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Preface

Dear readers,

As mentioned in the previous issue, there are ongoing global efforts to successfully facilitate the establishment of an internationally legally binding instrument with the aim of eradicating plastic pollution in marine environments. Towards the end of May, the second Intergovernmental Negotiation Committee was held in Paris, during which discussions were held regarding the content of the agreement. Active participation from a wide range of stakeholders in the Asia-Pacific region is crucial for the success of these endeavors. However, as showcased in this newsletter, we can witness a multitude of initiatives currently being implemented across the Asia-Pacific region that are focused on reducing marine plastic pollution.

In the Opinion section, USAID's Clean Cities, Blue Ocean program (CCBO) shares a co-hosted side event at the Our Oceans Conference, highlighting the use of the Solid Waste Capacity Index (SCIL) to improve waste management systems, along with the program's achievements. Activities in the AP region involve, first, a beach cleanup by Hiin Studio in Taiwan and address the challenge of marine debris by creating a "Marine Debris Art Wall". Second activity is Project ReCon, launched by Tangaroa Blue Foundation in Australia in partnership with Satlink, which aimed to tackle the issue of ghost nets and GPS-enabled tuna tracking buoys, providing communities with a way to contribute to the recovery, repair, reuse, and recycling of these items, particularly in the Great Barrier Reef. Third activity introduces a children's book named "Message in a Bottle" and initiated in UK, raising awareness on litter in the deep sea, and it has been used in various educational and artistic contexts in multiple languages. Fourth activity is the first local training of the "Enhancing Marine Litter Management in Manila Bay, Philippines" (EMLM) project, organized by us OSEAN in collaboration with KOICA and KOEM, which aimed to share Korean marine litter monitoring methods.

We are also glad to share some research efforts from the region. First, the Korean Coastal Big Data Platform led by the Korean Ministry of Science and ICT and the National Information Society Agency, collaborates with OSEAN and 24 other institutions to create a comprehensive coastal data platform, offering integrated data on various coastal topics. Second is India's plastic waste control efforts overshadowed by the doubling of plastic waste generation in recent years, underscoring the urgency of addressing the issue, while organizations like the Marine Aquarium & Regional Centre in Digha are actively combating plastic pollution. Last but not least is a research aimed to develop sustainable marine tourism on Pramuka Island in Seribu Island, Indonesia, by empowering women entrepreneurs. It emphasizes their vital role in family income and advocates for recognizing their entrepreneurial capacity in promoting sustainable tourism.

We are facing a historic moment in combating anthropogenic plastic waste and bearing the cost of plastic convenience. We would stand strong as we delve into the depths of this global challenge, seeking to understand, raise awareness, and take action towards a plastic-free marine environment. As an editor, I hold great admiration for the APLM members and our partners who tirelessly work towards the goal of conserving the marine environment and I express my sincere gratitude to all those who have contributed to Marine Litter News.

Ms. Semee Rhee, who has dedicated herself as an editor of Marine Litter News for two years, has decided to step down from her position as an editor. She moved to Break Free From Plastic (BFFP) and will contribute more significantly as a Global Policy Advisor in the ongoing Plastic Treaty related discussion. We deeply appreciate her hard work and dedication. We have invited a new editor to fill her position, Mr. Michael Bak, a Senior Analyst at GGGI and an expert in hydrogeology and nature-based solutions. We are thrilled to have him on board and look forward to working together.

As always, OSEAN is committed to bringing you more exciting news and updates in the upcoming issue.

With gratitude,

Sunny Hong

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An Index for Local Governments to Prevent Ocean Plastic Pollution

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▲ Figure 1. USAID CCBO Global Focal Countries and Sites

USAID's Clean Cities, Blue Ocean program works in 10 countries and over 25 cities in Asia and the Pacific Islands, the Caribbean, and Latin America to address ocean plastic pollution at its source.

Most of the 11 million metric tons of plastic waste that leak into the ocean annually—more than a garbage truck's worth of plastic a minute—comes from cities as urban waste escapes into surrounding environments. Around the world, waste management is the responsibility of local governments. Few municipal services are as visible in our daily lives—and directly impacting the ecological and public health of our communities—as waste management. Yet many local governments face challenges due to limited financial and technical resources, hindering their ability to effectively plan, build, and operate the on-the-ground waste management services that prevent ocean plastic pollution.

In March, global leaders convened in Panama for the Our Ocean Conference—now in its eighth year—to deliberate the state of our oceans and reaffirm their commitments to address marine pollution. During the conference, the United States Agency for International Development (USAID), through its Clean Cities, Blue Ocean program, co-hosted a side event to spotlight the role of local governments in managing their waste streams and preventing that waste from entering the ocean.

USAID, in collaboration with Urban Ocean®—a partnership between Ocean Conservancy, The Circulate Initiative, and the Resilient Cities Network—co-hosted the side event to emphasize the crucial role of cities as frontline defenders of marine pollution. The event also served as a platform to announce various tools and initiatives available to assist local governments in reducing the waste entering our waters.

▲ Figure 2. U.S. Senator Sheldon Whitehouse of Rhode Island delivers opening remarks at the USAID–hosted side event. (Photo Credit: Ocean Conservancy)

One proven tool to bolster local government capacity is the Solid Waste Capacity Index for Local Governments (SCIL, pronounced SKILL), developed by USAID. The SCIL serves as an initial step toward establishing a more robust and effective solid waste management system. The SCIL is a comprehensive and user–friendly tool that enables local governments to conduct self–assessments, identifying their strengths and weaknesses in waste management. Through a series of "yes" or "no" questions supported by verifiable data, the assessment generates scores that facilitate the development of feasible and actionable plans to improve critical aspects of a city's solid waste management system.

A core tenet of USAID's local systems approach to building a circular economy is that municipalities should engage in thoughtful and strategic considerations in their solid waste management planning process—and that planning processes are based on data–driven analyses and the local context. Conducting a SCIL assessment facilitates this process, enabling municipalities to make informed decisions relying on the assessment outcomes.

In a SCIL assessment, a designated local group called the SCIL Implementation Group, comprising municipal staff from multiple agencies supporting waste management, assesses and assigns scores to the following six areas. These areas receive equal attention and consideration as critical components of a well–functioning waste management system:

1. **Planning –** Is there a well-developed and comprehensive plan for the system that meets the needs of the local government's citizens?
2. **Policy and Legal Framework –** Do local laws and policies fulfill local government's responsibilities in accordance with national legal requirements, strategy, and policy?
3. **Financial Management –** To what extent are systems in place to administer, budget, and track all waste system expenses and revenues?
4. **Service Delivery –** Is there infrastructure and protocols in place to deliver to all its citizens reliable, equitable, and environmentally sound services for all waste?
5. **Human Resources –** Are there effective and equitable human resources, structures, and processes in place to competently and safely deliver waste management services?
6. **Community Engagement –** To what extent has the local government engaged stakeholders (including women) in planning and implementation and incorporated their input into the design and monitoring of the system?

