

Committee: Environmental Sub-Commission 2 (EC2)

Topic: Exploring the issue surrounding the Great Pacific Garbage Patch (GPGP)

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Topic Introduction

As the human population increases, so does its impact on the environment and the world surrounding it. Human activity produces a constantly growing amount of waste which renders its disposal a tricky process; disposal units, landfills, incineration, recycling and waste compaction are only a few of the many waste disposal methods that are being employed in an effort to deal with the 2.12 tons of trash that are being generated annually¹. Unfortunately though, no matter how much effort is put in towards the correct and sufficient waste management of debris, a certain percentage of waste is mishandled and improperly disposed resulting in environmental pollution. Man-made products are usually not biodegradable, with their decomposition being an onerous and extremely polluting process. One representative example of said cases constitutes the Great Pacific Garbage Patch (GPGP), in which tons of debris have accumulated and cannot easily degrade or decompose.

The GPGP, or also commonly referred to as the Pacific trash vortex is a collection of waste and litter, thrice the size of France², that is circling among currents in the North Pacific ocean. Plastic and other debris that have been discarded into the ocean and have shown resilience in the marine environment, are transported with the aid of currents and progressively accumulating in the patch. This phenomenon provides a shocking portrait of humans' impact on the environment and has captured the attention of various stakeholders which are all trying to grasp its impact and explore its gravity. Just as this year's conference theme indicates, "Sustainable Consumption and Production" need to be permanently adopted for the problem to be eradicated.

¹ *The World Counts*. www.theworldcounts.com/challenges/planet-earth/state-of-the-planet/world-waste-facts.

² The Ocean Cleanup. "The Great Pacific Garbage Patch | the Ocean Cleanup." *The Ocean Cleanup*, 4 Jan. 2024, theoceancleanup.com/great-pacific-garbage-patch.



Definition of key concepts

Ocean Gyre

An ocean gyre is generally defined as a large-scale “circular pattern of ocean currents”³ formed by global wind patterns and forces created by Earth’s rotation. They are categorized into five major ones; the North Atlantic Gyre, the South Atlantic Gyre, the North Pacific Gyre, the South Pacific Gyre, and the Indian Ocean Gyre.

Marine Debris

Marine Debris, also commonly referred to as marine litter, refers to “any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment”⁴. More specifically, marine debris consists of items that have been used by people and were deliberately discarded, accidentally lost or indirectly brought into any large body of water such as rivers, the sea or beaches. Marine debris comprises of various material types including plastics, metal, glass, paper and cardboard, clothing and textiles, processed timber and rubber.

Garbage Patch

A Garbage Patch is defined as “a very large area of waste material, especially plastic, which collects together in the ocean because of the movement of currents”⁵. Generally, garbage patches are created as debris accumulates and drifts into ocean gyres.

Microplastics

The term microplastics refers to “small plastic pieces less than five millimeters in length which can be harmful to the environment, especially marine life. They originate from a variety of sources including

³ Gyre. 12 June 2024, dictionary.cambridge.org/dictionary/english/gyre.

⁴“Marine Litter.” *UNEP - UN Environment Programme*, www.unep.org/topics/ocean-seas-and-coasts/regional-seas-programme/marine-litter.

⁵“Definition of garbage patch noun.” *Oxford Learner’s Dictionaries*, www.oxfordlearnersdictionaries.com/definition/english/garbage-patch.



larger plastic debris that degrades into progressively smaller pieces”⁶. They are not biodegradable and thus persist in the environment that they are left at, polluting it.

Stranding

Stranding is when animals are found “dead, either on the beach or floating in the water, or alive on the beach and unable to return to the water”⁷. Some causes that lead into animal stranding include diseases and viruses, starvation, unusual weather or oceanographic events, entrapment or entanglement in fishing gear, etc., all of which can be brought about by the GPGP.

