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Plastic Waste In The Ocean & Three Ways To Deal With It

If you take a look around you, try to spot something made out of plastic. Pretty easy right? When you no longer need the plastic that you see, what do you do with it? Throw it in the trash bag, that also is made of plastic. Where does this then go? If you live in Europe it's a 30% chance that it gets recycled, if you live in the US the chance is 9% and in the rest of the world even lower. The Communications and Marketing Manager at the Worldwatch Institute, Gaelle Gourmelon writes in a report to Vital Signs Online that "Between 22 and 43 percent of plastic worldwide is disposed of in landfills, where its resources are wasted, it takes up valuable space, and it blights communities"(p.2). As Gourmelon writes, plastic in landfills is a waste of resources, this plastic could instead be recycled and used again. Apart from landfills, every year 10-20 million tons of plastic end up in the world's oceans (Gourmelon, p.4) and it is estimated that 5.25 trillion plastic particles with a weight of 268 940 tons are floating in our oceans as of 2015 (Eriksen et al). These plastic particles and plastic waste that reach our oceans are filled with toxins and cause harm to marine life but also humans. Whales, fish, sea birds and dolphins can get tangled up in plastic nets or bags. Plastic particles are ingested by fish that rise in the food chain until it reaches humans, carrying chemical toxins into our diet. How can this plastic waste be stopped from harming the environment, marine life, and us humans?

First of all, an understanding of what plastic is needs to be established. This material, as explained by the American Chemistry Council is made of "synthetic, long-chain compounds derived from one or more monomers /… / These building-block monomers are derived from oil, natural gas, and increasingly, from bio-based sources" (p.2). Monomers are small, lightweight molecules that can react with other molecules and chemicals to form polymers (American Chemistry Council, p.32). To illustrate this, look at monomers, single molecules, as individual

links. One by one these links are light and easily handled, but several links that connect to each other form a chain. A chain consists of many links and is, therefore, a larger molecule, a polymer that is of significantly larger weight than a single molecule. Plastics are composed like this. Smaller molecules derived from oil, react and form larger chains of molecules, polymers. The bonds created to form these polymers are hard to break which is one reason to why plastic is a non-biodegradable material. The range for plastic to completely biodegrade is accordingly to National Geographic journalist Laura Parker a range "from 450 years to never".

The history of plastic starts roughly together with the industrialization. Plastic is made of oils, so it wasn't invented until the oil had become a significant material for industries in the late 19th century. The production, however, didn't really pick up speed until the 1950s (Parker). Since then, 9.2 billion tons of plastic has been produced and three-quarters of that, 6.9 billion tons have become waste, where 6.3 of that waste never ended up in a recycling system. In the early 1990s scientists were confused about why they didn't find more of the plastic that never was recycled in the oceans and the answer came in 2004 when marine biologist Richard Thompson found and coined the term "microplastics" (Parker). He had discovered that plastic is broken down into smaller bits and pieces, hardly visible for the eyes and, as of 2015 as many as 5.25 trillion microplastic particles were floating in our oceans (Eriksen et al). Parker further explains in her article how Thompson conducted a research of 504 fish of 10 species caught outside of Plymouth, England, a couple of years ago showed that more than a third of the fish had microplastics in their bodies. It's therefore warranted to say that fish digest these microplastics and humans digest the fish which means that the plastic we throw away, end up in our stomachs.

Getting back later to how these microplastics harm us, humans, let's talk about how microplastic and "normal plastic" harm the marine life. One of the most obvious ways is the strangling and entangling plastic cause to fish, dolphins, turtles and even birds. Entanglement in fishing nets, can holders or plastic bags cause the animals to starve, suffocate or hinders them from acting or moving normally which eventually cause death (Murray). Normal sized plastic, as well as microplastic also cause harm to the marine life through ingestion which has devastating results to the species as argued by Elizabeth Royte in the National Geographic article "We Know

Plastic Is Harming Marine Life. What About Us?". Royte explains what microplastics do to the marine animals; "They block digestive tracts, diminish the urge to eat, and alter feeding behavior, all of which reduce growth and reproductive output. Their stomachs stuffed with plastic, some species starve and die". These alarming effects of plastic ingestion together with Thompsons founding about the occurrence of microplastics in fish, show what a great harm plastic poses to marine life.

