Institute for Energy Economics and Financial Analysis

Briefing Note

June 2025

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Trade Measures a Cornerstone to the Success of Global Regulation To Curb Plastic Pollution

- *Plastics, across its lifecycle, is a globalized, interconnected market, so a lack of strong trade provisions would limit the effectiveness of the objectives of the proposed binding agreement.*
- *Primary plastic polymers are a key driver of fossil fuel demand. Strong trade provisions would help signatories meet decarbonization goals.*
- *Current regulations and provisions are not enough to govern the intricacies of the plastics lifecycle.*
- *Given that the polymer market is likely in a state of secular decline, it would be financially wise for governments to avoid depending on plastics to drive their country's economy.*

Introduction

In May 2022, the United Nations Environment Assembly passed Resolution 5/14 to address plastic pollution.[1] Since December 2022, a committee has been negotiating a proposed international legally binding instrument (ILBI). Five rounds of negotiations have concluded, and the final round is expected in August 2025. The resolution is a landmark in regulating plastic pollution. It recognizes that any meaningful approach must take the products' full lifespans—from primary polymer production to disposal—into account.

According to the International Energy Agency, demand for plastics— which has almost doubled since 2000—outpaced demand for other materials such as steel, aluminum or cement.[2] According to a recent study, 436.66 million tonnes (Mt) of polymers and plastics including feedstocks were traded in 2022, with final plastic products amounting to 111 Mt.[3]

Today, 99% of plastics are made of fossil fuels. Fossil fuels are refined and processed into monomers (the building blocks) and then polymers, with intermediates and chemicals (studies suggest that more than 16,000 chemicals are used)[4] added in different stages of production. Regulating plastics would necessarily translate into regulating these petrochemicals. To regulate plastic production and consumption, a focus on these building blocks, including their trade, is imperative.

Trade measures ensure that countries that are not party to an agreement do not subvert their provisions and objectives. Trade measures in the proposed ILBI to address plastic pollution across the lifecycle have been resisted. A small group of countries, including Iran, India, and Russia, helped block the inclusion of trade measures in a draft released in December 2024.

Some of the arguments made against having strong trade measures in the proposed ILBI may be summarized as:

- Hazardous chemicals used in the production of plastics and hazardous waste are governed by the Basel, Rotterdam and Stockholm.
- Trade is governed by the World Trade Organization (WTO), and provisions under the proposed ILBI would run counter to WTO agreements.
- Developing countries and those that depend on polymer trade would be affected by curbing trade.

It is widely agreed that trade in hazardous chemicals and waste needs to be regulated. However, plastics and its raw materials are a highly globalized market. A treaty that fails to address trade will likely have a limited impact on the global production and consumption of plastics. In this briefing note, using trade in monomers and polymers primarily utilized to produce single-use plastics (SUPs), we respond to these arguments and explain why it is important for the proposed ILBI to contain provisions for the polymer trade.

Methodology

This briefing note focuses on monomers and polymers that make the most problematic plastics—single-use plastics (SUPs). Ethylene is the world's most-produced organic compound and is at the heart of the global petrochemical industry. Along with its derivatives—polyethylene, polystyrene, mono ethylene glycol (MEG), and polyvinyl chloride (PVC), these petrochemicals are the foundation of the plastics industry. The packaging industry is the main consumer of ethylene. Other end-use industries include construction, automobiles, healthcare and textiles. Propylene is the second-largest produced petrochemical after ethylene. About two-thirds of propylene is used to produce polypropylene,[5] used to make apparel, outdoor furniture, plastic squeeze bottles, and many other products.

This note analyzes trade data of key monomers and polymers using the Harmonized System (HS) categorization. Statistics from the International Trade Centre's Trade Map database were used to assess the trade values and patterns for the following monomers and polymers:

Monomers

a. 290121: Ethylene
b. 290122: Propylene
c. 290250: Styrene
d. 291736: Purified Terephthalic Acid (PTA) and is salts

