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# Preface



Dear Readers,

OSEAN has been closely monitoring the negotiation process of the global plastic treaty since its inception at UNEA 5.2. Now, the world is turning its attention to Busan, South Korea, where the final negotiations will take place. The Bexco in Busan, where we gathered two years ago for the 7IMDC to address marine pollution, offers another opportunity for the global community to unite against marine plastic pollution. It remains unclear how fishing gear and other ocean-bound plastics will be incorporated into the treaty. Nonetheless, it is encouraging that during the 4th negotiation in Ottawa, Canada, the perspective that fishing gear should be viewed from the entire plastic lifecycle, not just as waste management, was accepted.

In this edition of our newsletter, we present an array of innovative initiatives and significant research efforts addressing the pervasive issue of marine debris and plastic pollution. The Activity section features OSEAN's comprehensive efforts in South Korea to mitigate the impact of recreational fishing debris on marine wildlife through extensive surveys, stakeholder workshops, and policy advocacy. In China, 2023 has seen substantial advancements in marine litter management with the revision of the Marine Environment Protection Law, coupled with extensive coastal cleanup campaigns and technological innovations aimed at protecting the marine ecosystem. Insights from the South Australian Department for Environment and Water highlight an integrated approach to teaching science through citizen science and marine education. This hands-on, project-based learning approach in South Australia's marine parks fosters environmental awareness and conservation among students. Following is the 2023 EASICO Year-End Report summary, which celebrates major strides in reducing marine litter across East Asia through capacity-building workshops, citizen science programs, and community engagement, all aimed at achieving zero plastics in the region's seas by 2030. From the Philippines, the Eco-Ikot Center aims to enhance solid waste management, reduce landfill dependency, and mitigate marine pollution in Manila Bay. It is part of Korea and the US's collaborative effort to expand sustainable waste management practices in Metro Manila. Finally, the GreenHub project in Can Gio, supported by the Coca-Cola Foundation, is making significant environmental and socio-economic impacts by promoting circular economy solutions. This project has successfully collected and recycled over 152 tons of plastic waste, empowering local women through sustainable practices.

The Research section includes a study from Thailand's Rayong Province, revealing widespread ingestion of microplastics by coastal marine fish, emphasizing the critical need to address plastic pollution's impact on marine ecosystems and human health. Additionally, a recent study by the Ecological Waste Coalition and De La Salle University exposes the severe extent of plastic pollution in Manila Bay, calling for improved waste management and strict enforcement of environmental policies to safeguard the bay's ecosystem and the health of its coastal communities.

I would like to extend my special thanks to Ms. Annalis for her efforts in editing this issue. We hope this collection of articles not only informs but also inspires concerted efforts and collaborations to tackle the global challenge of marine debris and plastic pollution. OSEAN will continue working with our diverse partners in preparation for the monumental treaty negotiations in Busan. Our next edition in November will be a special issue focusing on this global plastic treaty. Please stay tuned.

With gratitude,

*Sunny Hong*

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# Addressing the Hidden Threat: OSEAN's Initiatives to Combat Recreational Fishing Debris in South Korea[1]

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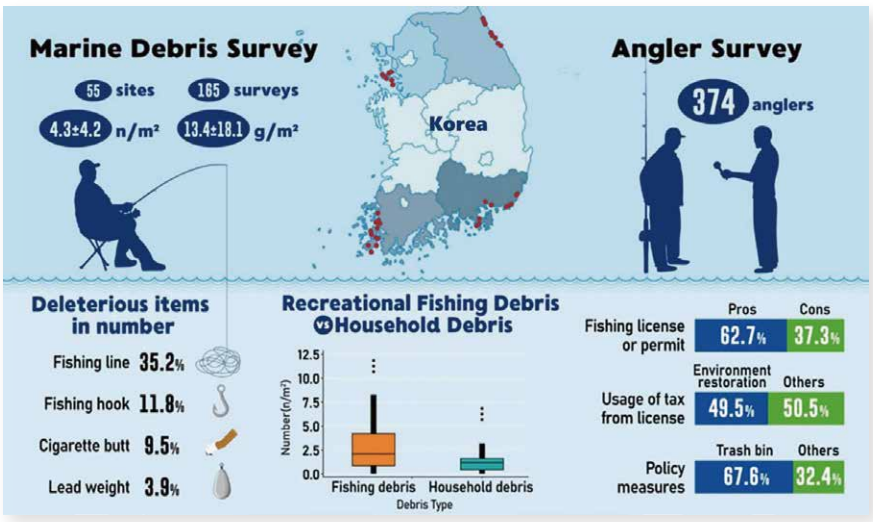
According to research on the impact of marine debris on wildlife in Korea, Recreational Fishing Debris (RFDs), although less abundant, causes significant harm to wildlife (Hong et al., 2014). OSEAN, the leading organization of this research, has been consistently working to raise awareness and reduce the impact of RFDs. This article aims to highlight three key initiatives undertaken by OSEAN to address the problem of RFDs.

## Nationwide Survey on Marine Debris at Recreational Fishing Sites and Questionnaire of Anglers to Assess Policy Preferences

From 2018 to 2020, the Our Sea of East Asian Network(hereafter OSEAN) conducted extensive surveys at major fishing spots across various regions in South Korea, including Gyeonggi-do, Incheon, Busan, Gyeongsangnam-do, Jeollanam-do, and Gangwon-do. The study focused on examining the types and amounts of RFDs and household trash discarded at these sites. The findings revealed that fishing lines and hooks were the most commonly found items, and in all regions, the volume of RFDs exceeded that of household waste. Surveys of the anglers' perceptions highlighted a notable outcome: over half of the respondents supported the introduction of fishing licenses or permits.

This research was supported by Patagonia's 1% for the Planet Fund and was published in the Marine Pollution Bulletin. The primary author of this study, LEE Jongsu, emphasized the lesser-known but significant impact of recreational fishing on marine pollution. Lee stated, "While the problem of abandoned fishing gear in commercial fisheries is well-recognized internationally, the significant contribution of recreational fishing to marine debris and its severe environmental impacts are not as widely acknowledged. Through this publication, we hope to initiate systemic and policy changes aimed at reducing fishing waste."




▲ Figure 1. Major findings of marine debris survey and questionnaires on recreational fishing grounds in Korea(Lee et al., 2023)

[1] https://doi.org/10.1016/j.marpolbul.2023.115229

## Stakeholders Gather to Address the Issue of Recreational Fishing Debris and Explore Institutional Improvements

On November 27, 2023, a significant policy workshop was held at the Korea Railroad Corporation conference room, organized by OSEAN with support from the Brian Impact Foundation. This gathering aimed to address the issue of RFDs, bringing together various stakeholders including the Korea Fishing Association, the Citizens Fishing Coalition, government agencies, and public organizations. The workshop focused on understanding the severity of RFDs and exploring solutions to mitigate their environmental impact.

The session opened with OSEAN's representative, Dr. HONGSunwook, emphasizing the need for collective action and understanding among different stakeholders to effectively address the marine debris problem. This was followed by discussions and presentations on the current state of RFDs, its impacts, and potential solutions. Key proposals included the introduction of a fishing license system, enhanced enforcement, and public education to promote responsible fishing practices.

In the afternoon, participants worked on developing actionable policy measures, utilizing stakeholder analysis and cause–and–effect models to identify the key drivers of RFDs and their ecological impacts. The workshop concluded with a strong consensus on prioritizing the introduction of a fishing license system and improving waste management practices among the fishing community.

Dr. Hong concluded the event by noting the day's success in fostering dialogue and setting the stage for significant policy shifts in marine conservation. She committed to forwarding the outcomes to relevant government bodies to ensure that the insights gained would influence national policymaking.

