



OPEN ACCESS

EDITED BY

Qi Xu,
Jinan University, China

REVIEWED BY

Shuli Han,
Jinan University, China
Yayuan Peng,
Jiangsu University, China

*CORRESPONDENCE

Asif Khan
✉ khan.asiff@yahoo.com

†These authors have contributed equally to this work

RECEIVED 13 May 2025

ACCEPTED 22 July 2025

PUBLISHED 12 August 2025

CITATION

Hui Z, Haider A and Khan A (2025)
International trade and plastic waste in
oceans: legal and policy challenges.
Front. Mar. Sci. 12:1627829.
doi: 10.3389/fmars.2025.1627829

COPYRIGHT

© 2025 Hui, Haider and Khan. This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

International trade and plastic waste in oceans: legal and policy challenges

Zhang Hui^{1†}, Aftab Haider¹ and Asif Khan^{2*†}

¹School of Law, Southwest University of Political Science and Law, Chongqing, China, ²School of Law, Hainan University, Haikou, China

Plastic waste pollution in oceans has emerged as a severe global crisis, exacerbated by international trade. The increased movement of goods, particularly plastic-based products, contributes significantly to marine plastic pollution. This study explores the intersection of international trade and plastic waste, focusing on legal and policy challenges. Using a qualitative research design, this paper reviews international legal frameworks such as the Basel Convention, the United Nations Convention on the Law of the Sea (UNCLOS), and regional trade agreements to assess their effectiveness in addressing plastic waste issues. The research highlights critical enforcement gaps, lack of standardized regulations, and insufficient international cooperation as major obstacles to effective plastic waste management. Key findings suggest strengthening international legal frameworks, enhancing monitoring and compliance mechanisms, and promoting sustainable trade practices are crucial for mitigating plastic pollution in oceans. The study underscores the necessity for binding agreements within trade policies to ensure a sustainable balance between economic growth and marine ecosystem preservation.

KEYWORDS

environmental governance, waste management policies, marine ecosystem degradation, transboundary pollution, regulatory enforcement, circular economy, sustainable development

1 Introduction

Marine environment protection, plastic waste management, and the sustainable use of marine resources are the essential pillars of human welfare and the protection of species. Nevertheless, as international trade has become increasingly prominent, the problem of plastic waste in the oceans has become even more severe. Globalization and economic growth, complemented by the greater demand for goods and services, have resulted in the production and disposal of plastics at the highest rate. Since countries are involved in international business, they export and import large quantities of plastic packaging, single-use plastics, and waste that pollute the marine environment. Many international conventions have sought to address waste management, but most of them have proven to be ineffective due to a lack of enforcement mechanisms and compromise of trade

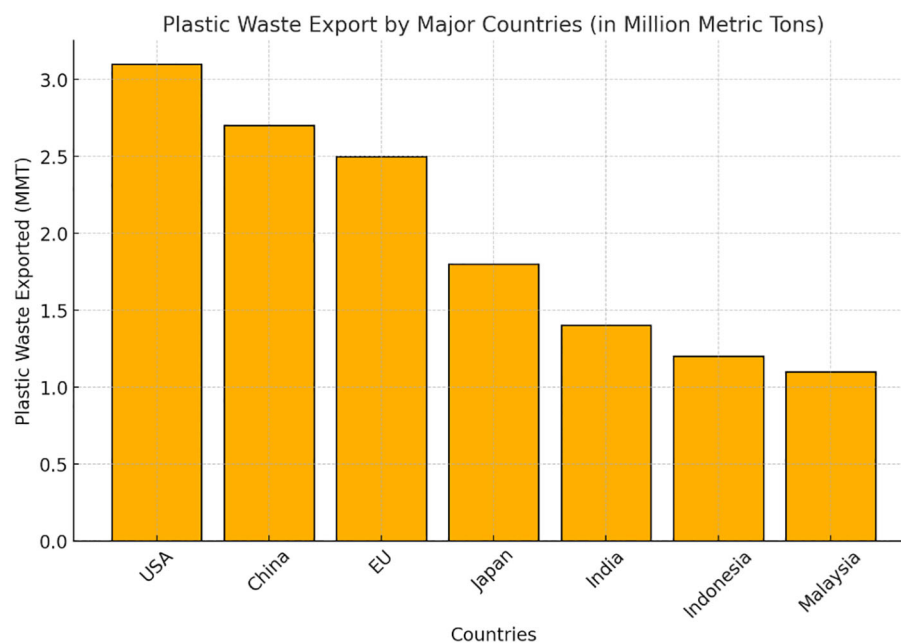


FIGURE 1

The world's leading exporters of plastic waste are depicted in the Plastic Waste Export by Major Countries (Kosior and Crescenzi, 2020).

liberalization over environmental conservation. This article is an effort to examine the legal and policy perspective of the issue of marine plastic pollution in the context of inter-generational equity (Wu, 2022).

With the advancement of globalization, the effects of plastics on marine life are very destructive. Marine waste is a global problem that has an impact on marine life and human beings, especially those living close to coastal areas. This is deteriorated by many countries' inability to control the movement of plastic waste across their borders, leading to ocean pollution. Trade rules are weak in terms of waste management, which enables developed countries to dump their waste plastics in the developing countries that have poor disposal systems. This leads to environmental injustices since such areas are unable to handle the increased flow of waste (Ferraro and Failler, 2020). Also, the existing practices and policies for the reduction of plastic waste involve guidelines and recommendations as well as treaties and agreements, which do not adequately capture the systemic, progressive, and accumulative characteristics of the problem. The lack of strict compliance mechanisms also poses a threat to the efficiency of the current existing international laws. The world's leading exporters of plastic waste are depicted in the Plastic Waste Export by Major Countries (Figures 1, 2), where it can be observed that developed countries are the major culprits. The figure depicts that the United States, China, the European Union, and Japan are the largest exporters of plastic waste to countries that have poor waste disposal systems.

This has resulted in a highly uncoordinated system in which some countries have put in place strict measures against plastic waste, while others still accept and dispose of foreign waste improperly. The increase in the use of marine transport by the international community to transport goods and products has also led to the discharge of plastics in

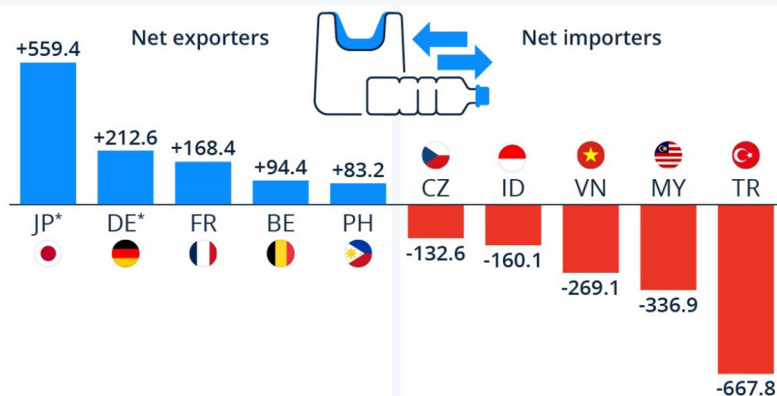
the marine environment by cargo ships, fishing vessels, and offshore industries through dumping. Furthermore, the growing use of plastic packaging materials in international trade has further exacerbated the disposal problem. Despite this, legal provisions for the lifecycle of plastics in trade agreements remain ambiguous. It will also mean that the effects of trade-related plastics on the environment will continue to increase (Jordan, 2024). This paper focuses on the legal and policy aspects of international trade in plastic waste and the marine environment, discussing the gaps. It deals with the problem of how to deepen environmental commitments in current trade treaties to mitigate the effects of the liberalization of trade on the marine environment. The article includes a comprehensive discussion on the effectiveness of the Basel Convention, the United Nations Convention on the Law of the Sea, and regional trade arrangements. It makes suggestions, including enhancing the waste management provisions in trade agreements and developing a common international institution. Finally, it proposes a roadmap of how to integrate international environmental standards with the trade policies towards the realization of a sustainable and legally binding solution to plastic waste in international trade. This study adopts an interdisciplinary approach by integrating environmental law, international trade law, and maritime law to explore the transboundary nature of marine plastic pollution. By combining legal analysis with political science insights, the research contributes to a comprehensive understanding of international governance challenges.

