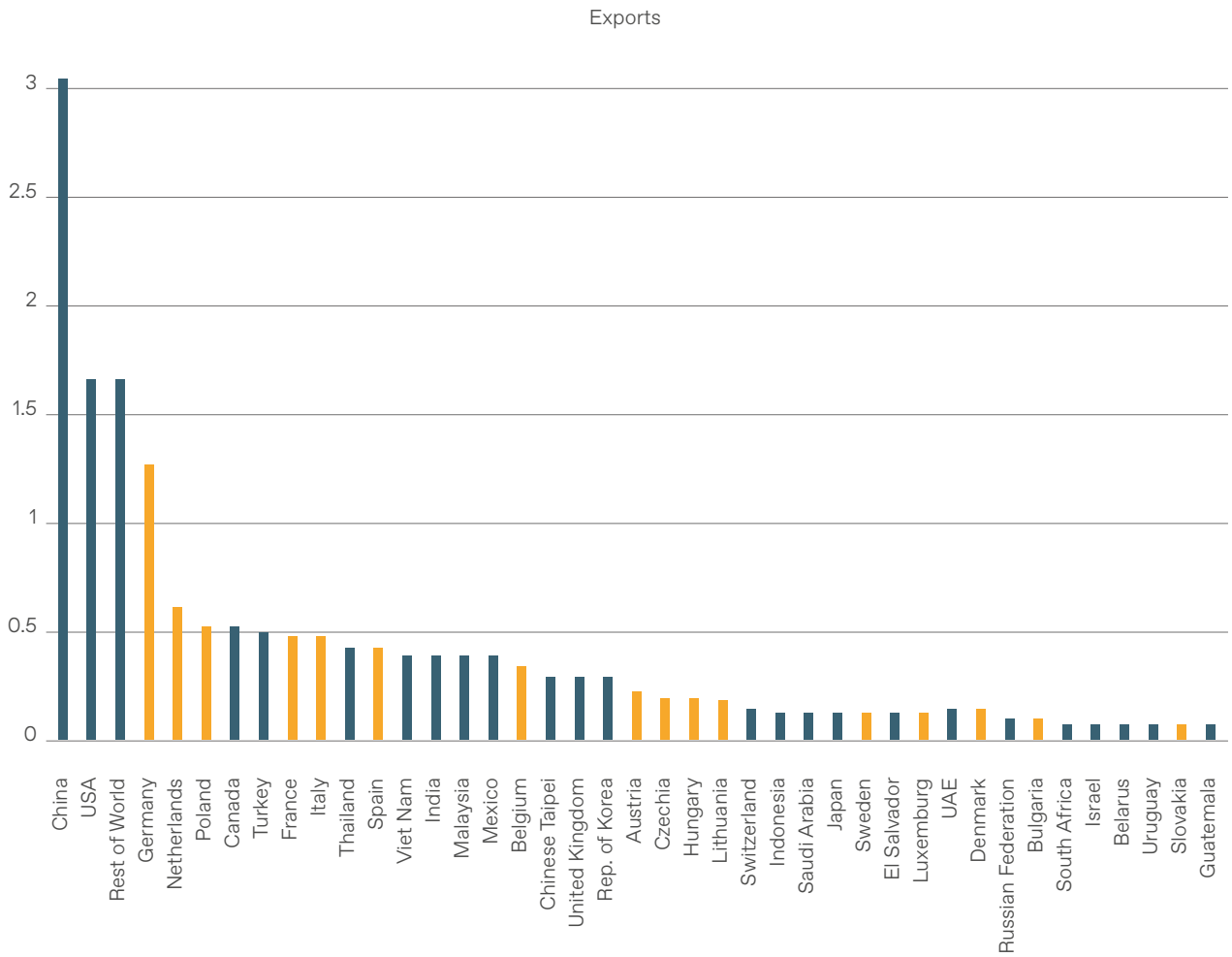
