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Environment Commission

Measures to combat plastic pollution

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Introduction

Plastic is a substance that made the modern world as we know it today possible. In the last 60 - 70 years, it has revolutionized everything from cooking, clothing, and cosmetics, to engineering, product design, and medicine. Since its invention, 8.3 billion tonnes of the material has been produced ("Seven Charts That Explain the Plastic Pollution Problem"). This astounding mass is similar to 25,000 Empire State Buildings. Half of this material was produced in the last 13 years which highlights the growing pace of human plastic consumption (McKenna, John). This is inevitable considering that the global population is also growing rapidly, but also modernizing, increasing the demand for plastic exponentially.

Albeit being a wonderfully useful material, plastic is a great polluter and has many negative effects on the environment. 79% of plastic is accumulated in landfills or the natural environment, whereas only 9% is recycled. Annually, about 10 million tonnes of plastic ends up in the ocean. This is extremely harmful to marine life, which often ingest small fragments of plastic causing internal blockages which usually results in death. Furthermore, great amounts of the larger pieces of plastic are suspended in the surface of the water and form "plastic soups" due to the ocean currents. According to the plastic pollution coalition, the weight of plastic in the ocean will be greater than that of fish by 2050 (Plastic Pollution Coalition). The UN ocean chief Lisa Svenson commented: "This is a planetary crisis... we are ruining the ecosystem of the ocean", highlighting the direness of the issue. The plastic in landfills can also have a negative effect on the land considering some toxic plastics may contaminated the soil and groundwater, posing a serious threat to the ecosystem. ("Seven Charts That Explain the Plastic Pollution Problem.")

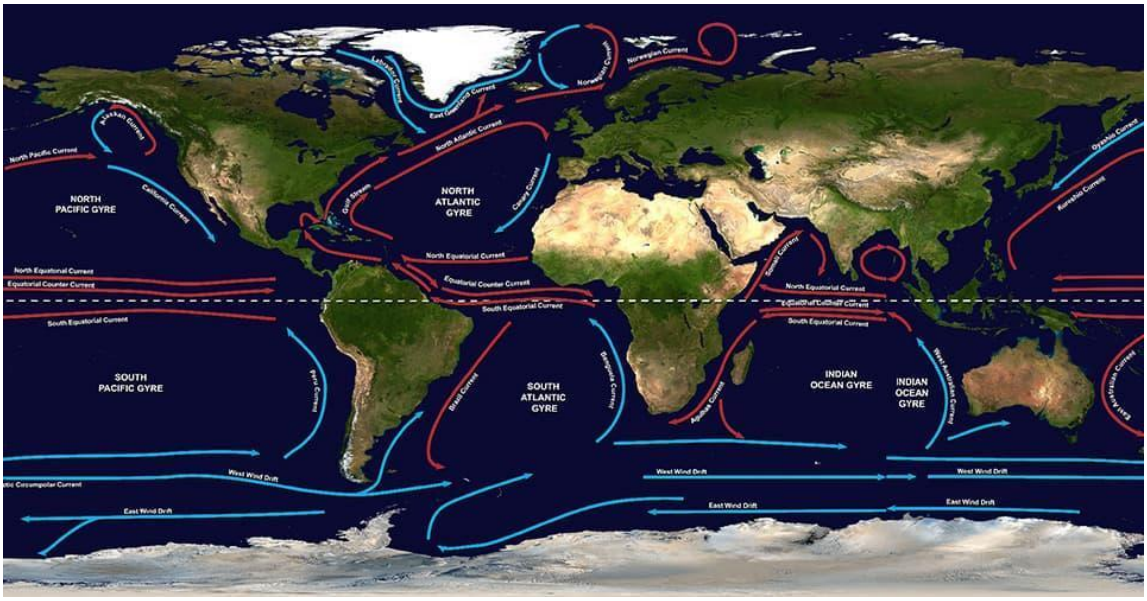
Definition of Key Terms

Plastic Pollution

Plastic pollution is the accumulation of man-made plastic products which generate problems for wildlife and their habitats. Plastic is a polymeric material which means that its molecules are relatively large and have a chain-like structure, each molecule being a linked together. Other polymers such as rubber and silk can also occur naturally but are not damaging to the environment the same way plastic is. This is because plastic was specifically designed to defeat the natural decaying process of materials and most plastics are therefore *non-biodegradable* (Knight, Laurence). Plastics can be categorized as micro-, meso-, or macro- debris based on size (Moore, Charles).