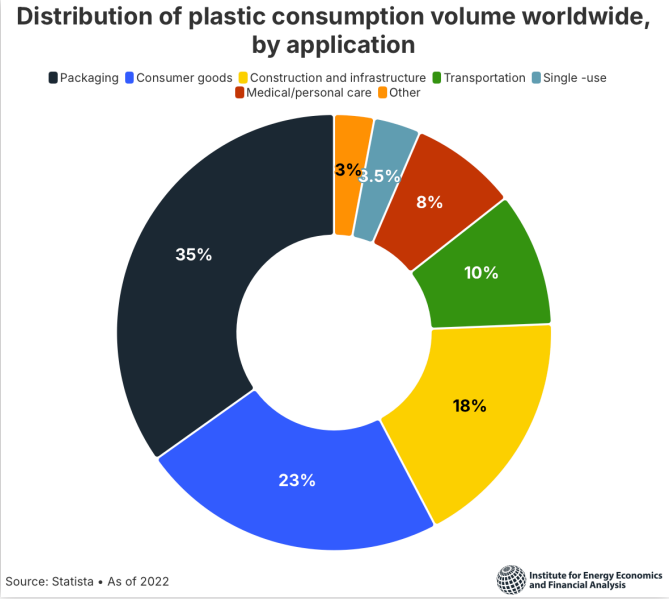
Polymers

e. 3901: Polymers of ethylene, in primary forms (which primarily includes LDPE, LLDPE, HDPE).
f. 3903: Polymers of styrene, in primary forms.
g. 390761: Polyethylene terephthalate, in primary forms, having a viscosity number of >= 78 ml/g
h. 390769: Polyethylene terephthalate, in primary forms, having a viscosity number of < 78 ml/g
i. 3902: Polymers of propylene or of other olefins, in primary forms.

SUPs—the Single Largest Category Contributing to Plastic Pollution

Plastics are embedded in our daily lives today; however, the UN has identified their indiscriminate use as a driver of the triple planetary crisis consisting of climate change, pollution and biodiversity loss.[6] SUPs, which are intended to be used only once before they are thrown away, are at the core of the plastic pollution problem. OECD's 2022 report, Global Plastics Outlook found that plastic waste generation more than doubled from 2000 to 2019. Approximately two-thirds of plastic waste is comprised of plastics with lifetimes of under five years, with 40% coming from packaging, 12% from consumer goods and 11% from clothing and textiles.[7] Studies have suggested that about 40% of all plastic products are discarded in one month.[8]

In 2022, packaging was the largest driver of plastic consumption, followed by consumer goods, with a combined share of 58%. Targeting and eliminating just these two segments of plastic consumption would significantly reduce plastic waste generated.

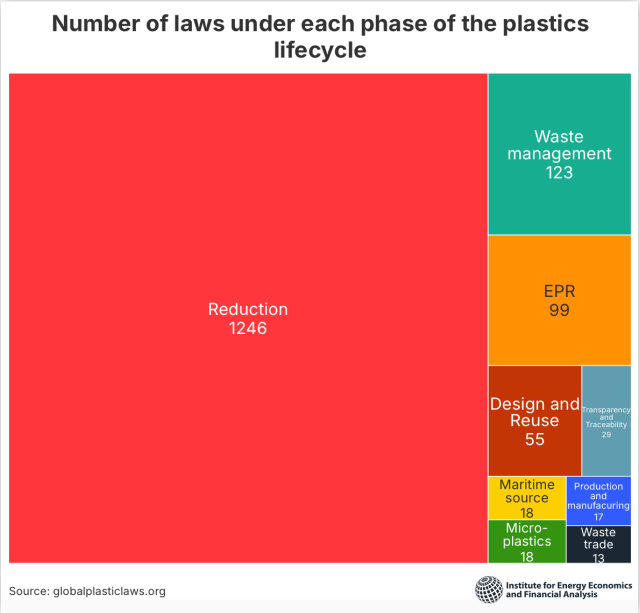


According to market analysts, the global plastic packaging industry has a current market size of $396.45 billion, with a forecasted compound annual growth rate (CAGR) of 4.4% from 2025 to 2034.[9] The global market size of plastics is also expected to grow at a CAGR of 4%.[10]

An assessment of the evolution of plastic material indicates that supply-side drivers have fueled its growth.[11] Fossil fuel companies, having discovered the potential of petrochemicals to open new markets for their products, have invested heavily in developing different kinds of plastics and their uses. This has accelerated since the shift towards renewable energy and electric vehicles. As a result, fossil fuel companies are increasingly looking to sectors dependent on the use of oil in their material form,[12] like plastics and agrochemicals, for their economic survival.

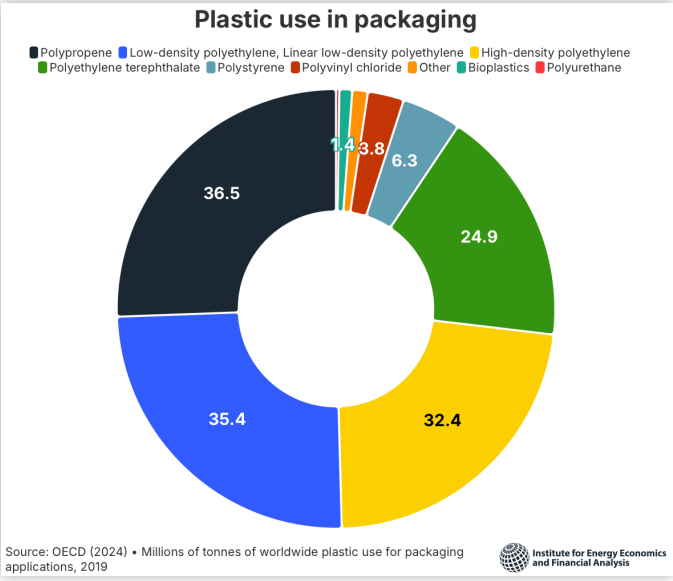
Reducing and phasing out SUPs would be a major step in addressing plastic pollution. An assessment of the existing laws to regulate plastic pollution, however, demonstrates an acutely inadequate legal regime to phase out primary plastic polymers. The Plastics Pollution Coalition and key partners have mapped 1,434 plastic laws globally across nine phases of the plastics lifecycle.

