Introduction

In today's world, plastic is defined as a synthetic polymer. Essentially what this means is that it is one large molecule made up of repeating subunits. Polymers are quite abundant in nature, and some examples include silk, DNA, wool, proteins and cellulose. Synthetic polymers are derived from these examples, such as with one of the first-ever plastics celluloid, which was made with an altered form of cellulose called nitrocellulose. The main reason for its invention was to be a suitable replacement for the coveted material ivory, which is mainly found in the tusks of elephants. Thanks to John Wesley Wyatt, the man who invented the plastic, this new alternative to the precious resource helped minimize the excessive hunting of elephants for their tusks.

For all the good that plastics first came with, nowadays we make 99% of our plastics using non-renewable sources such as coal and oil. Not coincidentally, this is a problem due to the fact that the process of mining these resources places heavy strain on the environment, and is a major contributor to the growing issue of climate change. We live in a society where we rely heavily on single use plastic which consists of non-renewable resources. Essentially what this means is that we use plastic products once and then dispose of them in ways that waste the resource. Most plastic ends up in landfills and then gets incinerated. The molecules released when plastic is combusted are extremely toxic to humans, and severely damages ecosystems in the surrounding area as well. Examples of said molecules include furan, dioxin, hydrochloric acid, sulfur dioxide and particulates.

Although plastic in its current state is harmful to the environment due to poor recycling and wasteful habits, researchers are looking for ways to make it more renewable and environmentally friendly. Plastic has brought many benefits since its inception, ranging from the field of medicine, technology, and packaging. Plastic offers a cheap way to create gadgets such as TV's, computer monitors, and cellphones, making them accessible to more people due to the reduced price.
Definition of Key Terms

Plastic

Plastic is a material consisting of a wide range of synthetic or semi-synthetic organic compounds that are malleable and can also be molded into solid objects.

Synthetic

Something made of artificial material, not natural items, can be described as synthetic.

Polymer

A large molecule made up of repeating subunits.

Single-use plastic

Plastics that are meant to be used once and then discarded or recycled. Examples include water bottles, soda bottles, utensils, straws & cups just to name a few.

Microplastics

Small plastic particles that are formed through a process called abrasion. These can be found in oceans, the air, packaged goods and more.

Abrasion

The process of scraping or wearing something away. Plastic products experience this which then create harmful microplastics which get into our food, drinks, etc.

Background Information

Single-use plastics are extremely prominent around the world, with an estimated 50% of all the plastic we use being single-use plastic. In total, taking into account both single-use plastic and reusable plastics, we produce around 300 million tons of plastic per year, with 8 million of it being dumped into our oceans. These plastics are usually used for no more than a day, yet they don't decompose for several hundred years. One bottle of water consumed by an individual today will, in theory, outlast multiple generations of that individual, and the average individual in the EU uses about 31 kg (68 pounds) of plastic per year. At the current rate of consumption, it is estimated that the production of plastic could account for about 20% of the oil industry by the year 2050, however this could be higher seeing as
demand only seems to grow. The plastic we produce is extremely harmful to our environment due to the fact that the fossil fuels we use in the plastic is foreign to all ecosystems on earth, and is toxic to wildlife and plantlife that inhabit these ecosystems.

**Types of plastic**

- Polyethylene Terephthalate (PETE or PET): Water bottles, dispensing containers etc.
- High-Density Polyethylene (HDPE): Milk jugs, grocery bags, soap bottles
- Polyvinyl Chloride (PVC): Shoes, sewage pipes, window frames
- Low-Density Polyethylene (LDPE): Cling wrap, frozen food bags, Squeezable condiment bottles
- Polypropylene (PP): Plastic diapers, tupperware, kitchenware
- Polystyrene or Styrofoam (PS): Disposable coffee cups, plastic cutlery, packing peanuts
- Miscellaneous Plastics: Plastic CD’s, baby bottles, Medical storage containers

**Why single-use plastics?**

Plastic was designed to be a flexible, light yet sturdy material for multipurpose use. This is why we have different types of plastics. The plastic used for Nokia phones needs to be less flexible than that used for a cup but strong enough to withstand constant use. This is why plastic was called the "miracle material" when it was first invented. In addition to being flexible and sturdy, plastic is also extremely resistant to degradation. This is both a blessing and a curse, as it lasts long enough to be used for many years yet if discarded improperly it won't go away on its own for a very long time. Another reason for its prominence in today's society is the fact that it is very inexpensive to produce, so it is most convenient.