Gyre

Gyres are a system of rotating ocean currents. They are huge vortexes of ocean water which sucks in all floating objects. Gyres are caused by ocean currents which are a product of the earth's rotation (“Oceanic Gyres”). The five major gyres are located in the North Pacific, South Pacific, Indian Ocean, North Atlantic and the South Atlantic Gyres. Due to the lack of wind in the centre of gyres, ships avoid them and it was only in 1997 when the first gyres where found. A “plastic soup” has been formed in these major gyres where plastic debris is being carried by a water column. In the North Pacific Gyre a high of 334,271 pieces of plastic per square kilometre was found. It is estimated to be twice the size of the state of Texas (Seleky, Eric, et al.). (



"Oceanic Gyres." *National Ocean Service*, American Oceanic and Atmospheric Administration, oceanservice.noaa.gov/facts/gyre.html.

Ecosystem

According to the Collins English Dictionary, an ecosystem is "all plants and animals that live in a particular area together with the complex relationships that exists between them and the environment". Ecosystems are being disrupted due to plastic pollution as the harm to the environment has repercussions on animals and the plastic also directly impairs the well-being of animals and plants (Collins English Dictionary).

General Overview

Source of plastic pollution

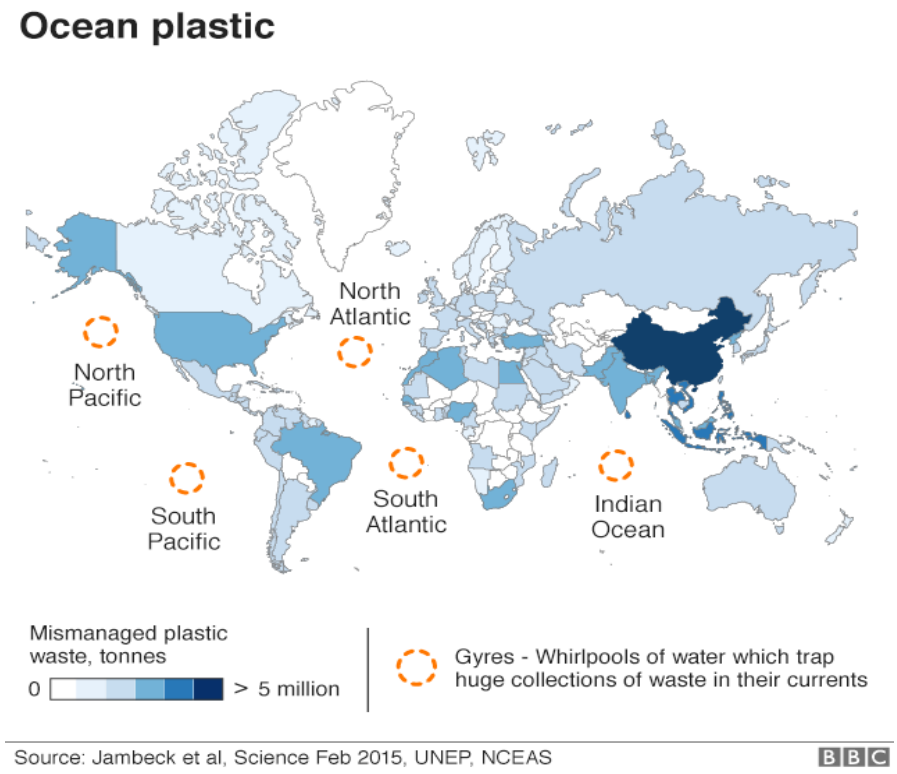
It is crucial to recognize that there are a great number of contributors to plastic pollution and that all aspects must be considered when working towards mitigating the effects of plastic pollution. 80% of marine debris actually comes from land-based sources rather than ocean-based sources which is the remaining 20% "(Plastic Debris in the World's Oceans.")