▲ Figure 3. SCIL Assessment areas

The SCIL process fosters a deeper understanding among local governments that waste management and establishment of circular economies extend beyond mere service delivery. Completing an assessment enhances awareness of the interconnectedness and complexities of the six SCIL components, and that areas covered by the assessment questions are critical to the overall waste system. Further, SCIL assessments serves as a tangible representation of local waste management capabilities for communities of all sizes. The SCIL, one of a number of technical support tools provided by USAID, has undergone pilot testing in four languages across more than 17 cities in seven countries; with larger cities working with their sub-districts to conduct further assessments.

USAID partner countries are beginning to incorporate the findings from SCIL assessments into their planning frameworks, enabling them to initiate local-level implementation. **Read more about the SCIL's application and impact in the Building Local Government Capacity for Improved Solid Waste Management Systems Case Study and brief factsheet. Use this link to access the SCIL Toolkit and associated components.**

More about USAID and its Ocean Plastic Pollution Initiatives

USAID is committed to addressing ocean plastic pollution directly at its source—in rapidly urbanizing cities across the globe—in alignment with the U.S. Government goal to eliminate plastic leakage into the environment by 2040. The U.S. government recognizes that the ocean plastics crisis is not isolated to one region or one country—once plastic enters our waters it becomes a global problem.

At the Our Ocean Conference, USAID announced to allocate $40.5 million, subject to the availability of funds and Congressional notifications, to initiate and expand on country programs that combat ocean plastic pollution and other marine debris at the local level. This includes USAID's Save Our Seas Initiative, which will create and expand on programs in 12 key countries and regions to address ocean plastic pollution and other marine debris at the local level that collectively generate more than 40 percent of the global total of mismanaged plastic waste. Of the total $40.5 million, $10 million has been designated for Clean Cities, Blue Ocean, USAID's global flagship program to address ocean plastic pollution under the Save Our Seas Initiative. Clean Cities, Blue Ocean works in 25 cities across 10 countries to test, scale, and share innovative, and proven solid waste management solutions with governments, communities, and businesses. **To date, Clean Cities, Blue Ocean has safely managed nearly 445,000 metric tons of waste, including more than 60,000 metric tons of plastic waste, equivalent to over 6.5 billion plastic bottles, effectively preventing their leakage into the environment.**

Turning Marine Debris into Art! – Taiwan's Marine Debris Art Wall

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To illustrate the concept of waste reuse, many environmental education courses incorporatemarine debris intoDIY projects. Participants have the opportunity to transform these materials into colorful souvenirs or practical household items through simple handicrafts. However, using marine debris for such purposes can present challenges due to the unstable nature of the materials or potential health risks. Further, many products avalable on the market that are made from recycled plastic sourced from marine debris often require the inclusion of virgin plastic materials to ensure product quality, making it difficult to achieve a 100% marine debris materials composition.

One environmental group in Taiwan, Hiin Studio, has been at the forefront of organizing beach cleanups with businesses and schools. Participants frequently inquire about how to manage the collected trash and express their desire to contribute more to environmental protection and community engagement beyond beach cleanups alone, especially with the growing emphasis on ESG (Environmental, Social, and Governance) practices.

In response to these requests, in 2020, Hiin Studio introduced a new approach. Following a beach cleanup activity with a partner company, they carefully selected more sturdy materials, such as plastic floats, flip–flops, plastic toys, and bottle caps, which were collected and affixed towall withs cement (excluding materials like PET or EPS which are not ideal for this purpose). The studio also encouraged community members and school students to participate in creating the "Marine Debris Art Wall".

▲ Figure 1. Children in the community also participated in the creation of the “Marine Debris Art Wall”

To make the marine debris stick to the wall more firmly, we applied a bottom layer of cement followed by a top layer of white cement. The use of white cement, which is denser, helps smoothen the rough texture of the cement. Once complet–ed, the wall can be touched with bare hands.

▲ Figure 2. The white part around the dolphin is the white cement.

The wall showcases the beauty of marine creatures through the use of marine debris materials, creating an art piece as a graceful marine creature from a distance but reveals itself as an aseemblage of endless trash upon closer inspection. With items like bottle caps, lighters, and other commonly used items, we intended to prompt viewers to reflect on whether we generate excessive and unnecessary waste that harms marine creatures. Through the visually attractive final art work, we encourage passersby to take photos and share them on social media, promoting greater awareness of marine debris art and highlighitng the value of collected beach trash.

▲ Figure 3, 4. The Marine Debris Art Walls feature various marine creatures constructed entirely from marine debris, including ghost knife, flying fish, whale shark, sea turtle, and squid.

Someone once asked us, "What's the purpose of creating art with trash?" We firmly believe that turning trash into art is not only an innovative way to reuse resources, but also a means to raise awareness of waste reduction, ocean conservation, and environmental protection. This project not only produces a captivating mural but also inspires people to contemplate their own contribution to environmental preservation.

▲ Figure 5. Participants in front of the art wall

There is a Chinese saying that goes “Make the few become the many”. Here, Hiin Studio creatively adopted a similar pronunciation between the word “plastic” and “few” to transform the sentence into “Make (the movement of) using less plastic becomes the mainstream”. Through this pun, the studio hopes to communicate the concept of source reduction of plastic through their art initiative.

Project ReCon: busting ghost nets haunting the Great Barrier Reef, Australia

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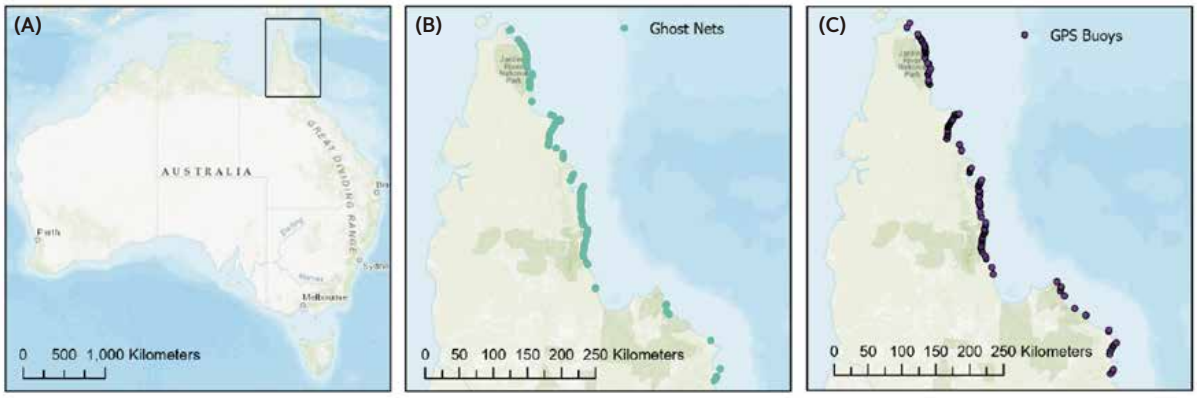
Global research into abandoned, lost, and derelict fishing gear (ALDFG) has grown immensely because of the environmental and navigational risks they pose (Do & Armstrong, 2023). ALDFG is a well-documented threat to the environment globally (Gilman et al., 2021; Gallagher et al., 2023; Richardson et al., 2021). In particular, ghost nets are an issue that the Australian Government is working to address. Ghost nets drift around the world in ocean currents and tides, where they pose a navigational hazard for ships, introduce marine pests, and take a great toll on coastal and marine wildlife that gets ensnared in the nets (Wilcox et al., 2014; Hardesty et al., 2021; Fig 1). Ghost nets are found regularly throughout Australian waters, including along the Great Barrier Reef. However, along Australia's northern coast, one of the highest ghost net density regions is in the Gulf of Carpentaria. More than 15,000 ghost nets have been removed from the Gulf of Carpentaria region since 2015 (Hardesty et al., 2021), and more than 8 tonnes of ghost nets were removed from waters between the Gulf of Carpentaria and the Torres Strait in December 2022, indicating that this problem persists (Ausmarine, 2022). We must be able to track ghost nets until they can be removed and disposed of properly because these regions are home to six of the world's seven marine turtle species, three of which are listed as endangered in Australia, and four sawfish species, which are endangered globally. A 2014 paper by Wilcox et al. sampled 8690 ghost nets and estimated that the total number of turtles caught by these nets was between 4866 and 14,600, assuming ghost nets drift for one year. Along 810 km of the Great Barrier Reef in Cape York, we identified 225 ghost nets amongst all the marine debris recorded in Tangaroa Blue Foundation's 2022 aerial helicopter survey highlighting the need for solutions to tackle this issue (Fig 2). We must develop innovative solutions to locate and remove ghost nets to protect Australia's marine wildlife.