Interestingly, 'Reduction'—which covers laws aimed at reducing single-use plastic and materials— has the largest number of laws at 1,246, while 'Production and Reduction'—which includes laws aimed at regulating the production of virgin plastics (aka polymers)—has the second lowest number of regulatory laws, amounting to 17. Most are national laws; a few have regional jurisdiction, but none are implemented globally. It is important to note that while several countries have identified and attempted to regulate the consumption of SUPs, there is no comparable regulation of production of primary plastic polymers. It is our contention that if polymers necessary for making the final SUP product are produced, fossil fuel and petrochemical companies will continue to find ways to keep plastics in circulation.



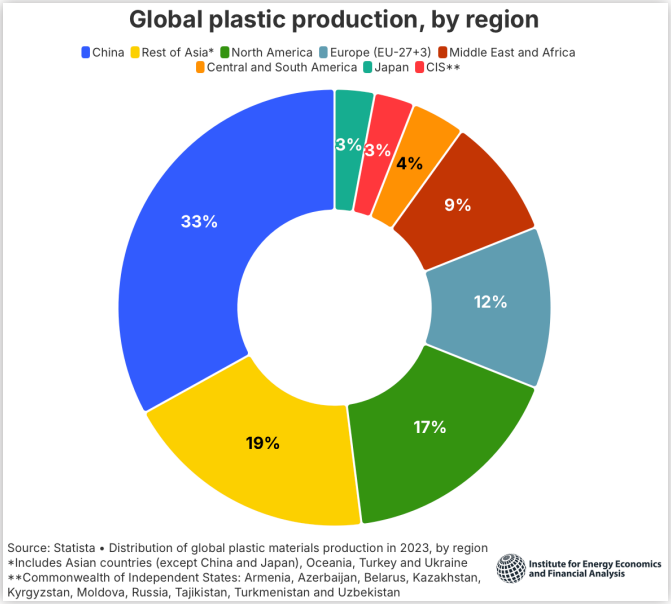
Trade in Primary Plastic Polymers: Facilitating SUP Production and Consumption in the Global South, Especially Asia

Ethylene, propylene, styrene and their derivatives are commonly used to make plastics. Ethylene derivatives like polypropene (PP), low-density polyethylene (LDPE), linear low-density polyethylene (LLDPE), high-density polyethylene (HDPE) and polyethylene terephthalate (PET) form the large part of downstream petrochemicals used to make plastic packaging. Polypropylene and polystyrene are the other common downstream petrochemicals used to make plastic packaging.

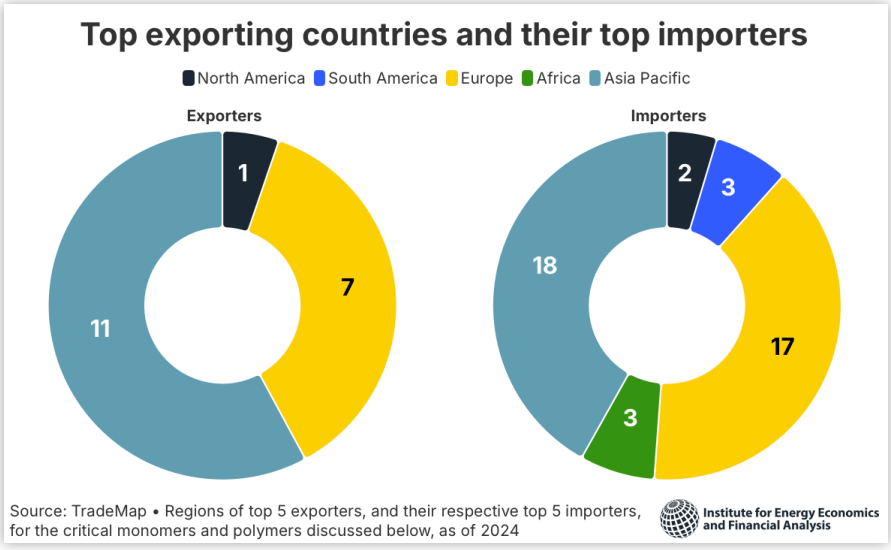


In Asia, packaging accounts for 60% of PE (PE includes LDPE, LLDPE and HDPE) consumption.[13] The packaging industry accounts for about 48% of the PP demand in 2024.[14] In 2022, packaging formed 41% of the extended polystyrene demand.[15]