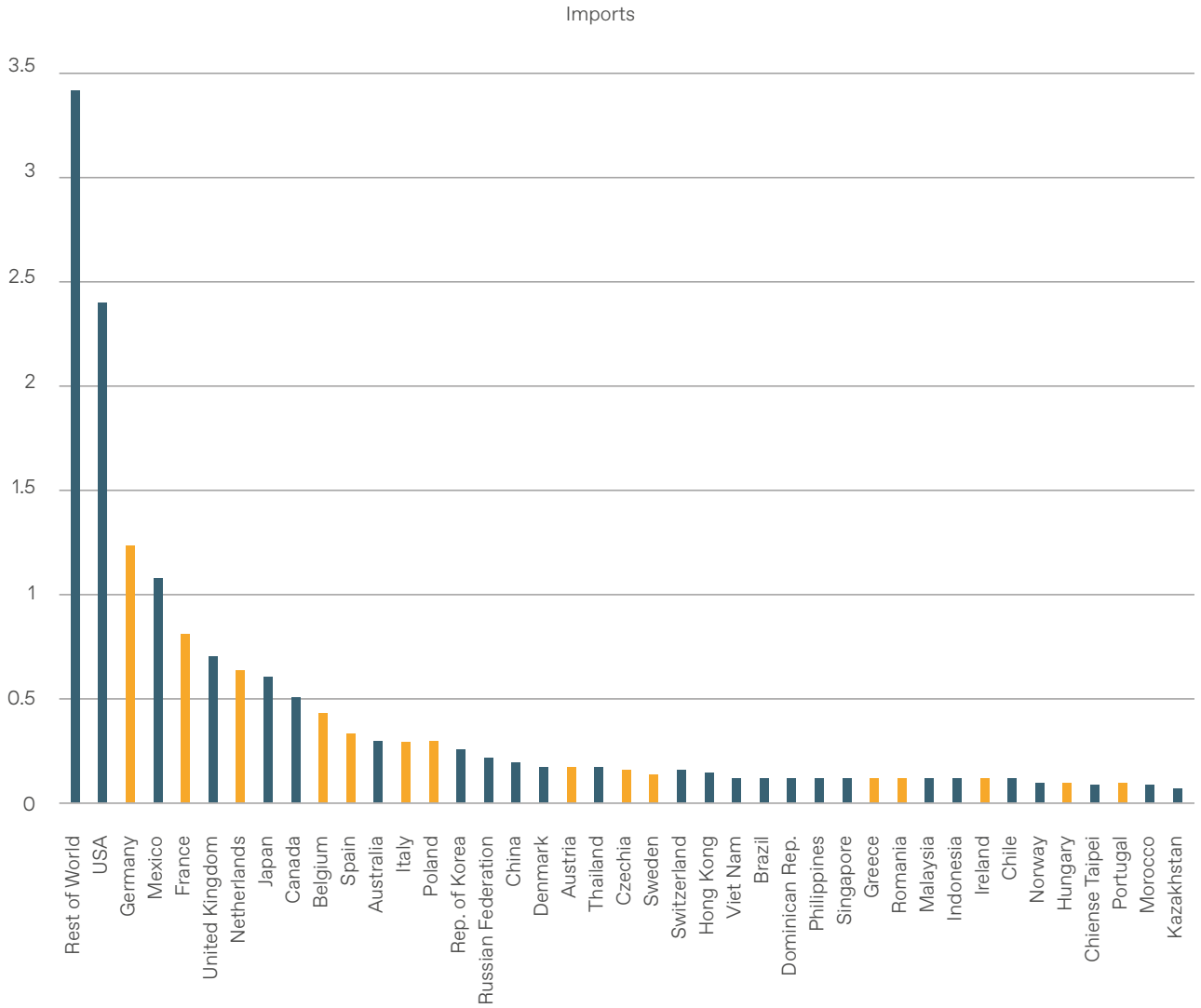