Land-based sources include storm water discharges, which is runoff water that contains plastic debris that is generated during heavy precipitation and discharged into streams, rivers, or directly into the ocean. A similar source is combined sewer overflows. During times of heavy precipitation, sewage (which often contains plastic debris) that is being carried to a wastewater treatment facility overflows and is discharged in the same manner as storm water. In the USA, this is the main source of marine debris. Littering by beachgoers and tourists along the coastline causes marine debris, but one must keep in mind that people further in-land also contribute to this if plastic waste finds it way into streams or rivers. Thought the intention of landfills is that the plastic stays underground, there is significant loss from landfills that does end up in the ocean. Furthermore, illegal dumping of domestic or industrial waste also contributes to the plastic pollution. Albeit being monitored by many governments, there is still a lot of plastic pollution that is produced by industrial activity such as plastic loss in loading/unloading at ports but also illegal dumping. ("Plastic Debris in the World's Oceans.")

There are also ocean-based sources which directly cause marine plastic pollution. Commercial fishing generates plastic debris when fishing gear or rubbish is dumped overboard or when they fail to retrieve fishing gear. Recreational boaters, merchant, military,

and research vessels also contribute to plastic pollution as the waste they produce is often dumped in the ocean. Offshore oil and gas platforms also produce waste that is accidentally or deliberately dumped into the ocean. ("Plastic Debris in the World's Oceans.")

The map below details oceanic gyres but also a chart of mismanaged plastic waste per country. It is clear that some countries have more mismanaged waste than others, but every single nation contributes and suffers from this global problem.



Jambeck et al. "Ocean Plastic." *BBC*, UNEP, Feb. 2015, www.bbc.com/news/science-environment-42264788.

Environmental damage

Land

Plastic, specifically, chlorinated plastic can release harmful chemicals. When excessive amounts of plastic come in contact with the soil, not only could the soil become contaminated, but the groundwater below it as well. This groundwater is a water source for many species and it being toxic could cause serious harm to the ecosystem (Moore, Charles).

Landfills are also a cause of environmental damage. About 79% of plastic is accumulated in these landfills where many microorganisms will catalyze the degradation process of biodegradable plastics. These microorganisms break down the nylon in the plastic which releases methane, a greenhouse gas that significantly contributes to global warming (Biello, David).

Ocean

It was estimated in 10 million tonnes of plastic in the world's ocean and according to a Greenpeace of 2006, 10% of plastic produced annually ends up in the ocean.

One of the key issues with the plastic pollution in the ocean is that it threatens the marine wildlife. The characteristics of plastic make it so that they are a great threat to marine life. These properties include buoyancy, durability, ability to absorb waterborne toxins but also decompose and release toxins such as Bisphenol A (BPA) (Moore, Charles). 70% of the mass of plastic in the ocean eventually sinks consequently damaging the sea bed. The plastic debris that remains on the surface, often trapped in gyres, is a great threat to marine wildlife. Plastic debris can cause serious injury or death through drowning, suffocation, strangulation, starvation, or injuries. 267 species have suffered from entanglement or ingestion of marine debris. This includes birds, turtles, seals, sea lines, whales, and fish. Entanglement rates of up to 7.9% have been recorded according to Greenpeace ("Plastic Debris in the World's Oceans.")

Ingestion of marine debris can also be lethal to animals. Often macro- or mees- debris is erroneously mistaken for prey by sea turtles and seabirds. This usually causes for their digestive tract to be blocked or their stomach filled which could lead to malnutrition and a slow, cruel death by starvation. It is estimated that 50 - 80% of sea turtles have ingested some form of plastic debris. This has had a great impact on the turtle population as a whole and plastic pollution will evidently also have an effect on marine biodiversity. This is further amplified by the fact that plastic debris can also be used as a vehicle by small sea creatures to grow and travel on. This could possibly lead to an invasion of alien species (non-native), disturbing the local food chain, ecosystem and biodiversity ("Plastic Debris in the World's Oceans.")

