Motivation of the Project

Why are we undertaking this?

Zilong used to watch TikTok for entertainment. There is a giant island which consists of ocean garbage in Pacific Ocean, and it called Great Pacific garbage patch.

We selected this project after witnessing our shoreline being covered with plastic following each storm. Those wash-ups clog drains, flood streets, compel beach closures, and subject families to smoke and tainted seafood. Our inspiration is to address the source, not simply tidy up the mess: prevent leakage on land, capture trash at river mouths and storm drains, and manage difficult-to-recycle plastics responsibly. It brings quick relief while building a healthier, more robust shoreline.

Why is it significant?

It causes direct harm to marine life through entanglement and ingestion. It destroys ecosystems by influencing natural processes.

1. There is survey which estimate 1.7 to 4 million tonnes of plastic, and possibly up to 12 million tonnes, enter the ocean annually.

2. An estimated 300,000 whales, dolphins a year die from gear entanglement. A huge damage to Ocean species.

Problem Statements

Coastal communities and environmental groups around the world struggle with the nonstop illegal dumping of plastic into the ocean. Because the high seas don’t have strong international rules or monitoring, there is a gap in accountability that lets violators act freely. If this gap isn’t fixed, both ocean health and the people who depend on it will continue to be harmed.

Challenges

While the purpose of cleaning our seas is paramount, large-scale cleanup is confronted with significant and related challenges. These can be from technical effectiveness to financial affordability, waste management, and addressing the polluting sources. An appreciation for these constraints is needed to formulate an effective plan.

1. **Technical Inefficiency and Environmental Impact:** It is technologically challenging to clean the ocean because plastic is highly dispersed across huge areas. Technologies like towed nets are not only ineffectual but carry high carbon expense as they require fuel. One major concern is accidental harm of marine life. As an example, The Ocean Cleanup's equipment has been trapping non-target species, including sea turtles and sharks, despite employing mitigation measures like escape hatches and onboard observers.

2. **High Financial Costs and Sustainable Funding:** Mass cleanups are extremely expensive and rely heavily on sustained funding, which takes the form of donations and corporate sponsorship largely. This creates long-term fiscal uncertainty. In addition, studies have found that cleanup technologies will be the most economically wasteful strategy compared to prevention-oriented approaches. Such reliance on corporate sponsorship also leads to "clean-washing," where organizations can utilize cleanup as a strategy for diversionary behavior to circumvent criticism over producing more plastic.

3. **Managing Non-Recyclable and Problematic Waste:** A lot of the waste collected from the ocean is not recyclable, e.g., sanitary pad and diapers. This raises a new problem: costly and logistically challenging disposal of the recovered litter. Often, cleanup teams lack a clear and public plan for the fate of this rubbish, risking that it just ends up getting back into the environment via sloppy dumping.

4. **Inadequate Land-Based Waste Management Systems:** The original source of ocean plastic is on land. Around 80% of ocean plastic is calculated to be land-based, and the reason is mostly due to unrecycled waste and ineffective management systems in most places. Research indicates that around 1,000 rivers contribute the bulk of plastic releases into the ocean. This indicates that the cleanup from the sea is not sufficient; it must be accompanied by extreme breakthroughs in global waste management to plug the source.

5. **Weak Enforcement on the High Seas:** The global law enforcing prevention of sea pollution includes covenants like the International Convention for the Prevention of Pollution from Ships (MARPOL), which bans dumping of plastics at the sea. At the national level, there are institutions like the U.S. Environmental Protection Agency (EPA) that govern programs for ocean dumping regulation. Such policies, nonetheless, do not

have significant loopholes. Science identifies essential enforcement loopholes and the lack of standardized regulations as main obstacles, hindering the system in making noncompliance visible to authorities and punishable. The format of the rules themselves can be a problem; if the rules are convoluted and monitoring isn't built in, compliance is difficult to obtain.

Sources:

- Cleaning up the garbage patches
- High Tech Clean-Ups: No Solution to Ocean Plastic Pollution
- New report finds marine plastic pollution clean-up technology is not all it seems on the surface
- How Do We Clean Up All That Ocean Plastic?
- Ocean dumping | Research Starters | EBSCO Research
- World Environment Day: a rising wave against ocean waste
- Protecting the Global Marine Environment

Target/End users

Who will utilize your app/system?

1. Governments
2. Non-profit Institutions
3. Individuals concerned in Ocean cleaning

Who are the key stakeholders?

1. Governments
2. The project team
3. Non-profit Organizations
4. Coastal Communities

The related survey or solutions

Non-recyclable / low-value plastics (films, sachets, diapers)

Challenge: A big share of what lands on beaches is low-value and hard to recycle. In usual, waste leaksor be burned. Recent baselines document the prevalence of these items.

Survey done on challenge: Australia's national litter-leakage baseline (1,907 transects; 443 coastal) establishes empirical loads and common items.

Existing solution (official reports): Basel Convention technical guidelines for environmentally sound management (ESM) of plastic waste; UNEP also calls for safe disposal for non-circular plastics alongside reduction/reuse.

What they're lacking: Local capacity and funding to accept and treat low-value fractions safely at scale.

Source links:

- CSIRO/DCCEEW – National baseline
- Basel Convention – ESM guidelines (plastic waste)
- UNEP – *Turning off the Tap*

High costs & unstable funding

Challenge: Solid-waste and cleanup systems are expensive; donation-driven operations struggle to sustain service.

Survey done on challenge: World Bank's *What a Waste 2.0* compiles global costs, service gaps, and financing needs.

Existing solution (official reports): Extended Producer Responsibility (EPR) to shift ongoing costs to producers. Development-bank finance for coastal projects.

What they're lacking: Stable O&M funding at city level and consistent, well-enforced EPR implementation.

Source links:

- World Bank – *What a Waste 2.0*
- OECD – EPR 2024 (report)
- EIB – Clean Oceans Initiative 2.0

Group member:

- **Zilong Wang (A00458589)**
- **Jeevan Dhakal (A00464915)**
- **Sridhar (A00493807)**