Figure 20. Volume of Exports and Imports in Empty Plastic Packaging (Mmt, 2021) (continued)



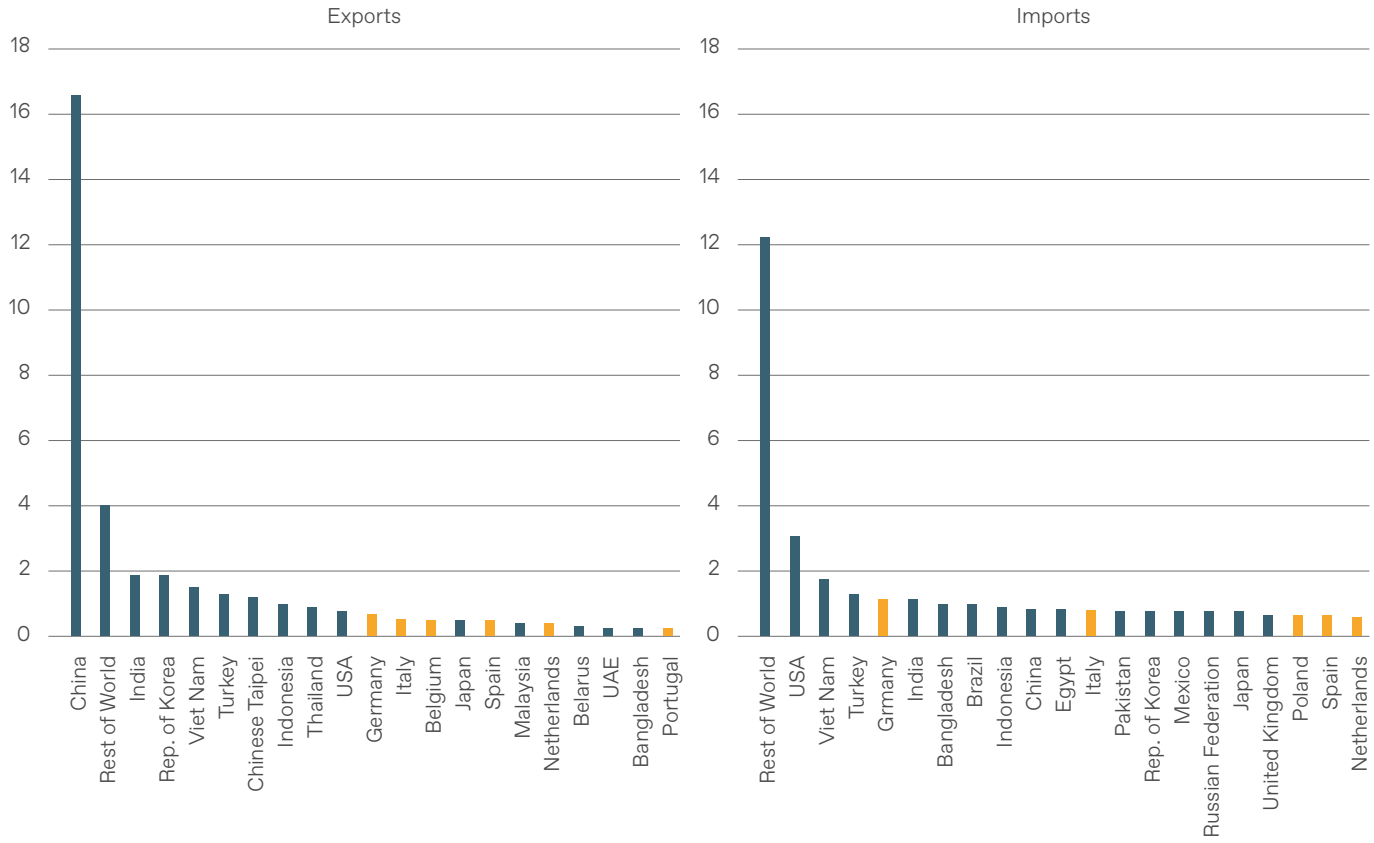
Note: This figure provides data only for trade in "empty" packaging as items with distinct HS codes solely for packaging traded as a product in its own right. The figure does not include plastic packaging associated with pre-packaged goods that are traded internationally or packaging used in the transportation of goods.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

Turning back to empty plastic packaging (as a product in its own right), Figure 19 shows that, overall, the EU was the top exporter by volume of empty plastic packaging, followed by China with 3 Mmt of exports (comprising 17% of total empty packaging exports) and then the US with 1.6 Mmt of exports (comprising 10% of total empty packaging exports). A broad array of other countries was also engaged in the export of plastic packaging, although at a lower level. The EU also led as the major importer of empty plastic packaging as a product in 2021, followed by the US, Mexico, the United Kingdom, Japan, and Canada.

6.2 Trade in Synthetic Textiles and Apparel

China was by far the largest exporter of synthetic textiles and apparel in 2021, accounting for upwards of 47% of international trade, followed by India, the EU (as a region), the Republic of Korea, Vietnam, Turkey, Taiwan, Indonesia, and Thailand (see Figure 21). The major importers of synthetic textiles were the EU as a group, the US, Vietnam, Turkey, Germany, India, Bangladesh, and Brazil. The total value of trade in synthetic textile products in 2021 was $195 billion, with a volume of 35 Mmt.

Figure 21. Volume of Exports and Imports in Synthetic Textiles and Apparel (Mmt, 2021)