GPS-enabled tuna tracking buoys are another ALDFG item found on coasts across Australia. The commercial fishing industry uses these buoys to track fishing equipment. They are solar-powered and are attached to the equipment left to drift in the ocean. However, these items can become lost or discarded at sea and then become marine debris. Since 2013, Tangaroa Blue Foundation has recorded more than 630 of these buoys in the Australian Marine Debris Initiative® Database and identified 209 in the 2022 Cape York aerial survey (Fig 2). Tangaroa Blue Foundation has been exploring ways to reuse and recycle these buoys since we began finding them but had not been successful in finding a solution until now.

In a world-first program, Tangaroa Blue Foundation partnered with Satlink, a world-leading provider of technological solutions for the fishing sector, to launch Project ReCon in December 2022 along the Great Barrier Reef. Project ReCon is a program that provides communities with a way of contributing to a recovery, repair, reuse, and recycling project for tracking buoys that, in turn, will help tackle ghost nets in Australian waters. Tangaroa Blue Foundation and our Australian Marine Debris Initiative® partners collect GPS-enabled commercial fishing buoys found during clean-up events. Satlink facilitates reassigning ownership of these buoys from the commercial fishing fleet to Tangaroa Blue. Buoys are then hosted by community partners from a variety of sectors, i.e., tourism, charter operators, and Aboriginal and Torres Strait Islanders so that they can be deployed on ghost nets that cannot immediately be recovered when located due to their size or the capacity of the vessel that found them. This ensures that the ghost gear is not lost while retrieval teams are mobilized to remove them. Previously, our recordings of ghost nets in the Great Barrier Reef were limited to those deposited on shore and found during coastal clean-ups and those reported by tourist and charter operators. However, Project ReCon allows us to engage all stakeholders, including the commercial fishing industry, to document and track ALDFG in Australian waters providing a more comprehensive understanding of ALDFG along the Great Barrier Reef region. Project ReCon is helping reduce technological waste, impacts on coastal environments, and benefits the local Australian communities that find the buoys.

▲ Figure 1. Examples of ghost nets.



▲ Figure 2: (A) The 2022 Cape York aerial survey location along the Northern Queensland coast of Australia. (B) ghost nets and (C) GPS buoys observed during the 2022 Cape York aerial survey.

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Litter in the deep

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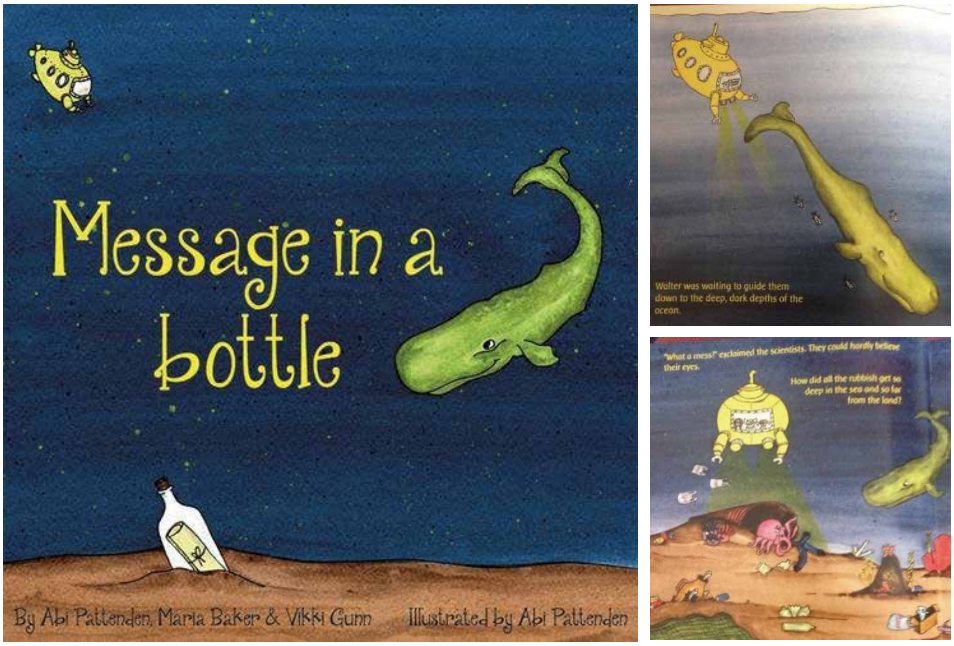

▲ Figure 1. Pattenden A, Baker MC, Gunn V (2013). Message in a Bottle. Published by HERMIONE/INDEEP, UK. 26pp. ISBN: 0957305206.

Inspiration for "Message in a Bottle" children's book arose from the author's work with deep-sea biology programmes. It has become increasingly apparent that wherever the science community explores the deep-sea searching for life, litter is often a bycatch of our haul or is evident in our deep-sea images. In 2013, Maria Baker led the INDEEP programme (International network for the investigation of deep-sea ecosystems), and Abigail Pattenden and Vikki Gunn were programme leads for the European Deep-Sea Hermione programme. With financial support from these two programmes, they wrote and illustrated a deep-ocean book for children highlighting the impact of litter in the deep sea. The deep ocean is often out of sight and out of mind for most people, so bringing this unseen impact to the public is important. Actual photos of deep-sea litter were included at the end of the book for effects. The English version of the book has so far been translated into French, German, Spanish, Portuguese, Italian, Norwegian, Flemish, and Faroese. Thousands of copies of the book have been distributed freely to schools (including via the EcoSchool network), nurseries, and other appropriate outlets across the globe. In addition, the book has been used in foreign language and art lessons and as inspiration for dances and plays – some of which are depicted in the images below. We still receive requests for the book from across the globe, but we have just a handful of English copies remaining with no further funds for reprinting. However, it is freely available online: https://www.dosi-project.org/wp-content/uploads/MIAB_hires.pdf

▲ Figure 2. Educational projects around the world have been inspired by "Message in a Bottle."