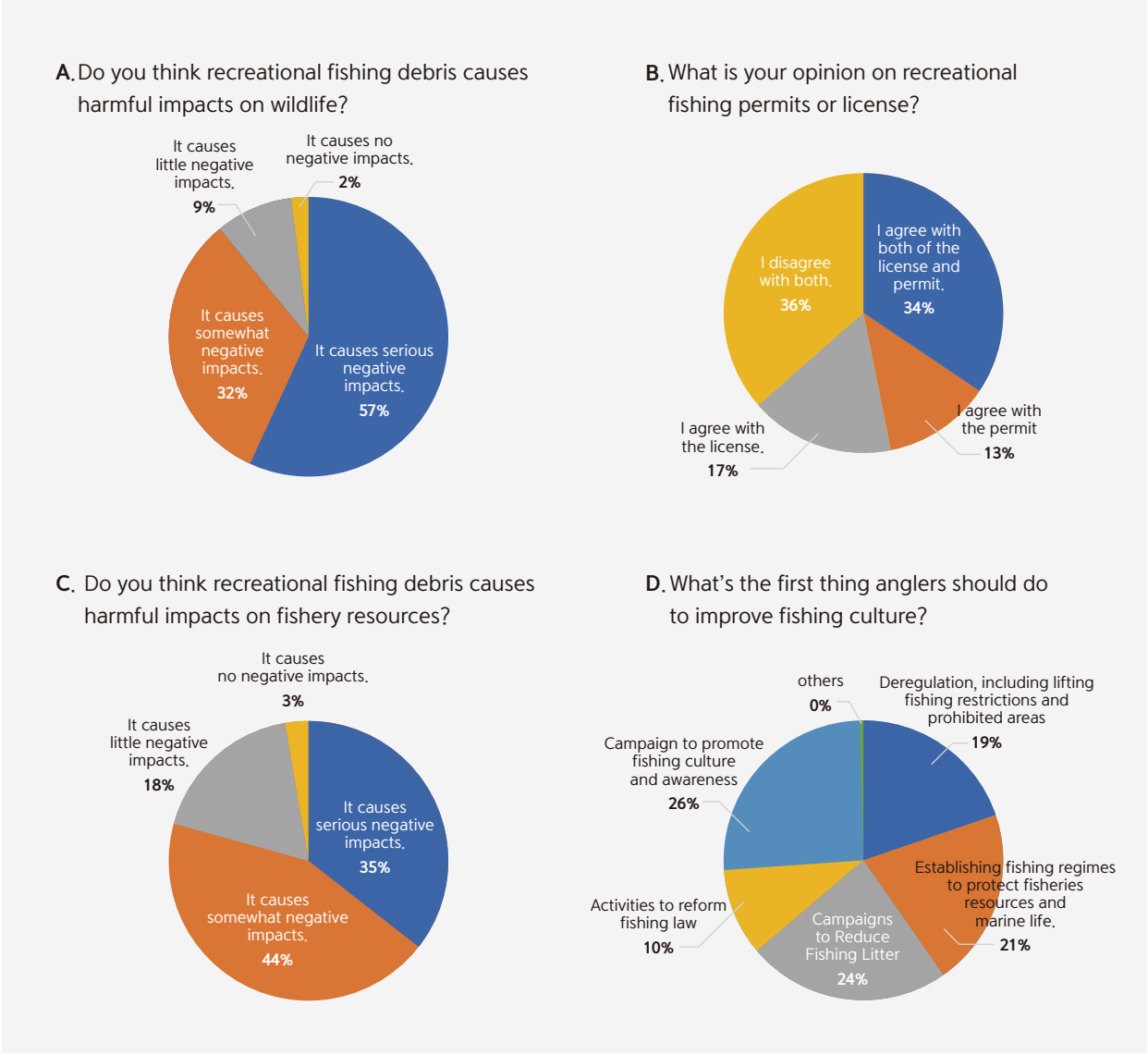

▲ Figure 2. Participants in the stakeholders' workshop to address RFDs issue

## Survey Highlights Angler Support for Fishing Licensing to Combat Debris

OSEAN carried out a survey in collaboration with the Citizens' Fishing Coalition (led by KIM Wook) and the Clean Fishing Campaign Headquarters (led by KWON Eun-Jung) in November and December 2023, gathering responses from 1,126 anglers to assess the impact of RFDs.

This survey, which included both online and face-to-face responses, indicates a significant demand among anglers for regulatory improvements to enhance fishing culture. The results showed that 89% of anglers recognize the severe ecological damage caused by RFDs and 64% of anglers support the introduction of a permit or licensing system. A notable 79% of participants agree that RFDs impacts fishery resources, and they cited campaigns to improve fishing culture as the first thing to do to address the problem of RFDs.

Supported by the Brian Impact Foundation, OSEAN plans to use these insights to advocate for policies aimed at reducing RFDs and enhancing angler engagement in environmental conservation efforts.




▲ Figure 3. Major findings of anglers' perception through questionnaire survey

# Action Overview of the 2023 Marine Litter Management in Mainland China

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Mainland China will continue its efforts in marine litter management in 2023

## 1. 2023 Revision of Marine Environment Protection Law

Marine Environment Protection Law of the People's Republic of China, revised and adopted at the Sixth Session of the Standing Committee of the Fourteenth National People's Congress, has come into force since January 1, 2024. Regarding marine litter management, two major areas are highlighted: the 2023 Revision emphasizes a systematic land-sea approach and establishes an appraisal system for local government.

## 2. China's National Coastal Cleanup Campaigns

### A. China's Nationwide Coastal Cleanup Joint Action

In 2023, China Zero Waste Islands (CZWI), the China Coordinator for the International Coastal Cleanup (ICC), started to organize nationwide coastal cleanup joint actions. During World Oceans Day in June 2023, CZWI, the organizer of the ninth Ocean Cleanup Battle, continued its partnership with marine environment protection organizations to combat plastic waste. By June 30, 2023, CZWI and its partners had organized 72 nationwide events and activities, during which 2,889 participants collected a total of 6,239.55 kilograms of waste.

▲ Ocean Cleanup Battle – Volunteers Sorting out Marine Litter

In September 2023, the 36th International Coastal Cleanup Day, CZWI organized Stop Feeding the Ocean, a nationwide coastal cleanup event. Throughout the month, 1,272 volunteers across China participated in 45 events and activities, collecting 5.36 tons of marine litter.

CZWI and Pick Up China co-launched a "Clean Islands, Linking Lives" campaign consistent with International Coastal Cleanup Day and World Cleanup Day. A total of 13 partnering islands joined, with a total of 2,355.8 kilograms of marine litter collected by 375 participants. H5 posters were designed and presented to educate the hazards of marine litter to the public.


▲ "Clean Islands, Linking Lives" – the H5 Poster

The national joint campaign sponsored by the China Oceanic Development Foundation (CODF)—the seventh National Coastal Cleanup—lasted for three months in 2023.

The events and activities across the 22 venues varied widely, and coastal cleanup was no longer limited to picking up litter. Fujian Dongshan held a "Drifting Post Office" flash mob activity. Visitors could exchange 10 pieces of marine litter for one postcard. Xingcheng Huludao held a popular science week of " Blue Economy Achievements and Marine Biodiversity". The venue invited professionals to illustrate a photo exhibition of 80+ marine benthic organisms.


▲ Xingcheng: Popular Science Week of Marine Organisms

**B. Regular Coastal Cleanup Campaigns by Local Partners**

During 2023, partners on various coasts have carried out regular coastal cleanups in addition to nationwide joint actions.

During 2023, Rendu Ocean held 30 coastal cleanup activities, with a total of 2.87 tons of marine litter collected. Out of all coastal cleanup activities, there were 26 corporate-oriented events, and 4 public-oriented events.

Run by the youth community, the Musu Ocean Workshop organized 11 coastal cleanup activities in 2023, with Xiamen's Huang Cuo Shi Hao Tou Beach as their main cleanup area.

The Qingbang Island Environmental Protection and Public Welfare Development Centre organized a total of 31 coastal cleanups in 2023, with 6,581.67 kilograms of litter collected. Moreover, the Centre paid special attention to recycling. During May 2023, the Community Recycling Centre began its formal operation. By the end of November 2023, 145 people participated in the recycling program, and a total of 14,072.8 kilograms of recyclables were collected.

▲ Qingbang's Community Recycling Centre

Throughout the year 2023, Blue Ribbon Ocean Conservation Association organized 20 volunteering teams in Haikou, Wenchang, Wanning, Sanya, and Qingdao for 47 cleanups, involving 1,800+ participants and 5,700+ minutes of volunteer time.

**C. College and University Coastal Cleanups**

College and university students have also played a great role in marine litter management and preservation. Students from Zhejiang Ocean University discovered a coastal litter issue after Xiaogan Island in Zhoushan City became a new bucket list travel spot. Student volunteers immediately organized a beach cleanup near Xiaogan Island with the support of the Chinese Society for Oceanography.

In the Guard the Origin of Life Campaign, a total of 186 volunteers participated in the huge coastal cleanup activity in December 2023. Those participants came from 19 universities. This campaign at Windmill Bay Beach in Shanghai cleaned up a total of 2,000 meters of coastline and 402.63 kilograms of coastal litter.

▲ Beach cleanup organized by students from Zhejiang Ocean University

## 3. Social Innovation in Digital Technology, Media Culture, and Education

**A. Blue Circle Environmental Initiative**

The United Nations Environment Program (UNEP), on 30 October 2023, honored China's Blue Circle environmental initiative with the 2023 Champions of the Earth award. Using blockchain technology and the Internet of Things, the procedures and data of plastic recycling are marked on the "traceability code" to ultimately realize the carbon footprint calculation.

**B. Internet Giants Making Use of Platform Resources**

On June 8, 2023, World Oceans Day, SEE Foundation once again collaborated with "Ant Forest –– Magical Ocean" in the beach cleanup action. Alipay's mobile terminal was connected to a huge number of online users, who could accumulate green energy points through green actions and exchange them for supporting offline beach cleanup actions.

On March 1, 2023, the Narwhal Ocean Research Centre, officially launched the Blue Up app. Developed with technical assistance from ByteDance's staff, the app aims to recruit volunteers for undersea cleanup efforts. Blue Up can accurately and visually display conditions for seabed litter salvaging to diving enthusiasts, saving the cost of communication between organizers and participants.


▲ "Blue Up" in Apple Store

**C. Environmental Education for Adolescents**

MarvelKids, a youth education and training organization in China, has launched the "Bird Watching and Beach Cleaning" study program. It incorporates university visits, ecological research, birdwatching, and beach cleaning.

The Shenzhen Blue Ocean Conservation Association's International Coastal Cleanup Day campaign prominently featured adolescents as the primary promoters of marine science. The event included a variety of games for the public, hosted by primary school students who served as 'knowledge stallholders.' Additionally, the students encouraged the public to participate in cleaning up marine litter and to practice ecological beachcombing.


▲ MarvelKids' "Birdwatching and Beach Cleaning" Study Program

**D. Marathon Plus Coastal Cleanup**

In 2023, various joint events and activities combined sports with coastal cleanup efforts, with marathons being a popular method to promote beach cleaning. Notably, the organizers of the Hainan Sanya Marathon and the Xiamen Marathon Charity Foundation collaborated to host 'Marathon plus Marine Environmental Protection.'