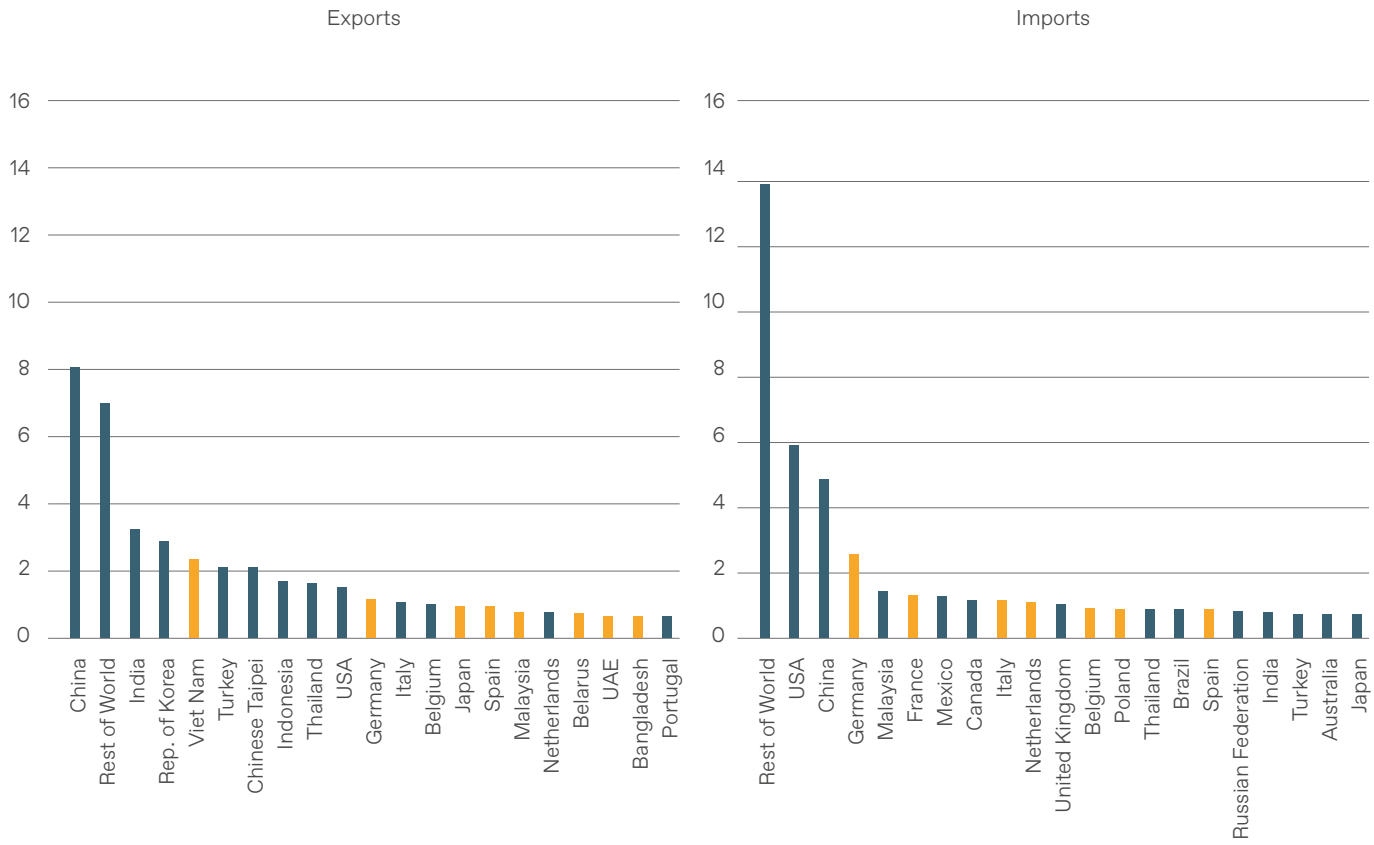
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020, Annex p. 6). EU members are coloured in orange.

6.3 Trade in Synthetic Rubber Materials and Products

A further subcategory of plastics trade relates to synthetic rubber materials and products. Figure 22 provides an overview of top traders in all materials and products categorized as synthetic rubber in the HS classification. Notably, in the UNCTAD database, this subcategory also includes HS codes related to rubber and retreaded tires, which contain a significant share of synthetic rubber and are the dominant contributor to microplastic pollution. The total value in synthetic rubber materials and products traded internationally in 2021 was $166 billion, with a volume of 42 Mmt. China comprised 19% of total exports by volume, followed by Thailand, the Republic of Korea, Germany, and Japan.

