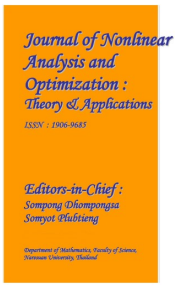
Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 15, Issue. 1, No.10 : 2024
ISSN :**1906-9685**



EXTRACTION OF PLASTIC FROM RIVERS AND OCEANS BY UPGRADING SYSTEM 002 TO SYSTEM 003

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Global plastic pollution is a serious issue. Both the land and the seas are impacted. On the other hand, monitoring plastic contamination on land is much easier than on water.

ABSTRACT: Millions of tons of plastic debris enter the oceans each year; much of it overflows from rivers. Some of this plastic ends up in ocean garbage patches, where it gets entangled in a current vortex with plastic from other sources, like offshore fishing operations. Plastic pollution will worsen our ecosystems, human health, and aquatic life if nothing is done [1]. The Ocean Cleanup Array is a practical and viable way to remove significant volumes of plastic pollution from a major accumulation zone, according to the study detailed in this feasibility report. According to computer models, floating barriers work well for gathering and concentrating floating plastic waste. Using a 100 km Array, it is possible to reach a cleaning efficiency of 42% of all plastic inside the North Pacific gyre in ten years when combined with ocean circulation models to calculate how much plastic would contact the structure. It has been established that this Array may be constructed and installed with the materials and technology available today in cooperation with offshore specialists [2,3].

Using a combination of cutting-edge technology, data-driven tactics, and a dedication to sustainability, The Ocean Cleanup seeks to eliminate 90% of ocean plastic pollution. The organization concentrates on developing cutting-edge technologies to remove plastic waste from the world's oceans [4,5]. Their approach is entered around passive systems that utilize ocean currents to concentrate and capture debris. The largest concentration of ocean plastic waste is the Great Pacific Garbage Patch [6].

Keywords: *SYSTEM 001, MR. Trash Wheel, Interceptors*

INTRODUCTION

In the context of ocean cleaning, the more effective and efficient use of systems to remove plastic from rivers and oceans. Micro, macro, meso, and nanoplastics are among the plastics found in the ocean water [7].

In this project, we clear plastic out of rivers and oceans with this effort. The goal of the ocean cleaning is to get rid of plastic waste.

1.1 where does the plastic in our oceans come from?

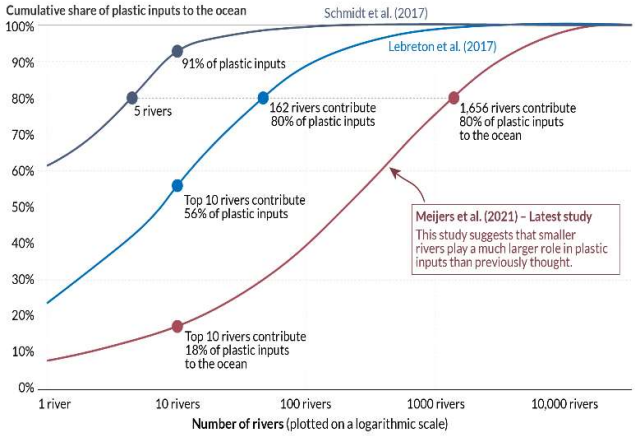

Figure-1.1: The major rivers are responsible for ocean plastic pollution

This has a significant impact on how we tackle the plastic pollution issue. If the majority of the issue originated from five rivers, then that is where we should concentrate most of our efforts. a focused strategy. However, if thousands of rivers are involved, mitigating measures will need to be implemented across a far larger area. Why do the most recent findings differ so much? The earlier research was based on less complex models of trash generation in river basins across the globe. They collected data on population density, the quantity of improperly managed waste produced in each basin, and correlation models of plastic contents in surface rivers. They then modelled the level of pollution from basins without recorded data on river plastics using these correlations. [8,9,10]This meant that the extremely large river basins with their dense populations and inadequate waste management techniques were thought to be the main emitters. The largest rivers that topped the list were the Amazon in Brazil; the Yangtze, Xi, and Huangpu rivers in China; the Ganges in India; the Cross in Nigeria [11,12].