2 Literature review

The issue of marine litter due to the import and export of plastics has been widely debated in literature in legal,

Which Countries Export & Import Plastic Waste?

Selected countries by net export balance of plastic waste and plastic scrap in 2022 (in thousand tons)



* Approximation based on dollar value imports/exports
Out of 129 countries reporting both imports and exports
Source: UN Comtrade



statista

FIGURE 2
Which Countries Export & Import Plastic Waste? (Buchholz, 2024).

environmental, and policy contexts. Different authors and international organizations have tried to explain how trade measures, disposal systems, and the absence of regulation that results in the export of plastic waste across the world cause marine pollution. This section underscores the findings of previous works that tackle the impact of trade on plastic waste, the sufficiency of current legislation, and the limitations of policies that prevent long-term solutions.

Many researchers investigate the link between trade liberalisation and environmental degradation, particularly in the context of the export of plastic waste. Brooks et al. (2018) also noted that developed countries contribute a significant amount of plastic waste to developing countries that do not have effective means of disposal. This has been described as having a significant part to play in discharging plastics into water sources, thereby polluting them. Lebreton and Andrady (2019) on sources of marine litter and plastic waste indicated that approximately 60% of the marine litter came from international shipping and plastic waste trade. Their study reveals that the existing legislation does not effectively address the issue of the flow of plastics.

Another element of literature focuses on how trade agreements and economic policies affect plastic waste management. Xanthos and Walker (2017) have pointed out that most of the FTAs are weak in the sense that they lack binding environmental provisions; hence, plastic waste can easily cross borders with little deterrence. Haward

(2018) points out that while countries are increasingly recognizing the problem of marine plastic pollution, economic considerations override political commitments in trade policy. This leads to poor policy enforcement, and there is no one to blame for the poor management of trade in plastic waste. Also, according to Idrees and Rehna Gul (2022), while the RTAs do contain environmental cooperation clauses, they do not place much emphasis on practical commitments regarding the management of plastic waste. The efficiency of the existing rules of international law has also been critically assessed. The Basel Convention is one of the main legal instruments that control the cross-border movement of plastic waste and has been amended many times to improve the effectiveness of its measures. However, other scholars like Kummer Peiry (2014) suggested that compliance and enforcement gaps are still a problem that impedes the effectiveness of the policy. Some developed countries still send plastic waste to other nations, disguising it as recyclable materials, and take advantage of the weak customs systems in the recipient countries. While the UNCLOS sets out broad responsibilities to prevent marine pollution, it lacks specific legal measures to regulate the flow of plastic waste through trade. There have been several policy suggestions to improve the regulatory systems and minimize plastic waste pollution through trade policies and regulations. There are other scholars who have argued that there should be legally enforceable requirements incorporated in FTAs and RTAs

and that environmental commitments should be mandatory. Some recommendations include enhancing the legal structure of the Basel Convention, using technology to track the movement of plastic waste in real time, and setting up international supervisory authorities. Moreover, the literature on circular economy proposes trade incentives for sustainable production, biodegradable packaging materials, and EPR to ensure producers are held accountable for plastic disposal.

The literature that researched suggests that international trade contributes significantly to plastic waste production ending up in the oceans due to inadequate policies and enforcement mechanisms and trade liberalization policies that increase the problem. To address these challenges, legal frameworks should be reinforced, the regulation of international trade improved, and trade measures should incorporate sustainability considerations. More studies must be conducted to establish global guidelines that will integrate economic growth and trade liberalization while at the same time trying to curb the problem of marine plastic pollution.

3 Research methodology

This study expands its scope by including examples from ASEAN and Africa. For instance, Malaysia and Indonesia have experienced surges in plastic waste imports after China's ban, often exceeding their processing capacities. In Africa, Ghana and Nigeria face similar challenges under bilateral trade deals with developed nations, showing discrepancies between treaty commitments and domestic capacity for enforcement. This research employs an exploratory qualitative research approach to investigate the legal and policy concerns on international trade and plastics in the oceans. Because of the subject matter, the study employs both qualitative and quantitative research methods, drawing from legal research, policy analysis, and case studies. It involves a study of international laws, regulations governing the importation and exportation of plastic waste, and international trade agreements and treaties. The Basel Convention, the United Nations Convention on the Law of the Sea (UNCLOS), and several Regional Trade Agreements (RTAs) are analyzed to determine their effectiveness in regulating the exportation of plastic waste. Special attention is given to the 2019 amendments to the Basel Convention, which further restricted the export and import of plastic waste. The policy review will involve an assessment of current national and international trade policies that relate to the management of plastic waste. The article examines how varying national laws create loopholes that allow the plastic waste trade to persist, posing a threat to the achievement of sustainable development goals. Further, the research seeks to establish the level of contribution of trade relations and economic measures in either increasing or reducing the problem of marine plastic pollution. Also, examples of legal and policy challenges and successes in managing the plastic waste trade are presented through cases. So, cases in Southeast Asia, Europe, and North America are compared to identify how different regions

deal with the issue of plastic waste in international trade. The case studies describe situations where the importation of plastics resulted in environmental disasters and effective policies that have been adopted to reduce plastic pollution through trade.

For the legal and policy analysis, secondary research data is used, including reports from international organizations such as the United Nations, World Trade Organization, and International Maritime Organization. The research also includes peer-reviewed articles, legal documents, and trade policy studies. This study contributes to the growing literature on the need to enhance international trade laws in combating the proliferation of plastic waste pollution. Thus, based on the analysis of legal provisions, assessment of policies, and case studies, this work offers recommendations to eliminate gaps in the legislation, improve compliance measures, and support sustainable trade. The research methodology ensures that the findings of the research are well grounded and that there is a clear link between international trade and plastic waste pollution, as well as identifying ways in which legal instruments can be enhanced to reduce the effects on the environment.

4 The impact of international trade on plastic waste in oceans

To clarify the causal chain between trade volume and marine plastic pollution, this paper suggests using indicators like per capita plastic consumption and GDP. For example, the United States, while a major exporter of plastic waste, also ranks among the highest in per capita plastic use, linking trade intensity to environmental externalities. Figures 1, 2 depict plastic waste trade as of 2020–2023 based on UN Comtrade and Statista datasets. These figures reflect the latest available data and offer insight into major exporting and importing countries, reinforcing the link between trade routes and environmental harm. Future versions of this study could employ panel data from 2000–2023 to map waste flows longitudinally.

4.1 Global trade and plastic production

Trade is a pillar of the worldwide plastics economy. In the life cycle of plastics, international trade is a mode of transport for plastics — virgin plastic, embedded plastics, waste — across borders. UNCTAD¹ estimates that the aggregate value of plastics trading includes \$1 trillion USD per year, which has accounted for around 5% of the aggregate value as merchandise trade. The value of the plastics trade in 2021 reached new highs, soaring to 1.2 trillion USD. This makes it difficult because of the very large heterogeneity of plastic products (with plastic accessible in packaging and plastic embedded in other traded products) traded globally and incorporated into the waste stream that makes its way to domestic countries to manage, frequently unsuccessfully, leading to leakages into the environment (Figure 3).

¹ UNCTAD <https://unctad.org/>

The global economy has played a key role in increasing the production of plastics by enhancing the consumption of plastics in international markets. With the development of trade links, plastic has emerged as a common material because of its cheapness, strength, and suitability in packaging and moving goods. However, this has come at a cost, leading to the increased production of plastics that have flooded the environment, especially the oceans. The pie chart (Figure 4) above shows the major contributors to plastic waste in oceans through international trade, where trade-exported waste is the biggest at 40% (Wang C. et al., 2022).