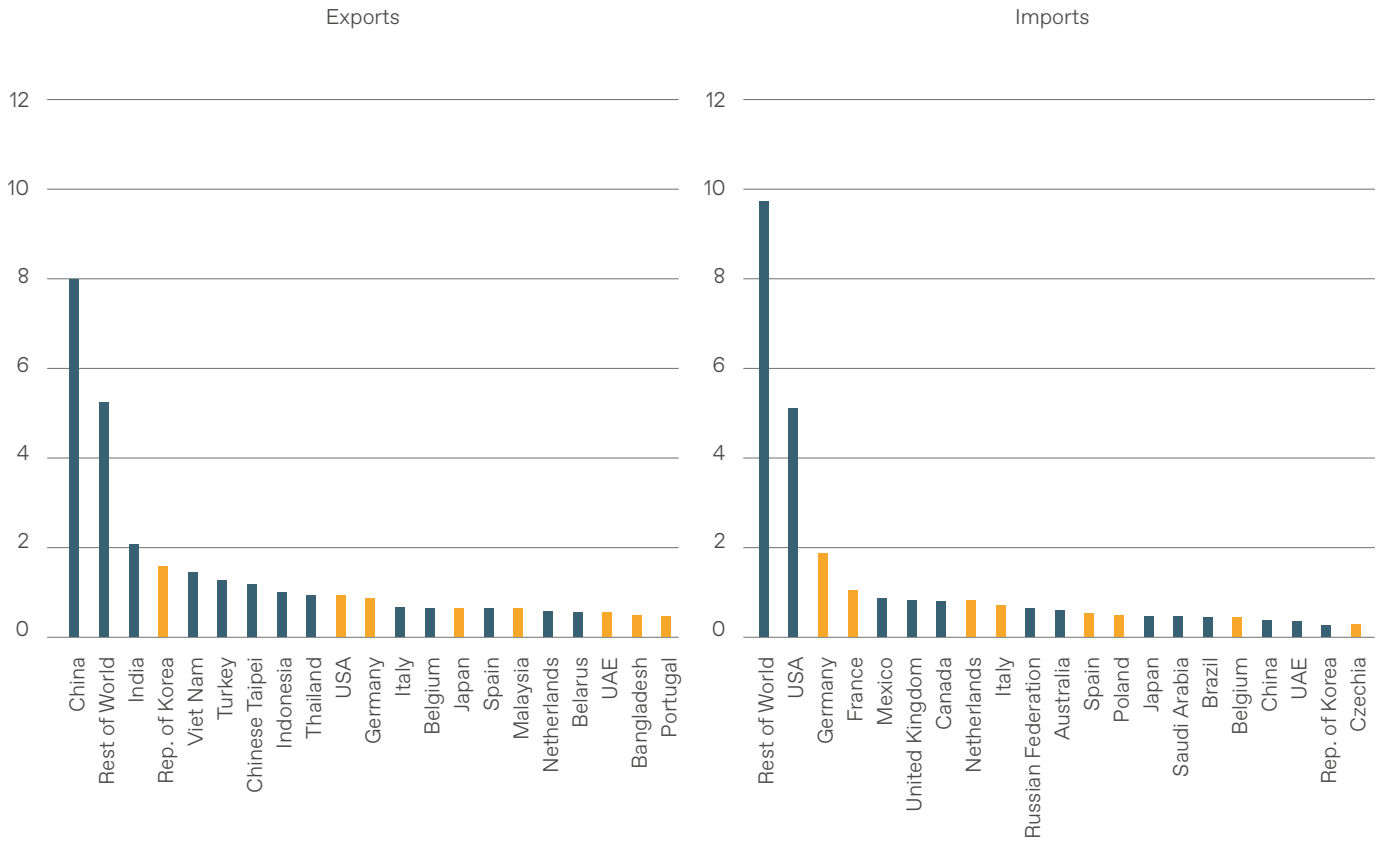
Figure 23 focuses specifically on new and retreaded rubber tires and inner tubes. In 2021, the total value of trade in rubber tires was $84 billion (half of the total rubber trade value), reaching 22 Mmt, with China exporting more than 25% of the total. The EU and the US were the leading importers.

Figure 22. Volume of Exports and Imports in Synthetic Rubber Materials and Products (Mmt, 2021)



Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020). EU members are coloured in orange.

Figure 23. Volume of Exports and Imports in New and Retreated Rubber Tires and Inner Tubes (Mmt, 2021)