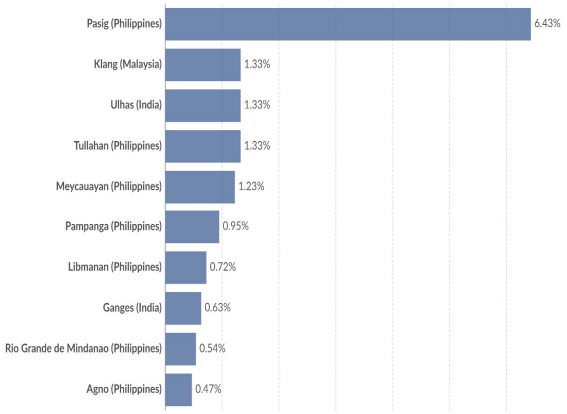

Figure-1.2:plastic pollution that comes from the world's ten largest emitting rivers.

Philippines rivers make up seven of the top 10.[13,14,15] One is in Malaysia, and the other two are in India. 6.4% of the plastic debris found in rivers worldwide comes from the Pasig River in the Philippines alone. This presents a significantly different image from previous research that found that the major rivers in Asia, the Ganges in India and the Yangtze, Xi, and Huangpu rivers in China, were dominant.

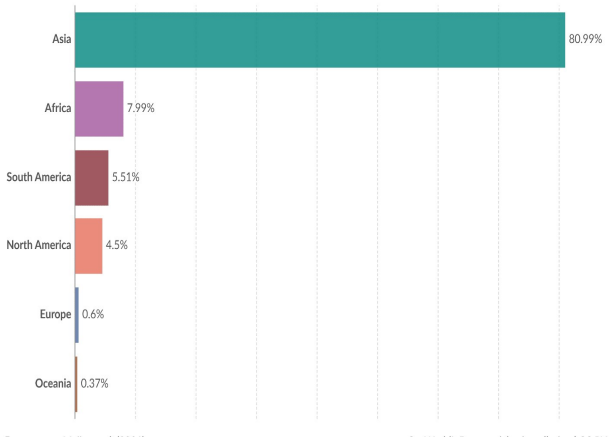

Figure1.3:Global plastic waste emitted to the ocean.

1.2 TYPES OF PLASTIC WASTE IN OCEANS

1 Cigarette butts (contains plastic filters)
2 Food wrappers
3 Plastic beverage bottles
4 Plastic bottle caps
5 Plastic grocery bags
6 Ghost nets
7 Aluminium cans

1.3 THE PROBLEM OF PLASTICS IN THE OCEANS

Today, plastic is found in practically everything we use, including clothing, cars, and medical equipment. Since plastic doesn't biodegrade until a millennium after it is dumped, the world created about 350 million tons of plastic in 2017. As a result, there are currently over 6.3 billion tons of plastic garbage languishing in landfills, damaging both aquatic and terrestrial environments worldwide [16,17,18].

Plastic pollution is the accumulation of plastic objects and particles (such as plastic bottles, bags, and microbeads) in the Earth's environment that negatively impacts people, wildlife, and their habitat. Plastics that behave as pollutants are classified as micro-, meso-, or macro debris based on their size. Manufacturers choose to use plastic over other materials because it is inexpensive, durable, and highly adaptable for various uses; however, the chemical makeup of most plastics makes them resistant to many natural processes of degradation, which results in their slow degradation [19,20]. Combined, these two characteristics allow large volumes of plastic to enter the environment as mismanaged waste that stays in the ecosystem and moves throughout food webs.

- Plastic destroys fish and other marine life, and it takes hundreds of years for it to decompose into less toxic substances.
- According to research, the amount of plastic debris in the oceans has tripled from 16 trillion pieces in 2005. Inaction might cause it to almost quadruple by 2040, according to scientists.
- There are 165 million tonnes of plastic waste floating around in the ocean. Plastic in the ocean may surpass all fish in 32 years. Furthermore, most plastics are not biodegradable. Thus, it will always be in the ocean.
- Marine life is put in risk by plastic, which even finds its way into our meals.