Southeast Asian countries such as Malaysia, Indonesia, and the Philippines are the major recipients of plastic waste exports from developed nations, and the effects of plastic waste on the marine ecosystem are quite apparent in this region. While the international community has signed conventions that regulate the export of waste, insufficient measures have been implemented to stop waste traders from bypassing the regulations. Sometimes, non-recyclable products are labeled as recyclable and thus end up in landfills, rivers, and coastal areas. After entering the environment, plastic degrades into microplastics that pollute the food chain in the ocean and threaten the lives of marine organisms. From Figure 4, research can infer that illegal dumping is estimated to contribute 15% of the plastics that end up in the oceans, increasing the waste threat in countries that lack proper waste management systems. Plastic pollution is a major issue for marine life. Fish, seabirds, and other creatures often ingest the debris, leading to internal injuries, poisoning, and higher death rates. It also presents a health risk to humans, as microplastics and toxic chemicals from degraded plastic waste enter the seafood chain, which humans rely on for food (Liu et al., 2022).

This is exacerbated by the economic factors that drive the trade in plastic waste. Most developing countries consider accepting plastic waste imports as a way of creating employment in the recycling sector and also as a source of revenue through the recycling of waste. However, the social costs to the environment and health are higher. The inconsistency in regulations across states creates an opportunity for waste traders to reroute shipments to less regulated markets, perpetuating the cycle of plastic pollution. As illustrated in Figure 4, approximately 25% of marine plastic waste comes from shipping and cargo loss, highlighting the impact of international trade on plastic pollution (Wang C. et al., 2022).

Marine life is greatly affected by the rising cases of plastic pollution in the oceans. Plastic can cover coral colonies, impede their development, and bring pathogens that compromise the health of the reefs. The loss of coral habitats reduces the availability of food for fish and the overall marine life, which in turn has an impact on the fishing industries of the coastal people. Littering the oceans with plastic can spread invasive species, harming fragile ecosystems. Fishing gear waste makes up 10% of the plastic in oceans, which includes nets and ropes that harm marine life. The effects of plastic pollution on the environment are long-term and catastrophic, which makes it essential for countries to come together and tighten the measures on trade rules (Wang E. et al., 2022).

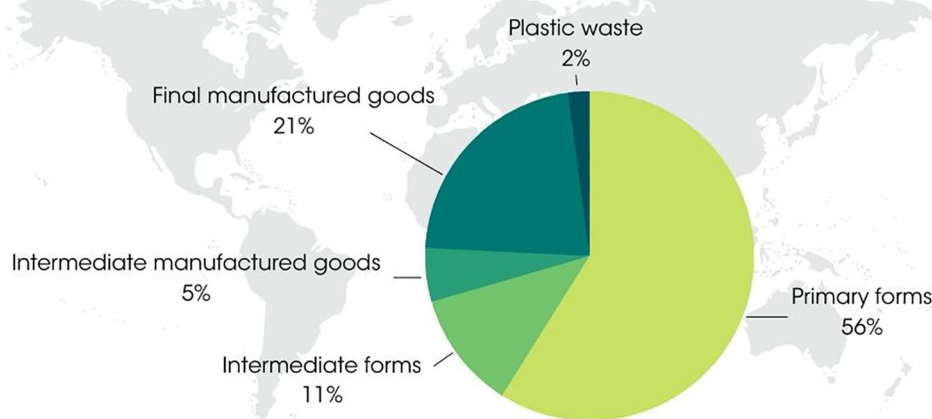
However, due to the increased concern of environmental degradation and pollution, many countries have not embraced the reduction of plastic waste as a priority to the economy. Plastic waste is not specifically covered by Globalization and Regional Integration Agreements (RIAs) because there are no binding legal instruments covering waste and pollution in RIAs. The primary defect of many of the enviro provisions in trade agreements is their non-binding character, allowing nations to easily avoid stronger provisions on grounds that they are not binding.) Moreover, it has been recorded that several modern treaties such as the Basel convention have limitations because stringent measures for enforcement are absent or too weak. Several are already implemented, including those that pertain to plastic waste export ban, subject to the laws of the country. This is because of the bad enforcement and follow-up with bad penalties for the people who still pollute the oceans and other water bodies with plastics. Improved legal policies, regulation, monitoring, and sustainable trading practices are necessary to solve the problem of plastic waste in the oceans. Governments should implement laws that will regulate the flow of plastic waste and make sure that countries where the rubbish is sent to be exported are held accountable at the same time (Barrowclough et al., 2020).

The measures include the use of real-time tracking of waste flows and improvements to border checks to tackle waste smuggling and to boost transparency in waste trade. Also promoting a circular economy that demands plastic goods to be designed for recycling and reuse should lead to lower plastic disposal and waste volumes. Promoting the use of other materials like biodegradable packaging and promoting sustainable business practices within the trade policies can also help in the fight against plastics.

4.2 The role of trade in waste disposal

The analysis also considers hidden flows of plastic waste, including illegal smuggling, mislabeling, and routing through transit hubs (entrepôt trade) to bypass environmental scrutiny. These unregulated movements contribute significantly to plastic leakage into marine environments, particularly in South and Southeast Asia. The plastics end up in landfills, are burnt in open areas, or are chucked into rivers and seas, where they find their way into the ocean. Figure 2 shows that a significant proportion of plastic pollution in oceans is a result of illegal dumping, which is at 15%. The importation of plastics to the developing countries has not only increased marine pollution but has also created environmental injustice where the poor countries are affected by the rich countries' plastic consumption. The recycling and waste management facilities differ from one country to another, and many developing countries cannot properly dispose of imported plastic waste. While some countries have various bans on the importation of plastic waste to reduce environmental pollution, others still accept foreign waste because of various economic returns, regardless of the impact on the environment. Importing plastics creates jobs and generates revenue. The informal sector uses these plastics for recycling and as raw

Global plastics trade in volume (2018)



Source: UNCTAD. *Global trade in plastics: insights from the first life-cycle trade database*. February 2021.

FIGURE 3
Global Trade and Plastic Production (Plastics and Trade, 2025).

materials. These problems continue to be widespread because there are gaps in the rules governing the international trade of plastic waste (Callao et al., 2021).

The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes (Oladosu et al., 2024) was intended to stop the export of hazardous waste to countries that do not have the capacity to manage it. For instance, in 2019, new rules were proposed to enhance the trade in plastic waste and the need for exporting countries to consult with the importing countries. However, enforcement of these regulations is still a major problem, and many waste exporters are still able to take advantage of the lack of clear classification, inadequate monitoring, and poor border control measures. Some developed countries export their plastic waste to other countries with less stringent rules to ensure that they do not violate the set measures but end up polluting the oceans. There is a lack of accountability and transparency in the trade of plastic waste. This leads to ongoing pollution of the environment, especially in countries with vulnerable coastlines (Liang et al., 2021).

Tourism is also affected in that plastic waste found on the beaches and coastal areas reduces the attractiveness and natural beauty of the seas. The negative effects of poor plastic waste management on the economy and the environment outweigh any benefits from trading waste. Therefore, the global community needs to take action. To address this, there is a need to improve international cooperation on the management of plastic waste through sustainable regulation of trade in plastics. Improving the efficiency of waste categorization and tracking, raising fines for

littering, and improving the supervision of compliance with the agreements are essential measures to minimize the adverse effects of plastic waste trade on marine life. The transition towards a circular economy where the use of plastic is reduced and materials are recycled can greatly help in the management of plastic waste. Promoting the recycling industries in the local economy, enhancing the disposal system, and the gradual elimination of the use of plastics are some of the measures that need to be taken in order to solve the problem of the increased plastic waste (Islam, 2020).