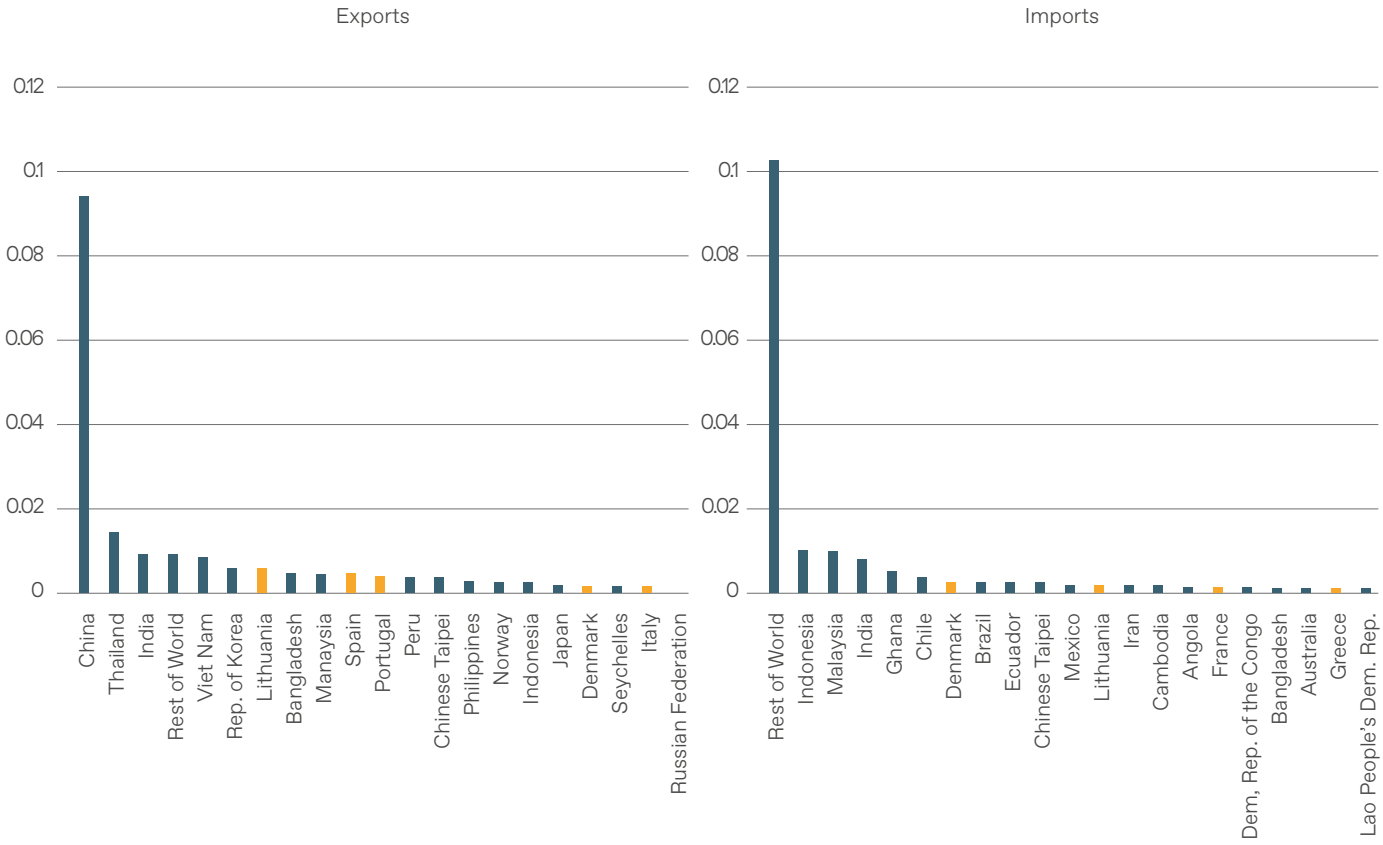


Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.). The HS codes covered in this Figure include HS 401110, 401120, 401130,401140, 401150, 401170, 401180, 401190, 401211, 401212, 401213, 401219, 401220, 401290, 401310, 401320, and 401390. EU members are coloured in orange.

6.4 Trade in Fishing Nets

Another subcategory of plastic products that is actively traded internationally involves synthetic fishing nets that are entirely or predominantly made of plastics and which constitute a key source of marine plastic pollution. Figure 24 presents data on the volume of fishing nets traded in 2021 at an estimated 0.81 Mmt (180,000 metric tonnes). China accounts for about half of all exports, followed at a distance by Thailand (8%) and India (5%). On the importing side, Indonesia and Malaysia each import around 6% of the total volume of fishing nets traded globally, with India in third place at 5%. The value of fishing nets traded internationally in 2021 reached $900,000 million.

Figure 24. Volume of Exports and Imports in Fishing Nets (Mmt, 2021)



Note: This figure focuses only on those fishing items contained in HS 560811 "made up fishing nets." A number of further HS codes cover a range of items used in fishing, such as fishing lines, which are predominantly plastic.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.). EU members are coloured in orange.

4. Conclusion

This paper has provided a broad overview of trade flows across the life cycle of plastics and for specific subcategories of plastics. It has identified the main exporters and importers within categories across the life cycle of plastics, highlighted the significance of trade flows, and shed light on the size and geographic distribution of global markets for plastics. These trends illustrate that international trade plays a central role in the global plastics economy and that all countries are involved to some degree as importers or exporters of plastics.

The paper has also highlighted that countries participate in different ways in trade across the life cycle of plastics. Some are major exporters across all stages of the life cycle, for instance, while others are key players in only specific points of the life cycle. Even the largest exporters in the global plastics economy are also importers of plastics at different stages of the life cycle.

Additionally, this paper has shed light on the limitations in how trade flows are classified for

the purposes of official statistics and monitoring and, in turn, how this affects transparency of trade flows across the life cycle of plastics. It is essential to be aware of these limitations—and potential options to address them—when considering trade and trade policy tools that could be used to support international efforts to end plastic pollution. In this regard, a key point underlined in this paper is that official trade data provide limited information on trade flows in a vast diversity of products that contain embedded plastics or that have associated packaging, such as pre-packaged products, or cross-border flows in plastic packaging used in distribution and transportation of products. Official trade classifications and data are also only available at a granular level for a limited number of the range of single-use plastics that many governments are seeking to better regulate at the national and international level.