Plastic disposal and reduction efforts

Most plastic products are single-use and once used, consumers dispose of them. Usually (79% of the time), plastic ends up in a landfill, about 12% is incinerated and a mere 9% is recycled ("Seven Charts That Explain the Plastic Pollution Problem"). However, plastic

waste is often improperly disposed of due to human carelessness. People throw out rubbish through car windows or heap it on top of an already full rubbish bin. This improper disposal causes pollution of the environment as a substantial amount of plastics ends up in the water where it can harm wildlife. According to the Marine Conservancy, the decomposition rates of common types of plastic debris are as following:

- Foamed plastic cups: 50 years
- Plastic beverage holder: 400 years
- Disposable diapers: 450 years
- Plastic bottle: 450
- Fishing line: 600 years (Le Guern, Claire)

Albeit not being a solution to the problem of plastic pollution, recycling is an effective way to prevent it from happening in the first place. Though recycling systems are in place, too little of the plastic is being reused for other purposes. One of the main reason for this is because businesses have no incentive to do so considering it is inefficient to reuse. For example, its low melting point means that it cannot be distilled through heating which means that a business has to take extra steps and use more resources. Governments have tried to counter this by subsidizing recycled plastic below the cost of raw plastic. It is only in Northern Europe where recycling rates are greater of close to 50% (Moore, Charles).

Another demonstration of plastic's effect on our ecosystem is that there is some evidence that bacteria may be mutating and evolving to feed on plastic waste. They exploit the energy in the hydrocarbon bonds of plastic and break them, decomposing the plastic. These bacteria are not, however, a feasible solution at this point in time and stage of development to the problem of plastic pollution considering there are many uncontrollable variables involved (Yoshida, Shosuke, et al.)

Major Parties Involved

Germany

Germany (the fourth highest GDP in the world) is Europe's largest plastic producer with 7.5% of the world's total. However, it is one of the seven EU Member States that recycles more than 80% of its used plastics. Indeed, Germany has adopted a management strategy. It therefore manages to cope with different waste streams in the best environmental and economic conditions. Nevertheless, the industrial sector remains highly developed and the resulting pollution is significant. Germany is the 6th most emitting country in greenhouse gas in the world.

Greece

Greece is considered as one of the most polluting European countries. In fact, about 20 years after the first attempts to recycle garbage in Greece, the country is lagging behind. EU experts say "lack of political will and environmental awareness" have caused the situation say. Indeed, the management of the environment seems to mismanaged and is generally ineffective. The government continues to favor particular economic interests before environmental preservation and the fight against pollution. Despite a slight improvement, only less than 10% of plastic waste was recycled in 2008 through the country.

China

The global health of the plastics market is partly attributable to emerging markets, notably China. Indeed, China concentrates 25% of global plastic production and is the largest producer and consumer of plastic in the word. By itself, China produces more than all the countries of Europe combined. Moreover, it is also the first contributor to marine pollution and has alone spilled more than 3 million tons of plastics into the oceans. Recently, the Chinese government has begun to realize the importance of the fight against pollution. As a result, local recycling is slowly growing.

United Nations Environment Program (UNEP)

The UNEP Global Initiative on Marine Litter establishes arrangements, partnerships and other activities. The main partners include Regional Sea Conventions, and Action Plans, government representatives, NGOs. It is an initiative to curb plastic pollution by cooperating.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

UNESCO coordinates international cooperation with issues such as marine and plastic pollution. With UNESCO's help, the United Nations Conference on Sustainable Development implemented relevant conventions adopted in the framework of the International Maritime Organization (IMO).

Indonesia

Cooke, Lacy. “Indonesia Pledges $1 Billion Annually to Tackle Ocean Pollution Problem.” Inhabitat Green Design Innovation Architecture Green Building, Inhabitat, 6 Mar. 2017, www.inhabitat.com/indonesia-pledges-1-billion-annually-to-tackle-ocean-pollution-problem/.

Indonesia is the second largest pollutant of plastic in oceans. It dumps 3.2 millions tons of plastic waste. This is due to its industrialization, rapid urbanization and climbing population. Because of mismanaged and under resourced governance and high poverty levels, proper waste disposal and management does not exist. Furthermore, with 90,000 retailers such as markets and stores, nearly 10 000 plastic bags are distributed annually. As a result, these bags litter roadsides, clog waterways (thus contributing to floods) and kill marine life. Experts say that in Jakarta’s Ciliwung River, plastic bags are embedded 3 meters deep.