4.3 Marine transport and plastic pollution

International shipping plays a key role in driving global trade, but it has also contributed to the problem of marine plastic waste pollution. As more products are shipped by sea, they create a lot of plastic waste. This waste includes packaging materials, containers, and industrial plastics, which are often thrown away in unsustainable ways. As depicted in the figure below, one-quarter of ocean-borne pollution comes from shipping and cargo loss, which highlights the environmental impact of maritime transport. Many shipping carriers experience the dumping of containers into the ocean through natural disasters, negligence in the handling of containers, or poor containment measures, resulting in the direct discharge of plastics into the ocean. Most of these plastics persist in the ocean for many years and disintegrate into small particles called microplastics that affect the food chains and the marine ecosystems. In addition to cargo loss, other ways that maritime transport contributes to plastic pollution are through the disposal of waste generated on-board ships and the general operational practices of the vessels. The packaging wastes are dumped in seas, especially in the global supply chain in areas where there are no strict laws to check

2 MARPOL Convention [https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx)

3 International Maritime Organization (IMO) <https://www.imo.org/>

Sources of Plastic Waste in Oceans Due to International Trade

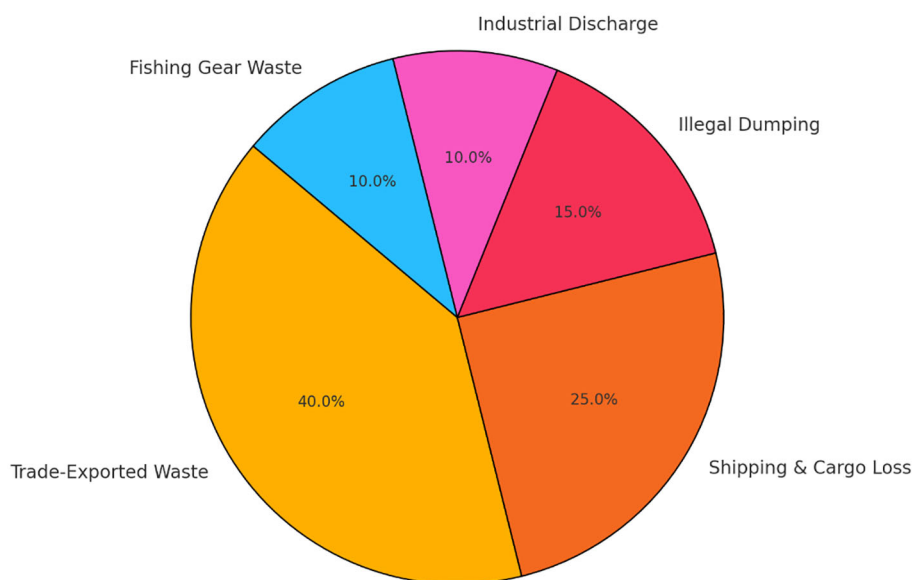


FIGURE 4

Sources of plastic Waste in Oceans Due to International Trade.

marine pollution. Some vessels dump plastic waste in the ocean to avoid paying high fees for proper disposal at ports. Lack of surveillance and supervision and ineffective sanctions enable such practices to be implemented and sustained with little penalty for noncompliance. Hence, large plastics float in the major shipping channels, distant offshore waters, and the shoreline, where they continue to harm marine wildlife (Thushari and Senevirathna, 2020).

Fishing activities make the problem worse because lost or discarded synthetic fishing gear contributes to 10% of ocean plastic pollution, as shown in Figure 4. Ghost fishing gear, nets, ropes, and traps that are abandoned or accidentally lost continue to drift in the ocean, trapping marine organisms and causing severe ecological damage. These man-made products have been known to entangle turtles, fish, and seabirds and cause drowning, suffocation, and sometimes death. Fishing gear waste is ever more dangerous for the environment since it is manufactured to be durable to withstand the marine environment, which makes it hard to decompose. The impact of ghost nets is especially damaging to coastal communities that depend on fishing as their source of income since it reduces fish stock and degrades essential habitats. To manage these challenges, there are international rules to limit plastic emissions from marine transport. The management of ship waste, especially plastics, is under the MARPOL Convention² and the International Maritime Organization (IMO)³ (Canton, 2021). These regulations seek to prevent the discharge of plastics into the sea and ensure that ships dispose of their waste as required within port and terminal standards. However, enforcement is still a matter of debate, given

that most ships can easily avoid legal supervision, especially out at sea. These efficiencies call for enhancing the existing international law regime on marine plastic pollution. By investing in real-time waste tracking systems, waste management systems onboard vessels, and monitoring systems, illicit dumping can be prevented. Governments and international organizations must also endeavour to extend the penalties for violation to ensure that the ships and shipping firms act responsibly and accountably. Expanding the patrol scope of coast guards, monitoring and surveillance through satellite imagery, and leveraging drones to track unauthorized disposal of waste could improve enforcement (Fitzmaurice, 2023).

However, there is a need to encourage the adoption of eco-friendly means of transport to reduce plastic pollution that arises from shipping. Some ideas that could help to minimize the plastics use include: Sustainable packaging, biodegradable products, and reusable containers for shipping. Incorporation of zero-waste management and encouraging the shipping industries to attain sustainability certifications would go a long way in the promotion of environmentally sustainable practices. There should also be measures against ghost gear pollution through tracking and return programs for fishing gear and financial incentives for their proper disposal, which should involve the fishing industry.

If no measures are taken, the pollution from international shipping and fishing boats will further increase and have a negative impact on the marine environment and coastal business. Enhancing the legal measures, enhancing the capacity of monitoring and enforcement, and advocating for sustainable maritime solutions are some of the ways of addressing the problem of plastic waste in the world's oceans. The world's population can curb the pollution of oceans through the enhancement of the regulatory mechanism and the application of

4 United Nations Convention on the Law of the Sea (UNCLOS) https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

new technologies in the maritime industry. Furthermore, the pie chart (Figure 2) provides a comprehensive visual representation of how international trade exacerbates plastic waste pollution in oceans. The largest contributor, trade-exported waste (40%), highlights the role of developed nations in discharging plastic waste onto countries with weak regulatory mechanisms, resulting in severe environmental consequences. Also, 25% of marine pollution comes from shipping and cargo loss since plastic cargo and mismanaged packaging end up in the sea. Another 15% is attributed to illegal dumping, while 10% is due to industrial discharge, suggesting that current measures towards waste management are insufficient and that there is a dire need for enhanced legal and policy frameworks (Hussain et al., 2023).

As a result, there is a need for more vigorous legal frameworks at the international level, especially in treaties that cover the exportation of plastics and their disposal. Plastic pollution requires action and trade measures must therefore be shored up. It is exactly through this process of developing stringent trade laws that countries can overcome some of these challenges—particularly common practices of dumping and mismanagement of plastics. This also incentivises these plastic producing countries to internally be better stewards of the impact that their products have on the ecosystem and invent healthier means of plastic production and usage. Still, we need to put more energy for recycling, better packaging and circular economy to limit plastics and reduce a marine pollution.

5 Legal frameworks governing plastic waste and international trade

In addition to the Basel Convention and UNCLOS, the London Convention (1972) and its 1996 Protocol establish international controls on marine dumping and should be recognized as vital to marine plastic governance. These frameworks prohibit the deliberate disposal of plastic waste at sea and mandate Parties to control marine dumping, thus complementing Basel and UNCLOS. While numerous international agreements address marine environmental protection, this paper focuses on the Basel Convention and UNCLOS due to their direct legal relevance and operational mechanisms concerning the transboundary movement of plastic waste and marine pollution. UNCLOS provides the foundational maritime legal framework, while the Basel Convention is the principal treaty regulating plastic waste trade. Nonetheless, we acknowledge that other agreements such as the London Convention and its 1996 Protocol also contribute meaningfully to marine plastic governance (see below).

5.1 The Basel convention on the control of transboundary movements of hazardous wastes

One of the key international treaties that regulates international transport of hazardous waste including plastics is the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes. The Convention, which was signed under the auspices of the UNEP in 1989, was intended to criminalize the trade of toxic waste from more developed nations to developing, inadequately governed nations and to mandate appropriate disposal of the waste. That expanded to include amendments seeking to control plastic waste exports, as awareness builds of hazardous and non-degradable plastics being shipped to developing countries without adequate waste disposal systems (Islam, 2020).