Importantly, governments do have opportunities to improve HS classifications to respond to evolving policy needs. Governments consider amendments to the HS in five-year cycles of intergovernmental negotiations at the WCO. In this regard, Vaca Eyzaguirre and Deere Birkbeck (2022) have identified a range of areas where improvements in the transparency of trade flows would be useful for policymakers focused on ending plastic pollution, including potentially through amendments to the HS. Specific areas that they noted include:

- Greater differentiation of primary plastics by polymer type and by feedstock (e.g. differentiating conventional feedstocks and recycled feedstocks, such as for recycled PET).
- Greater differentiation of chemicals of concern in HS codes, including for persistent organic pollutants and other harmful chemical additives used in plastics (including but not limited to those already individually regulated by the Rotterdam and Stockholm Conventions).
- Greater differentiation of specific single-use and other plastics of high environmental concern, such as PVC products, and that are widely regulated by governments.
- Greater differentiation of traded plastic products and wastes that are of high environmental or health concern according to their material composition, such as by polymer types and mixtures, share of recycled content, and the presence of toxic chemicals and chemicals of concern.
- Greater differentiation of the share and types of plastics embedded in products, focusing on goods of high environmental concern, such as fishing nets and equipment.
- Consideration of ways that HS classifications could provide more information on the share and composition of plastic packaging that is an integral part of traded products highly associated with plastic pollution (e.g. packaging associated with beverages, pre-packaged foods, and personal care products). This could include differentiation on the share of recycled plastic in packaging; the polymer type; and characteristics such as whether the packaging is mono-layer or multi-layer; mono-material or multi-material; or of non-plastic materials.

The 2027 HS amendment cycle at the WCO provides an immediate and critical opportunity for governments to strengthen the empirical foundation for national policies and international cooperation to end plastic pollution. Action on the HS amendment options—along with exploration of other technical tools, international standards, and technologies that can boost transparency across supply chains and at the borders—will be vital to ensure that governments and stakeholders have the information about cross-border flows of plastics along the life cycle needed to design and implement effective policy interventions.

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Annex 1. Top Exporters and Importers Across the Life Cycle of Plastics by Value

Table A1.1 Top Exporters Across the Life Cycle of Plastics by Value (2021)

Rank	Feedstocks and precursors	Additives	Primary forms of plastics	Intermediate forms of plastics	Intermediate manufactured plastic products	Final manufactured plastic products	Plastic waste*
1	Korea	China	US	China	China	China	Germany
2	US	US	Germany	Germany	Germany	Germany	US
3	Netherlands	Germany	Korea	US	US	US	Netherlands
4	Saudi Arabia	Indonesia	China	Japan	Taiwan	Malaysia	Japan
5	Japan	Korea	Saudi Arabia	Korea	Italy	Poland	Belgium
6	India	Singapore	Belgium	Italy	Korea	Italy	United Kingdom
7	Germany	Malaysia	Taiwan	Taiwan	Turkey	Vietnam	France
8	Taiwan	Belgium	Netherlands	Belgium	India	Thailand	Mexico
9	Belgium	France	Japan	Turkey	Japan	Japan	Philippines
10	Singapore	Netherlands	Thailand	India	Vietnam	France	Italy

Note: The plastic waste column (*) in this table does not include trade in synthetic textiles waste.
Source: Authors' elaboration using 2021 data from BACI (Base pour l'Analyse du Commerce International) (CEPII, n.d.), building on and updating Barrowclough et al. (2020).

Table A1.2 Top Importers Across the Life Cycle of Plastics by Value (2021)

Rank	Feedstocks and precursors	Additives	Primary forms of plastics	Intermediate forms of plastics	Intermediate manufactured plastic products	Final manufactured plastic products	Plastic waste (*)
1	China	China	China	US	Vietnam	US	US
2	Belgium	India	Germany	China	US	Germany	Netherlands
3	Netherlands	Germany	US	Germany	Germany	France	Germany
4	Taiwan	US	Italy	France	Bangladesh	United Kingdom	Malaysia
5	US	Netherlands	Turkey	Mexico	China	Canada	Vietnam
6	Germany	Korea	India	Italy	Mexico	Netherlands	Turkey
7	India	Turkey	Mexico	Vietnam	Indonesia	Japan	Taiwan
8	Korea	Italy	Vietnam	Korea	France	Mexico	Italy
9	France	France	Belgium	Poland	Italy	Italy	Belgium
10	Indonesia	Spain	France	Netherlands	Cambodia	Poland	Canada

Note: The plastic waste column (*) in this table does not include trade in synthetic textiles waste.
Source: Authors' elaboration using 2021 data from BACI (CEPII, n.d.) drawing on the categorization used in the UNCTAD plastics trade database and updating Barrowclough et al. (2020).