▲ Xiamen Marathon's Beach Cleanup Campaign

**E. Documentary**

At the 2023 China Public Welfare Image Festival Award Ceremony, the documentary 'Bring the Blue Back to the Blue' received the Excellent Works of Public Welfare Organization Award. This documentary highlights the efforts of three volunteers from the Blue Planet Marine Guardian Program. As of March 2023, this program had mobilized over 3,100 volunteers to conduct 453 coastal environment patrols across 11 cities.


▲ The Documentary: Bring the Blue Back to the Blue

## 4. Professional Exchanges

The Fourth National Symposium on Marine Microplastics Pollution and Control was held in Shanghai in 2023. The symposium invited nearly 600 guests from colleges and universities, research institutes, environmental monitoring organizations, and representatives of the environmental industry from all over the country.

In addition, the International Symposium on the UN Decade of Ocean Science for Sustainable Development –– "Stem the Tide of Asia's Riverine Plastic Emission into the Ocean –– was held at the Hainan Research Institute of the East China Normal University from 20 November to 22 November 2023, with 50 renowned experts, scholars, governments, business and NGO representatives from 11 countries participated.

## Conclusion

In 2023, mainland China saw numerous efforts aimed at tackling marine litter. These coastal cleanup campaigns involve diverse participants, including government bodies, corporations, nonprofits, and citizens. Beyond basic litter removal, the initiatives were varied and included joint campaigns with sports events, the application of digital technology for social innovation, marine environmental education targeted at youth, the production of cultural content, and academic communications, among others. Although not all initiatives can be detailed here due to space constraints, it is evident that mainland China is actively engaged in combating marine litter. It is hoped that these efforts will persist, with society continuing to work towards the preservation of the marine ecosystem in future years.

**Reference Links**


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# An Integrated Approach to Teaching Science in Schools in Australia

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## Abstract

This news reports an integrated approach to science in schools with primary and secondary classes incorporating citizen science through marine education. The integrated approach created opportunities for student engagement and learning through science, design and technologies, humanities, and social sciences (HASS), sustainability, and Aboriginal and Torres Strait Islander (ABTSI) cross-curriculum priorities while also creating meaningful connections to marine parks and their unique animal and plant species.

## Introduction

▲ Credit photo to Carl Charter.

Marine parks are internationally recognized as an essential way to help us conserve marine biodiversity and support the sustainable use of marine resources like fish and habitats.

Marine parks often work to keep our marine environment healthy, alongside other management efforts including limiting the number of fish that can be caught and restricting the use of harmful chemicals.

The United Nations encourages countries worldwide to look after their marine environment (Sustainable Development Goal 14). One of the key indicators (Sustainable Development Goal Target 14.5) is the establishment of marine parks. In Australia, 48% of our marine environment is currently protected within a marine park, contributing to this global target.

In South Australia, there are 26 marine parks. Nineteen of these occur in coastal waters and are managed by the South Australian Department for Environment and Water, and the remaining seven occur in offshore waters. Parks Australia, a Commonwealth government agency, manages them.

# Activities

The South Australian Department for Environment and Water and Parks Australia has invested in the development of a range of educational resources for schools available from https://www.parks.sa.gov.au/understanding-parks/kids-in-parks/marine-parks-learn-teach.

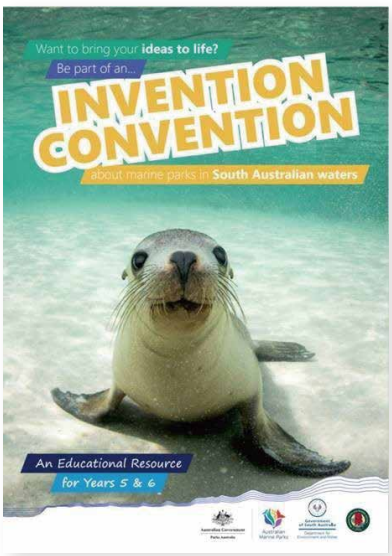
This paper focuses on two resources, namely, a year 5 and 6 resource https://www.parks.sa.gov.au/understanding-parks/kids-in-parks/marine-parks-learn-teach/marine-primary-school that inspires students to design a scientific technique to monitor or survey animals, plants and the environment in South Australia's marine parks and a year 7–10 resource https://www.parks.sa.gov.au/understanding-parks/kids-in-parks/marine-parks-learn-teach/marine-secondary-school that supports students to design an ecotourism venture in a marine park.

Science, particularly 'Science as a Human Endeavour', provides opportunities for educators to introduce sustainability projects to help students develop an awareness of the world around them ACARA (2022). Project-based learning and citizen science projects enable students to learn from the roles of scientists in the real world and engage in hands-on, authentic science that leads to exploring species in natural environments.

Citizen science is described by Dickson and Bonney (2012, p.1) as 'public participation in organized research efforts'. Citizen science projects are conducted worldwide and involve several citizens willing to use their free time to help scientists gather data for their projects. Citizen science is not new. It dates back to the nineteenth century, when European surveys were conducted (Drennen, 2021).

This paper focuses on an integrated project-based learning approach underpinned by the work of Lee Watanabe-Crockett. Each resource uses the Solution Fluency methodology through six phases: Define, Discover, Dream, Design, Deliver, and Debrief. The phases of the model are based on the 21st Century Fluencies[1] created by Crockett et al (2011).

## Marine Park teacher resources




The lead author of each resource employed Solution Fluency to create in-depth learning sequences built from students' prior knowledge across learning areas. The learning was planned and implemented through the STEM learning areas of science, technology, engineering (design and technology), and mathematics. The teaching and learning focus went beyond STEM and included HASS. Each learning sequence uses an 'essential question' and 'scenario' to guide and support student inquiries and investigations. For example:

**The essential question:**
What can you do to monitor, survey, track, and protect the marine plants and animals in marine parks in South Australian waters?

[1] https://books.google.com.au/books/about/Literacy_Is_NOT_Enough.html?id=JligZwEACAAJ&redir_esc=y

**Scenario:**
South Australia's marine environment is fortunate to have a network of 26 marine parks. Nineteen of these occur in coastal waters and are managed by the South Australian Department for Environment and Water[2]. The remaining seven occur in offshore waters and are managed by Parks Australia[3], a Commonwealth government agency. Source: National Parks and Wildlife Service South Australia[4].

South Australia is home to some of the world's most unique marine plants and animals. Marine parks boast colorful marine sponge gardens, the iconic leafy sea dragon, the giant Australian cuttlefish, and marine mammals such as Australian sea lions, whales, and dolphins. Of the 7,500 species that call this southern temperate zone home, about 85 percent are endemic or not found anywhere else in the world.

Did you know the South Australian Government is undertaking the most extensive ongoing marine biodiversity monitoring program in South Australia?

An example is the 2018 Expedition of Discovery to Western Eyre (Commonwealth) and Investigator (State) Marine Parks[5]. Scientists have carried out a range of monitoring and research from research vessels to understand more about these offshore marine parks.

As part of a Design Team, your challenge is to think like a scientist, engineer, traditional owner, or designer and re-engineer a device, tool, or technique that can survey, monitor, track, and help protect the marine plants and animals in marine parks in South Australian waters.

For example, can you re-engineer a Baited Remote Underwater Video System (BRUVS) to work at 200 meters of depth? Or could you design one for your local school?

Can you think of a way to track Australian Sea lions across multiple marine parks? How would you know where they are, how can you find out what they are eating, how are they using that marine park?

Could you re-design another tracking, monitoring, or surveying device? Which one? How? Why?

Record what you discover and then think about how you might share your ideas with others.

Please set up an activity day where teachers, students, and parents can learn all about the surveying, monitoring, or tracking techniques used by scientists in everyday research in places like marine parks (South Australian Department for Environment and Water, Marine Park teacher resources, (2020).

The secondary school resource involves students researching Commonwealth and State marine parks in and around South Australia and learning how they are designed to conserve biodiversity while allowing for ecologically sustainable uses, such as fisheries, tourism, coastal development, shipping, and other marine industries. They investigate how people connect to places in and around marine parks through their interconnections with place and how these connections affect change. They examine the interconnections between people and marine parks and investigate the effects of people's use and choices on places like marine parks and their implications for the future.

[2] https://www.environment.sa.gov.au/marineparks/home

[3] https://parksaustralia.gov.au/marine/

[4] https://www.parks.sa.gov.au/understanding-parks/marine-parks

[5] https://www.youtube.com/watch?v=wEmdT6DzxFc&t=76s

They also can design two tourism-focused ideas. The first is to create a Visitor Guide with detailed information about the Commonwealth and State Marine Parks in South Australia, their current uses, distribution of resources, biodiversity, and management arrangements. The Guide will also include attractions in and around Marine Parks and bring awareness to people's interconnections with them and the responsible ways of fishing, visiting, experiencing, shipping, and exploring South Australia's marine parks. The second is researching and designing a new ecotourism opportunity in their chosen marine park.

This learning sequence strongly focuses on place-based connections and the natural environment and provides opportunities for students to share knowledge with others. Including community connections in learning teaches students to value and respect their local environment (Buck et al., 2016). In this learning sequence, students model the work of scientists, naturalists, geographers, researchers, communicators, and innovators. Learning incorporates the world around them, especially marine parks and their unique marine plants and animals.

South Australia's waters have a rich, unique, and temperate marine zone with a range of habitats and species of biological importance while allowing for sustainable uses such as fisheries, tourism, shipping, and other marine industries.