The 2019 amendments of the Basel Convention included specific classifications for the shipments of plastic waste where the plastics were categorized as either recyclable or non-recyclable, and Prior Informed Consent became required for most exports of plastic waste. This means that exporting countries should seek permission from the importing country before exporting plastic waste, and this will help in preventing the situation where the developing countries are flooded with waste that they cannot manage. Also, the amendments banned the export of mixed, contaminated, and difficult to recycle plastics, which were commonly disposed of or burnt due to the unavailability of recycling facilities. Even though the above amendments are important steps towards the regulation of plastic waste in the global environment. Another drawback of the Basel Convention is that there is no global enforcement body to deal with the criminals. Furthermore, not all states have ratified the 2019 amendments, creating inconsistencies in enforcement and compliance at the global level (Yang, 2020).

This issue of non-compliance is further compounded by the absence of monitoring and tracking systems. Most of the plastic waste that is exported is not accurately declared. Accordingly, authorities cannot ascertain if the waste is being treated properly or is being dumped in landfills and water sources. In addition, issues like corruption, poor regulations and low funding for carrying out policies in the recipient countries are also factors in the recent mismanagement of the plastic waste trade. According to the Basel Convention, however, non-compliance is growing, and many developing countries continue to receive much of the world plastic waste. The following measures should be taken to enhance the functionality of the Basel Convention in combating plastic waste pollution (Islam, 2020).

Improving the monitoring systems that include real-time tracking of plastic waste shipments would enhance the visibility of the plastic waste trade. Measures like banning exports to or imposing fines on countries that do not follow the provisions of the convention could go a long way in checking the exportation of hazardous waste. However, there is a need for collective action, especially with a focus on ensuring that the producing countries are the ones who take responsibility for the disposal of the plastic waste

5 Progressive Agreement for Trans-Pacific Partnership (CPTPP) <https://www.dfat.gov.au/trade/agreements/in-force/cptpp/comprehensive-and-progressive-agreement-for-trans-pacific-partnership>

instead of shifting the responsibility to the developing nations. Another possible approach is to integrate the Basel Convention with the national and regional trade laws; this will mean that trade liberalization and economic cooperation agreements must include provisions for higher standards of waste management. Integrating sustainability requirements into international trade agreements would enhance the Basel Convention and limit the opportunity for firms to manipulate the type of plastic waste classification.

5.2 United Nations Convention on the Law of the Sea⁴

UNCLOS is an international treaty that has established the legal framework for the law of the sea and the prevention of pollution of the marine environment. UNCLOS was adopted in the year 1982 and is often referred to as the ‘constitution of the seas,’ as it provided the framework for the legal use of the sea and the maritime space, resources, and control of pollution. One of its objectives is to protect the marine environment from pollution caused by land-based sources, sea ships, and wastes. According to UNCLOS, particularly part XII, states are required to adopt necessary measures to prevent the pollution of the marine environment by substances that include plastics produced by international commerce. This involves measures concerning the dumping of wastes from ships, emissions from industries, and land-based sources that add to the ever-growing problem of plastics in the seas. Furthermore, UNCLOS acknowledges that marine pollution affects international waters, and the coastal states should collaborate at the regional and global levels to address the issue of waste disposal. However, UNCLOS does not have specific measures that can help enforce trade-related plastic pollution regulations. It gives legal coverage but does not prescribe the ban on the trade of plastic waste or the consequences of noncompliance with the marine pollution measures. This means that most of the plastic waste-exporting countries remain free from legal repercussions of polluting the ocean. The focus on national enforcement also undermines UNCLOS’s effectiveness because the degree of compliance depends on the domestic legal system, the interest, and the political will of the country. Many developing countries struggle with weak environmental governance. As a result, they do not enforce waste management laws effectively. This leads to an accumulation of plastic waste in coastal areas and the marine environment (Mendenhall, 2023).

One of the main weaknesses of UNCLOS is that it does not fully address the issue of international trade in marine plastics. It contains provisions on the prohibition of dumping of wastes and pollution from ships but lacks trade measures that address the flow of plastic waste across borders. This loophole enables nations to shift their environmental responsibilities by exporting plastic waste to countries that have less stringent measures against the dumping of plastic waste. This lack of standardization in UNCLOS also leads to legal gaps that enable industries and shipping firms to perpetuate the pollution of the oceans. However, to strengthen UNCLOS’s response to trade-induced plastic pollution, there is a need to

include other protocols that set out legal obligations regarding the management of plastic waste. One of the possible reforms could be the standardization of the international rules governing waste trade so that plastic waste would be strictly monitored and regulated under UNCLOS. Enhancing reporting systems and creating an international enforcement agency would enhance compliance among states, as non-compliant states cannot avoid their environmental obligations (Telesetsky, 2021).

Research should make sure that UNCLOS works well with other laws, like the Basel Convention, to create a united global plan for handling plastic waste in international trade. This could include coming up with universal guidelines on how to categorize plastic waste, standardizing the process of recycling and disposal, and ensuring that the international standards of waste management are followed in international trade. These measures would help avoid shifting the responsibility of dealing with plastic waste to developing countries and encourage the development of environmentally friendly solutions for waste management in global trade. However, financial and trade-related incentives could be used to ensure compliance with measures on control of pollution as provided by UNCLOS. Countries that make an effort to reduce exported plastic waste, enhance the recycling system, and implement marine pollution regulation could be given special trade opportunities or financial aid from the international community for waste management projects. As a result, sanctions or penalties could be placed on countries that remained involved in the exportation of waste to the seas.

5.3 Regional trade agreements and environmental provisions

Although this study emphasizes Regional Trade Agreements (RTAs) such as the CPTPP and RCEP, we recognize that multilateral frameworks like the WTO play a critical role in shaping global trade norms. However, WTO rules generally treat environmental goods and services through the lens of trade liberalization, and their influence on plastic waste is more indirect and less enforceable than the binding commitments seen in some RTAs. Further research could explore WTO dispute cases or trade-related environmental reviews concerning plastic waste, a limitation noted in this study.

RTAs contribute to the development of policies that govern the trade relations between countries/members and other countries, such as environmental and waste policies. Some RTAs have included environmental undertaking provisions that seek to guarantee that trade is not detrimental to the environment. Nevertheless, most RTAs are rather general and have not set legal requirements for controlling the flow of plastic waste (Young, 2021).

Perhaps the most significant RTA, namely the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP),⁵ contains an environmental cooperation chapter where the parties committed to enhancing sustainability and tackling pollution. However, these provisions do not provide adequate

measures to control the exportation of plastic waste or sanctions for offenders. This means that even though CPTPP members may put in place policies that support sustainable development, these do not necessarily include provisions for proper disposal of waste or non-exportation of plastic waste. Likewise, the trade agreements signed by the EU incorporate aspects of sustainability and the environment but do not specifically prohibit exports of plastics. Although the EU has regulations for dealing with plastic waste, it still exports this waste to nations that have poor waste disposal systems. This worsens environmental difficulties in the developing world, where there are few recycling plants and disposal amenities (Duong, 2022).

To strengthen RTAs in managing the problem of plastic waste, environmental measures should be incorporated to monitor the trade in plastic waste, report on the impacts on the environment, and evaluate those impacts. RTAs are involved in the setting of standards that govern the different aspects of international trade, including the environmental and waste management standards. Some RTAs include environmental measures because the proponents of free trade do not want liberalization to lead to environmental degradation. Nevertheless, most of the RTAs are weak or even lacking in legal certainty on the regulation of the trade in plastic waste. This means that more plastics are exported with little or no restrictions to the seas and oceans of the receiving countries, thus polluting the environment. Of all the initiated RTAs, the CPTPP contains an environmental cooperation chapter that requires member countries to work towards increasing sustainability as well as combating pollution. However, these provisions do not contain sufficient controls regarding the export of plastic waste or penalties for offenders. This means that even if CPTPP member states have good sustainable development policies in place, they do not have to guarantee adequate waste management or ban the exportation of plastic waste (Sakhuja and Francis, 2023).