- It has been observed that persistent organic pollutants in the marine environment adhere to the surface of plastic waste, and that contaminants are carried by ocean currents and accumulated on floating plastics in the water.

1.4 FACTORS AFFECTING OCEAN PLASTIC

- Land based sources.
- Rivers and waterways.
- Maritime activities.
- Tourism and recreation.
- Lack of recycling and circular economy.
- Single use plastic.
- Microplastics.
- Global distribution.

1.5 OCEAN SYSTEM

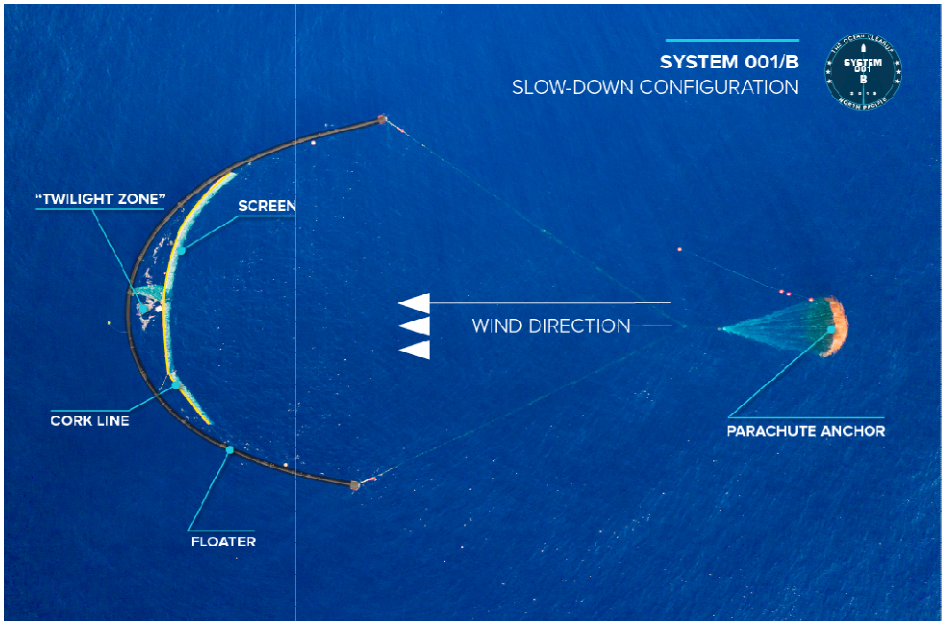

Figure-1.4:The successful System 001 design includes an underwater parachute to ensure the device drifts at a slower speed than plastic debris, and a screen suspended between the floaters that captures plastic pushed into it by the wind.

The latest Jenny design uses a towed, floating structure. The structure acts as a containment boom. [21,22]A permeable screen underneath the float catches subsurface debris. It incorporated an 800 m (2,600 ft) barrier and added active propulsion to allow the system to operate at higher speed. Crewed boats tow the U-shaped barrier through the water at 1.5 knots. The ship can also be steered to areas with higher waste densities. In July 2022, the floating system reached the milestone of 100,000 kg of plastic removed from the Great Pacific Garbage Patch.

1.6 OBJECTIVE OF THE STUDY

The objective of the research are:

- To create a future where the oceans are free of plastic pollution, allowing marine ecosystems to thrive and ensuring a healthy environment for future generations

2 METHODOLOGY

2.1 SYSTEM 001

The barrier known as System 001 spans 62 miles. Microplastics and ghost fishing nets from the Great Pacific Garbage Patch are its primary targets.[23,24,25] This system is a creation of the Ocean Cleanup. The barrier, which separates California from Hawaii, takes out about 80,000 tonnes of trash from the ocean annually.