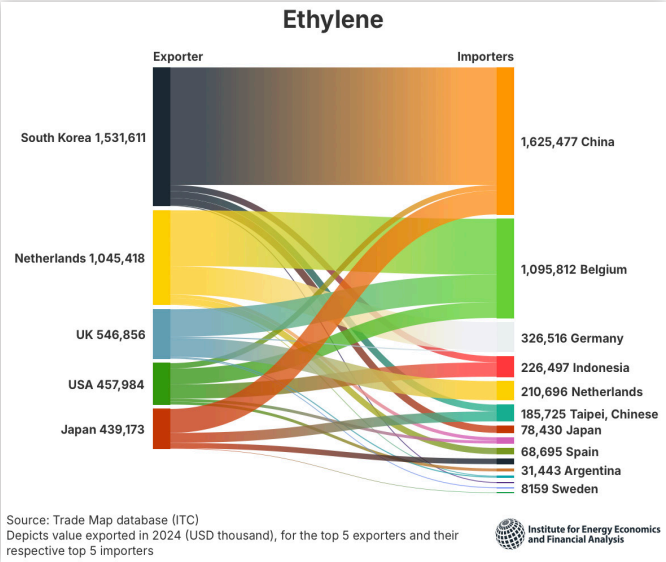
China and Asian countries (excluding Japan) accounted for 52% of global plastics production in 2023. North America and Europe had the second-largest share of 29%. Asian countries are clearly a lucrative market, as shown in the data on trade of key monomers and polymers.

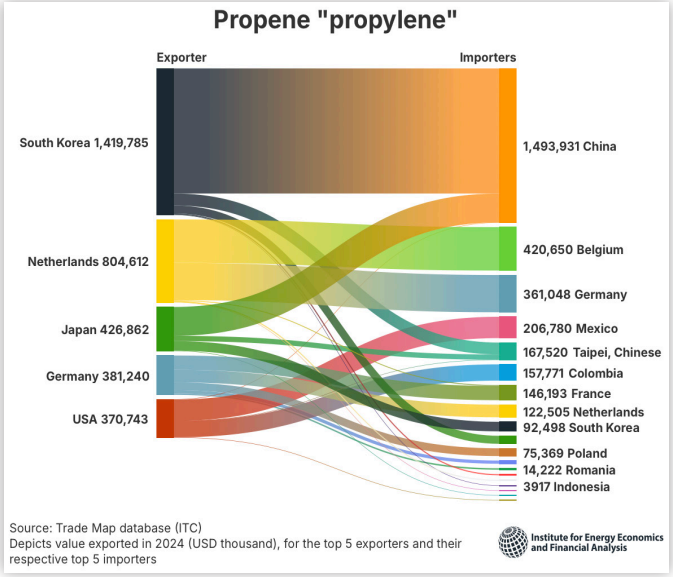


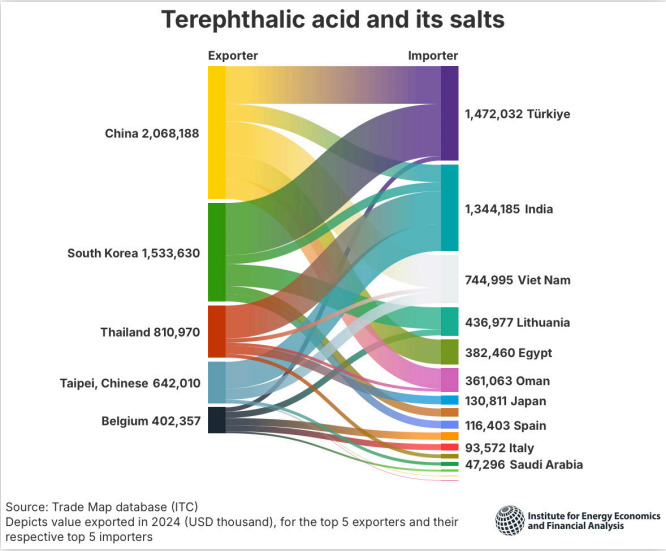
Looking at the top five exporters and importers of these nine critical monomers and polymers, it is evident that the Asian region dominates trade of primary plastic polymers with 11 exporting and 18 importing countries. The United States is the only country in North America that largely exports primary plastic polymers, and several countries in Europe are both importers and exporters. Africa and South America have negligible trade of primary plastic polymers.

