

Introduction

Plastic pollution

Plastic pollution is the accumulation of plastic objects and particles (plastic bottles bags and microbeads) in the Earth's environment that adversely effects humans, wildlife and their habitat. plastics that act as pollutants are categorized by size into micro meso and macro debris. It can be categorized in primary plastics, such as cigarette butts and bottle caps, or secondary plastics, resulting from the degradation of the primary ones. It can also be defined by its size, from microplastics - small particles (<5 mm) of plastic dispersed in the environment - to macroplastics .

Plastic pollution can take different forms including:

- The accumulation of waste
- The accumulation of marine litter, fragments or microparticles of plastics and non-biodegradable fishing nets, which continue to trap wildlife and waste.
- Waste causing the death of animals by ingestion of plastic objects
- The arrival of microplastics and microbeads of plastics from cosmetic and body care products.

el from for optical lens.

Classification of plastic materials

1.Polyethylene Terephthalate (PET or PETE)

This is one of the most commonly used plastics. It's lightweight, strong, typically transparent and is often used in food packaging and fabrics (polyester)

Examples: Beverage bottles, Food bottles/jars (salad dressing, peanut butter, honey, etc.) and polyester clothing or rope.

2.High-Density Polyethylene (HDPE)

Collectively, Polyethylene is the most common plastics in the world, but it's classified into three types: High-Density, Low-Density and Linear Low-Density. High-Density Polyethylene is strong and resistant to moisture and chemicals, which makes it ideal for cartons, containers, pipes and other building materials.

Examples: Milk cartons, detergent bottles, cereal box liners, toys, buckets, park benches and rigid pipes.

3.Polyvinyl Chloride (PVC or Vinyl)

This hard and rigid plastic is resistant to chemicals and weathering, making it desired for building and construction applications; while the fact that it doesn't conduct electricity makes it common for high-tech applications, such as wires and cable. It's also widely used in medical applications because it's impermeable to germs, is easily disinfected and provides single-use applications that reduce infections in healthcare. On the flip side, we must note that PVC is the most dangerous plastic to human health, known to leach dangerous toxins throughout its entire lifecycle (eg: lead, dioxins, vinyl chloride).

Examples: Plumbing pipes, credit cards, human and pet toys, rain gutters, teething rings, IV fluid bags and medical tubing and oxygen masks.

4.Low-Density Polyethylene (LDPE)

A softer, clearer, and more flexible version of HDPE. It's often used as a liner inside beverage cartons, and in corrosion-resistant work surfaces and other products.

Examples: Plastic/cling wrap, sandwich and bread bags, bubble wrap, garbage bags, grocery bags and beverage cups.

5. Polypropylene (PP)

This is one of the most durable types of plastic. It is more heat resistant than some others, which makes it ideal for such things as food packaging and food storage that's made to hold hot items or be heated itself. It's flexible enough to allow for mild bending, but it retains its shape and strength for a long time.

Examples: Straws, bottle caps, prescription bottles, hot food containers, packaging tape, disposable diapers and DVD/CD boxes (remember those!).

6. Polystyrene (PS or Styrofoam)

Better known as Styrofoam, this rigid plastic is low-cost and insulates very well, which has made it a staple in the food, packaging and construction industries. Like PVC, polystyrene is considered to be a dangerous plastic. It can easily leach harmful toxins such as styrene (a neurotoxin), which can easily then be absorbed by food and thus ingested by humans.

Examples: Cups, takeout food containers, shipping and product packaging, egg cartons, cutlery and building insulation.

Causes of plastic pollution

Negligence is the main cause. In fact, it is estimated that 80% of marine litter comes from land. This pollution comes mainly from household waste, which is poorly recycled, dumped in landfills or abandoned in nature. This waste is carried by the winds, pushed by the rains into sewers, streams, rivers, and finally in the oceans. Natural disasters such as floods must be considered as other causes of plastic pollution as well.