South Australia supports important fisheries, and South Australia's fisheries range from large-scale industrial-sized fisheries, such as the prawn, shark, and lobster fisheries, to small-scale community-based fisheries, such as those which operate within the 'marine scale fish fishery' and 'Lakes and Coorong fisheries'. These fisheries support commercial, recreational, and Indigenous traditional fishing activities, which contribute to the social and economic well-being of the State and many regional coastal communities.

Did you know that the Great Australian Bight Marine Park was established as a multiple-use area and reserve to protect breeding populations of southern right whales?

You can learn more about the science behind marine parks and on the understanding of page or the scientific reports page[6].
Source: https://www.environment.sa.gov.au/marineparks/Learn

You can find out about what is protected in individual marine parks on Enviro Data SA[7].
Educators are encouraged to discover more about each marine park's resources.

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[6] https://www.environment.sa.gov.au/marineparks/Learn/scientific-reports

[7] https://data.environment.sa.gov.au/Coast-and-Marine/Coast-Marine-Management/Pages/Marine-Parks.aspx

# 2023 EASICO Project: Year-End Report Unveils Achievements and Insights in East Asia

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▲ Figure 1. Cover of the 2023 EASICO Year-End Report.

The seas of East Asia are entry points for most of the world's marine plastics. However, despite the rapid economic development and lifestyle changes, the East Asian region has yet to establish adequate systems, facilities, and culture on plastic waste. Although countries in East Asia have attempted to implement various advanced waste management systems to mitigate the inflow of marine plastics, such attempts often fail because of the lack of understanding of the distribution and impacts of marine litter alongside insufficient public awareness and participation. Thus, for regions like the East Asian region that often experience resource constraints in combating marine litter, citizen science could be a good alternative. Raising public awareness of marine litter and developing programs that are based on current realities with a high probability of execution will be necessary.

As a brief background, signatories of EASICO officially launched the East Asian Seas Initiative on Clean Oceans (EASICO) on May 26th, 2021, and it is expected to be carried out from 2022 to 2024. The overall aim of EASICO is to achieve zero plastics in the East Asian seas by 2030 through collective partnerships in raising public awareness of marine plastics, utilizing citizen science in identifying the issues and impacts of plastic pollution, and building capacity by providing training and assistance to community-led programs. The parties to EASICO include the Ministry of Oceans and Fisheries Korea (MOF), Our Sea of East Asia Network (OSEAN), and Partnership in Environmental Management for the Seas of East Asia (PEMSEA) as administrative, financial, and overseeing bodies. While the organizations carrying out citizen science and community participation programs under the EASICO initiative are signatory organizations Indonesia Waste Platform (IWP) from Indonesia, the Centre for Supporting Green Development (GreenHub) from Viet Nam, and the International Coastal Cleanup Philippines (ICC-Philippines) from the Philippines. These organizations have long dedicated their efforts to reducing marine waste and have been instrumental in tackling marine litter in their respective regions.

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▲ Figure 2. Group photo from the 2023 EASICO Capacity Building Workshop in Ha Noi, Viet Nam.

In its first year of conception, IWP held the 2022 EASICO Capacity Building Workshop as a four–day workshop in Flores, Indonesia. The theme for the workshop was 'Collective Impact Approach on Reducing Marine Debris' and had attendees from the central and provincial government as well as the local communities. The success of the first capacity–building workshop strengthened the trust and network between related organizations, boosting members' confidence in carrying out activities under the EASICO project initiative. In its second year, GreenHub held the 2023 EASICO Capacity Building Workshop as a three–day workshop in Ha Noi, Viet Nam. The theme for the second workshop was "Enhancing Scientific Capacity for Accelerating Actions Towards Plastic Reduction" attracting participants from a diverse range of governmental organizations, academic institutions, NGOs, experts, and international organizations. Both workshops had different themes and target groups, but both were equally successful in fulfilling their goals. OSEAN will host the 2024 EASICO Capacity Building Workshop in Seoul, South Korea in July, with the theme "Towards East Asian Initiative for the Global Plastics Treaty".

▲ Figure 3. (Clockwise) Volunteers being guided by staff from GreenHub on classifying different waste from their monitoring survey; Volunteer divers in the Philippines carrying out underwater cleanup; Cigarette butts collected from IWP's beach monitoring survey.

Apart from the capacity-building workshops, member signatories have been active in carrying out its citizen science programs in each of their regions. In 2023, IWP conducted 17 monitoring surveys at six sites between March and November, an increase from the previous 10 monitoring surveys carried out in 2022. In the previous year, the total weight of debris collected amounted to 66.2kg, but the total weight doubled to 152.0kg in 2023. The total number of items collected in 2023 amounted to 11,302 items. As compared to the five coastal cleanups in 2022, ICC-Philippines scaled up their citizen science by conducting five combined beach-and-underwater cleanups in 2023. Despite the decrease in frequency, the scale of their cleanups was much larger, attracting participation from local government officials, navy officers, volunteer divers, and the community. ICC-Philippines collected 11,830 items weighing 2,233.5kg worth of trash in 2023. In 2022, GreenHub carried out five beach monitoring surveys during two seasons of May and August throughout Da Nang and Hoi An. The total number of items collected was 4,666 items, weighing 73.4kg. In 2023, GreenHub only selected three beaches in Hoi An for their May and August monitoring surveys. Despite the decrease in monitoring survey sites, the numbers did not fall drastically. The total items collected were 4,538 items weighing 94.2kg of waste.

The results above are only a sneak peek of the 2023 EASICO Year-End report. Readers can access more accurate, detailed, and visualized information about each signatory's citizen science programs in the report. Included are also the details of community participation programs carried out by the three EASICO signatories. For instance, information is provided on the citizen training programs carried out by IWP, the launching, and operation of the 'Happiness Shop' by GreenHub, and the Trash Trap Monitoring and underwater coral assessments carried out by ICC-Philippines, among other programs. Readers can also read details on the 2023 EASICO Capacity Building Workshop activities, lecture summaries, and the tentative workshop program for the 2024 EASICO Capacity Building Workshop.

The overall outcome of the second year of EASICO was a success with participating organizations expanding their scope of citizen science beyond their initial targets as well as carrying out capacity building programs. Activities, workshops, seminars, and training programs all aimed towards mitigating marine litter continued to be the focus of 2023. Going forward, we expect that citizen science programs will broaden their scope and deepen their analyses, while more concrete best practices are expected to be created in community participation programs.

Pictures included in this article are credited to OSEAN, GreenHub, ICC-Philippines, and IWP. The 2023 EASICO Year-End Report is available upon request.

# Korea and US Boost Waste Management Efforts to Save Manila Bay, Philippines

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Representatives from Korea, the Philippines, and the United States government gathered in Paranaque City on Thursday to support the expansion of an initiative promoting sustainable waste management and environmental conservation efforts in Metro Manila. The Korea International Cooperation Agency (KOICA), United States Agency for International Development (USAID) announced their support for opening additional "Eco-Ikot Centers" started by the nonprofit organization Communities Organized for Resource Allocation (CORA) Philippines in Barangay San Isidro, Parañaque City.

Through a circular economy waste management system, the Eco-Ikot Center incentivizes communities to exchange clean, dry, and segregated recyclables for points, redeemable for various sustainable goods and rewards. The "Manila Bay Community Waste Segregation and Collection Facility" project will establish additional Eco-Ikot Centers in Parañaque and the city of Manila to improve solid waste management, reduce landfill dependency, and mitigate pollution in Manila Bay and its surrounding areas. This initiative is part of the ongoing, five-year US$ 8.2 million "Enhancement of Marine Litter Management in Manila Bay (EMLM) Project" being implemented by KOICA, the Department of Environment and Natural Resources (DENR), and USAID.

"Korea recognizes that plastic waste and marine litter are global concerns that must be collectively addressed by all nations. With the Philippines being most threatened by waste in the coastal environment, it is our shared responsibility to support local efforts on marine pollution reduction and prevention. KOICA's activities on protecting the environment are intensified this year as we celebrate the 75 years of Philippines-Korea diplomatic relations and the 30th anniversary of KOICA in the Philippines. We are excited to work with USAID, CORA, and other partners in establishing waste management facilities that will help prevent and reduce marine pollution in Manila and its surrounding communities," KOICA Country Director Kim Eunsub said.

"USAID is excited to join our partners from KOICA and CORA in opening additional Eco-Ikot Centers in other areas near Manila Bay," USAID Deputy Assistant Administrator Sara Borodin said. "These new facilities will boost our efforts to recover and divert clean, dry, and segregated solid waste management from going into the ocean and promote 3R – reduce,reuse, recycle – practices in communities."

"We are thrilled to share the success of the Eco-Ikot Center, which we will be replicating in key areas of Metro Manila through the incredible support of our partners at KOICA and USAID," CORA Philippines Founder and Executive Director Antoinette Taus said. Taus said the Eco-Ikot Center, aimed at enhancing marine litter management in Manila Bay, is a testament to the power of partnership and innovation in addressing pressing environmental challenges. "This initiative underscores our shared commitment to environmental sustainability and community empowerment. By working together, we can create lasting positive change and build a better future for generations to come," Taus added.

Since the Eco-Ikot Center's launch in 2022, CORA has diverted over 50,000 kilograms of recyclables, prevented unsegregated waste transfer to landfills, empowered women as leaders in waste management, and fostered partnerships with businesses to achieve Extended Producer Responsibility (EPR) targets. The initiative has also influenced and engaged the public and private sectors to implement policy changes and ethical procurement practices. The success of the operation of the Eco-Ikot Center is also attributed to a robust Public-Private Partnership (PPP), including the local government of Parañaque City, the materials recovery facility (MRF), the City Environment and Natural Resources Office (CENRO), and the DENR.