6 Policy challenges and enforcement gaps

6.1 Weak enforcement mechanisms

Although there are some international treaties like the Basel Convention and UNCLOS in place, there are not enough effective enforcement mechanisms in place to prevent the trading of plastic waste. These agreements provide the legal instruments to regulate the cross-border movement of plastic waste, yet most countries do not implement or enforce these laws. The challenge is particularly significant in developing countries due to their lack of necessary facilities, capital, and institutional frameworks for monitoring plastic waste imports, managing its disposal, and penalizing offenders. Consequently, the illegitimate plastic waste market remains open, as waste exporters exploit low levels of compliance, lack of monitoring tools, and poor security measures at borders (Wu, 2022).

One area of concern is that many countries ratify treaties but do not domesticate them. For instance, while a country is signatory to the Basel Convention, the country may not have specific laws that

implement the Convention. They also reveal that the existing enforcement gaps enable waste traders to deceive the system and export plastic waste that is prohibited or hazardous to nations that cannot consent proper disposal to these wastes.

Lack of real-time tracking and monitoring of wastes also poses additional challenges to enforcement. A large number of shipments of plastics are not documented properly, and once these wastes get to the destination countries, there is nobody to monitor how they are managed or disposed of. The world generates a significant amount of plastic waste, which, if not properly recycled, ends up in the nearest landfill or river or is burned, thereby releasing toxic gases. The lack of transparency and regulatory oversight allows dishonest traders to engage in illegal practices without facing consequences. Greater enforcement measures are required to prevent illicit waste flows and to increase accountability (Ferraro and Failer, 2020). The use of real-time tracking systems such as digital technologies, blockchain, and satellite imaging can assist in identifying and preventing cases of unauthorized dumping and misdeclaration of waste, as well as tracking the flow of plastic waste from its source to the destination. Also, improved measures should be adopted so that only sorted, recyclable waste can be transported across borders because of increased border controls and customs measures.

Another significant measure includes raising the stakes for non-compliance. Many countries impose very small penalties on companies that pollute the environment by exporting their waste. This makes the practice both safe and profitable for them. This article argues that through increasing the severity of penalties such as the trade ban, financial penalties, and export controls, the governments can effectively discourage firms from engaging in the unlawful trade of plastic waste. International cooperation is also important because more effective cooperation between the exporting and importing countries can help guarantee that each country is doing its fair share in properly addressing the issue of plastic waste. Without proper reform measures in current agreements to improve enforcement, international deals on plastic waste trade will end up being unproductive and ineffective. This could lead to more pollution in our oceans and further harm to the environment.

6.2 Lack of standardized regulations

Different countries have different laws, which means that there are enforcement differences that enable the waste traders and corporations to avoid the more stringent laws. Certain developed countries have placed a ban or restrictions on the exportation of plastic waste to avoid causing harm to the environment. Many countries, especially in Southeast Asia and Africa, still accept plastic waste with few restrictions. This situation is changing how waste moves around the world. Some countries have stepped up their measures in regulating the exportation of plastic waste to other countries, this just shifts the problem to other countries instead of

6 Prior Informed Consent (PIC) <https://echa.europa.eu/regulations/prior-informed-consent/understanding-pic>

solving the problem. This trend has been observed in the aftermath of *The Plastic Waste Dilemma and China's National Sword Policy* (2013), (Vedantam et al., 2022) which prohibited the import of most plastic waste. In response, the developed countries simply shifted their waste exports to other countries like Malaysia, Indonesia, and Thailand, which were overwhelmed by the increased volumes of plastic waste.

The current problem is that there is no clear classification of plastic waste that would help to sort it properly. Different countries and international relations have varying definitions of what constitutes plastic waste, and exporters exploit this discrepancy to label non-recyclable plastics as recyclable products, thereby avoiding the ban. Other exporters also blend the waste plastics with plastics that are fit for recycling, hence making it difficult to sort the waste upon arrival. This also hampers the ability of waste-importing nations to manage plastics, and the likelihood of waste being dumped, burned, or leaked into the sea's increases. To address these issues, there is a need to have a uniform legal framework that will govern the trade in plastic waste. It should define what constitutes plastic waste, classify the recyclable plastics and those that are not, and make disclosure of information mandatory for countries exporting or importing waste. This would help in the proper tracking of the plastics to reduce the chances of mislabeling or even cases of contraband plastics. Moreover, it is necessary to create a common monitoring system of shipped plastic waste to avoid the use of fake labels and to control the proper disposal of waste. Thus, authorities can make the process more transparent and increase the accountability of violators by using blockchain technology, satellite tracking, and international waste trade databases. It will also prevent fraudulent activities of the plastic waste traders since the global registry will contain records of the shipments, destinations, and disposal of the plastic wastes. In addition, there is a need for more effective cooperation between countries in order to harmonize trade policies with sustainable development objectives. The exporting countries should legally require the exporting country to avoid exporting their plastic waste to countries that do not have adequate waste management systems. Trade agreements should contain binding measures for the assessment of the environmental and social effects of the import of plastic waste before allowing the importation of more plastic waste (Hussain et al., 2022).

The absence of standard laws not only makes it challenging to implement the laws but also encourages the continued emission of plastic waste into the environment. Eliminating such legal ambiguities, increasing the openness of the process, and developing universally accepted norms are crucial to making the system more accountable and less vulnerable to exploitation. There is no global agreement to stop the export of plastic waste, and it will continue to be shipped across borders and harm the environment and communities in the global south. Having a clear and unified set of rules will enable the global community to regulate the trade in plastic waste and prevent the further pollution of the seas.

6.3 Limited cooperation among trade partners

Lack of cooperation with trade partners continues to be a major challenge towards the implementation of measures to counter plastic waste pollution in the trade. This is because environmental issues are usually reflected as a reconsideration in trade policies, with economic benefits and market access being of paramount importance. This is because the pursuit of economic growth and development has put many countries in a dilemma to adopt more rigid rules regarding plastic waste in trade relations. Some countries believe that rigorous policies can negatively affect their export revenues, make business expensive for industries, or deter foreign investments. Despite the increasing evidence of the negative impacts of plastic waste on the environment, governments do not restrict the freedom of the market from allowing the various types of plastics to circulate freely in the market. This non-implementation of trade policies for sustainable objectives has therefore remained a major factor in the escalating levels of plastics in the environment, especially in developing countries, which are constantly receiving more plastics from developed countries. Despite the increasing evidence of the negative impacts of plastic waste on the environment, governments do not restrict the freedom of the market from allowing the various types of plastics to circulate freely in the market. This non-implementation of trade policies for sustainable objectives has therefore remained a major factor in the escalating levels of plastics in the environment, especially in developing countries, which are constantly receiving more plastics from developed countries (Sun et al., 2021).

To improve the efficiency of enforcement and accountability, there is a need to have enforcement agencies within trade relations to ensure compliance with laws on plastic waste. These agencies could supervise trade activities, examine shipments, and take legal action against violators of environmental laws. In addition, trade policies should also put in place necessary actions and sanctions against countries that engage in the exportation of plastic waste and those that do not accept their responsibilities of conserving the environment. These measures should help enhance compliance, lower the exportation of waste, and ensure that trade does not compromise the principles of sustainability. In the same regard, capacity-building measures should be encouraged to improve waste management in developing countries. Cooperation should be in the form of technology, provision of funds, and training through technical cooperation to enable the recipient countries to develop sustainable waste management systems. Through increasing the quality of recycling infrastructure, waste management systems, and the enforcement of policies, trade liberalization can assist in the promotion of sustainable development and the reduction of environmental degradation in the third world. Therefore, there is a necessity for environmental standards in trade agreements, enforcement procedures of these standards, and policies to address the irresponsible exportation of plastics. There is a need for a better-coordinated attack on the problem at the international

level to ensure that economic liberalization does not lead to the liberalization of pollution through trade liberalization that facilitates the dumping of plastics in the environment.