▲ Figure 3. Educational project inspired from Message in a Bottle.A– R. Tapia, Mexico; B– Cover of Message in a Bottle book; C– Alice, School Povoa, 4th grade, Portugal ; D– School art, Portugal; E– C– Maria, 4th grade, Portugal; F– Play from Agrupamento Alvergria a Velha, Portugal.

Philippines Manila Bay Marine Litter Monitoring Local Training

Sharing Korean Marine Litter Monitoring Methodology

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▲ Figure 1. Manila Bay Marine Litter Monitoring Local Training Participants

The first local training of the "Enhancing Marine Litter Management in Manila Bay, Philippines" (EMLM) project was held from February 13th to 17th, 2023. Our Sea of East Asia Network (OSEAN) has been carrying out this project in collaboration with the Korea International Cooperation Agency (KOICA) and the Korean Marine Environment Management Corporation (KOEM) from 2021 to 2025. This training was conducted as part of the project to share the marine litter monitoring method with local experts and officials in charge in Manila Bay. The training was attended by about 20 trainees, including officials from the Philippines Department of Environment and Natural Resources (DENR) and local governments, professors, and researchers from De La Salle University (DLSU), who are responsible for actual field surveys. External lecturers, including Professor Martin Thiel from the Catholic University of Chile and Ms. Antoinette Taus from the Philippine NGO CORA (CORA), also participated.

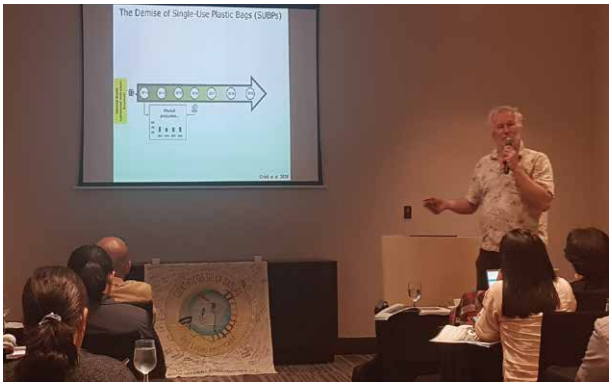
Opening ceremony and keynote lecture on "Marine Plastic Response and International Trends in Citizen Science"

At the opening ceremony, Dr. HONG Sunwook, the representative of OSEAN, began her welcome address by stating that plastic pollution is one of the three major problems facing the planet, according to the United Nations Environment Program (UNEP), along with the climate crisis and biodiversity loss. She emphasized that numerous research results clearly demonstrate a steep increase in the amount of plastic entering the ocean. Dr. Hong mentioned that at the UN Environment Assembly held in Nairobi, Kenya, a year ago, all UN member countries unanimously agreed to create a treaty to end plastic pollution and highlighted that depending on how this treaty is established, our daily lives in the next 20–30 years and future generations will be significantly affected. In this regard, she expressed that the monitoring training program for measuring marine litter pollution in the Philippines is a valuable opportunity, and she hopes that participants can share their determination and passion for solving the issue of marine litter during the training period.

▲ Figure 2. Dr.Hong, the representative of OSEAN giving her opening remarks

Mr. Al O. Orolfo, Director of International Cooperation and Special Projects at the Philippines Department of Environment and Natural Resources, began the opening remarks as a greeting to Dr. HONG. He mentioned his experience of receiving education on marine litter in the United States and expressed that he is now witnessing Korea taking a leading role in the international marine litter response through various activities. He also emphasized the significance of data management in the training program, which is not yet fully utilized in Manila Bay, as it will enhance the practicality of the acquired skills.

As the first keynote lecture, Dr. SHIN Wontae, the Regional Project Manager representing the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) in place of Ms. Amy Gonzalez, the Secretary-General of PEMSEA, introduced "Global Plastic Agreement Discussions and PEMSEA's Marine Plastic Activities." The newly established international agreement on plastic pollution is expected to have a significant impact on the Philippines. There are challenges in drastically improving waste management policies through measures such as waste separation and strengthening regulations on disposable products, as it burdens the low-income population. Extreme weather events such as typhoons also have a significant impact, and there are issues with the marketability of recycled plastics. PEMSEA, with support from the Ministry of Oceans and Fisheries of Korea, has initiated marine plastic reduction projects in the Philippines and Timor-Leste. The basic concept of this project was developed by OSEAN, and the project will start this year. Six regions in the Philippines and four regions in Timor-Leste have been selected to support the enhancement of local government's marine plastic management. In some areas, advanced recycling technologies will be utilized for waste separation and sorting projects, along with conducting marine litter monitoring. Dr. Shin introduced cases from Korea where citizen science-based monitoring confirmed a decreasing trend in coastal litter and expressed that this monitoring method would also be useful in the Philippines.



▲ Figure 3. Dr.Thiel's lecture on International trends in Citizen Science for Marine Litter

Dr. Martin Thiel, a professor from Universidad Católica del Norte in Chile, delivered the second keynote lecture on "International Trends in Citizen Science for Marine Litter." He began his lecture with an analogy, showing volcanic stones brought from Chile and highlighting the evolution of life on the surface of floating volcanic stones, which is fascinating, but contrasting it with the lack of biological evolution on the surface of plastics. He mentioned the advantages of utilizing citizen science in addressing marine litter issues, including 1) large-scale sampling, 2) citizen engagement, 3) finding effective solutions, 4) generating decision-making power, and 5) realizing a circular economy. He also presented considerations for citizen science, such as 1) meticulous coordination, 2) data verification, 3) scientific interpretation, 4) leveraging the benefits of volunteerism, and 5) the need for efforts and monitoring for tangible changes. Dr. Thiel started investigating marine litter after discovering plastic mixed in floating organism samples he was studying as a marine biologist. In Chile, he conducted citizen science to survey the distribution of coastal litter and public awareness with students nationwide. Based on this experience, he published a textbook on citizen science for marine litter, in which Dr. Hong, the representative of OSEAN, has also participated.

Coastal Litter Monitoring Methodology

On the third day, Dr. LEE Jongmyeong, the Chief Science Officer of OSEAN, started the day with his first lecture on the research outcomes of "Developing a decision-making framework for marine litter monitoring for APEC member countries." OSEAN has been commissioned to conduct the research by the APEC Secretariat from 2020 to 2022 and provided procedures, considerations, and relevant cases to enable Asia-Pacific countries to determine their own coastal litter monitoring methodologies according to their respective needs and conditions. The research analyzed the characteristics of 31 programs collected from papers, manuals, reports, and websites worldwide that were ongoing or had been conducted in the past, aligning with the purpose of this research. Based on this analysis, the research selected five key factors and 11 criteria to consider when planning marine litter monitoring and provided detailed descriptions of their characteristics, options, and representative cases in the report. This content was shared during the APEC Country Focal Point and Expert Workshop held in July 2022, and participants' opinions were reflected in the final report. In the last phase, a case study was conducted for countries wishing to develop actual monitoring programs, with Peru and Chile participating. By reviewing the Google Form submissions from officials in both countries, the research identified the key elements for determining monitoring methodologies and derived specific programs and implementation methods through in-depth discussions. This project was completed at the end of 2022, and it is expected that many countries will be able to utilize the results for advancing coastal litter monitoring once the final report is made public.