One of the key features of the Eco-Ikot Center is empowering women in the communities as "circular center women champions" and equipping them with specialized training on waste management, business, and sustainable practices such as composting, urban gardening, and renewable energy. "We believe in the power of women to lead sustainable growth and development in their communities, and our Eco-Ikot Women Champions are a testament to this," Taus added.

The project will also mobilize and engage public and private schools and youth groups in educational campaigns, clean-up projects, and recycling programs. Data from the government in 2023 showed that the Philippines generates an estimated 61,000 metric tons of waste daily, of which 24 percent is plastic waste.

**Notes:**
For more information about the program and details on the waste management efforts in Manila Bay led by KOICA, USAID, and CORA, or about the Eco-Ikot Center in Barangay San Isidro, Parañaque, visit the official website:
http://wearecora.org/ecoikot

About CORA Philippines: Communities Organized for Resource Allocation (CORA) is a nonprofit organization established in 2016 that fosters sustainable development through missions focused on addressing hunger and poverty, plastic pollution, climate action, biodiversity conservation, and women's economic empowerment.

About KOICA: The Korea International Cooperation Agency (KOICA) is a government agency under the Ministry of Foreign Affairs of the Republic of Korea mandated to provide Official Development Assistance (ODA) grants to partner countries. The KOICA Philippines Office was formally established in 1994 to help support the sustainable economic development of the Philippines. KOICA Philippines has been implementing various development programs and projects in the fields of urban resilience, rural development, health, transportation, governance, HRD, education, and disaster risk reduction, among others.

About USAID: The United States Agency for International Development (USAID) is the world's premier international development agency and a catalytic actor driving development results. A long-time ally of the United States and the oldest democracy in Southeast Asia, the Philippines is a key partner in promoting resilient and inclusive development in the Indo-Pacific. For more than 60 years, USAID has worked with the Philippine government and local organizations to achieve shared development goals and build a more prosperous, resilient society for Filipinos.

# Promote Circular Economy Solutions to Reduce Plastic Waste in Can Gio, Ho Chi Minh City, Viet Nam

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Can Gio is the location of the Mangrove Biosphere Reserve – the first World Heritage site in Vietnam. With the desire to preserve and sustainably develop the "green lungs", the People's Committee of Cần Giờ District collaborates with the Centre for Supporting Green Development (GreenHub), sponsored by the Coca-Cola Foundation, to implement the project "Plastic Waste Management in Can Gio based on circular economy model" from May 2022 to February 2024. The project aims to facilitate collaboration between consumers, waste pickers, recyclers, and local governments to pilot new and innovative Circular Economy approaches and provide feedback to refine the national policy.

## Main Objectives

- Objective 1. Collective actions from piloting Circular Economy will lessen the environmental impact of plastic waste leakage to Can Gio Biosphere Reserves
- Objective 2. Circular Economy Solutions is promoted for strong collaboration of technology business, formal and informal innovative plastic collection, and recycling companies in Can Gio
- Objective 3. National policy and action plan are consulted for effective implementation and/or adaptation based on the outcomes of the project (National/ Provincial/ District Action plan on EPR and Circular Economy)

## Highlight Results

Over the past two years, the project has successfully connected the local recycling value chain, reduced plastic waste, and empowered the community to manage a cleaner, greener environment. Specifically, within the project framework, it successfully supported 05 aggregators/ junk shops in increasing income after improving their infrastructure. Fifty-one women engaged in waste collection underwent occupational safety training and received support with essential tools. Additionally, 118 leaders at various levels and stakeholders (non-governmental organizations, businesses, etc.) shared project information and provided insights into plastic waste and the circular economy. During its operations, the project also educated and promoted awareness of plastic waste collection, sorting, and recycling to 2,000 tourists. Summarizing its activities, the project successfully collected and recycled 152.23 tons of plastic waste, concurrently spreading awareness of waste collection and plastic waste sorting to 76,516 citizens. Through training activities, participation in local circular economy waste models, and educational outreach, 9,500 individuals directly benefited from the project.

## Impact

**Environment Impacts:** During the project implementation, 152.23 tons of plastic waste was collected and transferred for recycling by connecting the plastic waste value chain. Additionally, over 1,000 kilograms of plastic banners (flex) and 100 kilograms of fabric scraps were reused to make products and commercialized in the business models. The project also provided a strengthening circular system including planning and preparation for waste management projects in Can Gio, strengthening recovery and expanding access to recycling markets and solutions for the recycling sector, and preparation for waste management infrastructure for Can Gio to collect recyclable plastic waste by 75 community–based collection points.

▲ Figure 1. To May Xanh (Green Garmen Team) created new life for used banners (Source: GreenHub, 2024)

**Socio–Economic Impact:** The project has been successful in connecting the recycling value chain and mobilizing the official sector's participation in waste sorting, collection, and recycling. The project successfully connected Duy Tan Recycling company to two biggest aggregators in the area and connected the biggest aggregator with the junk shops. Representatives of 75 collection points have been trained in occupational safety, 5S practices, and five of them are actively involved in the collection chain.

In terms of business development, 03 economic models from reused and recycled products were established and implemented to create livelihoods and extra incomes for 20 local women. The project's education and training have raised awareness about waste collection and plastic sorting among 76,516 citizens, promoting local circular economy models. Additionally, 9,500 individuals have directly benefited.

▲ Figure 2. Mrs. Nguyen Thi Chau besides her new cart supported by the project (Source: GreenHub, 2024)

## Lesson Learned

- **In terms of Project Management**

The timely attention and guidance from the leadership of Can Gio District. The project faced a significant delay in its approval in year 1, resulting in most project activities being carried out during the second year. Thanks to the timely attention and guidance from the leadership of Can Gio District the activities were organized efficiently and effectively.

Understand the actual needs of local actors. To ensure the interventions' effectiveness, designing, constructing, and implementing activities must be based on the local context's needs.

Longer duration of project. The activities would have achieved greater effectiveness if the project had extended the implementation period to provide continuous support to the model.

- **In terms of Model Implementation**

The plastic value chain requires the involvement of aggregators and junkshops. Identifying their needs is essential for effective support. Economic and market factors are crucial for sustainable collection. Waste workers, as collection partners, need better tools, working conditions, safety, livelihood improvements, and social welfare. Recognizing contributions from both informal and formal sectors in the collection and sorting process is vital.

Women's Union is a very supportive and effective local actor. The Women's Union's collection program creates a dual impact by collecting and fundraising to support disadvantaged households and minimize waste. A more effective program would require additional efforts to directly engage households of Women's Union members, integrating organic waste recycling to minimize on-site waste.

The Circular Economy Sorting Bin is a practical tool for collecting recyclable waste. Managed by beneficiaries, these bins ensure proper sorting and serve as communication tools with easy access, sufficient size, and clear signage. Changing the perception of trash bins from pollution sources to communication tools is crucial.

Tailored Media Channel. Media should be designed to suit the target audience with appropriate language, visuals, and calls to action to educate residents and tourists. Educating adolescents and teachers is crucial for long-term impact. Accessing Trainers of Teachers (TOT) through educators and supervisors can promote good practices and initiate behavioral changes in schools.

Creative educational materials. Educational materials for the program should be innovative, including games for easy access and regular competitions to encourage students to explore and foster behavioral change.

# Microplastics in Coastal Marine Fish of Rayong Province, Eastern Gulf of Thailand

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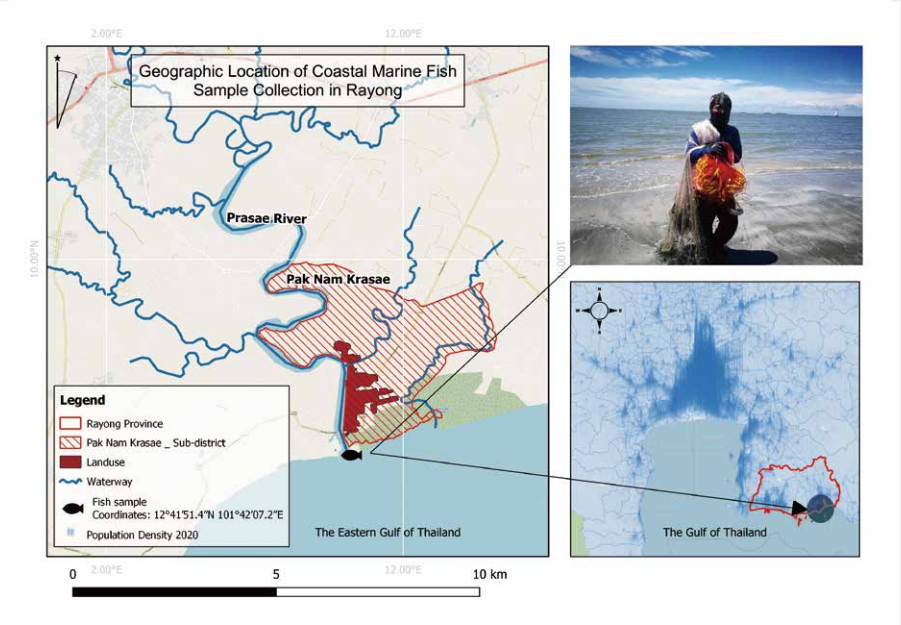
Marine plastic debris is no longer a distant threat; it has become an urgent reality that affects aquatic ecosystems and marine biodiversity. The seriousness of this issue was underscored in 1997 when Laist (1997) reported on the devastating effects of marine plastic debris, noting instances of ingestion or entanglement in 267 marine species. Tragically, this problem has only worsened over time, as the world's oceans and seas continue to be polluted with human-made waste since the end of World War II.

