



CLEARBOAT – WASTE-COLLECTING BOAT

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Annotation: *This article discusses the “Clearboat” project, a modern ecological vessel designed for waste collection. The project aims to protect the environment and clean water bodies by using modern approaches and automating the waste collection process, thereby reducing the need for manual labor. “Clearboat” technology serves as a convergence point of robotics, ecology, and renewable energy, as its technological solutions reflect innovations from all these fields. Its implementation contributes to environmental sustainability and helps preserve the natural food chain.*

Keywords: *water bodies, waste, robotics, ecological cleaning, remote control, solar energy, monitoring system.*

Relevance of the Project Nowadays, the pollution of water bodies with waste is one of the major global environmental problems. According to the United Nations, approximately 11 million tons of plastic waste are dumped into water bodies around the world every year [1]. If this trend continues, by 2040 this figure could reach 29 million tons. Oceans, rivers, and lakes currently contain over 150 million tons of plastic waste, and more than 100,000 marine animals die each year as a result [2].

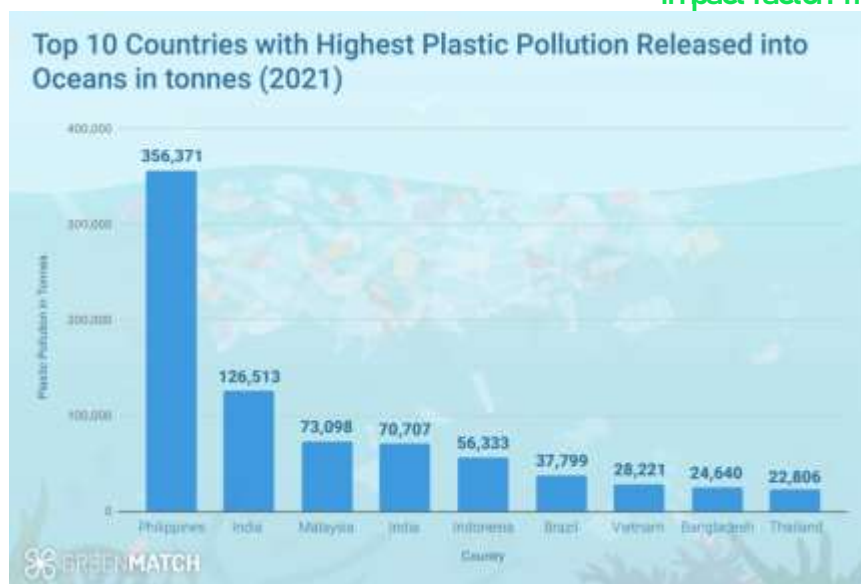


Figure 1. Top 10 countries contributing most to ocean plastic pollution as of 2021 [3]

In the context of Uzbekistan, the problem is becoming increasingly severe. According to the 2022 report by the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan, more than 8,000 tons of household and industrial waste are discharged into the country's water bodies each year [4]. In particular, high levels of pollution have been recorded in basins such as the Amu Darya, Zarafshan River, and Charvak. In 2023, nearly 315 tons of large and small plastic waste were detected in the Zarafshan River basin. As a result, water quality in some farming areas declined, and crop yields decreased by 12–15% [5].

About the Project

Clearboat is an environmentally friendly smart boat designed to collect floating waste efficiently in seas, oceans, lakes, and other slow-flowing water bodies. The boat can be remotely controlled from a distance of 1.5 to 2 kilometers using a FlySky remote control. The prototype can carry up to 10 kg of waste in its specially designed onboard tank.

Clearboat is powered by solar panels and can operate continuously for up to 16 hours on a full charge. Its body is made of stainless, corrosion-resistant material and reinforced with both external and internal waterproofing.

Additionally, Clearboat is equipped with an advanced monitoring system. Its 360° camera can detect and clean waste from a distance and also helps prevent illegal fishing and other poaching activities in lakes.



Figure 2. Front and side views of the Clearboat

General technical specifications:

- Control: FlySky remote controller (1.5–2 km)
- Waste capacity: Up to 10 kg (for the first prototype)
- Power source: Charged via solar panels
- Operating time: 16 hours (when fully charged)
- Camera: 360° surveillance system
- Project cost: 10,332,000 UZS

Main functions and advantages:

- Removes surface waste remotely
- Capable of detecting illegal activities using the camera
- Enhances environmental safety
- Operates on solar energy

I believe that understanding international experience and developing distinguishing features based on competitors' strengths is the responsibility of every inventor or founder. Therefore, below we will compare “Clearboat” in detail with its foreign counterparts.

1. USA — Clear Blue Sea (San Diego) The “FRED” (Floating Robot for Eliminating Debris) boat, developed by the non-profit organization “Clear Blue Sea” was tested in the port of San Diego. It has the following technical features: Propulsion: Hybrid system powered by battery and solar panels waste collection capacity: 20–25 kg per hour Remote monitoring via GPS The “FRED” boat has shown especially effective results in harbors, ports, and coastal waters. This project is currently being expanded in cooperation with universities in San Diego [6].

2. Netherlands — The Ocean Cleanup (Rotterdam) The most globally recognized water-cleaning project is “The Ocean Cleanup.” Founded by Dutch inventor Boyan Slat, this project consists of two main systems: *System 002* (for oceans): A large, passive collection system that traps waste using ocean currents *Interceptor* (for rivers): A mobile, solar-powered, automatic waste-cleaning boat key features of the Interceptor: Operating time: 24/7 automated Waste collection capacity: 100 kg per hour Annual collection potential: up to 50,000 tons per boat minimal human intervention required although still in the testing phase, these devices have already been deployed in countries such as Indonesia, Vietnam, India, and the Dominican Republic [7].

3. India — Ganga River Cleaning Robots As part of the “National Mission for Clean Ganga” (NMCG) program, the Indian government has developed robotic boats to mitigate environmental degradation. These were tested in the most polluted sections of the Ganges River — specifically in the cities of Varanasi and Kanpur. Movement: Hybrid (electric + solar) Operated by 2 personnel Sensors detect waste, which is then mechanically removed Daily capacity: 300–500 kg of waste (manual supervision required) [8].

Comparison with “Clearboat”

Table 1

Parameter	Clearboat (UZB)	FRED (USA)	Interceptor (NLD)	Ganga Bots (IND)
Energy source	Solar panels	Solar + battery	Solar panels	Solar + electric
Waste capacity	10 kg	20–25 kg/hour	100 kg/hour	300–500 kg/day
Price	~820 USD	~15,000 USD	~70,000 USD	~25,000 USD
Autonomy	High (16 hours)	Medium	High	Low (operator)
Monitoring system	FPV camera + sensors	GPS + sensors	AI + sensors	Basic sensors

Conclusion

By creating this “Clearboat” waste-cleaning boat, we aim to contribute, even if slightly, to preserving our environment and maintaining ecological and animal life chains. By reducing human labor, we seek to increase the economic efficiency of small business entities or other financial organizations. This efficiency might not fully manifest through our small model, but we hope that once we build and present to the public our modern, large-scale water waste-cleaning boats in the future, this goal will be achieved. What changes do we plan to make to this prototype in the future?

1. Build a large-format “Clearboat.”
2. Implement an automatic sensor-based control system.
3. Introduce GPS tracking and adapt the system for oceans.
4. Establish entrepreneurship by recycling plastic waste collected from large waste-cleaning vessels.

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