As the second lecture of the day, Ms. LEE Jongsoo, the senior researcher at OSEAN, presented the "Manila Bay Marine Litter Monitoring Methodology." In this project, the OSEAN research team planned to conduct quarterly surveys from 2023 to the first half of 2025 at ten beaches in Manila Bay, using the methodology of Korea's national coastal litter monitoring. During the surveys, marine litter measuring 2.5 cm or larger was separated by material, and its quantity and weight were measured. Specifically for plastics, the number was recorded after further categorizing them based on their form and purpose. Additionally, the team added items to the recording categories that represent the commonly found litter in Manila Bay through site visits, workshops with local officials and experts, and provided explanations about the types of litter. An active discussion among participants regarding waste classification and recording methods followed the lecture. Participants asked questions about distinguishing fragments from other litter, counting the number of clustered wastes, and proposed and discussed methods for coordinating cleaning and survey schedules with local authorities.

▲ Figure 4. Monitoring Methodology Lecture of OSEAN's senior researcher Ms. LEE Jongsoo

They also shared the monitoring implementation plan of local partner institutions for actual surveys. The on-site monitoring in Manila Bay was assigned to the Eco Waste Coalition (EWC), an environmental NGO in the Philippines, commissioned through a public bidding last year. EWC is a collaborative organization established in 2000, with the participation of more than 150 organizations and institutions. The lecture was conducted by Aileen Lucero, the Secretary-General of EWC. The monitoring for this project will be carried out in collaboration with De La Salle University (DLSU). EWC and DLSU have previously conducted waste management surveys and public awareness assessments in the Manila Bay Waste Management Improvement Project, which is being implemented by the United States Agency for International Development (USAID). DLSU plans to utilize the coastal waste monitoring methodology from Korea in university lectures and other regions in the Philippines.

The data platform was also introduced for registering and managing the monitoring results of this project. OSEAN's senior researcher, Mr. JEONG Hoseung, and researcher Alicia Lo presented the structure, functions, and utilization methods of the platform specially developed for the Manila Bay marine waste monitoring. In Korea, the results of marine waste monitoring are managed through the Ministry of Oceans and Fisheries' Marine Environment Information Portal (MEIS). When survey institutions input data into the platform, not only government officials but also researchers and the general public can access the monitoring results. The results can be searched by region, period, and type of waste, and all monitoring results since 2008 are included in the platform. The results of the Manila Bay marine waste monitoring will also be stored in a website-based platform, which provides not only the ability to download survey results but also simple analysis functions through tables and graphs.

▲ Figure 5. Participants were discussing methods to improve the classification records of marine waste.

On the third day, the final lecture on the analysis and utilization of monitoring results was delivered by OSEAN's senior researcher, Ms. LEE Jongsoo. Since 2008, South Korea has been conducting "National Coastal Litter Monitoring" under the Ministry of Oceans and Fisheries. After conducting the initial monitoring from 2008 to 2017, spanning a ten-year period, the current second-phase methodology has been established and continues to the present day in 2023. The number of surveyed beaches, which started with 20 in 2008, increased to 40 in 2014 and 60 in 2021. During the initial phase of the first monitoring, it was revealed that the most prevalent coastal waste in South Korea was styrofoam buoys used in aquaculture. Based on these results, policies such as promoting environmentally friendly buoys, raising awareness among fishermen, and developing retrieval systems were implemented. The effectiveness of these measures was demonstrated by the continuous decrease in styrofoam buoys observed in the monitoring results. The national coastal waste monitoring identified seven types of waste that were consistently found most frequently each year. Efforts are underway to reduce these ten types of waste, including those with significant environmental impacts. It is expected that by focusing on targeted campaigns and policy interventions for the most found waste in Manila Bay, the results can be measured through monitoring.

Field Practice for Coastal Marine Litter Monitoring

On the fourth day, participants departed early in the morning for the field practicum at Las Piñas-Parañaque Wetland Park (LPPWP). LPPWP serves as one of the monitored beaches for this project and also hosts monthly demonstration clean-up activities. In LPPWP, participants practiced the coastal waste monitoring survey method they had learned during the previous day's lectures, going through the entire process from start to finish. In the first survey section, everyone listened to the explanations together and observed the classification method. Subsequently, each group collected, classified, measured, and recorded the waste in their assigned sections. After recording the data for each section,all participants cleaned a 100-meter stretch of the beach. Conducting clean-ups after each survey allows the amount of remaining waste in the beach

area to be determined until the next survey. DLSU survey staff who did not participate in the training and local government volunteers also took part in the field practicum. After completing all the exercises, participants had lunch together at the site before returning to their accommodations. Considering that the practicum took place from early morning until lunchtime, there were concerns about the participants' meals. However, CORA, a partner in the awareness promotion aspect of the project, provided a meal without disposable plastic. The meal was packaged in banana leaves and paper, and beverages were served in reusable cups from large containers.

▲ Figure 6. Plastic-free breakfast prepared by CORA.

In the afternoon, there was a session to input the survey results obtained during the morning field practicum into the platform. By inputting the results for each section, it is possible to examine the composition of materials based on the totals of each section, as well as the entire beach. The survey results can be compared by time-period and specific locations on the platform. During the participants' discussion time, OSEAN also sought policy alternatives utilizing the survey results, along with suggestions for improving the classification records. As OSEAN aimed to enhance the initially provided classification record items on the survey cards, the team found some cases where the terminology used in the Philippines differed. In such instances, we decided to rename or add explanations for those items. On this day, the most frequently found waste at LPPWP was vinyl fragments and plastic bags. Participants proposed strengthening and expanding regulations on disposable items and plastic packaging, as well as enhancing producer responsibility for recycling systems. Particularly in Manila, where waste separation has not yet been fully established, they highlighted the issue of waste getting mixed together during transportation by the local government, even if residents separate their waste. Alternative suggestions included designating specific collection days for different materials and providing sustainable incentives for recycling item disposal.

▲ Figure 7. Dr. Johnny Ching, the DLSU monitoring officer responsible for waste classification (left).

Closing ceremony and training evaluation.

During the final lecture of this training, Ms. Antoinette Taus, the founder and representative of the Philippine NGO CORA, presented the "Awareness Campaign for Improving Marine Waste Management in Manila Bay and Citizen Science Activities." Ms. Taus is a well-known celebrity in the Philippines and has established a foundation named after her mother to promote human rights and environmental activism. She also serves as a Goodwill Ambassador for the United Nations Environment Programme. Since 2017, she has actively participated in cleaning activities at LPPWP and has consistently emphasized the importance of scientific data collection. However, through her involvement in this project, she was able to utilize the pilot purification manual developed by OSEAN to conduct rapid assessments of coastal waste quantities and record waste types. Currently, she is collaborating with citizen scientists to conduct experiments by collecting waste in garbage bags, aiming to create indicators that can be used to assess waste quantities in rapid assessments. As part of the awareness campaign, upcoming activities include recycling promotion events and exhibitions in large shopping malls, an online educational series called "OSEAN School" targeting students, and the production of recycling guides and booklets.