Fish are among the most diverse organisms in terms of species and ecological diversity, which increases their vulnerability to encounters with plastic marine debris. Microplastics, defined as particles smaller than 5 millimeters, have become ubiquitous in marine environments around the world, from the surface waters to the deep sea (Katija et al., 2017). These particles pose significant risks through both direct and indirect ingestion, raising concerns about the potential harmful effects of plastic-contaminated fish on human health.

In May 2022, ten marine fish were collected by local fishermen from the Eastern Gulf of Thailand, specifically at the Prasae River waterfront in Rayong Province, using a fishing net. The composition of the collected samples was as follows: 2 Sardinella gibbosa, 2 Lutjanus russellii, 2 Triacanthus biaculeatus, 2 Leiognathus equulus, and 2 Gerres erythrourus.

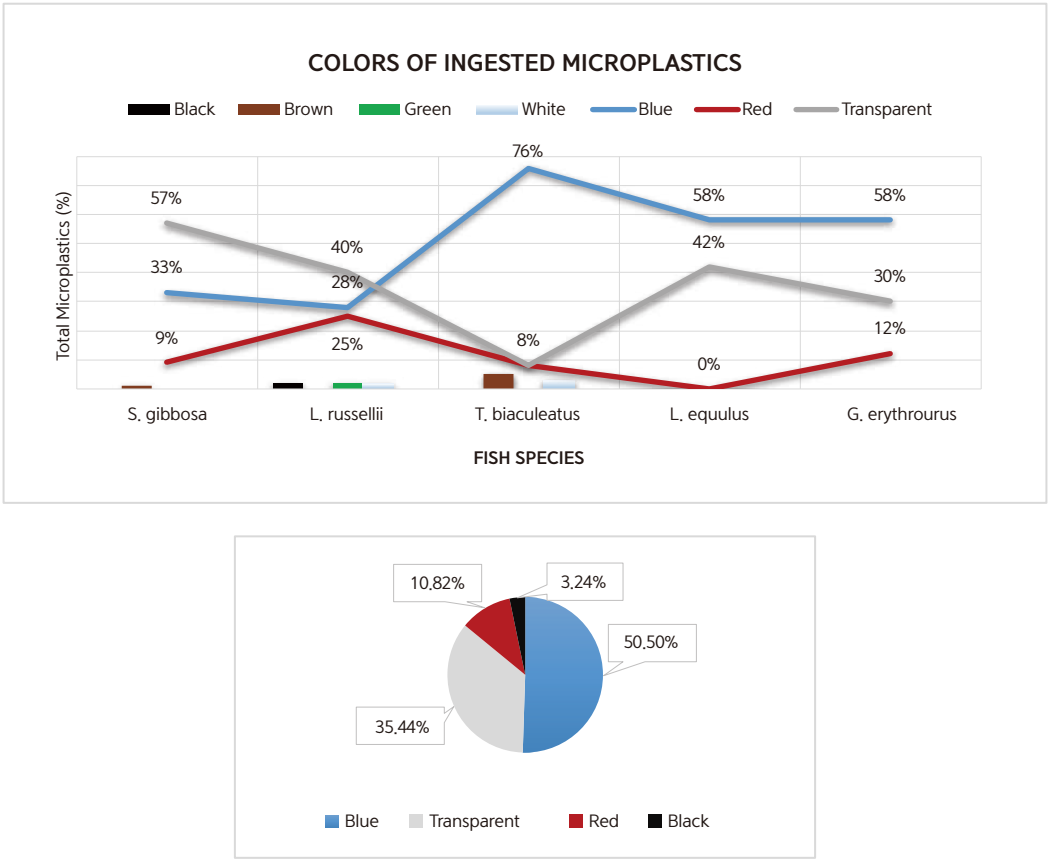



▲ Figure 1. Geographic Location of Coastal Fish Sample Collection in Rayong Province.

Each fish was weighed and measured to an accuracy of 0.1g and 0.1cm, respectively. The gastrointestinal tracts (GIT) were then removed via anatomical dissection and transferred to a sterile beaker covered with a watch glass to prevent contamination. A mixture of 4M potassium hydroxide (KOH) and 30% hydrogen peroxide (H2O2) was added for sample digestion, and the samples were left to react for three days at room temperature. The organic matter was dissolved using Wet Peroxide Oxidation (WPO) with ferrous sulfate (FeSO4) as a catalyst. Plastic particles were isolated by sieving through a 125µm mesh and desiccated in a petri dish at 50°C for 24 hours. Finally, the plastic particles were analyzed for color and shape using a ZEISS Stereo Microscope – Stemi 305 and EOS Utility software for digital image capture.

Microplastics were detected in all sampled fish, with 182 plastic particles found in their gastrointestinal tracts (GIT). The prevalence of microplastics among fish species ranged from 9.34% to 28.02%, with the highest occurrence observed in the goldstripe sardinella (Sardinella gibbosa). This elevated presence could be attributed to their planktivorous feeding behavior, as they primarily consume plankton, their ability to inhabit various marine environments due to their euryhaline nature, and likely also to passive ingestion of microplastics through the marine food web, as documented by previous research (Kalaiselvan et al., 2022).

These microplastic particles showed a diverse range of colors, including blue, black, brown, green, red, transparent, and white. The most commonly ingested color of microplastics was blue, accounting for 50.50% of the total microplastic particles found. Transparent microplastics followed closely at 35.44%, while red microplastics made up 10.82% of the total ingested microplastics and other colors were found in low percentages.

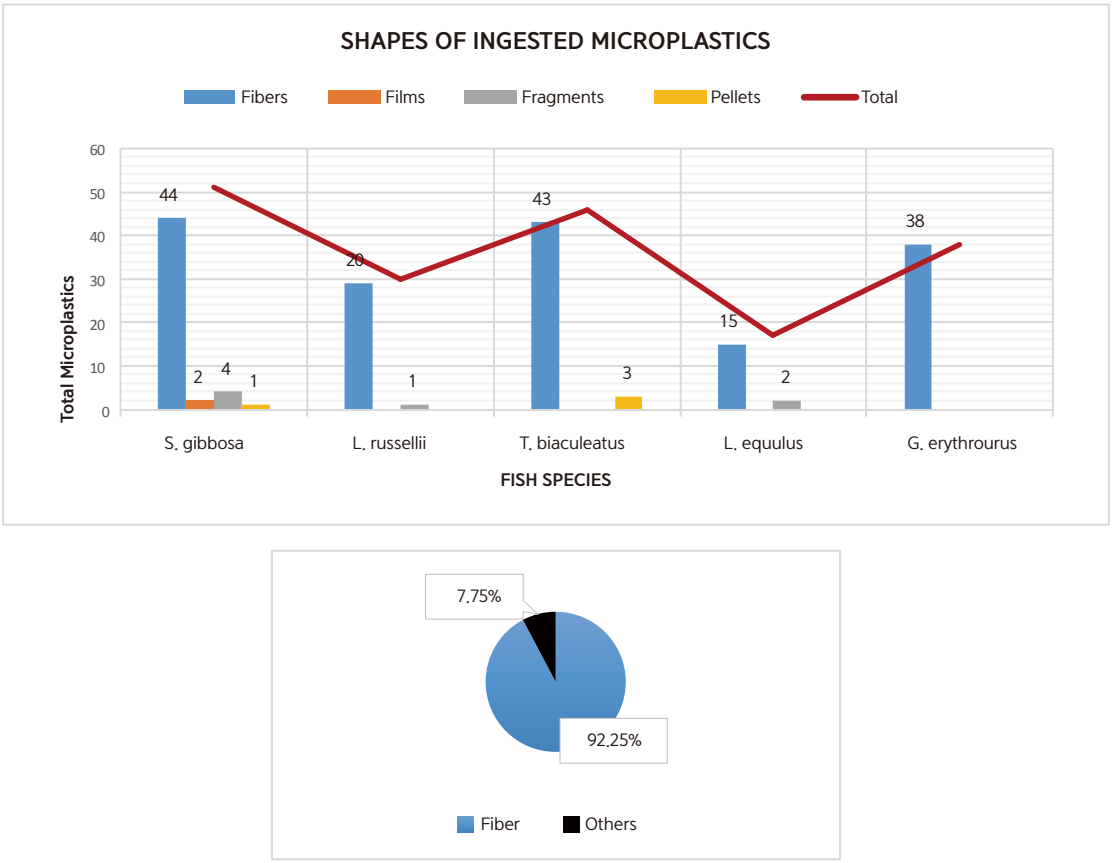



▲ Figure 2: Colors of Ingested Microplastics.