Plastic pollution is a pervasive environmental problem caused by a variety of factors:

1. **High Production:** The global production of plastic has exponentially increased since the 1950s, driven by its low cost and versatile applications.

2. **Overuse of Single-Use Plastics :** A significant portion of plastic products, such as packaging materials, bags, bottles, and straws, are designed for single use. After a very short functional life, these items are discarded.

3. **Inadequate Waste Management :** Many regions lack proper waste management infrastructure to handle the volume of plastic waste generated. This leads to improper disposal, and plastics can end up in landfills, or worse, in natural environments.

4. **Littering :** Individual behavior significantly contributes to plastic pollution, especially when people dispose of plastic products improperly.

5. Recycling Challenges : *Not all plastics are recyclable, and for those that are, the processes can be costly and complex. Moreover, contamination of recyclables can render large batches of materials unrecyclable.*

Effects of plastic pollution

Plastic pollution has widespread and multifaceted effects on the environment and human health:

1. **Wildlife Harm :** Animals, both terrestrial and marine, can ingest plastic waste, mistaking it for food. This can lead to internal blockages, starvation, and even death. Animals can also become entangled in plastic waste, leading to injury or death.

2. **Habitat Disruption :** Accumulation of plastic waste can alter habitats for many organisms. In aquatic environments, for example, floating plastics can block sunlight from reaching marine plants and algae that depend on it for photosynthesis.

3. Chemical Contamination : Plastics contain various chemical additives, such as plasticizers, flame retardants, and stabilizers, which can leach into soil and waterways, thereby contaminating them. These chemicals can have toxic effects on wildlife and ecosystems.

4. Microplastics: As plastic debris degrades, it breaks down into smaller particles known as microplastics. These particles can absorb and concentrate pollutants from the environment, such as pesticides and heavy metals, and can be ingested by aquatic organisms, entering the food chain.

5. Impact on Human Health: Humans may be exposed to plastics and their additives through consumption of contaminated seafood and water, as well as through use of plastic products. Some of these chemicals, such as bisphenol A (BPA) and phthalates, are suspected endocrine disruptors, which may affect reproductive health and child development.

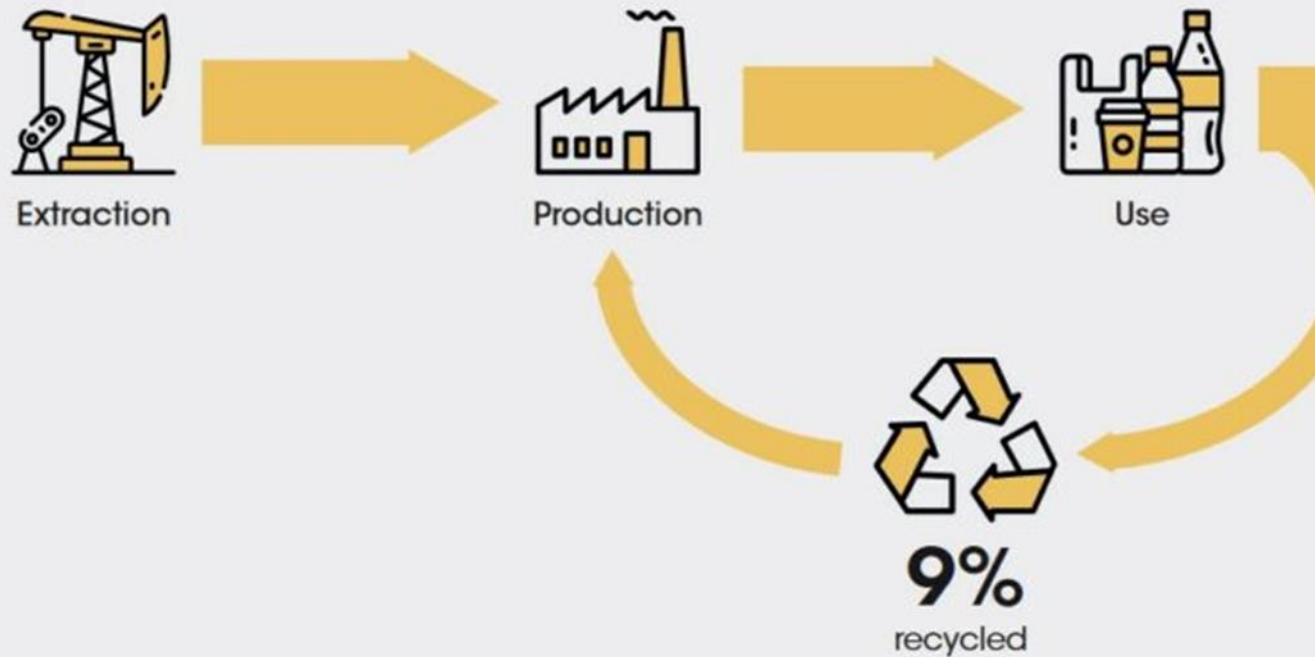
6. Economic Costs: The cleanup of plastic pollution incurs significant costs. Coastal communities, for instance, must spend considerable resources managing plastic litter to maintain the health of their beaches, which are crucial for tourism.