Furthermore, the ingestion of microplastics by fish and other marine animals result in plastic entering the food chain of other predators, where we, humans are at the top of the food chain. Microplastic is part of our diet, but Thompson was not alarmed by the fact that we're eating microplastic bits. Current research shows that microplastic doesn't go further than the guts of the fish and not the tissue that we eat. However, the toxins and chemicals that plastic contains that can spread and enter the cells and tissue of fish (Parker). Some of these chemicals are listed by Royte in her article; "pigments, ultraviolet stabilizers, water repellents, flame retardants, stiffeners such as bisphenol A (BPA), and softeners called phthalates". She further explains how these additives can cause harm to us humans in a wide, yet frightening way. Royte explains that some of the chemicals disrupt the normal behavior of our hormones which could go as far as being a factor for weight gain. Fetuses and children might experience interference with their brain development due to the flame retardants and Royte also states that "other compounds that cling to plastics can cause cancer or birth defects". However, the causes microplastics and their chemicals can have on humans are hard to detect since human experiments can't be conducted. It wouldn't be ethical to feed humans plastic and chemicals in order to see what happens to them. Therefore there's little research done on the harm the plastic does to us, humans. The positive aspect of this is although the plastic seems to stay in the gut of the fish and doesn't reach the tissue, which we eat. But as argued in Parker's article, it's a fact that chemicals can be found in the tissue of the fish. Based on the effects listed by Royte, is it really worth the chance to "hope" that the microplastic and its chemicals don't reach us? No, they're alarming enough for us humans to start making a change and decrease the amount of plastic waste in our oceans.

There are multiple solutions to how plastic waste in the oceans can be stopped. Actions can be taken by individuals to recycle more and buy less plastic. This though requires access to

effective recycling systems and options for example how to store food without plastics needs to be developed. An effective recycling system can be found in Sweden. In Sweden, 85% of PET plastic bottles are recycled due to a system called panta which is Swedish for a deposit (The Local). When buying a plastic bottle (or aluminum can) in Sweden you pay an extra charge, a deposit of 1 Swedish Krona (SEK) for cans and small bottles and 2 SEK for big bottles which equals 10 and 20 cents (USD), and when these bottles are recycled you get back the deposit. In every supermarket, there's at least one machine where you can recycle the plastic bottles and it has its own verb in Swedish, panta. Therefore it is a common sight to see Swedes carrying big trash bags of bottles and cans to the store to recycle them and get back their deposit that they can use as a coupon in the store or as kids do, exchange it for a couple of dollars and buy themselves a treat. Homeless people usually take advantage of this system by looking for plastic bottles in public areas or trash cans which enables them to collect a large number of bottles that they can recycle, which will give them enough money to buy food. Sweden's goal is that 90% of the consumed bottles should be recycled and there are active campaigns that call on the people to recycle their bottles (The Local).

So, the individual in Sweden contribute to the massive recycling of bottles but the initiative is driven by the government and recycling associations. Similar systems like Sweden's panta can be found in, for example, Norway and Germany but this is a system that needs to spread worldwide since everyone benefits from it (The Local). This means that the perspective has to be broader, it's not just the individuals cause to save the planet, governments all around the world has to step up to the table and initiate recycling system in their countries. Especially in countries where the water is not clean enough so that everyone has to drink water from water bottles which create a huge number of plastic bottles that just goes in the trash. A solution to reduce the plastic waste would, therefore, be that countries like Sweden share their experience and knowledge with other countries and that other countries are open to reform their waste management systems.

Therefore the perspective has to become even broader, looking at international collaborations and initiatives. In October 2018 the EU voted on banning single-use plastic materials by 2021. These materials include, for example, straws, cups, plates, drink stirrers and

plastic utensils (Andrews). Apart from this complete ban, single-use plastic like food packaging and other plastic items to which there is no alternative yet has to be cut down. By 2025 plastic food packaging has to be reduced by 25%, plastic bottles will have to be recycled to a rate of 90% and cigarette stumps will be required to be reduced to 50% and then by 2030 to 80% (Andrews). This initiative, to ban and reduce single-use plastic was taken across borders and across nations in the EU. However, Europe is not the region that manufactures the most plastic in the world. 22.9% of the world's plastic is produced in Europe and former Soviet Union states whereas North America comes close with 19.8%. China stands for the largest amount of plastic manufacturing with 24.8% and the rest of Asia produces 20.8% (Gourmelon p. 2). Therefore bans like the one EU voted for in October of 2018 has to be established by governments in the other regions of the world.