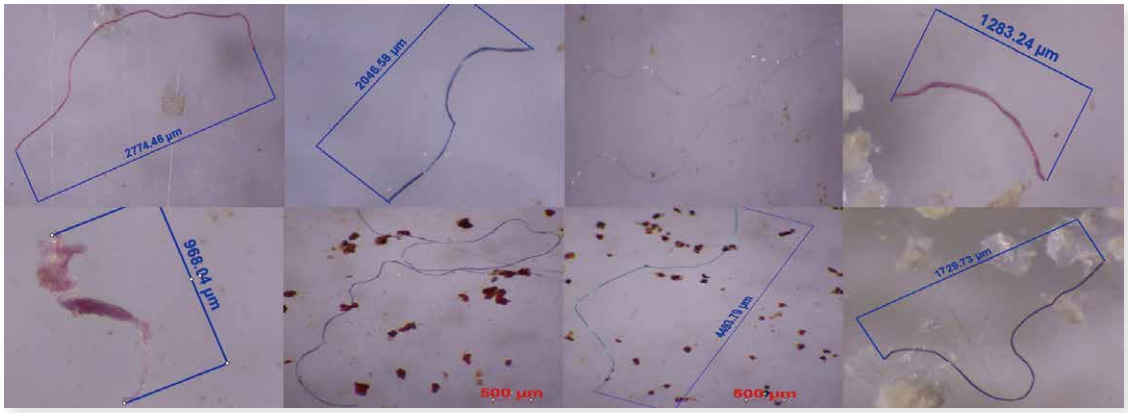
The most abundant type was fiber, accounting for 92.25% of the total 182 plastic particles within the sampled fish, while the remaining 7.75% comprised of plastic films, fragments and pellets. This observation is similar to the study of (Tien et al., 2020), where the fish seem to prefer ingesting long fibrous microplastics when feeding.

Notably, Gerres erythrourus had only ingested microplastic fibers with an average of 19 particles per 2 individual fish, and no other types of microplastics were identified. In contrast, a previous study (Phaksopa et al., 2021) reported a substantially lower average ingestion rate of 0.30 particles per three individual fish of the same species. This discrepancy underscores the importance of further investigation to clarify the underlying factors contributing to such differences in microplastic ingestion among these fish populations and reinforce the need for further research on anthropogenic activities in the study area.

On the other hand, Sardinella gibbosa, Leiognathus equulus, and Gerres erythrourus, which are known to be coastal species that may feed near the water surface, showed higher fiber ingestion, possibly due to the prevalence of fiber particles in surface water (Kwon et al., 2020). While Lutjanus russellii and Triacanthus biaculeatus are associated with coral reefs and are not typically surface feeders, their behavior can be influenced by various factors such as the availability of prey and environmental conditions including temperature and pollution, which are increasingly common in coastal areas (McKenzie & Claireaux, 2010).




▲ Figure 3: Shapes of Ingested Microplastics.




▲ Figure 4: Examples of Microscopic Images of Microplastics Found in the GI Tracts of the Coastal Marine Fish.

The findings of this study highlight the alarming prevalence of microplastic ingestion among coastal marine fish species in the Eastern Gulf of Thailand, underscoring the urgent need for action to mitigate the impacts of plastic pollution on marine ecosystems and human health. The results showed that all sampled fish species ingested microplastics, with the highest occurrence noted in planktivorous species Sardinella gibbosa. The microplastics found within the GITs of these fish were predominantly fibers, suggesting selective ingestion of long fibrous microplastics during feeding. Additionally, the diverse colors of ingested microplastics underscores the pervasive presence of plastic debris in the area.

In summary, the implications of microplastic ingestion by coastal marine fish not only raise ecological concerns but also pose potential risks to human health, necessitating urgent measures to mitigate plastic pollution and its detrimental effects on marine environments and human well-being.

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# Sounding the Alarm: Philippines' Manila Bay Inundated by 12 Million Pieces of Marine Litter

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## Introduction: Marine Litter and The Manila Bay

Marine litter is one of the most serious environmental problems in the world's oceans (UNEP, 2016). It is defined as persistent, manufactured, or processed solid materials from land–based or sea–based activities discharged deliberately or accidentally into the marine and coastal environments (Williams & Rangel–Buitrago, 2019; Lohr et al., 2017; Bergmann et al., 2015). It is reported that the rapid increase of marine litter is associated with the overproduction and overconsumption of products, together with inefficient or inappropriate waste management practices of countries (Lestari & Trihadiningrum, 2019; Vince & Stoett, 2018; European Union, 2016). As an archipelagic country, the Philippines is one of the countries with the highest amount of mismanaged waste in its coastal areas (Rubio et al., 2021). Annually, the country disposes of 0.28 to 0.78 million metric tons of plastics in the world's oceans (Jambeck et al., 2015) and one of its highest contributors is Manila Bay.

Manila Bay is one of the Philippines' most economically significant bodies of water. It is a semi–enclosed bay facing toward the West Philippine Sea with a surface area of 1,800 km2 and a surrounding watershed area of 17,000 km2. It is bordered by coastal cities of the National Capital Region (NCR) such as the City of Manila, Pasay, Parañaque, Las Piñas, and Navotas; the coastal provinces Bataan, Pampanga, and Bulacan in Region 3; and Cavite in Region 4A (Cruz and Shimozono 2021). It is the primary livelihood source for millions of coastal residents and holds a significant historical, cultural, and environmental value in the country. Sadly, Manila Bay is also home to almost 9.4 billion pieces of plastic waste, 12 million being found in the coastal areas, mainly contributed by the seven major rivers and 26 catchment basins located across the 190 km coastline of the bay – making it a huge floating dump of Metro Manila and provincial suburbs.


▲ Figure 1. Map of Manila Bay

## The Marine Litter Monitoring Survey: Objectives and Significance of The Study

To assess the marine litter situation of Manila Bay, the Ecological Waste Coalition (EWC) together with the De LaSalle University – Dasmariñas (DLSU–D), conducted the marine litter monitoring survey of the 10 coastal areas within the coastline of Manila Bay to profile the marine litter and estimate its contribution to the overall marine litter in our world's oceans. This study conducted as part of a KOICA project in collaboration with OSEAN. The study accomplished the following objectives:

1. Classify the marine litter based on the following types: plastic, wood, metal, natural fiber, glass, rubber, paper, and other mixed materials;
2. Make a comparison of collected marine litter during dry and wet months in terms of actual count and weight;
3. Identify the top items of marine litter based on the highest count; and
4. Determine relative and estimated values of the total count and weight of marine litter in the entire Manila Bay coastline based on actual values.

This is a 3–year study that will assess and identify the trends of marine litter in the country. EWC and DLSU–D emphasized that this study is important in producing baseline information that will help stakeholders develop significant waste management policies and projects to alleviate the marine litter problem in Manila Bay.

## Methodology

The study used a quantitative comparative research design on the extent of marine litter pollution. The researchers identified the actual counts and weights of the various types of marine litter during the dry and wet months. Along with it is the identification of the highest counts of items of marine litter and ranking them based on their types. After that, the total counts and weights of marine litter in the entire Manila Bay were estimated based on the actual counts and weights of the collected marine litter on the research sites. The following research sites were chosen based on the following criteria: 1.) sandy or pebble beaches with a length of at least 100 meters, 2.) Accessible for litter cleanups but not regularly cleaned up, 3.) Beach litter must accumulate for two months before the said survey. The following 10 areas identified are as follows:

| Cluster | Survey Sites | Reference Coordinates | |
|---|---|---|---|
| | | Latitude | Longitude |
| NCR | Las Piñas – Parañaque Wetland Park | 14.494900 | 120.981391 |
| | Tanza Marine Tree Park, Navotas City | 14.684628 | 120.924620 |
| Region 3 (Bataan) | Brgy. Bantan, Orion | 14.651100 | 120.580100 |
| | Brgy. Cabcaben, Mariveles | 14.450200 | 120.591666 |
| | Brgy. Sisiman, Mariveles | 14.429437 | 120.532255 |
| Region 4A (Cavite) | Brgy. Timalan Conception, Naic | 14.349502 | 120.781539 |
| | Brgy. Capipisa, Tanza | 14.341312 | 120.776253 |
| | Brgy. Julugan I, Tanza | 14.410536 | 120.844070 |
| | Brgy. Silangan I, Rosario | 14.422970 | 120.858971 |
| | Brgy. San Rafael IV, Noveleta | 14.448964 | 120.876778 |

▲ Table 1. Research sites

The field survey procedure used for this research was adopted from the Manual for Beach Litter Monitoring Program developed by the Korean Ministry of Oceans and Fisheries and Korean Marine Environment Corporation by Hong J., Lee J., Kim J., Jang YJ., Muslin M., Kang D., Cordova R. (2021).

## Results and Discussion

From the survey sites, researchers found that most of the marine litter collected across the coastal areas covered in the research are macro-sized plastics, especially in the dry season due to increased tourism activities across the beach area of Manila Bay. Based on the average count and weight, hard plastics comprised the most marine litter collected in the study areas. Hard plastics are types of plastics that are generally resistant to being scratched easily or crushed such as lunch boxes, plastic trays, etc.

