

Forum: Environmental Committee (EC)

Issue: Addressing the problem of microplastic pollution

Student Officer: Nikitas Stamatopoulos

Position: Deputy President

INTRODUCTION

Microplastics have become one of the most widespread and worrying pollutants of the 21st century, contaminating the planet at alarming rates¹. Mainly concentrated in oceans, rivers, soil, air, and even plaguing the human body, microplastics currently pose a major threat to environmental health, human well-being, and economic stability globally.

Recently, production of plastic has spiked to unprecedented levels, with global plastic production exceeding 400 million tons annually². Naturally, a major part of this plastic gets broken down into microplastics, which are defined as plastic particles smaller than 5 millimeters³. Recent studies speculate that there are over 5 trillion⁴ particles floating in oceans worldwide — more than half of these particles are from the last 2 decades, which signifies a threatening increase in the last years which will continue unless measures are taken.

Microplastic-related consequences can be classified into three categories: environmental, health, and economic. Environmentally, they disrupt marine and terrestrial ecosystems through harming wildlife which confuses microplastics for food. Because these tiny particles carry toxic chemicals, they lead to bioaccumulation and contamination throughout the food chain. Health-wise, microplastics are often detected in drinking water and seafood placed there through the pollution in the environment, this way microplastics find their way into human blood streams, raising concerns about their long-term effects on the immune, respiratory, and digestive systems. Economical detriments are closely linked to the environment, as microplastic pollution burdens industries such as fishing, tourism, and water treatment, with global costs estimated to reach billions of dollars annually due to cleanup efforts.

¹ "Microplastics are now pervasive across global ecosystems, including human tissue." *UNM Health News*, 2025 <https://hscnews.unm.edu/news/hsc-newsroom-post-microplastics-human-brains>

² "Global plastic output has soared to over 450 million tonnes per year." *OECD – Global Plastics Outlook*, 2023 <https://ourworldindata.org/grapher/global-plastics-production>

³ "Microplastics, by definition, are < 5 mm and mostly derived from larger degrading plastics" *PennState University*, 2025 <https://www.psu.edu/news/research/story/sounding-alarm-microplastic-pollution>

⁴ Plastic Pollution in oceans worldwide "PLOS 2024" <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913>

As microplastics continue to spread, this issue demands urgent international intervention and effective solutions.

DEFINITION OF KEY-TERMS

Atmospheric transport⁵

Atmospheric transport is when substances, like pollutants or microplastics, are dispersed through the air.

Microplastic Bioaccumulation⁶

Microplastic Bioaccumulation is the build up of microplastics in an organism at rates exceeding egestion.

Biomagnification⁷

“Biomagnification across a food web can thus be defined as the increase in concentration of a contaminant (i.e. MPs or additives) in one organism compared to the concentration in its prey. An important assumption...trophic transfer is occurring.”

Circular Economy⁸

Circular economy is a model of production and consumption that aims to minimize waste and pollution by reusing products and materials for as long as possible.

Microplastics⁹

Microplastics are plastic particles smaller than 5mm in size.

⁵ “The movement of pollutants in the atmosphere is caused by transport, dispersion, and deposition. Transport is movement caused by a time-averaged wind” *National Institute of Health* flow. <https://www.ncbi.nlm.nih.gov/books/NBK218142/#:~:text=The%20movement%20of%20pollutants%20in,used%20to%20average%20the%20transport>.

⁶“bioaccumulation is occurring when uptake of a contaminant is greater than the ability of an organism to egest a contaminant”*National Institute of Health* <https://pmc.ncbi.nlm.nih.gov/articles/PMC7567360/#:~:text=The%20classical%20concept%20of%20bioac%20cumulation,i.e.%20trophic%20transfer%20is%20occurring> .

⁷ *Biomagnification | Definition Public Library of Science* <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0240792&type=printable#:~:text=Bio%20accumulation%20and%20subsequent%20trophic%20transfer,all%20species%20within%20each%20level>. ⁸“What is the circular economy?” *The European Parliament, 2023.* <https://www.europarl.europa.eu/topics/en/article/20151201STO05603/circular-economy-definition-importance-and-benefits>

⁹ *Microplastics | English Meaning - Oxford Dictionary* <https://www.oxfordlearnersdictionaries.com/definition/english/microplastic>

Primary Microplastics¹⁰

Primary microplastics are microplastics intentionally manufactured for specific purposes.