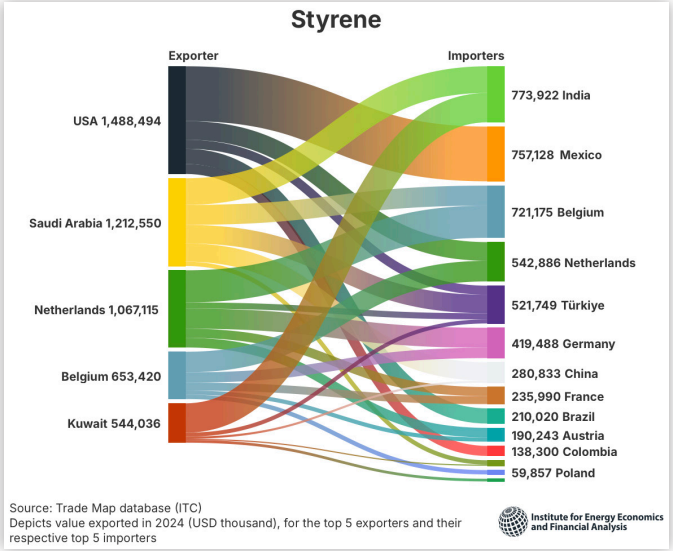


Korea, China and USA Dominate Trade in Monomers and Intermediate









The trade flow chart highlights that the global ethylene trade is dominated by a few major exporters, with South Korea leading and supplying primarily to China—the world's largest importer. The Netherlands plays a dual role as both exporter and importer, serving as a key distribution hub within Europe. Other significant exporters, such as the U.S., U.K., and Japan, maintain diverse trade routes across Asia and Europe. On the import side, Belgium, Germany, Indonesia, and Taiwan are notable buyers, reflecting strong industrial demand. Some countries such as Japan and the Netherlands import and export, highlighting the complexity of regional supply chains. Overall, the chart underscores China's central role in demand and the intricate, global ethylene trade network.

The trade flow chart provides a snapshot of global propylene exports in 2024, highlighting the top five exporters and their leading import partners by value. South Korea, Netherlands, Japan, Germany and the U.S. are the top five countries that account for the bulk of global propylene

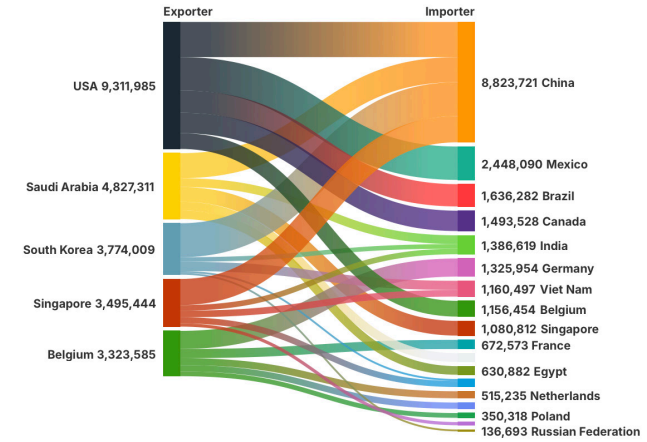
exports, with South Korea leading by a wide margin. South Korea to China is the dominant trade route, with China being by far the largest importer and absorbing the majority of South Korea's exports. Japan, Germany, and the United States each contribute sizable export volumes, with more diversified trade routes spanning Asia, Latin America, and Europe.

The trade flow chart underscores the global trade dynamics of styrene in 2024, showcasing the top five exporters and their principal import destinations. The United States, Saudi Arabia, and the Netherlands emerge as major suppliers, with extensive trade networks reaching multiple continents. On the demand side, countries across Asia, Europe, and the Americas—such as Belgium, India, Mexico, and Türkiye—stand out as major consumers, pointing to the widespread industrial applications of styrene in plastics, packaging, and synthetic materials. The chart underscores the interconnectedness of global chemical markets, where supply chains span regions and are shaped by both production capacity and industrial demand.

The trade flow chart underscores China's dominant role in the global PTA monomer market and shows China's extensive export links to countries such as Türkiye, India, and Vietnam, which are the three largest importers of PTA globally. The diversity of import destinations — spanning Southeast Asia, the Middle East, Europe, and North America — underscores the global demand for PTA as a foundational input for polyester fiber, film, and PET resin production. The prominence of Asia, both in exporting and importing, reflects the region's dominance in the polyester value chain, while Europe and North America appear more modest in terms of volume, indicating a reliance on Asian supply for PTA needs.

Polymers: Embedding SUPs in Asia

Polymers of ethylene, in primary forms



Source: Trade Map database (ITC)
Depicts value exported in 2024 (USD thousand), for the top 5 exporters and their respective top 5 importers

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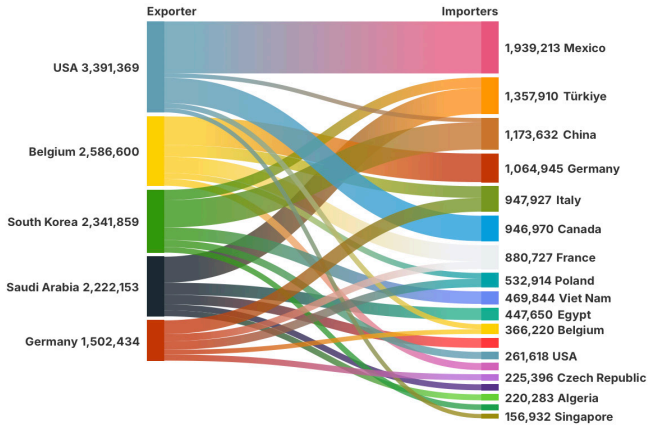
Polymers of propylene or of other olefins, in primary forms