During the closing ceremony, Mr. Hong, the representative of OSEAN, presented completion certificates to the participants. Ms. Yu Jiyoung, Deputy Director of the KOICA Philippines Office, congratulated the participants on successfully completing the training. Deputy Director Yu emphasized that monitoring education is a crucial element of the EMLM project. Through monitoring, participants can identify the distribution, sources, and impacts of marine waste, and this information can be utilized in the development of response policies. It is hoped that the monitoring techniques shared during this training will be effectively applied in practical fieldwork, and OSEAN, which conducted the training, expressed their belief in continuing to provide technical support in the future. With this, all the training activities spanning five days have been completed, and the participants submitted their post-program assessment forms.

▲ Figure 8. Introducing the plans for awareness promotion and citizen science activities, CORA representative Ms. Antoinette Taus.

In this project, a total of three local trainings are planned. The second training, focusing on raising awareness is scheduled to take place in Manila for five days in the second half of this year. The third training, centered around policy development, is planned for the coming year. Two other training sessions in Korea are also a part of the project, inviting Philippine government officials responsible for marine waste management. These sessions are planned for ten days each, with one held in April this year and the other in the first half of the next year.

▲ Figure 9. Participant representative received completion certificate by Dr.Hong

Creating new value from gathering coastal big data

Sunny Hong | President of OSEAN | sunnyhong@osean.net

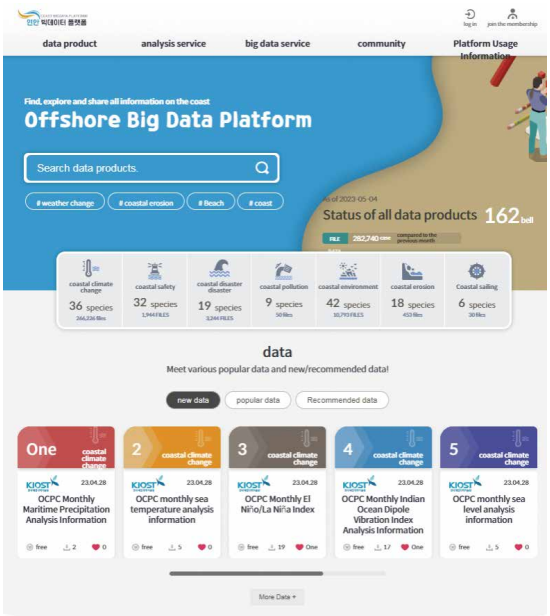
OSEAN participates in building the Coast Big Data Platform

OSEAN, Our Sea of East Asia Network, is now involved in a new research project initiated by the Ministry of Science and ICT and the National Information Society Agency. This project, which runs from 2022 to 2024, aims to build a big data platform in the field of coastal studies. This new project represents an exciting opportunity for OSEAN to expand its reach and impact. the coastal sector.

In the Coast Big Data Platform, 24 institutions provide 150 data consisting of 1.2million files annually

The term "coastal" can encompass a wide range of information related to coastal disasters, climate change, natural environment changes, navigation safety, hazardous facilities, erosion, pollution, leisure and tourism, energy, and more. This information is typically scattered across various sources such as websites, reports, theses, and others. It can be difficult to find the specific information needed amidst the abundance of available data. Integrating this data can be even more challenging due to its disparate sources and formats.

The Coast Big Data Platform aims to address this issue by collecting and integrating data from 24 institutions across various topics related to the coastal field. This innovative data-based service creates new value by combining and processing data, making it more accessible and useful to those who need it. By centralizing and integrating data, this platform can provide valuable insights and solutions to various challenges facing the coastal sector.



▲ Figure 1. Website of the Coast Big Data platfom(https://bigdata-coast.kr)

Under the leadership of the Korea Institute of Ocean Science and Technology Big Data Center, a total of 24 institutions (universities, companies, and non-profit organizations) are participating. Ten information centers, organized by coastal major field, will provide 450 types of data over three years by producing 150 types of data per year, consisting of a total of 1.2 million files annually. The data is available for a fee or free of charge, depending on the status of the user, on the Coast Big Data Platform and can be used for disaster reduction, safety, environmental protection, leisure activities, fisheries, shipping logistics, manufacturing, and research observation.

Major data of ten centers within the Coast Big Data Platform

Below is a summary of the ten centers participating in their respective fields:

1. National Oceanographic Research Center: provides comprehensive marine survey and marine spatial information in its jurisdictional area, marine forecasting, and basic marine safety information.
2. National Fisheries Research and Development Center: provides real-time coastal environment, marine conditions, fishery disaster monitoring, unmanned underwater drone coastal observation, and hyperspectral drone image.
3. Inha University Industry Cooperation Foundation Center: produces coastal seawater physical property survey data & secondary processing data converged with numerical models.
4. Marine Information Technology Center: provides big data analysis and information provision for severe weather coastal risk analysis.
5. BNT Center: produces and distributes satellite-based surface water temperature analysis data to respond to climate change.
6. Oceanic Center: produces and provides detailed terrain data and real-time coastal water level data in areas with a high risk of accidents for coastal users.
7. Geo Story Center: provides ground lidar coastal erosion monitoring and underwater underground facility data.
8. Elecocean Center: analyzes climate change affecting coastal environmental pollution and opens marine debris data.
9. Geosystem Research Center: collects, analyzes, and processes coastal erosion-related data and provides ocean-related information affecting coastal erosion.
10. Nsonesoft Center: produces data for safety support of coastal small and medium-sized vessels, including LTE M ship operation analysis data, Gaetgol data, passenger ship trajectory data, IoT-based ship operation data, and VDR-based ship operation data.

▲ Figure 2. The major fields of the Coast Big Data Platfom

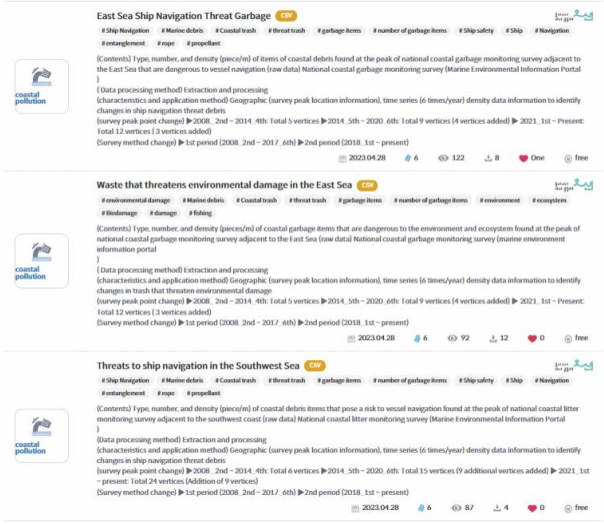
Marine litter data that threatens ship navigation and threatens environmental damage provided by OSEAN

OSEAN participated in Elecocean Center to expand access to data on marine debris that can cause serious damage to ship navigation and the ecosystem.

Marine debris, such as ropes and nets, pose a threat to the voyage of ships. Hong et al. (2017)[1] analyzed naval vessel accidents across 2,386 records and found propellers stopped 2.3 times per year per ship due to entanglement with floating debris from 2010 to 2015. Despite advancements in equipment and preventative measures taken on naval vessels, floating debris remains difficult to detect and dangerous.