Introducing recycling systems and bans is not the primary solution though, the biggest step, the best solution lays in the hand of the world's most prominent companies. As argued by the executive director of Greenpeace USA, Annie Leonard, "Recycling alone will never stem the flow of plastics into our oceans; we have to get to the source of the problem and slow down the production of all this plastic waste". In order to do so, Leonard argues that it is the companies that produce plastic items or products sold in plastic packaging, that need to lead the way in the decreasing of plastic production, thus also reducing the potential plastic waste that could end up in our oceans. Leonard further states the fact that drink companies produce 500 billion single-use plastic bottles every year and to agree with Leonard, these companies have to make a change, in order for the earth to see a change.

You may ask yourself now, how am I supposed to live without plastics? The answer is that you don't stop living with it completely, just reduce your amount of plastic in your surroundings since plastic, in fact, has several benefits. Plastic has increased our living standards drastically and helps in, for example, decreasing food waste and lower the gas mileage by enabling lighter cars. All of which is a positive contribution when you look towards, for example, climate change. However, you don't have to live without plastic, but change your habit of plastic use. If you, as an individual use less plastic bags or bottles, and someone else uses less and so on it leads to a massive decrease in the use of plastic, so companies have to decrease their

production. If single-use plastic items get banned, reusable or recyclable items will be the alternative. To be honest, plastic is beneficial to us humans in many ways, but it is the excessive use that is the problem.

To decrease the excessive plastic use, plastic alternatives must be introduced and spread. Instead of plastic straws, paper straws can be used. Sure, you can't leave them in your drink forever but just enough to finish your drink in a fashionable time. Also, ask yourself do you really need a straw? Most drinks can be enjoyed without them, reducing a lot of plastic waste. Next time you go to a restaurant or order a drink, you can start reducing plastic waste by refusing the straw! Drink without a straw! I promise you that it's possible! Next, plastic cups and lids need a replacement. The answer is simple, paper cups and lids! Paper cups are already widely used and paper lids are starting to spread, but in order to reduce the plastic waste created by, for example, plastic lids for coffee cups, a company like Starbucks must be held accountable. If Starbucks replace their plastic lids all over their coffee shops, all over the world, imagine how much plastic waste that can be reduced. Picture this. You buy coffee once a day at Starbucks, which equals seven lids per week. One lid equals 3 grams which roughly adds up to 1000 grams per year in lids that you buy. 1000 grams, 1 kg, 2.2 lbs of plastic waste created by you, every year just from plastic lids. A thousand people with this Starbucks habit adds up to 1 ton of plastic waste, a number that is alarming. So, if Starbucks takes its responsibility, as advocated by Leonard, that prominent drinking companies should, thousands, maybe millions of plastic waste could be reduced annually. In Sweden, there is an established substitute for plastic when it comes to food storage. It is called tetra pak and is cardboard boxes with waterproof linings that are used to store any liquid grocery product such as milk, juice or yogurt. When the food product is finished the package is rinsed and washed out in order to recycle the cardboard. So, there are alternatives to plastic out on the market already. Companies and countries must have to open their eyes, be held accountable and make a change.

In conclusion, there is excessive use of plastic that is harming the marine life in oceans and therefore also us humans. In order to stop this, companies need to take responsibility for their plastic production. More initiatives like the EU banning the production and selling of single-use plastic items need to break ground. Individuals must be more responsible with their

use of plastic and advocate for broader recycling options. Combining these solutions the excessive use of plastic that is causing damage to our oceans, the marine life and us humans can be stopped. Look around you and try to spot a plastic item. How many more times can you actually use that item? Could you have bought that item but made of another material? All I'm asking is for you to look around you, and see how YOU, can contribute to a healthier life for the oceans as well as your fellow humans on this earth.

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