Source: Trade Map database (ITC)
Depicts value exported in 2024 (USD thousand), for the top 5 exporters and their respective top 5 importers

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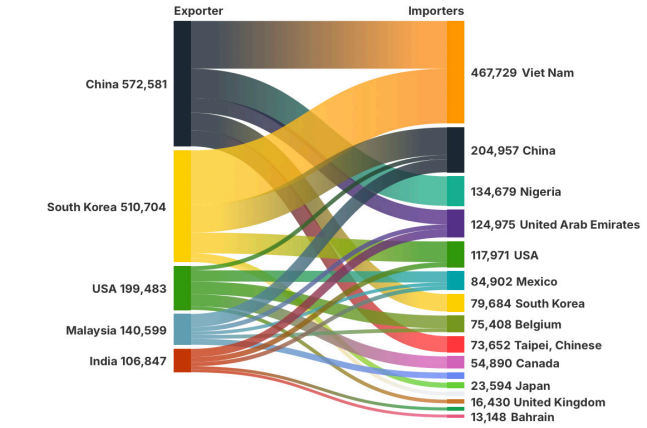
Poly"ethylene terephthalate", in primary forms, having a viscosity number of < 78 ml/g



Source: Trade Map database (ITC)
Depicts value exported in 2024 (USD thousand), for the top 5 exporters and their respective top 5 importers

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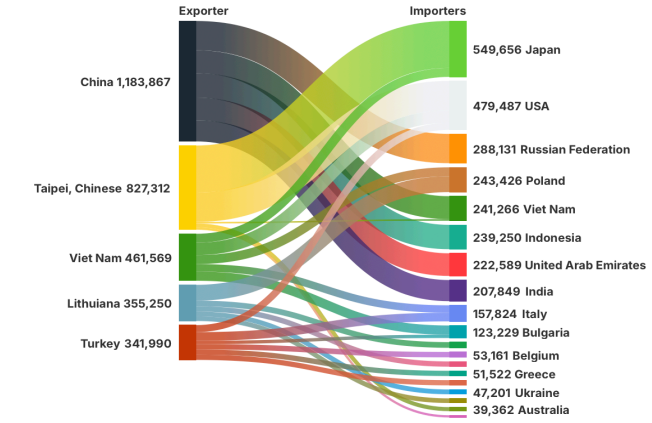
Poly"ethylene terephthalate", in primary forms, having a viscosity number of >= 78 ml/g



Source: Trade Map database (ITC)
Depicts value exported in 2024 (USD thousand), for the top 5 exporters and their respective top 5 importers

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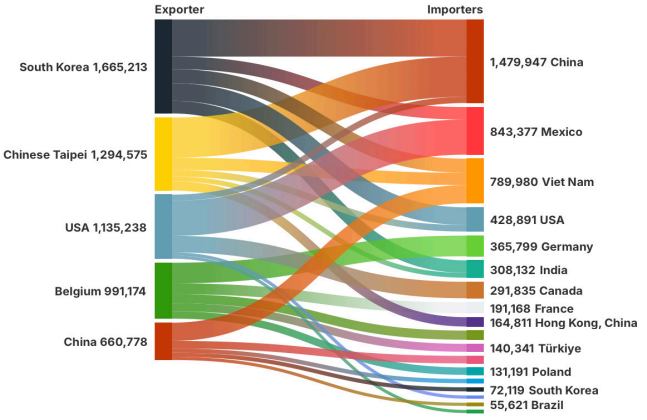
Polymers of styrene, in primary forms



Source: Trade Map database (ITC)
Depicts value exported in 2024 (USD thousand), for the top 5 exporters and their respective top 5 importers

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Petro States Lead Polyethylene Trade

Polymers of ethylene are the single largest contributor to plastic packaging and single-use plastics. The U.S. is a global leader in ethylene polymer exports with China, Mexico, Canada and Vietnam being top recipients of these polymers. Saudi Arabia is the next largest exporter, with significant flows to China, India and Egypt. Both the U.S. (natural gas) and Saudi Arabia (oil) are rich in fossil fuels, making them the obvious leaders in ethylene production and exports. Both these countries are also strategically located, with access to major shipping routes.

Predominant Intra-Regional Trade Patterns

Polymers of propylene and styrene demonstrate regional trade patterns. For example, in the case of polymers of propylene, the U.S. exports primarily to Mexico and Canada. Belgium and Germany are major exporters and importers, highlighting their role in intra-European and global trade. South Korea and Saudi Arabia export mainly to China, India, and other Asian markets. Polystyrene shows similar sub-regional trends. Taiwan exports to China and Vietnam, and Belgium exports to Germany, France, Poland, and Italy. The U.S., while being an exporter and importer of polymers of styrene, primarily exports to Mexico and Canada.