7. Aesthetic Damage: Plastic waste can diminish the natural beauty of landscapes, particularly on beaches, in parks, and along waterways, potentially reducing enjoyment and lowering property values.

8. Climate Change: The production and incineration of plastic contribute to greenhouse gas emissions. The lifecycle of plastics, from production to disposal, thus plays a role in exacerbating climate change.

The plastics life cycle and its impacts on people and the environment

8.3 billion MT plastics
produced since 1950



Cross-cutting impacts of the plastics life cycle



Greenhouse
gas emissions



Air pollution



Soil and water
pollution



Wildlife and
ecosystems



Human
health

Source: Geyer, Jambeck & Lavender Law. *Production, use, and fate of all plastics ever*

Here are some accounts of effects of debris from terrestrial habitats, for example ingestion by the endangered California condor, *Gymnogyps californianus* (Mee et al. 2007). However, the vast majority of work describing environmental

consequences of plastic debris is from marine settings and more work on terrestrial and freshwater habitats is needed. Plastic debris causes aesthetic problems, and it also presents a hazard to maritime activities including fishing and tourism (Moore 2008; Gregory 2009). *Discarded fishing nets result in ghost fishing that may result in losses to commercial fisheries* (Moore 2008; Brown & Macfadyen 2007). Floating plastic debris can rapidly become colonized by marine organisms and since it can persist at the sea surface for substantial periods, it may subsequently facilitate the transport of non-native or 'alien' species (Barnes 2002; Barnes et al. 2009; Gregory 2009). *However, the problems attracting most public and media attention are those resulting in ingestion and entanglement by wildlife.* Over 260 species, including invertebrates, turtles, fish, seabirds and mammals, have been reported to ingest or become entangled in plastic debris, resulting in impaired movement and feeding, reduced reproductive output, lacerations, ulcers and death (Laist 1997; Derraik 2002; Gregory 2009). The limited monitoring data we have suggest rates of entanglement have increased over time (Ryan et al. 2009). A wide range of species with different modes of feeding including filter feeders, deposit feeders and detritivores are known to ingest plastics.

Plastic pollution effects on Health

Humans are exposed to a large variety of toxic chemicals and microplastics through inhalation, ingestion, and direct skin contact, all along the plastic lifecycle.

Health impacts are also observed all along the plastic value chain. Examples include pollution at extraction sites, workers exposure to chemicals, air pollution from waste incineration, and water and soil contamination. Vulnerable groups, including children, women, workers in the informal waste sector and marginalized communities are particularly exposed, thus raising concerns of human rights and environmental injustice. The adverse effects of plastic are particularly acute children in the womb and young

ones, with increased risks of prematurity, stillbirth, birth defects of the reproductive organs, neurodevelopmental impairment, impaired lung growth, and childhood cancer (Minderoo-Monaco Commission on Plastics and Health, 2023). Finally, plastics contribute to the numerous health risks associated with warming temperatures and extreme weather events due to climate change. The effects of plastic production on human health also have important monetary costs, recently estimated to more than \$250 billion in 2015 globally and more than \$920 billions in the USA alone for diseases and disability caused by the diseases and disability caused by the plastic-associated chemicals PBDE, BPA and DEHP.