Plastic Lifecycle¹¹

Plastic lifecycle is the journey of plastic from production, use and end-of-life management.

Secondary Microplastics¹²

Secondary microplastics are microplastics that are a result of larger pieces of plastic litter like plastic bags and bottles.

BACKGROUND INFORMATION

How Microplastics Enter the Environment

Microplastics are introduced into the environment through both direct and indirect sources. They originate from various human activities and products, as a result, their spread is difficult to control, since there are many factors in play to consider and take measures against.

There are two main categories of microplastics, those being primary microplastics and secondary microplastics. Firstly, primary microplastics are commonly found as “Microbeads” in cosmetics, such as facial scrubs and toothpaste. Although bans have been placed in many countries worldwide, they remain a source of microplastics in places without regulations preventing them.

Synthetic textiles used in washing like polyester, nylon and acrylic are capable of releasing major amounts of microfibers into wastewater. Just a single load of laundry can lead to up to 700.000 fibers being released, in other words 700.000 pieces¹³ of microplastics. Even though this is a major entryway of microplastics into the environment there are only a few countries that have placed measures through regulations, product requirements, and research initiatives.

Secondly, secondary particles are released into the environment through discarded plastic bags and wrappers; these break down in oceans, rivers and landfills due to weathering,

¹⁰ Microplastics factsheet | “UK Centre of Ecology & Hydrology”
<https://www.ceh.ac.uk/sites/default/files/Microplastics%20factsheet%20310120.pdf>

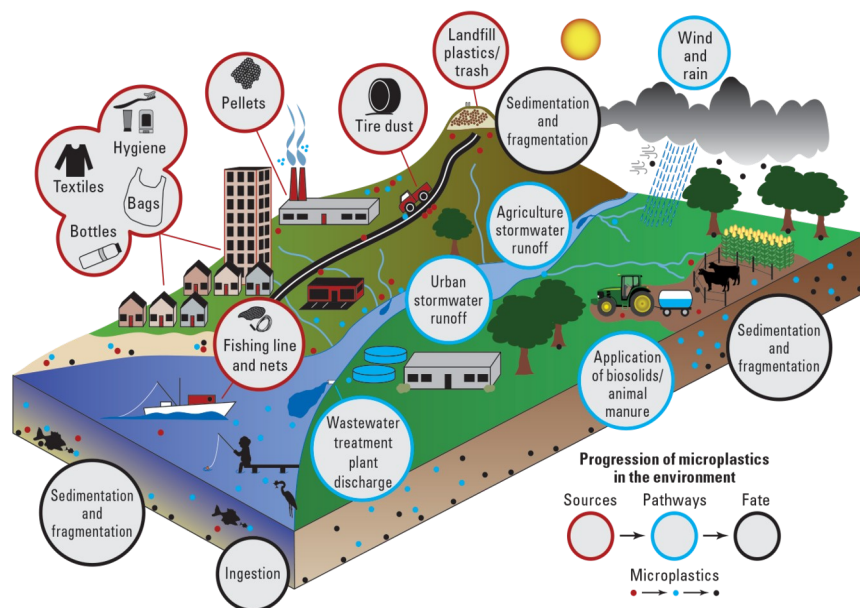
¹¹ The plastics life cycle | “GRID Arsenal”
<https://www.grida.no/resources/14863>

¹² Microplastics factsheet | “UK Centre of Ecology & Hydrology”
<https://www.ceh.ac.uk/sites/default/files/Microplastics%20factsheet%20310120.pdf>¹³

Laundry’s significance in Microplastic pollution “European Parliament ,2024”
<https://www.europarl.europa.eu/topics/en/article/20201208STO93327/the-impact-of-textile-production-and-waste-on-the-environment-infographics#:~:text=A%20single%20laundry%20load%20of,that%20promote,s%20many%20first%20washes.>

UV radiation and mechanical forces like abrasion. Vehicle movement is a big contributor to microplastic pollution since, as tires wear down, microscopic particles are released due to friction which then get washed down by rainwater.