7 Proposed legal and policy solutions

Although strengthening commitments and promoting a circular economy are essential, developing countries face constraints such as inadequate infrastructure, technical capacity, and funding. Therefore, this study recommends phased implementation paths, including: Differentiated obligations based on recycling capacity; International financial support mechanisms; South–South technology transfers; Capacity-building through WTO’s Trade and Environment Division or UNEP partnerships. (a) Extended Producer Responsibility (EPR) is increasingly regarded as an emerging principle in environmental governance, supported by UNEP and OECD as a market-based tool for promoting sustainable waste management. (b) Some regional trade agreements, especially within the EU and OECD-led partnerships, are beginning to incorporate EPR-like provisions or recommend their adoption. However, EPR remains largely absent as a binding clause in most current RTAs, revealing a policy gap that this paper highlights for future reform.

7.1 Strengthening legal frameworks through binding commitments

In May 2019, the Conference of the Parties to the Basel Convention approved amendments that regulate the exportation of plastic waste across borders. These amendments categorize plastic waste as non-hazardous or hazardous, and its export and import are governed by the Prior Informed Consent (PIC)⁶ system. This requires that plastic waste should be disposed of in an ecological manner and not be exported to countries that do not have the necessary mechanisms of disposal.

The Extended Producer Responsibility (EPR) laws are policy interventions that make producers of products, such as packaging material, bear the cost of managing their products after their useful life. This makes sure that producers incorporate the idea of ensuring their products will have a long useful life while accepting responsibility for the fate of these products once they get into the hands of consumers. Currently, eight U.S. states have EPR laws for packaging material, including California, Colorado, Maine, Oregon, New Jersey, Minnesota, and Washington. These laws set the fees that producers are required to pay according to the amount and kind of packaging they put into circulation, hence promoting sustainable packaging (Kosior and Crescenzi, 2020).

7.2 Enhancing global monitoring and compliance systems

A global digital monitoring system can be of great help in increasing transparency of the flow of plastic waste. Such systems

can incorporate satellite monitoring and the use of blockchain to monitor consignments to avoid a breach of international laws on dumping. For instance, the amendments of the Basel Convention have brought about better control measures of plastic waste exports by demanding the exporting country to secure prior written consent from the importing country before shipping the waste, hence improving on monitoring and compliance.

An independent international supervisory authority can act as a mediator between the governments and the business world to enforce environmental laws and trade policies. This body would be entitled to audit, inspect, and fine those countries who fail to meet the standards, hence enhancing proper waste management all over the world. For instance, the Basel Convention has made some amendments that have altered the global approach towards the trade in plastic waste, and such mechanisms are needed (Goncalves, 2020).

7.3 Promoting sustainable trade practices and circular economy models

Trade policies should favor the use of biodegradable, compostable, and recyclable products. Some of the measures that can be taken include offering incentives such as rebates, tax exemptions, and low tariffs to firms that engage in proper packaging. For instance, the United Kingdom has planned to put into action an Extended Producer Responsibility (EPR) policy that is aimed at shifting the costs of waste collection and recycling to the packaging manufacturers in order to encourage the use of environmentally friendly packaging materials (Sarwar et al., 2021).

The adoption of environmental standards in the context of trade agreements can aid in the formulation of zero-waste supply chain solutions. This could include the use of reusable containers, compact packaging, and sustainable ways of packaging and transporting the products. The “polluter pays” principle is a common concept that ensures that the producers bear the cost of pollution caused by their products throughout their life cycle. This means that the producers should be held responsible for the costs resulting from the impact they impose on the environment. It has been implemented in European Union law and some states’ laws to encourage environmental responsibility.

7.4 Introducing a global treaty on plastic waste management

It can improve the definition of plastic waste and its classification and eliminate loopholes that enable hazardous or non-recyclable plastics to avoid legislation. The Basel Convention has made some progress in this regard by introducing amendments that aim at defining which kind of plastic waste falls under the purview of the convention, thus enhancing the categorization of waste internationally.

To address the issue of exporting plastic waste to countries with low recycling rates, it may be possible to restrict the amount of

waste that can be exported to a country in a year depending on the ability of that country to recycle the waste and the standards in their country. The amendments made to the Basel Convention have enhanced the controls of the exportation of plastic waste by insisting on the exporter seeking consent from the importing country, which helps in the promotion of sound management of wastes.

8 Conclusion

The intersection of international trade and plastic waste pollution poses a significant legal and environmental challenge that requires urgent global action. As trade continues to expand, plastic production, consumption, and disposal have reached unprecedented levels, exacerbating the crisis of marine plastic pollution. While several international legal frameworks, such as the Basel Convention and UNCLOS, aim to regulate plastic waste trade, enforcement gaps, weak compliance mechanisms, and a lack of standardized regulations have hindered their effectiveness. Additionally, regional trade agreements (RTAs) and free trade agreements (FTAs) often prioritize economic growth over environmental sustainability, further complicating the regulation of plastic waste in global trade. Despite existing regulations and treaties, illegal plastic waste trade, mismanagement of exported waste, and insufficient monitoring systems continue to fuel plastic pollution in the world's oceans. Trade-exported waste, cargo loss, illegal dumping, and industrial discharge collectively contribute to the growing marine plastic crisis, as illustrated in [Figure 4](#). The lack of cooperation among trade partners, loopholes in international agreements, and inconsistent national policies have allowed developed nations to offload non-recyclable plastic waste onto developing countries, where poor waste management infrastructure exacerbates marine pollution.

Addressing these challenges requires a comprehensive, multi-level approach that integrates legal, policy, and enforcement strategies. Strengthening international legal frameworks, such as amending trade agreements to include binding plastic waste management provisions, expanding Basel Convention enforcement, and introducing a dedicated global treaty on plastic waste trade, is critical for long-term regulatory effectiveness. Furthermore, enhanced monitoring systems, real-time waste tracking, and stricter penalties for illegal plastic waste trade would improve compliance and accountability. Promoting sustainable trade practices is equally essential. The adoption of circular economy models, extended producer responsibility (EPR) schemes, and incentives for biodegradable packaging materials within trade agreements can reduce plastic waste at its source. Ensuring that environmental sustainability becomes an integral part of trade policy negotiations will be crucial in mitigating the harmful impacts of plastic waste in global trade. Without immediate and coordinated global action, the impact of plastic waste on marine ecosystems will continue to escalate, threatening biodiversity, fisheries, human health, and economic stability. Governments, international organizations, trade regulators, and businesses must

collaborate to enforce legally binding commitments, enhance transparency in plastic waste trade, and invest in sustainable waste management solutions. Only through cohesive, legally enforceable policies can the international community curb plastic waste pollution, protect marine ecosystems, and ensure a more sustainable future for global trade.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Author contributions

ZH: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Software, Supervision, Validation, Writing – review & editing. AH: Formal Analysis, Funding acquisition, Project administration, Resources, Validation, Visualization, Writing – review & editing. AK: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Generative AI was used in the creation of this manuscript.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