World Health Assembly and Plastics

At the **Seventy-sixth World Health Assembly (WHA76)** taking place in Geneva from **21 to 30 May 2023**, a resolution on **the impact of chemicals, waste, and pollution on human health** initially tabled by Peru, Canada, Colombia, Ecuador, El Salvador, Mexico, Monaco, Switzerland, Uruguay, and the European Union and its Member States was adopted. The resolution, available on the WHA76 portal, includes notes and references to various ongoing negotiations as well as UN Environment Assembly and Human Rights Council resolutions. Among these, Plastic pollution and the Intergovernmental Negotiating Committee in charge of developing a legally binding instrument on plastic pollution. The resolutions requests to scaling-up work on plastics and health.

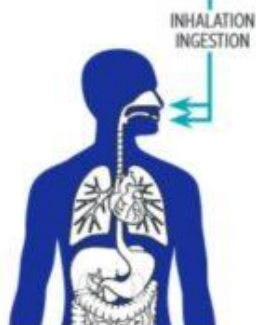
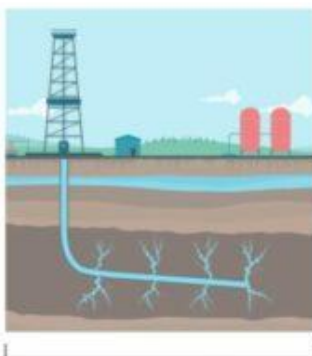
FIGURE 2

Plastic & Health: The Hidden Costs of a Plastic Planet

Humans are exposed to a large variety of toxic chemicals and microplastics through inhalation, ingestion, and direct skin contact, all along the plastic lifecycle.

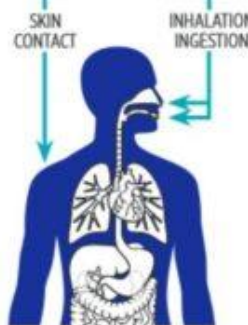
DIRECT EXPOSURE

Extraction & Transport



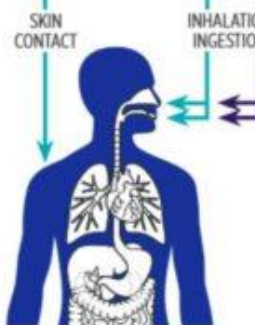
- **Emissions:** Include Benzene, VOCs, and 170+ toxic chemicals in fracking fluid
- **Exposure:** Inhalation and ingestion (air and water)
- **Health:** affects the immune system, sensory organs, liver, and kidney; impacts include cancers, neuro-, reproductive, and developmental toxicity

Refining & Manufacture



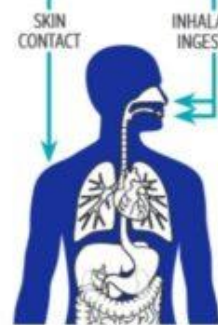
- **Emissions:** Include Benzene, PAHs, and Styrene
- **Exposure:** inhalation, ingestion, skin contact (air, water, and soils)
- **Health:** impacts can include cancers, neuro-toxicity, reproductive toxicity, low birth weight, and eye and skin irritation

Consumer Use



- **Emissions:** Include heavy metals, POPs, carcinogens, EDCs, and microplastics
- **Exposure:** inhalation, ingestion, and skin contact
- **Health:** affects renal, cardiovascular, gastro-intestinal, neurological, reproductive, and respiratory systems; impacts include cancers, diabetes, and developmental toxicity