Once microplastics are released they can travel long distances using several pathways. Waterways transport microplastics from urban areas and landfills to oceans and lakes which make up the major storehouses of microplastics and waste. Another important factor to consider is wind, through wind light microplastics can travel through air currents, contributing to atmospheric transport over large areas. Lastly wastewater systems are unable to completely filter out microplastics which can lead to them to pass into agricultural systems in the form of sludge being used as fertilizer.



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Figure 1: In this diagram it is clearly illustrated how some of the aforementioned sources of microplastic pollution enter the environment. Despite their different production origins, they follow the same pathways leading into the environment, including water, wind and wastewater systems as analyzed above. Through this diagram it is highlighted how microplastics eventually accumulate in key environmental compartments such as oceans, rivers, and soils.

¹⁴ Conceptual diagram of microplastics sources, transport pathways (water, air, land), and their fate in different environmental compartments. (Source: US Geological Survey) <https://www.usgs.gov/media/images/microplastics-sources-pathways-and-fate-conceptual-diagram>

Consequences

Environmental concerns. Food chain disruption

Throughout various levels of the food chain microplastics can be detected, both smaller species as well as larger predators contain microplastics that are consumed mostly in marine environments, where microplastics are often mistaken by animals for food due to their microscopic size, this leads to them being especially dangerous and disruptive to the food chain.

The root of the problem lies at the base of the food chain where microorganisms like plankton and filter-feeding species, such as oysters and mussels consume and ingest large quantities of microplastics that get moved up the food chain through a process known as biomagnification. As such microplastic bioaccumulates in predator's organisms and remains in their systems, even when consumed by humans. Studies have indicated that commercial fish and shellfish often have high concentrations of microplastics¹⁵, which are passed on to the human body after consumption. Though the problem does not only exist in animal consumption but even fruits, vegetables and other plant-based foods ingest microplastics through their root systems due to the heavy environmental pollution and pass them on to our meals. Naturally, this is detrimental to human health in various ways, which will be analyzed further in the next section, but also has a significant impact on ecosystems, reducing their growth, reproduction and survival of organisms. Furthermore floating microplastics in marine ecosystems can block sunlight leading to differentiations in temperatures underwater, as well as be a hindrance to certain species in their survivability and hunting strategies.

Human health concerns

Although research in the area of human health concerns is still developing, it is well established that microplastics can trigger inflammation, oxidative stress and tissue damage. Additionally many microplastics can carry heavy metals and persistent organic pollutants (POPs), which may leach into the body after ingestion or inhalation. Even though studies are uncertain it is indicated that long-term health issues can start appearing due to microplastics in blood streams and lungs, affecting the blood flow and respiratory system A 2022 study published in Environment International found microplastics in human blood for the first time, with about 80% of participants showing detectable levels of plastic particles¹⁶.

Economical burdens

The economical consequences that follow microplastic pollution are wide-ranging and affect multiple sectors, such as fisheries, tourism, waste management and public health. Especially in the waste management section, the root of the problem is ingrained in the

¹⁵"Fiber forms were detected in the majority of cases based on the MP morphology." "National Institute of health" 2022 <https://pubmed.ncbi.nlm.nih.gov/35279548/>

¹⁶Article regarding quantity of microplastics in human blood "Science report 2022" <https://www.sciencedirect.com/science/article/pii/S0160412022001258?>

inefficiencies in the plastic lifecycle and the expenses of managing pollution after it has already entered the environment.