**Environmental impact**

Nowadays, approximately 99% of the plastic we produce are made with chemicals derived from fossil fuels and natural gas. This is a problem because these resources are non-renewable and dirty. Whenever we produce these products, we are dirtying the atmosphere and slowly killing ourselves.

Whenever coal is mined, it is required that a large portion of land be cleared to make room for the necessary equipment to be brought in. During this process, vegetation, habitats and ecosystems are destroyed. The mining can also be harmful to nearby water sources if done incorrectly, as the runoff on the land will leak into the nearby water source. Drilling for oil yields similar consequences on the environment. It too disrupts the ecosystem, and if leakages occur, they are devastating to the environment. The oil ruins habitats, killing organisms by sticking to them and poisoning their food.

**Health issues**
Bisphenol A (BPA), an industrial chemical used in the production of certain plastics, has severe effects on health. If ingested in quantities that are too large, it can cause problems with brain development in small children and fetuses. It is also possible that the chemical affects an individual's blood pressure.

**Disposal**

Most plastics we produce are made from non-renewable sources. This means that there is no natural process that can absorb non-biodegradable plastic into the natural biological cycle. Plastic cannot be composted or left to rot, so it must be either recycled or incinerated. Incineration is the worst form of disposal environmentally speaking due to the fact that the fumes produced in the process are harmful.

**Alternatives to single-use plastic**

The most simple alternatives to plastic are glass, metal and paper. Paper is a good substitute for plastic bags which are prominent in grocery stores. Glass, on the other hand, is a great substitute for cups, while metal makes very sturdy and long lasting water bottles. Other creative methods are being experimented with, such as straws made of pasta or bottled water made of an algae that is both biodegradable and edible.

**Major Countries and Organizations Involved**

**U.S.A**

In March of 2019, U.N Member States agreed to reduce their single-use plastic consumption drastically by 2030. The U.S., however, has not fully followed through with this agreement. The U.S. is the second largest producer of plastic, producing 39 million tonnes, with China producing the most at a staggering 60 million tonnes. While there is no national ban on the use of single-use plastics, certain states such as Hawaii and California have banned it of their own accord.

**Canada**

Canada plans to eradicate single-use plastics by 2021. PM Justin Trudeau stated that along with the ban on single-use plastics, Canada will also strive to further reduce plastic pollution. Some items that may be banned include plastic straws, bags, cutlery and plates, however, this is not the finalized list.

**China**
China is the most significant producer of plastic to date, producing 60 million tonnes. The problem is so bad that in 2008, there was a full-on ban on plastic, however the enforcement of this law is very poor.

India

While there are bans on single-use plastics, the results are mixed. Nevertheless, India has vowed to completely get rid of single-use plastics by the year 2022.

UK

Recently, there have been many restrictions placed on single-use plastics in the UK. These restrictions mainly focus on the pollution of the ocean, and limit certain items such as straws, stirrers, etc. Plastic drink stirrers are a problem in the UK, as they are currently used at a rate of 316 million a year.

France

France is the first country to have banned plastic cups. Following its Energy Transition for Green Act, they will also include plastic straws, coffee stirrers, cotton buds and other single-use plastic items. The ban is set for January 1st, 2020.