In interviews surveying 20 fishermen in 2015, it was found that fishing boats were entangled more than thirty times per year on average. Propeller entanglements are a daily occurrence for vessels of all sizes and can cause significant disruptions to fishing, as boats require repairs, towage, or even diver intervention. If these incidents occur far from shore or in bad weather, they can be even more dangerous. To mitigate these risks, it is crucial to identify and track the distribution and temporal changes of debris. Data related to marine litter items such as ropes, fishing nets, and traps are presented on the Coast Big Data Platform.

OSEAN has been studying the impact of marine debris on ecosystems. Hong et al (2013)[2] analyzed cases of biological damage caused by marine debris that were gleaned from wildlife rescue centers, environmental groups, and coastal birdwatchers. Lee et al. (2015)[3] reported that large quantities of floating debris was found in nesting materials of endangered spoonbills instead of natural objects; This report was picked up by media outlets and shocked the public. Recently, Kwak et al (2021)[4] analyzed cases of ecosystem damage reported by scuba divers and found that a high proportion was caused by ghost fishing. Today, fishing debris and discarded fishing gear are the most prominent marine debris causing ecosystem and environmental damage in Korea. Accordingly, OSEAN is providing information on the distribution and temporal fluctuations of these marine litter to the Coast Big Data Platform.



▲ Figure 3. The data set provided by OSEAN

Looking forward to the development of new industries in the future by utilizing big data in the coastal field

The Coast Big Data Platform is currently in its early stages. Starting in 2023, it plans to enhance its open data services significantly. This will include (1) the production of new data that will be highly beneficial to the stakeholders, (2) the expansion of innovative services, and (3) higher quality and more complete data. In the face of growing concerns about the changing global environment, the role of the Coast Big Data Platform as a comprehensive source of coastal information is increasingly important. With the creation of new opportunities, we hope that more interested stakeholders will lead to the creation of opportunities to face a new future and to leverage the power of big data in the coastal industry.

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Microplastics in Indian Marine Environment

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Today, plastics have become an essential part of our daily lives due to their lightweight, durability, affordability, and non-reactive properties. However, plastics are not easily biodegradable in nature. Depending on the type of polymer, it takes several hundred years for plastics to degrade, which means their hazardous effects and threats will persist for future generations. Plastics have permeated every aspect of modern life, reaching great depths (Challenger Deep) and soaring heights (Mount Everest) across the planet.

India, with a population of 1.4 billion, is one of the fastest-growing economies in the world. As the population continues to increase, so does consumption and demand. Consequently, India has become a major contributor to plastic waste production and has been taking measures to control and manage it. In recent years, the Indian plastic industry has reached its peak levels, with production, consumption, and exports valued at 3.7 lakh crore rupees. This figure is expected to triple in the next 4–5 years[1]. The country's growing population and its reliance on plastics have led to an escalating waste problem that spans decades. Each year, India produces 3.4 million tonnes of plastic waste, with a significant portion either filling landfills or finding its way into aquatic environments and eventually, the oceans[2]. According to a report from the OECD, 47% of plastic waste in India falls under the category of mismanaged and uncollected litter, while 36% is disposed of in landfills[3]. Significant contributors of plastic waste in India are from the fast-moving consumer goods (FMCG) sector, which includes items like straws, cups, plates, food wrappers, polyethylene & polypropylene-based food containers and beverage bottles. Moreover, single-use plastics make up a significant portion of the waste found in dumping sites and garbage locations across the country.

To address the plastic waste issue, India implemented the Plastic Waste Management Rules in 2016, which were subsequently amended in 2018 and 2021. These regulations prohibit the manufacture, import, stocking, distribution, sale, and use of single-use plastics, including polystyrene and expanded polystyrene, starting from July 2022. Furthermore, to discourage the use of lightweight polybags for single use, the thickness requirement has been increased from 50 microns to 75–120 microns, promoting their reuse. As part of the "Swatch Bharat Mission" (India cleaning campaign program), policymakers have strengthened waste management infrastructure to ensure effective implementation of the Plastic Waste Management Rules throughout the country. Special inspection teams have been appointed by relevant governing bodies to eradicate single-use plastics across India[4]. Despite these efforts, the amount of plastic waste generated in the country has nearly doubled in the past three years, with only 30% of the plastic waste being recycled annually[2].

Microplastics (MPs), which are particles smaller than 5 mm, have emerged as global environmental pollutants. They are now recognized as the fourth major environmental threat, alongside ozone depletion, climate change, and ocean acidification. MPs can be classified into two groups: primary MPs and secondary MPs. Primary MPs consist of plastic beads, pellets, fibers, films, granules, and powders that originate from cosmetics, detergents, textile fabrics, and various drug formulations. Whereas secondary MPs are formed through the physical, chemical, and biological degradation of larger plastic materials in the natural environment, particularly through UV photo-degradation[5]. These tiny plastic particles have

significant impacts on all aspects of nature. They can be easily ingested and accumulated, posing potential health risks to humans, sea birds, and all aquatic and terrestrial animals. Recent studies have even detected the presence of these micro-plastics in human blood[6] and breast milk[7]. Further, MP pollution in the ocean can be consumed by a variety of marine life and enter into food chains through various sources, eventually reaching dinner plates around the world.

India has a vast coastal environment teeming with rich marine biodiversity. However, this ecosystem faces a grave threat from plastic pollution. Horseshoe crabs, sea turtles, sea anemones, hermit crabs, and other organisms frequently become entangled in discarded fishing nets along India's shorelines (Figure 1). Further, the accumulation of marine litter along the high tide lines not only disturbs the tranquility of beaches but also has negative repercussions on marine life[8] (Figure 2).

▲ Figure 1. Marine fauna entangled-to-death in abandoned shore nets at Tajpur beach

▲ Figure 2. Interaction of Marine life with shoreline trash at Talasari beach

Our team from the Marine Aquarium & Regional Centre (ZSI) in Digha, a picturesque coastal town and popular tourist destination in the eastern Indian state of West Bengal, works tirelessly to implement government policies aimed at cleaning up marine debris along the shorelines of Digha. As part of the Mission Life Awareness program, we organize rallies in nearby beach market areas to raise awareness among local shoreline vendors, hotels, and restaurants, urging them to avoid using single-use plastics (Figure 3). Moreover, we collaborate with local academic institutes to conduct beach clean-up campaigns (Figure 4) along the coastlines of Digha, India. During our marine faunal expeditions, we also rescue trapped marine life (Figure 5) ensnared in discarded nets and release them back into the ocean.

▲ Figure 3. Interaction with shoreline vendors during Mission Life Awareness program at old Digha beach

▲ Figure 4. Coastal Clean-up Day event at Mohana Beach, Digha

▲ Figure 5. Rescue and release of an entangled horseshoe crab from Subarnarekha Island

Conclusions

Banning plastics outright is not possible at this stage, as it would significantly impact the economies of many countries worldwide. However, it is imperative to establish stringent norms and regulations to control the proliferation of plastic waste in order to avert irreversible threats to communities and ecosystems. Adherence to laws and policies should be strict and backed by hefty penalties for violations if plastic waste is to be effectively regulated. Proper management, including the collection and segregation of plastic waste for recycling, is vital for effective litter management. Policymakers should incentivize and provide tax benefits to industries and start-up businesses to facilitate the development of the necessary waste management infrastructure.