Due to microplastics entering the food chain and bioaccumulation, the fishing and aquaculture sectors suffer, as quality and safety of seafood are put in jeopardy. As such its market value drops and consumer demand lowers, damaging the industry. In the tourism industry, polluted beaches and degraded marine environments lead to declining visitor numbers, particularly in island and coastal regions which promote their natural beauty and ecotourism. Thus governments are forced to fund expensive cleanup efforts, often diverting resources from other public services, an example of this being the cleanup of the Seine river in Paris shortly before the 2024 Paris Olympic games, which cost an estimated 1.5 billion USD.¹⁷

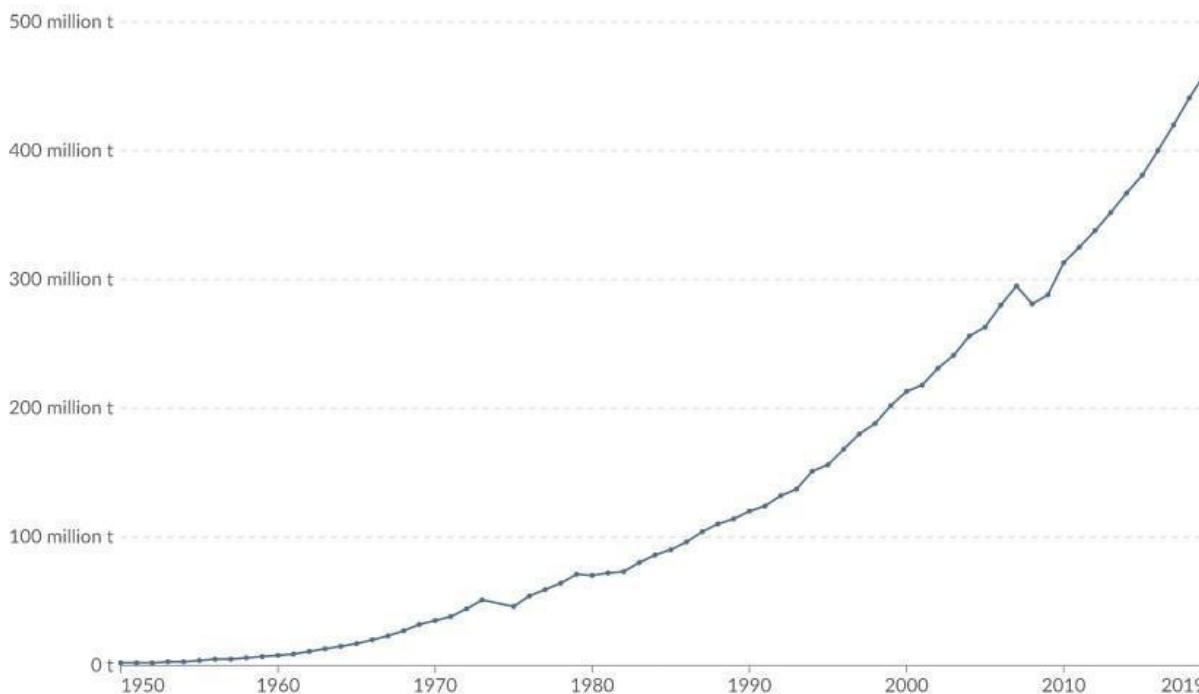
These economic burdens highlight the issues of today's linear plastic lifecycle, which does not include a sustainable end-of-life plan. On the contrary, a circular economy promotes the reduction of plastic usage and improvement of product design, focusing on recyclability and ability to be kept out of the environment. Investments in such strategies, such as textile innovation, tire redesign and closed loop recycling could significantly reduce perpetual economic damage caused by microplastics

¹⁷Report of National Geographic on the cleanup effort of the Seine river "National Geographic 2024"
<https://www.nationalgeographic.com/environment/article/seine-river-cleanup-paris-olympics>
<https://www.nationalgeographic.com/environment/article/seine-river-cleanup-paris-olympics>

Scale of the problem

Global plastics production

Annual production of polymer resin and fibers.



Data source: Geyer et al. (2017); OECD (2022)

OurWorldinData.org/plastic-pollution | CC BY

¹⁸**Figure 2:** In this graph it is illustrated how plastic production has dramatically increased over the past seven decades, during which there is a spike from 10 million tonnes in the 1950s to surpassing 400 million tonnes annually by 2019. This exponential growth is a reflection of rapid urbanization and consumer culture paired with the lack of sustainable product lifecycles.

The scale of microplastic pollution is still vast and growing at alarming rates, it has become one of the most widespread and persistent forms of pollution all across the world with an estimated 400 million metric tons of plastic being produced yearly, of which a significant portion gets broken down into microplastics. To put into perspective how rapidly this issue is progressing, a 2022 OECD report, projected plastic pollution to be tripled 2060 if no countermeasures are taken. The main causes of this rise is the increase in major microplastic pollutants, such as synthetic textiles, tires, and single-use plastics.