Background Information

Trash vortex: The Great Pacific Garbage Patch (GPGP)

The GPGP is considered to be the largest of the five garbage accumulation zones. Situated halfway between Hawaii and California, the GPGP comprises of around 100,000 tonnes of plastic debris which account for a range of 1.1 to 3.6 trillion pieces of plastic⁸. Garbage that ends up in the ocean near the west coast of the United States and the east coast of Japan, travels with the aid of currents towards the GPGP where it gets trapped inside the ocean gyre. There, the plastics slowly degrade breaking down into tiny particles which harm the marine environment and ecosystem. Unfortunately, this phenomenon has been persistent for a long time; unintentionally discovered by a racing boat captain, Charles Moore, in 1997, the GPGP has been growing in popularity ever since. Scientific and laboratory research has indicated that some of the debris that is located in the patch dates way back to the 1970s⁹ when plastic consumption skyrocketed.

⁶“Microplastics.” *UNDRR*, 7 June 2023, www.undrr.org/understanding-disaster-risk/terminology/hips/ch0014#:~:text=Microplastics%20are%20small%20plastic%20pieces.and%20NOAA%2C%20no%20date).

⁷Fisheries, NOAA. “Understanding Marine Wildlife Stranding and Response.” NOAA, www.fisheries.noaa.gov/insight/understanding-marine-wildlife-stranding-and-response#:~:text=Whales%2C%20dolphins%2C%20and%20porpoises%20,to%20return%20to%20the%20water.

⁸ The Ocean Cleanup. “The Great Pacific Garbage Patch | the Ocean Cleanup.” *The Ocean Cleanup*, 4 Jan. 2024, theoceancleanup.com/great-pacific-garbage-patch.

⁹ Kostigen, Thomas M., and From Discover Magazine. “The world’s largest dump: the great pacific garbage patch.” *Discover Magazine* 10 (2008).





Figure 1: A highly contaminated area of the GPGP¹⁰

Impact on the Marine Environment

Undeniably, plastic pollution, particularly at such a high concentration, poses great threats to the marine ecosystem. First and foremost, degrading debris breaks down to various toxic particles, including microplastics, which have the ability to absorb and concentrate toxic chemicals, polluting the environment in which they are found. In addition to that, due to their small size they can easily enter the food chain and introduce various health risks for different trophic levels, including indigestion and suffocation. Larger debris in particular such as fishing nets and beverage holders, pose the danger of entanglement and suffocation for many marine species including turtles. Apart from the effects of degrading debris to ocean flora and fauna, it is also generally constated that plastics degrade into methane and ethylene, two compounds that contribute to and accelerate climate change¹¹.

¹⁰ marketing75036. "The Great Pacific Garbage Patch: Think Trash Soup, Not Trash Island." *Seaside*, 22 July 2022, www.seasidesustainability.org/post/the-great-pacific-garbage-patch-think-trash-soup-not-trash-island.

¹¹ United Nations Environment Programme. "Double Trouble: Plastics Found to Emit Potent Greenhouse Gases." *UNEP*, www.unep.org/news-and-stories/story/double-trouble-plastics-found-emit-potent-greenhouse-gases.

Impact on Public Health

Apart from its negative impact on the marine ecosystem, the GPGP affects humans as well. As microplastics get absorbed into marine fauna, they travel up the trophic levels of a food chain and can eventually get consumed by humans as well. This process is referred to as bioaccumulation and more specifically occurs when a chemically contaminated species gets consumed by others of the same food chain, a process which increases the concentration of chemicals inside the organism's tissues and organs. In addition to that, microplastics and other chemicals produced by degrading debris often render swimming an unsanitary practice. Lastly, a lot of microplastics go through the evaporation and precipitation processes, traveling and polluting the atmosphere as well. The inhalation of microplastics poses various health risks including lung tissue damage, coughing and breathlessness.¹²