Timeline of Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Description of event</th>
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<tbody>
<tr>
<td>1862</td>
<td>The first plastic, Parkenstine, was created by Alexander Parks</td>
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<tr>
<td>1865</td>
<td>Celluloid is invented by John Wesley Wyatt</td>
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<td>1891</td>
<td>Rayon is created as a suitable replacement for silk by Louis Berniguat</td>
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<tr>
<td>1907</td>
<td>First ever synthetic plastic, Bakelite, is created by Leo Baekeland</td>
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<tr>
<td>1912</td>
<td>Cellophane is invented</td>
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<tr>
<td>1926</td>
<td>Polyvinyl Chloride is created</td>
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<tr>
<td>1939</td>
<td>Nylon stockings are created by DuPont</td>
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<tr>
<td>1944</td>
<td>German chemist Hans von Pechmann invents polyethylene</td>
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1950-1970  Polyester becomes commercially available but plastic production remains relatively low

1990-1999  Plastic production triples and the amount of waste increases at about the same rate

2000  Plastic waste increases more in one decade than in the last 40 years

2018  The city of Vancouver, Canada became the first major Canadian city to ban plastic straws as part of a plan to remove all solid waste by 2040

2018  In 2018, the Hilton hotel chain announced that by the end of the year it would eliminate plastic straws from its 650 managed properties

2019  Costa Rica plans to ban single-use plastics by 2021

2019  Ikea plans to remove single-use plastic products from its stores and restaurants

2019  The EU approves a ban on single-use cutlery that will come into effect in 2021

**Relevant UN Treaties and Events**

- In June 1992, at the Earth Summit in Rio de Janeiro, Brazil, 178 countries adopted the 21 Agenda, outlining the protection of the environment and the betterment of human lives through a global partnership.
- The first United Nations Environment Assembly (UNEA-1) was held in Nairobi, Kenya in 2014. From June 23rd to June 27th, the countries present discussed the post-2015 sustainable development agenda. UNEA-1 adopted 17 resolutions, among them those on the improvement of air quality, measures to prevent illegal trade of wildlife and taking action regarding marine debris and microplastics.
- In 2015, all United Nations Member States adopted the 17 sustainable development goals for 2030, which included increasing regulations on plastic use.
• In the year 2019 from March 11th to March 15th, the Fourth Session of the United Nations Environment Assembly (UNEA-4) took place in Nairobi, Kenya. UN offices at Nairobi organized the conference around the theme of “Innovative solutions for environmental challenges and sustainable consumption and production.”

Previous Attempts to solve the Issue

According to the UN report: “Banning single-use plastic: lessons and experiences from countries” UN Environment report (2018), 127 countries had placed some restrictions on the usage of plastic bags by July 2018. The effectiveness of these bans and restrictions depended on how well they were planned, implemented and enforced. In regards to enforcement, performance has not been very effective. In countries where enforcement is strong, another problem has arisen in that people are illegally distributing plastic bags.

Possible Solutions

Keeping in mind that bans are not as effective as once thought, another possible course of action would be to directly contact producers and consumers and reach out to them in a more personal manner. Educating the public on the dangers of non-renewable single-use plastics is a great way to get them to think about their consumer habits. Similarly to how children are taught in school to be emotionally invested in these topics, reaching the public is a good way to get producers to act.

Furthermore, groups in different communities such as consumers, local governments, tourism centers, and environmental groups would need to be drawn in on the efforts, which in turn would need to be supported by evidence-based studies to add extra credibility. This credibility can be further reinforced using the aforementioned solution of educating the public to reduce pushback.

Generally, however, the issue of the production, use, and mismanagement of single-use plastic and also all plastics as a whole, is one that will require the combined efforts of individuals, communities, and countries. The first step to achieving this is through proper education, and the best group to begin educating is the people, as they hold the power to influence their communities, plastic producers and governments.
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Appendix or Appendices

I. Bulletin of world action against plastic pollution, including summaries of UNEA conferences, held every couple years. [http://enb.iisd.org/vol16/enb16153e.html](http://enb.iisd.org/vol16/enb16153e.html)

II. List of global efforts to end plastic pollution, concentrated on single-use plastic. [https://www.earthday.org/plasticban/](https://www.earthday.org/plasticban/)


V. A guide provided by UNEP to sustainability and the elimination of harmful single-use plastic items. [https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1](https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1)