It is important to mention that the problem isn't confined to only marine environments, as terrestrial environments and agricultural soils may actually contain more microplastics than

¹⁸ Global plastic production (1950–2019), showing rapid growth from less than 10 Mt to over 400 Mt annually “Our World in Data 2019” <https://ourworldindata.org/grapher/cumulative-global-plastics>

marine systems, due to microplastic particles from wastewater sludge used as fertilizer which have often been found in soils all across Europe, North America and China. Furthermore, due to the various transport ways of microplastics in the environment, they have been detected in rainwater and snow, even being found in remote ecosystems like the arctic and rainforests and Mount Everest, illustrating how far-reaching and uncontrollable the spread has become.

Responsible for this exponential growth are mainly rapidly urbanizing regions, where rivers such as the Ganges, Yangtze and the Nile have essentially been transformed into massive plastic waste conveyor belts. Due to the aforementioned reasons the volume and impact of microplastics will likely continue to increase, posing serious threats to ecosystems, food systems, and human health as previously mentioned worldwide.

Changes in the last decade

In the past decade the global plastic crisis has skyrocketed, but this rise has emerged as a consequence to many changes during this time. It has been fueled by key shifts in production systems, waste management and consumption patterns.

Rising demand in sectors like packaging, fast fashion, e-commerce, and consumer electronics have been at the core of the increase in plastic production, so much so that between 2010 and 2020 global plastic production has increased by over 30%,¹⁹ with much of it contributing to wasteful consumption patterns, due to it being intended for single-use.

The boom in textile production is owed to fast fashion and the affordability of synthetic fabrics, which account for over 60% of clothing worldwide, due to their price availability. The cost of the low prices is seen in product quality and longevity. With each wash synthetic garments break down releasing microfibers in the wastewater system, which carry thousands of microplastic particles that eventually end up polluting the environment

The appearance and frequency of e-commerce has led to a massive increase in plastic packaging waste, due to it being intended for single-use and are not made of recyclable materials. As a result wastewater systems have been flooded with excess plastic material in circulation.

Case study: The great Pacific Garbage Patch (GPGP)

The GPGP remains as the world's largest accumulation of floating plastic waste, with an estimated 1.8 trillion pieces of plastic ²⁰most of them being microplastics caused from other material breaking down. It is located between Hawaii and California in the North Pacific Ocean and spans 1.6 million square kilometers, which to put into perspective is around triple the size

¹⁹ Stemming plastic pollution to protect the ocean "OECD 2023"

<https://www.oecd.org/en/data/insights/data-explainers/2025/05/stemming-plastic-pollution-to-protect-the-ocean.html>

²⁰ "How much plastic floats in the Great Pacific Garbage Patch"

<https://theoceancleanup.com/great-pacific-garbage-patch>

of France. Though its size isn't what makes it alarming but the dense concentration of plastics in it.

Through the GPGP the long range transport of microplastics is illustrated and put into perspective. Furthermore it demonstrates the persistent nature of plastic pollution, as many of the plastics examined from the GPGP date back to the 1970s and 1980s, even though they have barely degraded after almost half a century.

Several other key issues are highlighted through this case like the ineffectiveness in global waste management when it comes to plastic pollution, as well as the breakdown of plastics into microplastics after they enter the environment. The difficulty in removing microplastics once they've dispersed across international waters remains imminent.

Efforts to clean the GPGP have faced major technical and logistical obstacles. Initiatives like The Ocean Cleanup have deployed large scale collection systems²¹ to remove floating plastic debris. While they have achieved a partial success in gathering plastics, these efforts are far less effective for microplastics, which remain too small, too widely dispersed, and often are located below the ocean surface, where technology cannot function as intended.

MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED

European Union (EU)

The EU leads the world when it comes to combating microplastic contamination. It has set restrictions on microbeads in cosmetics²² in all of its member states and on intentionally added microplastics through the European Chemicals Agency (ECHA). The EU promotes research on improved waste management, as well as promotes the circular economy to reduce plastic waste at its source.