The system's design enables it to efficiently collect plastic and garbage by moving in time with ocean currents. The plastic is taken out of the system after it is full. Experts have been attentively observing System 001 ever since its first launch to make sure it doesn't interfere with marine life. System 001 was developed by the Ocean Cleanup to save the marine ecosystem by removing plastic before it turns into microplastics.

Figure-2.1: System 001 deployed in the Great Pacific Garbage Patch

RIVERS

Our Interceptors are capturing plastic in highly polluting rivers around the world, preventing plastic emissions reaching the ocean adding to pollution in the oceans.

2.2 MR. TRASH WHEEL

Mr. Trash Wheel is a technology created by Clearwater Mills, LLC to collect trash from rivers and streams. The layout is cleverly done. [26,27]One piece of technology is a water wheel. Plastics and other trash are collected by the revolving wheel from the water body and converted into electricity. Up to 38,000 pounds of garbage can be removed by it every day. It has kept 1.6 million pounds of trash out of the ocean so far.

It can gather not only garbage but oil slicks as well. The collected rubbish is moved via a conveyor belt on a floating barge that is fueled by solar energy and river currents. After that, the garbage is burned to create energy. Any debris that flows down the river, including mattresses, tyres, and even trees, can be collected by the sturdy conveyor belt. Additionally, the conveyor belt moves very slowly, giving any straying animals plenty of opportunity to get away from the machinery. Mr. Trash

Wheel's design enables it to function in tidal streams and other similar situations. Thus, even with water flowing upstream, the wheel will continue to function [29,30].

Figure-2.2: Mr. Trash Wheel deployed in Inner Harbor in Baltimore, Maryland

2.3 INTERCEPTOR 019

In order to begin the initial phase of a multi-year project to clean the Chao Phraya river, the Ocean Cleanup has launched Interceptor 019. [31,32,33]We're working with our partners to solve plastic pollution in Bangkok's busiest river and stop hundreds of tonnes of trash from entering the Gulf of Thailand annually by combining our technology, personnel, and research capabilities.

Figure 2.3: Interceptor 019 in Chao Phraya River in Bangkok, Thailand.

In order to determine where plastic pollution is entering the Chao Phraya, Ocean Cleanup will investigate the movement of plastic garbage across Bangkok. [34,35]We'll apply our technological know-how to help intercept that waste in the upcoming phase of the project, rehabilitating the Chao Phraya and having a major influence on plastic emissions into the Gulf of Thailand.

3 DATA COLLECTION

3.1 DATA COLLECTION AT NEAR BY LOCATIONS

Figure 1Pastic contamination at the site where it was discharged into a pond or lake nearby location

- Drainages
- Streams
- Rivers
- Lakes

MAJOR RIVERS ARE AFFECTED BY PALSTIC POLLUTION

In India rivers and streams are in serious danger because to plastic pollution.The river's waterways are becoming more and more contaminated by plastic pollution as a result of milk bottles, food packing films, and abandoned plastic bags.

Figure 2 Plastic at Ganga River, Varanasi

4. CONCLUSION

In conclusion, the collection of plastic from rivers, oceans, streams, and other water bodies is a critical step in addressing the global issue of plastic pollution.[36,37,38] Various technologies and approaches, including river interception, drone technology, cleanup vessels, autonomous cleanup systems, volunteer cleanup events, community engagement, policy and regulation, and innovative solutions, are being employed to remove plastic waste from waterways.

Efforts to collect plastic from water bodies not only help prevent further pollution of the oceans but also protect marine life, reduce the impact of plastic on ecosystems, and contribute to cleaner and healthier environments for both wildlife and humans. However, while collection efforts are essential, they are just one part of a comprehensive strategy to address plastic pollution. [39,40]It is also crucial to focus on reducing the production and consumption of single-use plastics, promoting recycling and waste management, and raising awareness about the importance of protecting our oceans and waterways.

By continuing to innovate, collaborate, and take action at local, national, and global levels, we can work towards a future where plastic pollution is significantly reduced, and our oceans and waterways are cleaner and more sustainable for generations to come.

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