Timeline of Key Events

Date	Description of Event
1862	The first plastic is made from cellulose
1907	Bakelite, the first synthetic fossil fuel plastic is invented
1950s - 1960s	Invention of the first plastic that could be cheaply produced at massive scale was invented.
1970’s	First research concerning environmental impacts of plastics

1997	Captain Charles Moore sets sail to Southern California from Hawaii and is the first to encounter the North Pacific Gyre.
1999	UNEP (United Nations Environmental Programme) formed a a subsidiary programme which manages crises in over 40 countries and territories which include the Balkans, Afghanistan, Nigeria, Ukraine, Liberia, Japan, Iraq, China, Lebanon and Rwanda
2002	Bangladesh bans plastic bags
2011	The The Honolulu Strategy
2014	Global Partnership on Marine Litter
2014	The Netherlands bans microbeads in the cosmetics

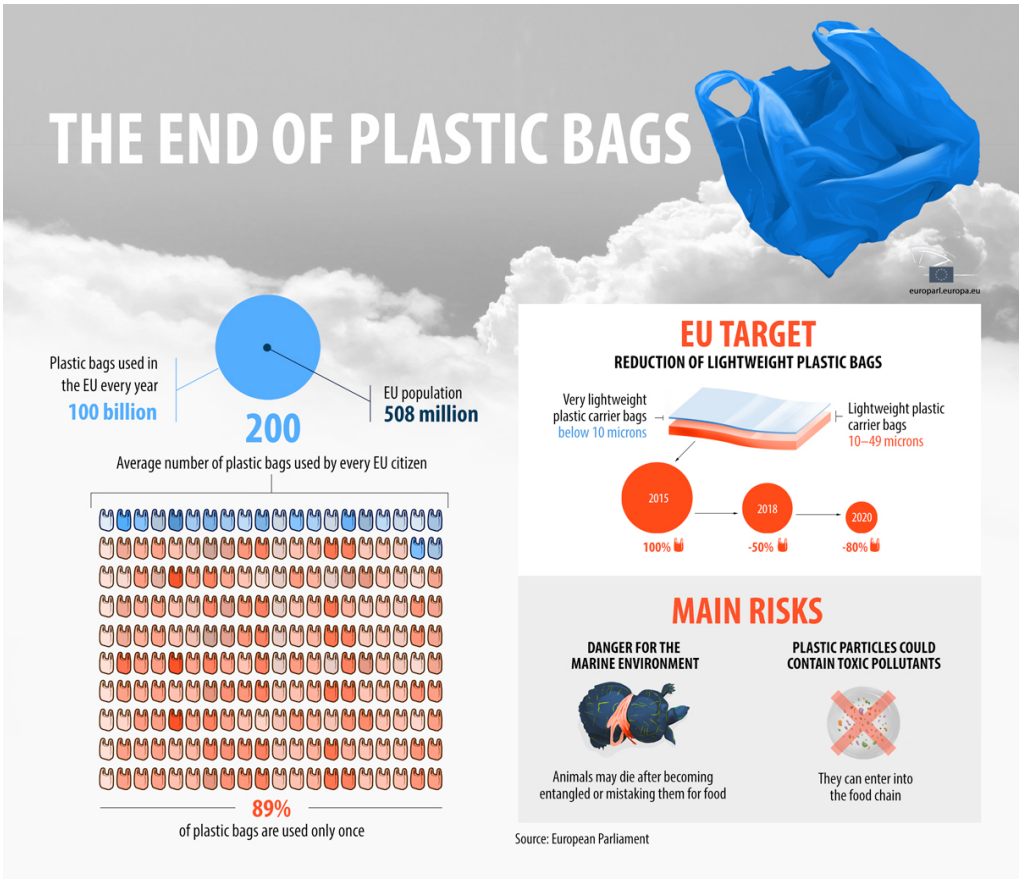
Previous Attempts to Resolve the Issue

Several organizations have cooperated to try and curb the issue of plastic pollution and to prevent it from worsening. The departments of the United Nations (UN) such as the UNEP and UNESCO, through their various treaties and conventions on marine litter and plastic pollution have provided frameworks and regulations, which legal bind its signatories to tackle this issue.