United States of America (USA)

The USA has banned microbeads in rinse off cosmetics nationwide since 2015 when the Microbead - Free Waters Act was passed²³. Many states have enacted additional legislation limiting synthetic microfibers, which contribute to worldwide pollution. National research agencies, such as the National Oceanic and Atmospheric Administration monitor microplastic pollution in marine habitats to inform policy formulation.

²¹ Research: The Great Pacific Garbage Patch is Rapidly Accumulating Plastic “*The Ocean Cleanup (2018)*” <https://theoceancleanup.com/press/press-releases/the-ocean-cleanup-to-complete-100th-extraction-live-from-the-great-pacific-garbage-patch>

²² Microplastic Restriction placed by the EU “2023”
<https://news.ceway.eu/eu-reach-microplastics-restriction> ²³

Microbead-free Waters Act
<https://www.fda.gov/cosmetics/cosmetics-laws-regulations/microbead-free-waters-act-faqs>

Japan

Japan is one of the nations which has taken action against microplastic pollution. Some of its acts include the Osaka Blue Ocean Vision²⁴ at the 2019 G20 summit, which upheld a goal of elimination marine pollution by 2050, additionally Japan has taken action against microbeads in cosmetics since 2018, which makes them one of the first nations to do so and in 2022 it enacted the Plastic Resource Circulation Act²⁵, which required businesses to minimize the use of single use plastics, due to their detriment to the environment. Japan contributes to eco-design through supporting innovation, such as the development of ocean dissolvable plastics, which don't leave a residue of microplastics. On the global aspect Japan standardizes microplastic monitoring methods and assists countries through technical cooperation.

Cleanup of the Ocean

Putting emphasis on hotspots like the Great Pacific Garbage Patch, this NGO creates cutting edge technologies to remove plastic pollution from oceans. Their research improves knowledge of plastic fragmentation into microplastics and influences cleanup tactics globally, despite mainly focusing on larger plastics.

TIMELINE OF EVENTS

DATE	DESCRIPTION OF EVENT
07 May 2004	The first scientific paper to define and name microplastics was published by Richard Thompson, raising awareness in the scientific community.
2012	UNEP releases its first major report on plastic waste in oceans, identifying microplastics as an emerging threat.
2015	The United States passes the Microbead-Free Waters Act
2018	The Ocean Cleanup launches its first plastic collection system in the GPGP.

²⁴G20 Implementation Framework for Actions on Marine Plastic Litter “Ministry of the Environment, Japan 2020 “
https://www.env.go.jp/en/water/marine_litter/gp_frmfp_00001.html

²⁵ Japan's New Plastic Recycling Law “American Bar Association 2022”
https://www.americanbar.org/groups/environment_energy_resources/resources/newsletters/oceans-coast/microplastics-seabirds-japans-new-plastic-recycling-law/

2019	The European Chemicals Agency (ECHA) proposes EU wide restrictions on intentionally added microplastics.
25 September 2021	The UNEA (UN Environment Assembly) establishes a working group on marine litter and microplastics to explore a global agreement.
29 April 2022	UN Member States agree to begin drafting a legally binding Global Plastics Treaty with the goal of tackling plastic pollution, including microplastics.
17 October 2023	The EU officially adopts Regulation (EU) 2023/2055, restricting intentionally added microplastics in products.
2024- 2025 (ongoing)	International negotiations continue for the Global Plastics Treaty, with a target completion date by the end of 2024.

RELEVANT UN RESOLUTIONS, TREATIES AND EVENTS

United Nations Environment Assembly (UNEA) Resolution 5/14 (End plastic pollution: Towards an international legally binding instrument)²⁶

Adopted on March 2, 2022, by 175 nations during UNEA-5 in Nairobi, this resolution calls for the development of a legally binding international agreement to address plastic pollution, including microplastics, throughout the entire plastic life cycle. With a goal of reaching its completion by the end of 2024, it signaled the start of formal negotiations toward a Global Plastics Treaty.