The second highest count is the film plastics. These are types of plastics that are generally used in single-use packaging such as sachets, small quantity food packaging, and even single-use products. It is also used for its printable surfaces that companies use to print their logo or trademark on their product. Among the best examples are shampoo sachets, 3-in-1 coffee sachets, etc.

| Materials | | NCR | | | | Region 3 (Bataan) | | | | Region 4A (Cavite) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Count | | Weight | | Count | | Weight | | Count | | Weight | |
| | | Dry | Wet | Dry | Wet | Dry | Wet | Dry | Wet | Dry | Wet | Dry | Wet |
| Plastics | Hard | 30.1 | 11.6 | 18.1* | 202* | 338* | 41.5* | 351* | 953* | 9.8 | 15.8 | 95.1* | 482* |
| | Foam | 12.0 | 6.0 | 4.7* | 67.9* | 88.7* | 10.6* | 162* | 403* | 6.1 | 9.4 | 96.4* | 183* |
| | Fiber | 2.4 | 3.9 | 3.5 | 215 | 326* | 5.1* | 671* | 429* | 1.4 | 3.6 | 244* | 525* |
| | Film | 18.4 | 14.4 | 16.2* | 268* | 378* | 39.1* | 632* | 1032* | 4.6 | 13.7 | 112* | 166* |
| | Others | 1.6 | 1.2 | 1.0* | 147* | 121* | 1.5* | 463 | 405 | 0.4 | 0.5 | 49.4* | 82.5* |
| Wood | | 0.5 | 0.8 | 0.6 | 0.4 | 35.0 | 19.5 | 130* | 467* | 0.2 | 0.2 | 154 | 148 |
| Metal | | 0.1 | 0.1 | 0.2 | 0.2 | 19.5 | 6.9 | 3.4 | 3.1 | 0.6 | 0.4 | 4.6 | 19.2 |
| Natural fibers | | 0.2 | 0.08 | 0.5 | 0.1 | 14.0 | 0.8 | 82.8 | 63.9 | 0.07 | 0.2 | 1.7 | 7.5 |
| Glass | | 0.9 | 0.7 | 0.8 | 0.8 | 53.4* | 81.3* | 154* | 92.9* | 2.2 | 0.7 | 102* | 50.5* |
| Rubber | | 0.5 | 1.6 | 0.6 | 1.0 | 30.8* | 111* | 220* | 373* | 0.5 | 0.9 | 7.5 | 27.6 |
| Paper | | 0.04 | 0.09 | 0.8 | 0.5 | 41.9* | 10.6* | 11.2 | 0.3 | 0.4 | 0.3 | 8.7 | 26.3 |
| Mixed materials | | 1.1 | 0.7 | 0.6 | 0.5 | 45.6* | 80.9* | 776* | 104* | 2.8 | 0.8 | 2578* | 56.7* |

*with significant difference between dry and wet months' collections (p(T<=t) two-tail [0.01]

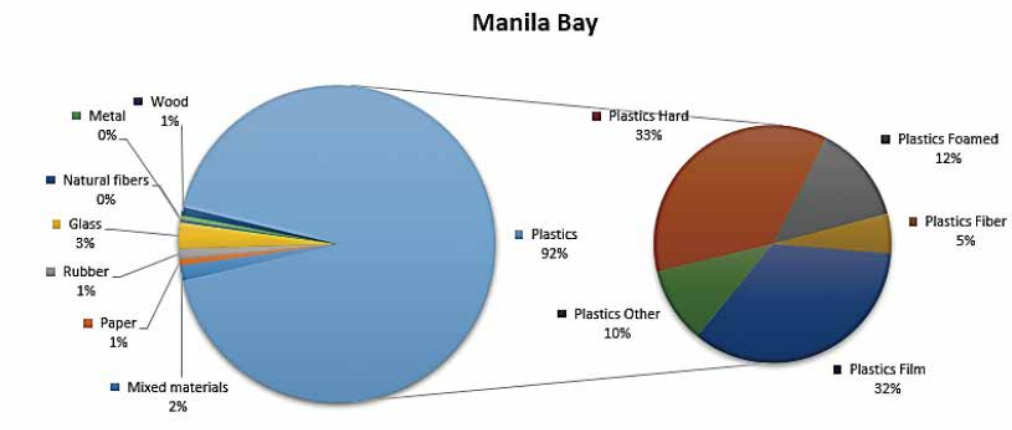
▲ Table 2. Average Count (number) and weight (g/m) of Collected Marine Litter During Dry and Wet Months.


▲ Figure 2. Researchers collecting the marine litter

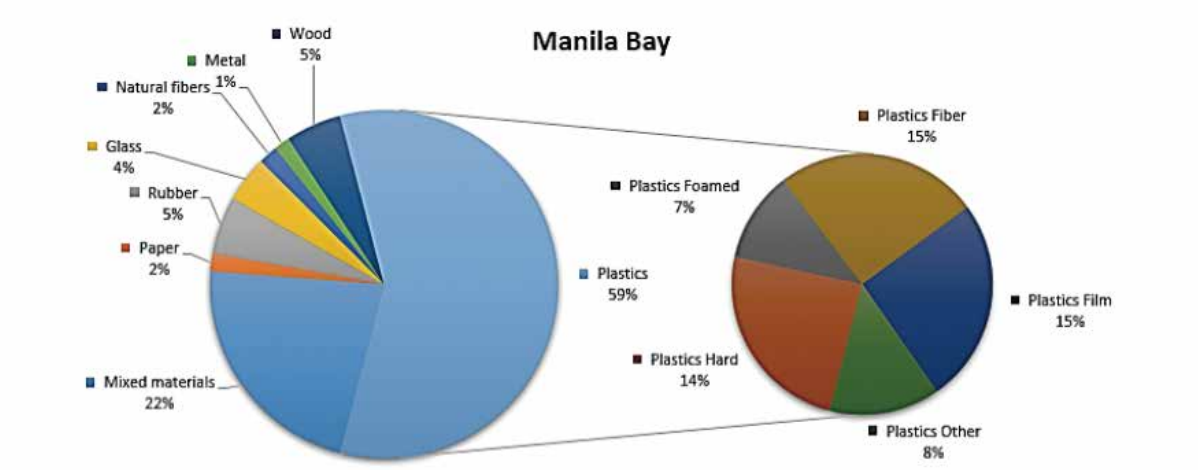
Using the actual values of collected plastic litter along the coastal barangays covered by this research, the researchers estimated the total count and weight of marine litter across the 190 km coastline of Manila Bay. Based on their calculations, the researchers are alarmed as the total count of marine litter on the coastline of the bay has reached up to 12 million. Most (90%) of these wastes are plastics in different forms and types. The total weight of this present marine litter on the coastline is approximately 548 tons.

| Plastics | Total Count (million pieces) | Total Weight (kg) |
|---|---|---|
| Plastics | 11.10 | 318,955 |
| Wood | 0.10 | 28,471 |
| Metal | 0.05 | 8,028 |
| Natural fibers | 0.03 | 9,816 |
| Glass | 0.32 | 23,538 |
| Rubber | 0.13 | 29,388 |
| Paper | 0.07 | 9,011 |
| Mixed materials | 0.19 | 121,390 |
| **TOTAL** | **12.00** | **548,597** |

▲ Table 3. Estimated counts and weights of Marine Litter on the Coastline of Manila Bay based on Collected Actual Values




▲ Figure 3: Relative count of collected marine litter on the entire coastline of Manila Bay




▲ Figure 4: Relative weight of collected marine litter on the entire coastline of Manila Bay

## Recommendation: Better Monitoring and Efficient Waste Manegement

Based on these recent findings of the 1-year monitoring survey, several recommendations have been endorsed:

1. National government and local government units should have a strong political will to strictly implement landmark laws and policies regarding solid waste management and conservation and protection policies of coastal resources in the Philippines such as R.A 9003 (Solid Waste Management Act of 2000), R.A. 9275 (Clean Water Act of 2004), EO 192 s.1987 (Operational Plan for the Manila Bay Coastal Strategy – OPMBCS) among others.
2. Each coastal barangay or community must implement information and education campaigns (IEC) regarding solid waste management and plastic litter pollution. Households and beach resort owners and locals must be knowledgeable on different classifications of waste, aware of its impacts, and should practice proper waste segregation and reduction.
3. Illegal dumping, burning, and/or burying of marine litter must be avoided and regular collection by respective local government units must be initiated.
4. Regular coastal/beach cleanup must be regularly conducted involving community stakeholders including LGUs, CSOs, and NGOs to reduce marine litter and conserve mangroves as well.
5. Concerned government agencies should devise an integrated marine litter management plan for Manila Bay where the monitoring data can be utilized.

## Conclusion: Whole-of-Government and Whole-of-Society Approach Toward the Protection of Our Seas

The findings of this study provided a glimpse of the present situation that Manila Bay and its coastal areas are experiencing. It highlighted how the Philippines is highly dependent on single-use plastics that pose several threats to the environment and marine biodiversity. The proliferation of marine litter on the entire coastline of Manila Bay poses a great risk to the environmental and economic sustainability of the bay as it might affect the health and livelihoods of the community living on the coastline, and it might disrupt the tourism and other economic activities of the area. On top of that, marine litter also poses a great threat to the great biodiversity in Manila Bay.

In a recent press conference of the EWC, together with DLSU-D, held last January 2024, they emphasized that the massive plastic litter in Manila Bay is very alarming given that these products are non-biodegradable and could last hundreds of years before they decompose. The two organizations explained that plastics could destroy the ecosystem of the massive biodiversity of Manila Bay and they could get inside the fish that are caught in the bay that the citizens consume.

With the ongoing reclamation of land from the surrounding waters of Manila Bay, the researchers believe that this will worsen the marine litter problem in the bay. With the increase in tourist activities, the researchers argued that the generation of plastic litter (especially single-use plastics) in the coastal areas in Manila Bay could double. The researchers underscored that the country still has a long way to go in eliminating single-use plastics and marine litter as a whole (Argosino, 2024).

The EWC urged the government to intensify its efforts to alleviate the marine litter problem in Manila Bay. The group said that local government units and the Department of Environment and Natural Resources should have a strong political will to fully implement the National Plan on Marine Litter (NAPMALI) in order to achieve Zero Waste Philippines by 2040.

Besides the government's efforts, there is a need for various environmental groups and civil society organizations to boost their efforts in engaging stakeholders and community organizations and empowering them to become zero waste advocates. Researchers emphasized the importance of initiating behavioral change as an integral part of creating an efficient marine litter management system in Manila Bay and the Philippines as a whole. This could be achieved through a massive integrated information, education, and communication (IEC) campaign and an active collaboration between the government and environmental groups in creating policies and programs that could help raise awareness about the dangers of marine litter.

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