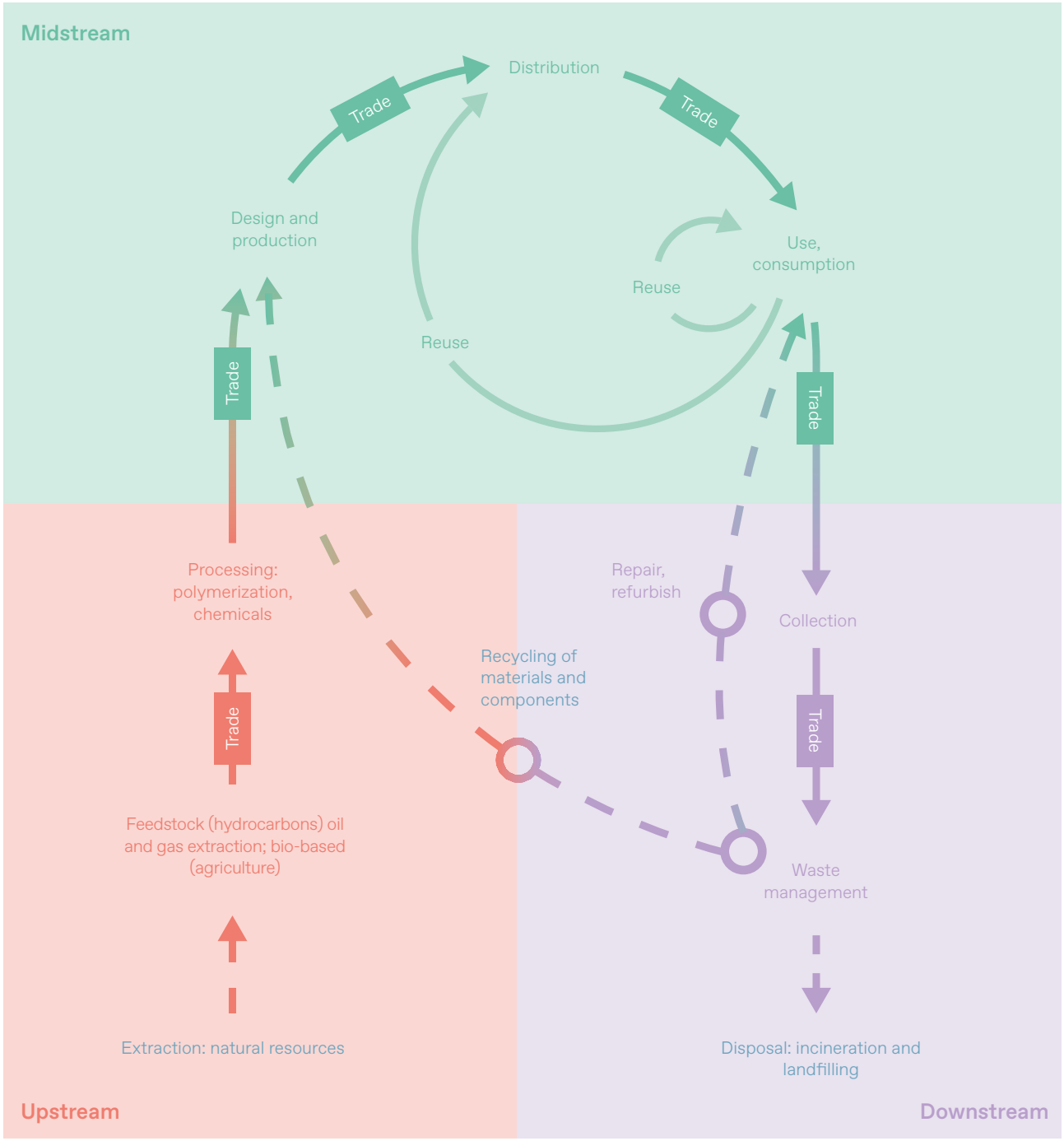
Annex 2. Examples of Harmonized System Codes Covering Single-Use Plastics

Table A2.1 Examples of Harmonized System Codes Covering Single-Use Plastics

392310	Plastics; boxes, cases, crates and similar articles for the conveyance or packing of goods
392321	Ethylene polymers; sacks and bags (including cones), for the conveyance or packing of goods
392329	Plastics; sacks and bags (including cones), for the conveyance or packing of goods, of plastics other than ethylene polymers
392330	Plastics; carboys, bottles, flasks and similar articles, for the conveyance or packing of goods
392340	Plastics; spools, cops, bobbins and similar supports, for the conveyance or packing of goods
392350	Plastics; stoppers, lids, caps and other closures, for the conveyance or packing of goods
392390	Plastics; articles for the conveyance or packing of goods n.e.c. in heading no. 3923
392410	Tableware and kitchenware, of plastics
630531	Sacks and bags; of a kind used for the packing of goods, of polyethylene or polypropylene strip or the like
630532	Sacks and bags; of a kind used for the packing of goods, of man-made textile materials, flexible intermediate bulk containers
630533	Sacks and bags; of a kind used for the packing of goods, of man-made textile materials, of polyethylene or polypropylene strip or the like, not flexible intermediate bulk containers
560811	Twine, cordage or rope; fishing nets, made up of man-made textile materials
560819	Other knotted netting of twine, cordage or rope; made-up fishing nets and other made-up nets, of textile materials

Annex 3. Illustration of the Life Cycle of Plastics

Figure A3.1 Illustration of the Life Cycle of Plastics



Source: Adapted from UNEP/PP/INC.2/4 (Appendix II, p. 35).

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