MARPOL Convention – Annex V (International Maritime Organization)²⁷

The MARPOL Convention's Annex V, adopted in 1978, forbids ships from dumping plastics and other waste into the ocean. Although it is not specifically aimed toward microplastics, it is essential in lowering marine plastic debris, which eventually decomposes into microplastics due to environmental processes.

²⁶ Resolution 5/14 March 2022

https://wedocs.unep.org/bitstream/handle/20.500.11822/40597/Plastic_pollution_UNEP_EA.5_Res.14_E_PP_EN.pdf?sequence=6&isAllowed=y

²⁷ Marpol Convention Adopted 1973

https://wedocs.unep.org/bitstream/handle/20.500.11822/40597/Plastic_pollution_UNEP_EA.5_Res.14_E_PP_EN.pdf?sequence=6&isAllowed=y

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

The Global Plastics Treaty

The in negotiation Global Plastics Treaty initiated at the United Nations Environment Assembly (UNEA) in 2022, it stands as an effort to create the first legally binding treaty with the goal of addressing plastic pollution, with a strong emphasis on microplastics, across their entire lifecycle.

It places emphasis on solutions such as reducing plastic production, not just managing its waste. If successfully finalized, it could set global standards and oblige countries to enforce stricter domestic policies. However the treaty's effectiveness is highly dependent on the collaboration of diverse stakeholders, some of which have different economic priorities.

Sustainable Development Goals (SDGs): Goals 12, 13, and 14

The 2030 Agenda for Sustainable Development includes 17 Global Goals, of which microplastic pollution is impacted on SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action) and SDG 14 (Life Below Water)

These SDGs offer a comprehensive framework for policy that links social, economic, and environmental goals. They serve as a guide for international funding priorities and national policy, but they are not legally binding like the aforementioned global Plastics Treaty. Because of their diverse effects, microplastics are covered by several SDGs. But accountability and monitoring prove to be difficult, particularly in areas with lower incomes and less capacity.

EU Plastic Regulations – SUP Directive & PPWR

Two of the most crucial EU laws that restrict the use of plastic and packaging waste are the Single Use Plastics (SUP) Directive and the Packaging and Packaging Waste Regulation (PPWR). These seek to promote a circular economy, encourage recyclability, and lessen plastic waste.

A notable example of a global leader in plastic regulation is the EU. These binding laws mandate that member states invest in alternatives, enhance labeling, and phase out specific single use plastics, which are common polluters. Most importantly, they advocate for a circular economy model that discourages waste throughout the entire lifecycle of a product. However, enforcement outside of the EU is still lacking, and implementation differs by nation.

POSSIBLE SOLUTIONS

Regulation of Microplastic Sources

Direct regulation of known microplastic sources remains as one of the most immediate and effective strategies. This includes the ban of microbeads in cosmetics (as already done in the US, UK, and Canada) and the requirement of microfiber filters in washing machines in order to reduce textile shedding. This can be implemented through the funding of quality control

checks. By cutting emissions at their source, these regulations prevent microplastics from entering the environment. However, issues arise in countries whose economies heavily depend on these industries and such measures might have adverse economic impacts.

International Cooperation and Funding Mechanisms

As plastic pollution is not confined by borders, it must be met with appropriate international strategies. Cooperation platforms like the G20 Marine Litter Action Plan and the European Commission as well as European Parliament Committee on the Environment, Public Health and Food Safety foster dialogue, data sharing and policy alignment. Funding sources such as the Green Climate Fund (GCF) and The International Monetary Fund (IMF) can support less economically developed countries in improving infrastructure and innovation. This way developing nations aren't left behind and collective funding power is leveraged. Environmental problems of a worldwide scale demand coordinated global governance.

Extended Producer Responsibility (EPR)

EPR policies make sure that the burden of waste management is shifted from governments to producers, obliging companies to fund and manage the collection, recycling, and disposal of plastic products. Through EPR an economic incentive for manufacturers to design products that are more durable, easily recyclable, and less polluting, is created. It aligns itself with circular economy goals and is already being set in use in the EU, South Korea, and Japan. This way companies are more wary of their product quality, when it comes to environmental pollution. Though the EPR can cause conflict in some nations where it isn't easily applicable due to the circumstances of each nation.

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