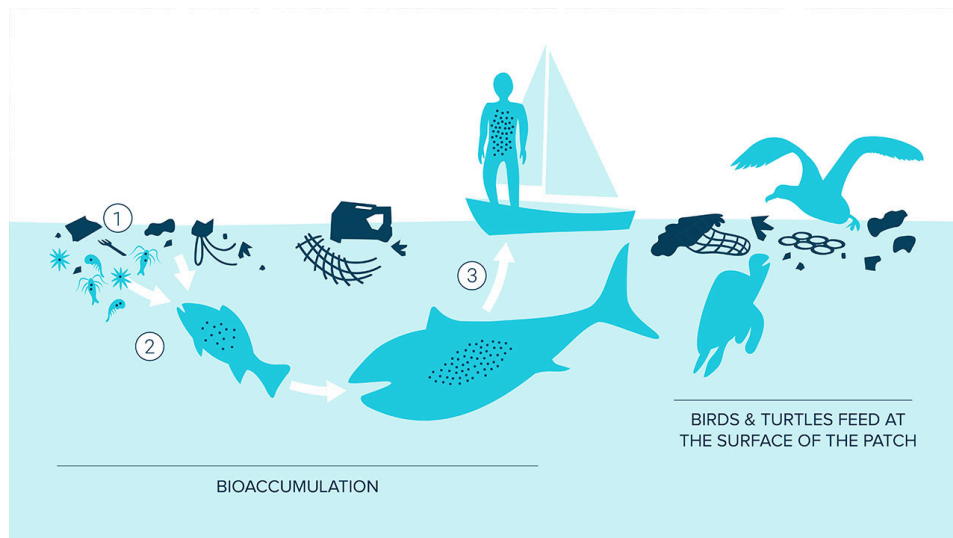


Figure 2: Illustration depicting the process of bioaccumulation¹³

¹² Van Uffelen, Carina. "How Damaging Is Breathing in Microplastics? - Plastic Soup Foundation." *Plastic Soup Foundation*, 18 June 2020, www.plasticsoupfoundation.org/en/2018/03/how-damaging-is-breathing-in-microplastics.

¹³ The Ocean Cleanup. "The Great Pacific Garbage Patch | the Ocean Cleanup." *The Ocean Cleanup*, 4 Jan. 2024, theoceancleanup.com/great-pacific-garbage-patch.

Socio- Economic Impact

The GPGP and ocean pollution in general, posing so many risks and dangers to human health and the environment, require a lot of resources and attention globally. Unfortunately, however, this has a negative effect on the economy, preventing innovation in other domains and threatening the financial state of those involved. Apart from that, the aesthetic beauty of coastal regions is reduced as they are filled with debris, while people may refrain from visiting for sanitary reasons. This situation negatively impacts beach communities by harming coastal tourism and affecting the overall economy of such areas.

Challenges Imposed by the GPGP

While directly removing the trash that lies in the GPGP is the ultimate solution, an initiative as such is far more complex than it may seem. Due to the big size of the patch, as well as its constantly changing shape and density, conventional methods of clearing up the water are rendered ineffective and extremely costly. Additionally, the current methods that are being employed to clean up the patch, have been accused of endangering, harming and possibly killing sea creatures by accident. Lastly, it is said that these efforts are extremely polluting since their operation requires the combustion of many polluting fuels, and thus uncertainty prevails as to whether this initiative is overall worth pursuing.

Major countries/ organizations and alliances

Japan

Research indicates that $\frac{1}{3}$ of the plastic accumulated in the patch originates from Japan¹⁴. This can be greatly attributed to the country's significant fishery industry as well as to many natural disasters that have affected Japan's cities. Particularly during the 2011 earthquake and tsunami, large amounts of debris were washed offshore, eventually ending up in the patch. However, despite Japan's unfavorable past, the country is actively trying to contribute in efforts to ameliorate the situation. More specifically, the Japan Ministry of Environment has given various research grants to many NGOs

¹⁴ Ritchie, Hannah, and Max Roser. "Most Plastic in the Great Pacific Garbage Patch Comes From the Fishing Industry." *Our World in Data*, 28 Dec. 2023, ourworldindata.org/plastic-great-pacific-garbage.



with the aim of studying the debris that is accumulating in the patch. Additionally, the Japanese government has enacted various legislative measures promoting the recycling, reusing and reducing of plastic product usage. In short, Japan, despite its unfortunate past with the creation of the Patch, is actively engaged in efforts to reverse the situation.