Presence of Global Petrochemical Hubs: Value Addition, Re-Processing and Re-Exporting

Belgium is both a major exporter and importer of polymers of ethylene, acting as a hub within the EU. Similarly, the role of Singapore as both an export and import shipping center, indicates that it is used as a transshipment hub where re-exporting could be a possible reason.

While China dominates exports in the higher viscosity of PET, it imports a significant amount in the <78 ml/g category, possibly for lower-end applications or reprocessing. Similarly, Vietnam is a major importer of low-viscosity PET and a significant exporter of high-viscosity PET, indicating strong domestic processing or re-export capabilities. In some instances, import volumes by developed countries are greater, indicating higher consumption of SUPs. For example, lower viscosity PET (<78 ml/g) seems to have a more diverse set of importers, but with smaller volumes. Higher viscosity PET (≥78 ml/g) is imported by in large volumes by a few industrialized countries (such as the U.S. and Japan) indicating greater use of SUPs. A similar trend is observed with China, which is both a top importer of styrene polymers and a mid-tier exporter.

Germany is a top exporter of polypropylene but also a major importer, indicating its role as both a processor and redistributor in the global supply chain. Similarly, Belgium is an importer and exporter, indicating that the country is involved in value-added processing or re-exporting.

Climate Implications of Polymer Trade

The inclusion of trade provisions makes sense on economic grounds alone, given the interconnected nature of globalized trade. But a climate rationale also exists, for the simple reason that the plastic supply chain is a major contributor to global greenhouse gas emissions. A failure to address trade in the proposed ILBI would generate significant possibilities for emissions leakage—undermining countries' abilities to meet their climate goals.

Plastics synthesis is a uniquely carbon-intensive endeavor, given that 99% of product on the market is derived from fossil fuel feedstocks.[16] The greenhouse gas emissions of primary plastics production amount to some 2.24 gigatons of carbon dioxide equivalent (CO_2e)each year (four times that of all global aviation, for comparison).[17] Even under a conservative growth outlook, one recent study finds that plastic production could eat up about a quarter of the remaining carbon budget for Paris Agreement 2050 goals.[18]

These emissions must be understood in the context of the political economy of global plastics trade: A rough estimate suggests that the process emissions and carbon content embedded in exported polyethylene from just the top five producers in the category accounts for more than 100 million tons of CO_2e. To put it another way, the footprint of this single category of products from just five producers alone is analogous in scale to the emissions of a mid-size industrialized country.[19]

Exporter	Tons of LDPE Export	Tons of HDPE Export	Approx. tons embedded CO_2e
United States	3,495,837	4,890,954	35,679,142
Saudi Arabia	4,577,011	4,197,909	37,560,171
Belgium	1,307,959	1,216,725	12,534,293
South Korea	686,833	1,656,612	11,497,416
Singapore	780,130	719,361	7,445,375

Source: Trade Map, RFF, IEEFA estimates[20]

This is only intended as a high-level approximation.[21] But both importer and exporter economies have reason to care about the magnitudes. For producer states, research indicates that the continued growth of petrochemical exports creates new sources of emissions, and new pathways for lock-in that undermine domestic decarbonization prospects.[22] It also creates potential reputational and commercial vulnerabilities, as changing global demand patterns and rising environmental consciousness reshape markets for these products.[23] Producer countries should consider how the export of significant embedded emissions to the world market might hinder their own transition leadership.

For consumer states, the import of carbon-intensive plastics products comes with its own risks. The Intergovernmental Panel on Climate Change (IPCC) has long warned of the risks of "carbon leakage," where countries offshore high-emitting industries to other jurisdictions, driving paper decarbonization while doing little to bend the global carbon curve.[24] A failure to account for trade in global plastics negotiations would only heighten the potentials for carbon leakage, allowing non-party states to hinder treaty success. There are also blind spots, data gaps, and inconsistencies in existing petrochemical emissions inventories, suggesting that

some trade-related emissions may not be reflected on any nations' books.[25] Consumer states must consider their own role in underwriting future emissions, regardless of where and whether they are recorded.

The debate over trade provisions parallels another discussion in global climate policymaking: carbon border adjustment mechanisms (CBAMS). Jurisdictions with carbon price regulations have an interest in ensuring that less-ambitious markets cannot undercut and undermine their own economic competitiveness. Major markets such as the EU are turning to import adjustments for goods produced in jurisdictions without comparable commitments.[26] The case for trade provisions in the Global Plastics Treaty is conceptually parallel: Party states have an interest in ensuring that non-party states cannot unilaterally undercut their own domestic commitments. As such, states that recognize the need for CBAMs should recognize the need for trade provisions too.

Do the Arguments of Low Ambition Countries Hold?

Regulation Under Existing MEAs[27]

Countries with little ambition in the ongoing treaty negotiations have suggested that the Basel, Rotterdam and Stockholm (BRS) conventions are sufficient to regulate trade in primary plastic polymers. The function of these conventions is to control transboundary movements of hazardous wastes and their disposal; to ensure that prior informed consent for international trade in certain hazardous chemicals; and to protect human health by reducing and eliminating the use of persistent organic chemicals.