After decades of neglect of the environment in favor of ultra-rapid development, the Chinese government seems to be beginning to realize the importance of the fight against pollution. Local recycling is developing more and more. "China is the largest producer of plastic waste but begins to make efforts to reduce it" said the president of UNEP. In March 2017, the government Chinese launched the "National SWORD" program. Its aim is to better control the import of certain wastes into the country by limiting the licenses of Chinese factories producing plastic products. It also goes as far as closing permanently those which do not respect the environmental standards, import authorizations or technical conditions. A few months later, the government announced that it had controlled 1162 of them, and 65% were indeed found guilty of environmental violations (“China's Action Against Plastic Pollution.”) .

With the aim of designing a green car that is less harmful to the environment, Brazilian scientists at the University of Sao Paulo have developed a technique that uses pineapple fiber, banana fiber and other plants to create a new plastic for cars. In contrast to traditional plastics that contain raw materials from oil and natural gas, the fibers is created

with fruits that are completely renewable. "The properties of these plastics are incredible. They are light, but very durable: 30 times lighter and 3 to 4 times stronger, "says one of the researchers. This innovation is an example of bioplastics that reduce the weight of the vehicle and therefore its fuel consumption, the main cause of climate change (“Future We Want”).



TheCivilEngineer.org. “France Bans Common Plastic Bags from Supermarkets.” *The Plastic Pollution Problem in Charts - TheCivilEngineer.org*, www.thecivilengineer.org/news-center/latest-news/item/983-france-bans-common-plastic-bags-from-supermarkets.

In France, there are five billion single-use plastic bags each year, which are distributed a checkout. Their average usage time is only 20 minutes, yet they take up to 400 years to be degraded. Therefore, on 31st March 2016, the law on the energy transition for Green Growth issued a decree imposing the ban on single-use plastic bags in France. Thus single-use plastic bags are now banned in supermarkets, unless they are compostable or bio base. This decree aims to reduce the considerable environmental impacts related to the production and distribution of plastic bags. These measures are part of a European approach, within the European directive of 2015 on packaging. They also constitute an

opportunity to promote French companies that manufacture new biobased or compostable bags (“France's Single-Use Plastic Bag Regulation.”).

Possible Solutions

It is absolutely necessary to further deepen and implement various previous agreements, in all countries, especially the major offenders to achieve international action of magnitude. Instead a creating new summits and agreements, member states should respect the agreements they have signed. For countries with poor waste managements (nearly all LEDCs), governments should put in place a system of waste disposal and correctly manage infrastructure within the regional and national levels. There are endless solutions to the problem, and innovation is key. Prevention is imperative being both cost-effective and better for the environment. Here is a list a few solutions that could be put in place by and in member states. They should be developed in order to create viable, realistic solutions in accordance with the country’s economic situation and culture.

This is a list of ideas of possible solutions to elaborate and create viable clauses :

- Encourage the reuse, recycling and energy recovery of plastics to progressively eliminate the landfilling of recyclable or recoverable plastic waste.
- Promote degradable, biodegradable and compostable alternatives, instead of to single-use, short-lived plastic products. It is also necessary to increase the number and efficiency of plastic waste collection and management systems in countries where they are insufficient.These solutions are already in place in some More Economically Developed Countries (MEDCs), put should be present in more countries for a proper management of plastic waste on a large scale (Global Partnership on Waste Management”).
- Convert jobs in the plastics industry to recycling and create new ones. This can be particularly effective in countries with high unemployment rates. In order for solutions to be sustainable, countries must prepare the economy for the future plastic industry.
- Sensitize consumers and producers on overconsumption, overpackaging, responsible consumption, eco-design and the principle of circular economy. Such education is effective in all member states, and its importance should not be overlooked. Sensitizing producers is also key, as they can then decide to stop overpacking and to use recyclable plastic.
- Increase public and private investment in research aimed at to obtain more durable plastics in order to encourage innovation in sustainable development.

Appendices

Appendix A

Greenpeace report on plastic debris in the World's Oceans from 2006:

http://www.greenpeace.org/austria/Global/austria/dokumente/Studien/meere_Plastic_Debris_Study_2006.pdf

Appendix B

The Honolulu strategy: https://marinedebris.noaa.gov/sites/default/files/publications-files/Honolulu_Strategy.pdf

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