United States of America (USA)

The United States, both contributed a lot to the creation of the Patch, but also is one of the main stakeholders involved with it. Funding and contributing in many initiatives not only to address the GPGP itself but also plastic pollution in general, the US is undeniably a major participant in efforts to clean up our world's oceans. So far, the country in collaboration with the Environmental Protection Agency (EPA) as well as the National Oceanic and Atmospheric Administration (NOAA), have conducted groundbreaking research, studying and monitoring the patch's behavior and debris. Finally, alongside the country's scientific research, the complementary dedication of some of its resources into the cleaning of the GPGP would be an optimal solution.

The Ocean Cleanup

The Ocean Cleanup is a Non Profit Organization, founded in 2013 by Boyan Slat, that develops technologies to clear the world's oceans of plastic. So far, the Ocean Cleanup has gained recognition from various stakeholders, including the UN, and through donations and the aid of individuals, governments and institutions it is channeling all efforts towards clearing up the oceans. Particularly, the organization is orchestrating an initiative to pick up trash from the GPGP with a goal of removing 90% of floating plastic from Earth's oceans by 2040¹⁵.

Previous attempts to solve the issue

Research and Cleanup Efforts

Until now, various stakeholders have attempted to address the issue of the GPGP. Research, attempts to map and understand the patch, expeditions to measure its density and width as well as initiatives to pick up debris from it, have all contributed in ameliorating the situation. More specifically, various

¹⁵ For more information you can visit their site: Slat, Boyan. "Oceans | the Ocean Cleanup." *The Ocean Cleanup*, 6 Mar. 2024, theoceancleanup.com/oceans.



organizations have crafted innovative methods of picking up debris from the world's oceans, such as System 001 by the Ocean Cleanup which consists of a wide barrier that surrounds and targets the debris in the patch, Seabin V5 a vacuum like design that pumps water and filters the pollutants out of it, and even some magnetic coils that can be used to break down microplastics with the help of some chemical reactions. All of these groundbreaking initiatives alongside the eyeopening researches and studies that have helped us monitor, measure and visualize the patch, can ultimately contribute to its cleanup.

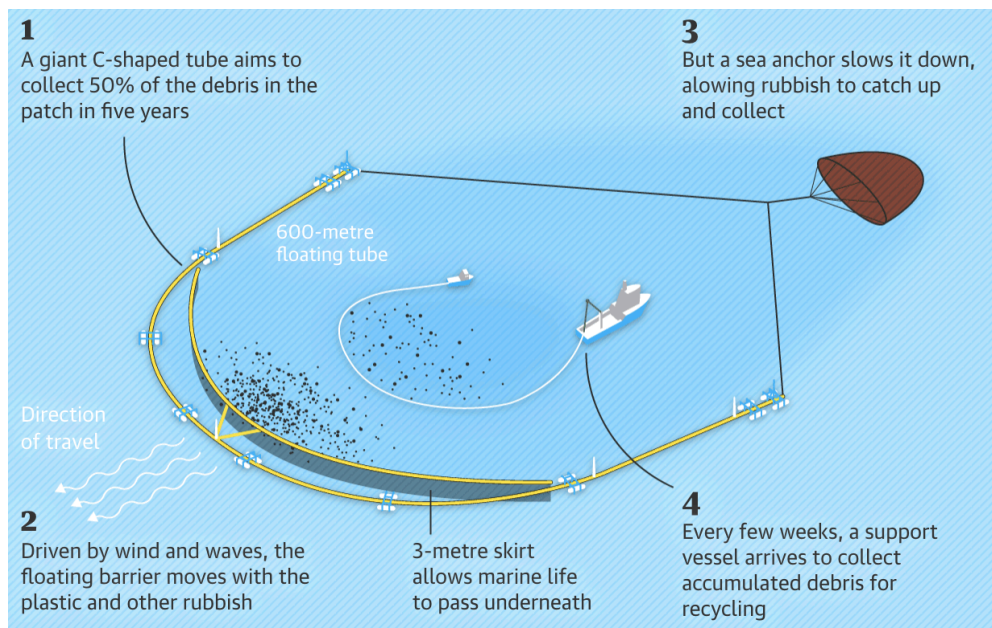


Figure 3: Visualization of System 001 by the Ocean Cleanup¹⁶.