- Brooks, A. L., Wang, S., and Jambeck, J. R. (2018). The Chinese import ban and its impact on global plastic waste trade. *Sci. Adv.* 4, eaat0131. doi: 10.1126/sciadv.aat0131
- Barrowclough, D., Deere Birkbeck, C., and Christen, J. (2020). Global trade in plastics: insights from the first life-cycle trade database. *UNCTAD Research Paper No. 53 UNCTAD/SER.RP/2020/12*, 01–59. Available online at: <https://repository.graduateinstitute.ch/record/299122?v=pdf>.
- Buchholz, K. (2024). *Infographic: Which Countries Export & Import Plastic Waste?* (Statista Daily Data; Statista). Available online at: <https://www.statista.com/chart/18229/biggest-exporters-of-plastic-waste-and-scrap/> (Accessed January 2025).
- Callao, C., Latorre, M. P., and Martinez-Nunez, M. (2021). Understanding hazardous waste exports for disposal in europe: A contribution to sustainable development. *Sustainability* 13, 8905. doi: 10.3390/su13168905
- Canton, H. (2021). “International maritime organization—IMO,” in *The Europa Directory of International Organizations 2021* (Oxfordshire, England: Routledge, Milton Park, Abingdon-on-Thames), 338–342.
- Duong, T. T. T. (2022). Harmonisation between trade liberalisation and environmental protection-A long way to go? An analysis of Vietnam's debris importation control in light of WTO and CPTPP rules. *Vietnamese J. Legal Sci.* 19, 652–667. doi: 10.2478/vjls-2022-0002
- Ferraro, G., and Failler, P. (2020). Governing plastic pollution in the oceans: Institutional challenges and areas for action. *Environ. Sci. Policy* 112, 453–460. doi: 10.1016/j.envsci.2020.06.015
- Fitzmaurice, M. (2023). “The international convention for the prevention of pollution from ships (MARPOL),” in *Research Handbook on Ocean Governance Law* (Cheltenham, United Kingdom: Edward Elgar Publishing), 91–108.
- Goncalves, L. C. S. (2020). Legal Remedies against the Plastic Pollution of the Oceans: an analysis of the attempts from public international law and private initiatives to face the plastic soup [doctoral thesis]. *ProefschriftMaken*. [Doctoral Thesis, Maastricht University]. doi: 10.26481/dis.20200611lg
- Haward, M. (2018). Plastic pollution of the world's seas and oceans as a contemporary challenge in ocean governance. *Nat. Commun.* 9, 667. doi: 10.1038/s41467-018-03104-3
- Hussain, N., Khan, A., and Memon, S. (2023). Addressing marine pollution: an analysis of MARPOL 73/78 regulations and global implementation efforts. *J. Soc. Sci. Res.* 3, 572–589. doi: 10.54183/JSSR
- Hussain, M., Liaquat, S., and Aftab, K. (2022). “Regulations to minimize the entry of plastic waste into the oceans,” in *Impact of plastic waste on the marine biota* (Springer Nature Singapore, Singapore), 49–80.
- Idrees, R. Q., and Rehna Gul, D. S. K. (2022). The China trade model in the ambit of belt and road initiative Pakistan and international law perspective. *Pakistan J. Int. Affairs* 5, 01–16.
- Islam, M. (2020). The Basel convention on the control of transboundary movements of hazardous wastes and their disposal: critical analysis. *Int. J. Multidiscip. Res. Growth Eval.* 1, 11–16.
- Jordan, R. (2024). *Top 10 countries responsible for most exported plastic waste*. (Interplas Insights). Available online at: <https://interplasinsights.com/plastic-industry-insights/latest-plastics-industry-insights/top-10-countries-responsible-for-most-plastic-waste/> (Accessed January 2025).
- Kosior, E., and Crescenzi, I. (2020). “Solutions to the plastic waste problem on land and in the oceans,” in *Plastic waste and recycling* (Cambridge, Massachusetts, United States: Academic Press), 415–446.
- Kummer Peiry, K. (2014). The C chemicals and waste regime as a basis for a comprehensive international framework on sustainable management of potentially hazardous materials? *Rev. European Comp. Int. Environ. Law* 23, 172–180. doi: 10.1111/reel.12084
- Lebreton, L., and Andrady, A. (2019). Future scenarios of global plastic waste generation and disposal. *Palgrave Commun.* 5, 1–11. doi: 10.1057/s41599-018-0212-7
- Liang, Y., Tan, Q., Song, Q., and Li, J. (2021). An analysis of the plastic waste trade and management in Asia. *Waste Manage.* 119, 242–253. doi: 10.1016/j.wasman.2020.09.049
- Liu, X., Lei, T., Boré, A., Lou, Z., Abdouraman, B., and Ma, W. (2022). Evolution of global plastic waste trade flows from 2000 to 2020 and its predicted trade sinks in 2030. *J. Cleaner Production* 376, 134373. doi: 10.1016/j.jclepro.2022.134373
- Mendenhall, E. (2023). Making the most of what we already have: Activating UNCLOS to combat marine plastic pollution. *Mar. Policy* 155, 105786. doi: 10.1016/j.marpol.2023.105786
- Oladosu, O. A., Olodo, A. A., Oloruntoba, E. A., Opeodu, O. T., and Adegoroye, A. (2024). Investigation of Efforts and Problems in Implementing the Basel Convention on the Control of Transboundary Movements of wastes and their Disposal in Nigeria. *Asian J. Geographical Res.* 7, 69–84. doi: 10.9734/ajgr/2024/v7i1216
- Plastics and Trade (2025). *Plastics and the Environment Series*. (Genevaenvironmentnetwork.org). Available online at: <https://www.genevaenvironmentnetwork.org/resources/updates/plastics-and-trade/> (Accessed January 2025).
- Sakhuja, V., and Francis, A. M. (Eds.) (2023). *India & Australia: Strengthening International Cooperation Through the Indo Pacific Oceans Initiative*. (Caulfield North, Victoria, Australia: Centre for Public Policy Research and Monash University).
- Sarwar, F., Ali, S., Bhatti, S. H., and Ur Saif, R. (2021). Legal approaches to reduce plastic marine pollution: Challenges and global governance. *Ann. Soc. Sci. Perspective* 2, 15–20. doi: 10.52700/assap.v2i1.32
- Sun, J., Fang, C., Chen, Z., and Chen, G. (2021). Regional cooperation in marine plastic waste cleanup in the south China sea region. *Sustainability* 13, 9221. doi: 10.3390/su13169221
- Telesetsky, A. (2021). Keeping UNCLOS relevant: revising UNCLOS to address 21st century fishing, labor practices, pollution, and climate change. *Korean J. Int. Comp. Law* 9, 18–34. doi: 10.1163/22134484-12340143
- The Plastic Waste Dilemma and China's National Sword Policy. (2023). *Unsustainable*. Available online at: <https://www.unsustainablemagazine.com/global-plastic-waste-dilemma/>.
- Thushari, G. G. N., and Senevirathna, J. D. M. (2020). Plastic pollution in the marine environment. *Heliyon* 6, 19–43. doi: 10.1016/j.heliyon.2020.e04709
- Vedantam, A., Suresh, N. C., Ajmal, K., and Shelly, M. (2022). Impact of China's national sword policy on the US landfill and plastics recycling industry. *Sustainability* 14, 2456. doi: 10.3390/su14042456
- Wang, E., Miao, C., and Chen, X. (2022). Circular economy and the changing geography of international trade in plastic waste. *Int. J. Environ. Res. Public Health* 19, 15020. doi: 10.3390/ijerph192215020
- Wang, C., Sun, W., Lim, M. K., Hu, X., Gao, Y., and Ghadimi, P. (2022). Structural evolution of global plastic life cycle trade: A multilayer network perspective. *Sustain. Production Consumption* 33, 1031–1042. doi: 10.1016/j.spc.2022.08.027
- Wu, H. H. (2022). A study on transnational regulatory governance for marine plastic debris: Trends, challenges, and prospect. *Mar. Policy* 136, 103988. doi: 10.1016/j.marpol.2020.103988
- Xanthos, D., and Walker, T. R. (2017). International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): A review. *Mar. Pollut. Bull.* 118, 17–26. doi: 10.1016/j.marpolbul.2017.02.048
- Yang, S. (2020). Trade for the environment: Transboundary hazardous waste movements after the Basel Convention. *Rev. Policy Res.* 37, 713–738. doi: 10.1111/ropr.12386
- Young, M. A. (2021). Protection of the marine environment: Rights and obligations in trade agreements. *Korean J. Int. Comp. Law* 9, 196–211. doi: 10.1163/22134484-12340155