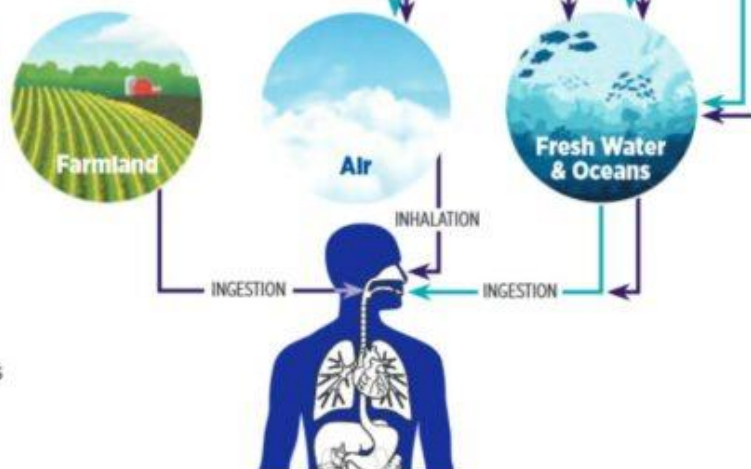
Waste Management



- **Emissions:** include heavy metals, dioxins and furans, PAHs, toxic recycling
- **Exposure:** ingestion and inhalation (air, ash, slag)
- **Health:** impacts include cancers, neurological damages, and damages to immune, reproductive, nervous, and endocrine system

ENVIRONMENTAL EXPOSURE

- **Microplastics** (e.g. tire dust and textile fibers) and **toxic additives:** including POPs, EDCs, carcinogens, and heavy metals
- **Exposure:** inhalation and ingestion (air, water, and food chain)
- **Health:** affects cardiovascular, renal, gastrointestinal, neurological, reproductive, and respiratory systems; impacts include cancers, diabetes, neuro-, reproductive, and developmental toxicity