There are two concerns with externalizing trade provisions of the proposed ILBI to the BRS conventions:

- Not all countries have ratified all 3 BRS conventions, making it difficult to hold them accountable under those conventions. There also is no way to ensure that all countries who will be party to the proposed ILBI would also ratify the BRS conventions.
- The BRS conventions, while playing a critical role in the context of trade of hazardous chemicals, are limited to regulating the use and trade of hazardous chemicals and waste and do not explicitly include global and national targets of polymer production and consumption, which might not be classified as "hazardous" in nature.

Regulation Ander the World Trade Organization[28]

According to the WTO, "WTO members are free to adopt environmental policies, such as environmental requirements and taxes, at the level they choose, even if they significantly

restrict trade, as long as they do not introduce unjustifiable or arbitrary discrimination or disguised protectionism through the back door."[29] In 2020, 50 WTO members launched an initiative—a Dialogue on Plastic Pollution (DOPP)—to explore how the WTO could contribute to efforts to reduce plastics pollution. During the WTO's 13th Ministerial Conference in 2024, six trade-related measures were identified, two of which were directly linked to the trade and use of plastics. The DOPP agreed on an increase in transparency in trade flows and a reduction in

harmful and unnecessary plastics, including SUPs. However, both these measures are limited to the final plastic product and do not extend to the polymers. This allows for polymers to continue being traded with no regulation of any kind.

The position that less-ambitious member states have taken on trade measures will ensure that the petrochemical industry can continue to produce primary plastic polymers, innovate to find new uses and markets for plastics, weakening the effectiveness of proposed ILBI.

Economic Implications of Trade in Primary Plastic Polymers

Ten countries form the top five exporters of the three monomers. The United States, Saudi Arabia and Kuwait are fossil fuel-rich countries. The UK has significant fossil fuel reserves. The other six countries all rely on import of fossil fuels for their energy and industry needs. The Netherlands imports its oil and has become an importer of natural gas from 2018 due to a declining domestic supply.[30] Belgium is fully reliant on imports for all its fossil fuel consumption.[31] According to the International Energy Agency (IEA), South Korea imported 98.9% of its total crude oil supply in 2023.[32] Japan imports almost all the fossil fuel it consumes.[33] Germany is heavily dependent on imports for its oil and gas needs.[34] The fossil fuel-importing countries are vulnerable to erratic prices of these feedstocks in the upstream and depend on robust derivates market in the downstream.

Polymer trade has a wider base, with 20 countries comprising the top five exporters and importers. Of these, the U.S., Saudi Arabia and Malaysia are the only three countries which are fossil fuel-rich and have access to cheap feedstocks. All the other countries either refine imported crude oil to monomers and produce the polymers, or import monomers and process them to polymers. All the other exporting countries depend on healthy demand of plastic products in the destination countries.

The petrochemical industry is facing risks of secular decline due to a global economic slowdown, Chinese economy's inability to bounce back to pre-COVID-19 levels, global concern for environmental and health effects of consuming plastics.[35] Market analysts do not see the sector reviving any time soon.[36]

With shrinking markets and a pile up of polymers and their feedstock, developing countries dependent on petrochemical trade are only exposing themselves to a looming financial crisis.

Why Strong Measures on the Trade of Primary Plastic Polymers Are an Essential Provision for the Success of the ILBI

With the petrochemical industry facing prospects of a secular decline, the sector is likely to pursue new products and markets aggressively, to help boost its prospects. History has demonstrated as much.[37] If the production and consumption of primary plastic polymers, including its trade, is not regulated and the proposed ILBI only focuses on product design and waste management, it will result in only changing the nature of the beast rather than eliminating it—the purpose of Resolution 5/14.

The Stockholm Resilience Centre, which first proposed the concept of planetary boundaries, describes novel entities as "entities that are novel in a geological sense and that could have

large-scale impacts that threaten the integrity of Earth system processes."[38] Novel entities include synthetic organic pollutants, radioactive materials, genetically modified organisms, nanomaterials, and/or micro-plastics.[39] Studies presented in 2022 concluded that plastic pollution is a key element in the novel entities of planetary boundaries and that the safe operating space had been exceeded.[40] Avoiding trade in polymers will result in exporting or importing countries being unable to honor their climate commitments.

The analysis of economic and climate implications for just nine polymers has demonstrated the need for their trade to be regulated. Unlike downstream impacts such as waste management, upstream legislation of polymers—including trade—is severely inadequate.

We believe that the proposed ILBI is an opportunity for the leadership of countries to transform our current levels of plastic production and mandate more sustainable systems of consumption. Towards this end, we urge that:

- 1) The proposed ILBI should establish global and national targets for the production and consumption of primary plastic polymers; and
- 2) Trade should be considered an inherent element establishing these global and national targets.

Endnotes

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About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

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