UN Involvement

The UN and its organizations have shown their evident engagement on the topic through various measures and initiatives that they have taken. The UN in particular holding the Ocean Conference, promotes and fosters the ideals that are necessary to protect our oceans. Additionally, through the 14th Sustainable Development Goal¹⁷ (Life Below Water) which aims to conserve and sustainably use

¹⁶ Menezes, Fino. "Boyan Slat's 'the Ocean Cleanup' Successfully Collects Plastic for First Time - BrightVibes." *BrightVibes*, 20 Sept. 2023, www.brightvibes.com/boyan-slat-the-ocean-cleanup-successfully-collects-plastic-for-first-time.

¹⁷ *Goal 14 | Department of Economic and Social Affairs*. sdgs.un.org/goals/goal14.

our oceans, the UN emphasized the need to protect the marine environment from pollution, while generating discussion on the topic. Overall, while not specifically issuing the GPGP, this could be considered as a great starting point in channeling global interest towards the cleanup of our oceans. Finally, the UN, through various regulations and legislative measures, has focused on reducing ocean pollution and protecting marine life.

Possible solutions

Cleaning up the garbage patch

Neglecting the situation and leaving the debris that has accumulated in the patch as it is, is by no means a viable solution. On the contrary, it is of utmost importance that efforts are made to remove the majority of debris that has accumulated in the Patch. Funding and participating in attempts to clean up the patch, initiating research and innovation, and generally contributing in all efforts to address the GPGP in the most cost and time effective manner possible, are all greatly shot out for. In any case, clearing the oceans completely from debris and plastics is impossible, since microplastics are very hard to capture. Despite that, removing a significant majority of debris is not unattainable. By collaborating with engaged stakeholders, such as the Ocean Cleanup and the United Nations Environment Programme (UNEP), countries should collaborate to find different cleanup methods such as magnetic coils, Seabin V5¹⁸ and System 001¹⁹. Generally, setting international goals and deadlines for how much debris should be removed, is critical in boosting progress.

Implementation of preventative measures

Apart from orchestrating the removal of the garbage from the patch, it is crucial to focus on bettering waste management in order to prevent other debris from entering the ocean and worsening the situation. Stakeholders including member states, NGOs and UN entities, need to collaborate and craft solutions to promote and strengthen the management and disposal of waste both on a national and international level. Additionally, an optimal solution would be to minimize waste by promoting the

¹⁸Nature Certificates: *Combatting Microplastics and Ocean Pollution*. seabin.io/home.

¹⁹The Ocean Cleanup. "System 001 • Milestones • the Ocean Cleanup." *The Ocean Cleanup*, 23 Mar. 2022, theoceancleanup.com/milestones/system001.



reusing and recycling of products, and adopting a circular economy model in all domains, meaning a system of production and consumption which extends the lifecycle of products. Regardless, it is critical that attention is paid to prevent a phenomenon such as the GPGP from recurring.

Application of measures to combat the consequences and impact of the GPGP

When addressing the GPGP itself, it is important to also address the ecosystems it has already affected. Protecting marine life and ocean fauna and flora could ultimately contribute to this initiative's whole goal; protecting our oceans. Governments, the civil society, the private sector, UN entities, etc., all need to collaborate in order to protect and conserve the oceans and the species that inhabit them. Rescue operations initiated by engaged Non-Governmental Organizations (NGOs), which aim at disentangling animals trapped in debris, initiatives to heal wounded animals as well as prevent animal stranding, are a key step in restoring marine wildlife and ecosystems.

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