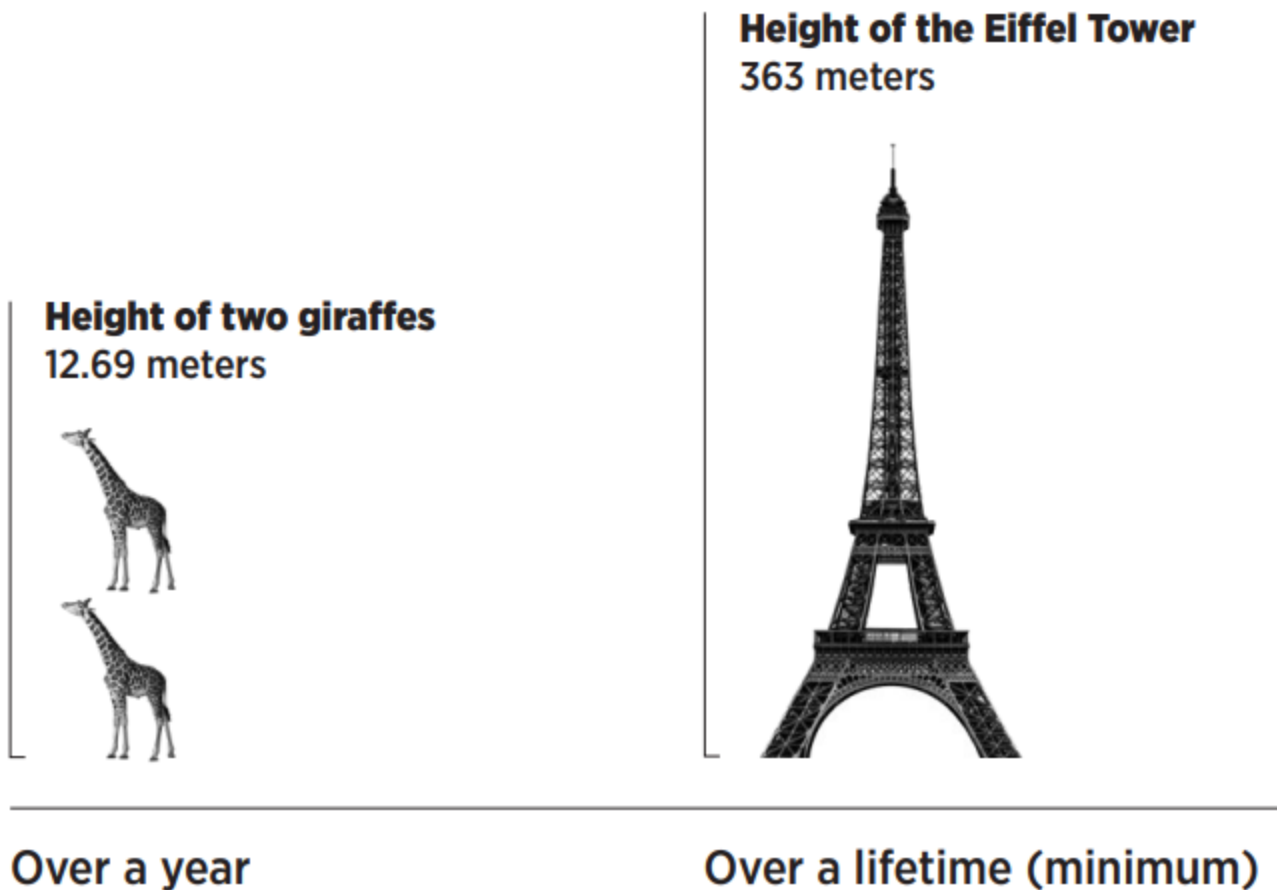
KEY: Microplastics Chemicals

Health risk of microplastic

Micro- and nanoplastics in the human body may have harmful effects on health. The main microplastics exposure route for humans is ingestion, followed by inhalation and dermal exposure. Although there is no scientific certainty of the amount of plastics humans ingest, estimation guesses around 0.1–5 g/week, while inhalation can amount between 26 and 170 airborne MNPs of per day and up to 22,000,000 micro- and nanoplastics inhaled by humans annually. Studies on animals indicate that plastic particles can cross the gut barrier and travel through the body. While this field of study is rather recent, recent studies have found a correlation between presence of microplastics in the human body and inflammatory bowel disease symptoms, respiratory complications among others which still require further study. Additionally, plastics increase disease risk by acting as a vessel for human pathogens which have a particularly strong bind to plastic waste.

Microplastic Inhalation over the Average Human

If we think of microplastic inhalation as a visual height chart, over the course of these periods of time, the average human inhales the equivalent of...



Imagery not drawn to scale.

Source: [Data from an investigation by the University of Portsmouth and Good Morning Britain.](#)

Impact on Planet: Biodiversity and Climate Change

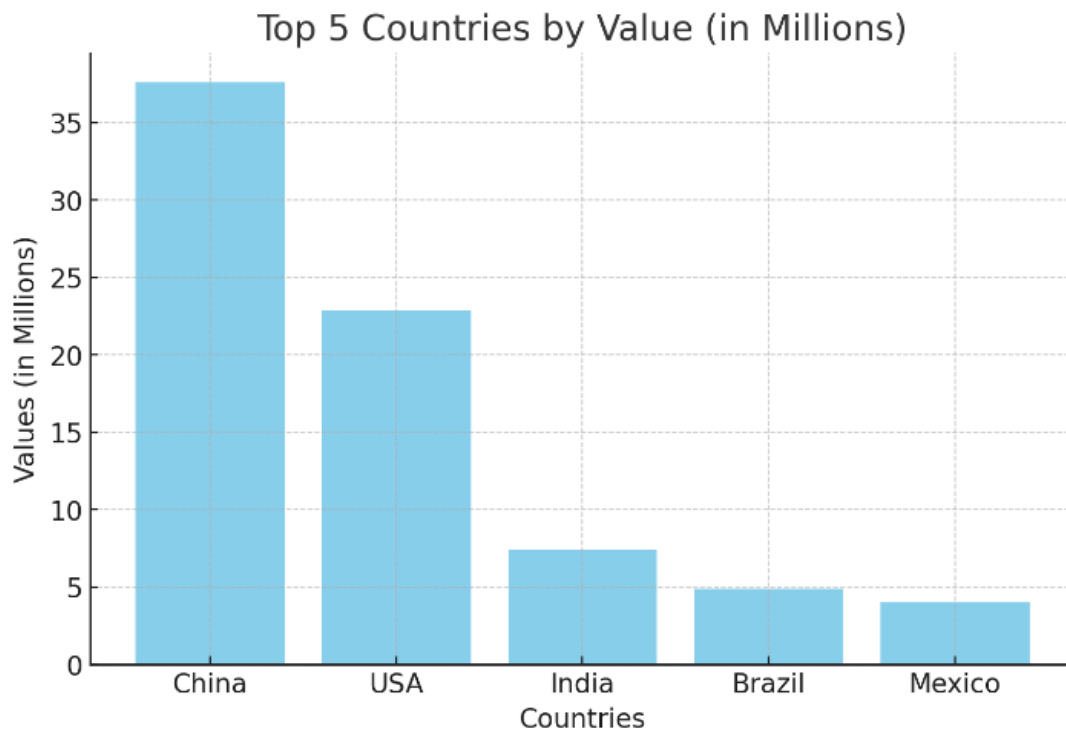
Ecosystems and Biodiversity

Given the persistent nature of plastic and its toxicity, plastic pollution is a significant threat to biodiversity. It threatens ecosystems, animal and plant species, impeding their ability to deliver essential services to humanity. While the leakage of plastics into the ocean and the subsequent impacts of marine life has been most studied, plastic pollution also affect freshwater and terrestrial ecosystems.Indeed, plastic and chemical leakage into the environment may arise at various stage of the plastics life cycle, and the resulting pollutants are transported around the globe through air and oceans streams.

Environmental degradation occurs in the upstream, as extraction, fracking, production of plastics and chemical additives release substantial amounts of toxic substances into the air and contaminate the local environment. Disposal is also problematic: incineration of plastic waste releases toxic chemicals and micro- and nano-plastics into the air, while landfills contaminate soil and water. All these elements then impact biodiversity both locally and globally.

Plastic pollution: A Globe Crisis(Top 5 Countries produce the most plastic waste)

Country	Plastic Waste
China	37.6M
USA	22.9M
India	7M
Brazil	4.9M
Mexico	4M



Prevention of Plastic Pollution

Preventing plastic pollution involves a comprehensive approach that targets the production, consumption, and disposal of plastic products. Here are key strategies to prevent plastic pollution:

1. Reduce Plastic Production and Consumption:

- *Single-Use Plastic Bans* : Implementing bans or restrictions on single-use plastics like bags, straws, and cutlery can significantly reduce plastic waste.

- *Promote Alternatives*: Encourage the use of eco-friendly alternatives, such as paper, glass, bamboo, or metal products, which are biodegradable or reusable.

- *Reduce Excessive Packaging* : Work with manufacturers and retailers to minimize packaging and promote sustainable packaging solutions.

2. Improve Waste Management :

- Expand Recycling Programs : Increase the capacity for recycling and ensure that recycling facilities are accessible to the public.

- Separate Waste Streams : Encourage the separation of recyclable and non-recyclable waste to improve the efficiency of recycling processes.

- Invest in Waste-to-Energy Technologies: Explore technologies that convert non-recyclable plastic waste into energy to reduce landfill accumulation.

3. Promote Reuse and Recycling:

- Encourage Reusable Products: Promote the use of reusable bags, bottles, and containers to decrease the demand for single-use plastics.

- Implement Recycling Incentives: Create incentives for individuals and businesses to recycle, such as deposit return schemes for bottles.

- Raise Awareness About Recycling : Educate the public about recycling practices and the environmental benefits of recycling.

4. Legislation and Policy :

- Regulate Plastic Production: Implement policies that limit the production of non-essential plastic products and encourage the use of recycled materials.

- Extended Producer Responsibility (EPR) : Require manufacturers to take responsibility for the disposal and recycling of their plastic products.

- International Agreements : Support global initiatives and agreements aimed at reducing plastic pollution, especially in oceans and international waters.

5. Public Awareness and Education:

- Awareness Campaigns : Conduct public campaigns to raise awareness about the impact of plastic pollution and the benefits of reducing plastic use.

- Educational Programs: Integrate environmental education into school curricula to foster a culture of sustainability among future generations.

International law's about plastic pollution

BASEL, ROTTERDAM, & STOCKHOLM CONVENTIONS

As of 2019, 187 countries have taken a major step toward solving the plastic waste crisis by adding plastic to the Basel Convention, a treaty that controls the movement of hazardous waste from one country to another. The ever-expanding research on plastic and its chemical additives further raises awareness about their potential relevance to the Stockholm and Rotterdam conventions, covering persistent organic pollutants (POPs) and hazardous chemicals, respectively

INCs

In March 2022, United Nations Member States adopted a mandate to negotiate a global plastics treaty at the resumed fifth session of the United Nations Environment Assembly (UNEA-5.2). The mandate, “End plastic pollution: Towards an international legally binding instrument,” sets out a goal for the treaty to be negotiated before the end of 2024. While the mandate provides the general objective and frame for the negotiation, the treaty’s content, design, reach, and function will be developed between 2022 and 2024.

UN

On 2 March, 2022, the resumed session of the Fifth Session of United Nations Environment Assembly (UNEP) adopted a resolution to initiate an international law-making process to combat global plastic pollution including marine plastic pollution by 2024 (UNEP Resolution 5/14). Plastic pollution is recognized by the UNEP Resolution 5/14 as a global-scale serious environmental problem negatively impacting the

environmental, social and economic dimensions of sustainable development. This resolution has received extensive attention and has been welcomed by different sectors in the international community since its adoption.^[2] The first meeting of the ad-hoc open-ended working group (OEWG) responsible for preparing the organization and timetable of the INC was held on 1 June 2022.

Plastic Waste Management

There are primarily three ways of managing plastics:

- Reduce
- Reuse
- Recycle



According the jute packaging act 2010,

promotes the use of jute bags as an alternative of plastic bags. Every product must be packaged in jute bags, as required by the act for using non biodegradable synthetics for packaging.

Governmental Steps /Act prevent plastic pollution

The jute packaging act 2010

promotes the use of jute bags as an alternative of plastic bags. Every product must be packaged in jute bags, as required by the act for using non biodegradable synthetics for packaging, offenders risk a maximum of one year in prison and or a fine of BDT 50,000.

Transparency International Bangladesh (TIB) today demanded for stronger implementation of law to resist illegal production, marketing and usage of plastic to prevent environment pollution.

Extended producer responsibility (EPR):EPR policies require manufacturers to take responsibility for the entire lifecycle of their products, including end-of-life disposal and recycling. This encourages manufacturers to design products that are more sustainable and easier to recycle.

Recycling Regulations and Infrastructure:Governments can enforce recycling requirements and invest in the infrastructure needed to collect, sort, and process recyclable plastics. This can include funding for recycling facilities, collection programs, and technology to improve recycling efficiency.

Public Education and Awareness Campaigns

Governments can launch campaigns to raise awareness about the environmental impact of plastic pollution and promote sustainable practices. These campaigns can focus on reducing single-use plastics, encouraging recycling, and fostering a culture of sustainability.

Conclusion

Plastic pollution is a major environmental threat, harming ecosystems, wildlife, and human health. Persistent plastics, especially single-use items, contaminate land and water, endangering marine life and entering the food chain. Tackling this crisis requires reducing plastic use, improving recycling, adopting sustainable alternatives, and global cooperation to protect our planet.

Bibliography

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Moore 2008; Gregory 2009

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Laist 1997; Derraik 2002; Gregory 2009

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