Finally, regardless of the laws, policies, and regulations established by governments and policymakers, it is crucial for individuals to exercise common sense, maintain a positive mindset, and exhibit responsible attitudes toward the environment in order to effectively address the management of plastic waste.

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Development of Sustainable Marine Tourism in Seribu Island, Indonesia through Empowerment of Women Activity

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Introduction

The Indonesian archipelago possesses immense potential for the growth of marine tourism. With its abundant natural resources and diverse marine life, including fish, coral reefs, seagrass, and unique coastal landscapes, it has a strong appeal that makes marine tourism a vital sector for the development of the Indonesian economy. In line with global tourism trends, where reference [1] reveals that the number of foreign tourists visiting Indonesia reached 8.802 million trips, domestic tourist trips amounted to 248 million with a growth rate of 1.1%, and total expenditures reached 176.32 trillion rupiah.

According to Article 17 of the 2007 short-term development plan [2] states that :

"…tourism is developed so as to encourage economic activity and improve Indonesia's image, improve the welfare of local communities, as well as providing the expansion of employment opportunities. Tourism development utilizing the diversity of natural beauty and charm of the national potential as the largest marine tourism region in the world in a wise and sustainable, as well as to encourage economic activities related to the development of national culture".

The oceans in Indonesia hold great potential as a tourism resource, including both human and marine resources. The national development program recognizes that marine resources and fisheries serve as crucial support systems for the livelihoods of coastal communities, particularly fishermen. Participatory development is closely linked to empowering these communities, necessitating efforts to strengthen community institutions, enabling progress, independence, and well-being within a framework of ongoing justice. This approach aims to elevate dignity and prestige while breaking free from the cycle of poverty and underdevelopment. These efforts represent tangible forms of empowerment. [3]

Community empowerment is a process of giving power to individuals who may feel powerless. Every member of a community has the potential, ideas, and abilities to make progress, but these often cannot be realized due to certain factors. To regain self-reliance in community development, it is necessary to provide early ideas or impulses to revive the role and position of individuals in building a civil society.

The process of raising public awareness is done through capacity development concepts. Community capacity development is an effort to increase the knowledge, attitudes, and skills of the community so that they can actively participate in sustainable and independent development. According to Kusnadi (2006), one of the elements of social potential to increase the income of coastal communities is women, especially the wives of fishermen. The role of women in fishing communities is crucial for several reasons. First, in the sexual division of labor system in fishing communities, women take on a major role in socio-economic activities on land, while men's roles are in the sea catching fish. Second, the impact of this division of labor in coastal areas requires women to be involved in public activities, such as making a living for the family when their husbands don't earn as much during certain seasons. Third, the division of labor system and the uncertainty of income in fishing households everyday place women as one of the pillars of household necessities of life. Therefore, when fishing communities face economic vulnerability and poverty, the burden falls on dalah women, the wives of fishermen, to address and maintain the viability of households.

The role of women in the lives of coastal communities can also be seen in the Seribu Islands District. This district, which has an area of 869.61 hectares and a population of approximately 21,864 inhabitants, consists of two districts and six villages (Untung Jawa Island, Tidung Island, Pramuka Island, Harapan Island, and Kelapa Island). The Seribu Islands District, as it is known, has a large potential for sea products, making fishing a major livelihood for the local population. Moreover, small businesses have also grown in the district, providing another source of income for local communities, carried out by housewives. The marine products of the Seribu Islands District include seaweed, tuna, swordfish, shrimp, tiger grouper, and other types of fish.

The public role of women in the life of coastal communities can also be found in the Seribu Islands District. Seribu Islands district has an area of 869.61 hectares and a population of approximately 21 864 inhabitants (in 2010), consists of two districts and six villages (fortunately Untung Jawa Island, Tidung Island, Pramuka Island, Harapan Island and Kelapa Island). Seribu Islands District also has the potential sea large enough so that one of the livelihood of the population as a fisherman. Moreover, in the district of Seribu Islands have grown to small businesses that also has become the livelihood of local communities carried out by housewives. Marine products of Seribu Islands District are seaweed, tuna, swordfish, shrimp, tiger grouper and some other types of fish.

Pramuka Island is a village located in the Seribu Islands district, with a population of 5,800 inhabitants and abundant tourism and marine resources. The majority of the community on Pramuka Island work as fishermen, with approximately 70% of the population involved in the fisheries sector. Most people do not have a college education and face limited work opportunities. Men on Pramuka Island, including heads of families and school dropouts, typically work as fishermen. Housewives on the island engage in various professions such as fish smoking, running restaurants and snack businesses, crafting shellfish, tailoring, teaching at kindergartens and elementary schools, and other occupations. The income generated by housewives significantly contributes to the fishermen's families' finances.

Pramuka Island, one of the islands in the Seribu Islands region, serves as a case study in this research. The selection of Pramuka Island as the research focus is due to its status as a major fish producer and a prominent tourist village. Additionally, housewives on the island manage businesses such as homestays, souvenir shops, catering services, culinary establishments, recreational activities, and fish processing. The women on Pramuka Island also play a role in meeting the needs of household heads. The involvement of housewives in various activities is well-established. Previous research conducted by Kusnadi (2006) explored the participation of fishermen's wives in earning a livelihood and fulfilling household needs. They sell fish caught by their husbands or purchased from other fishermen, selling them in local or external markets.

The marketing approach used by female entrepreneurs on Pramuka Island involves direct sales in the market without standardized quality assurance. These female-led enterprises are managed traditionally, without formal accounting practices to record income and expenses. Small-scale industries such as homestays, catering, culinary services, and tourist attractions remain relatively simple. Moreover, the island's housewives also carry out household chores such as childcare, cooking, and laundry. This dual role places housewives in the position of both homemakers and providers for the family.

Therefore, it is important to recognize the capacity of housewives as entrepreneurs, considering their multifaceted role on Pramuka Island. Economic empowerment should not solely benefit the head of the household (fishermen), as demonstrated by the contributions of women to family income on the island. This study aims to identify and analyze the economic empowerment activities of women in promoting sustainable tourism development in the Seribu Islands, particularly on Pramuka Island.

Theoretical Framework

1. Tourism

Tourism is a complex activity that can be understood as a comprehensive system comprising various components, including economic, ecological, political, social, and cultural aspects. Viewing tourism as a system implies that analyzing its different facets cannot be done in isolation from other subsystems, such as politics, society, economy, culture, and interdependent relationships. Within this system, changes in one subsystem will have an impact on other subsystems, ultimately leading to the discovery of a new equilibrium.

The tourism system can be likened to "··· a spider's web–touch one part of it and reverberations will be felt throughout" [4].

Within the tourism system, numerous factors contribute to its functioning. The actors involved can be categorized into three main pillars: the general public, government entities, and the private sector. The general public refers to the local community residing in a destination, as they are the rightful owners of various tourism resources, such as cultural heritage. The individuals engaged in these communities include public figures, intellectuals, non–governmental organizations (NGOs), and the media.

The private sector consists of tourism enterprises and entrepreneurs, while keompok government encompasses various administrative levels, from the central government to provincial, district, or city administrations [5]. According to Law No.10 of 2009 on tourism in Indonesia, the objectives of tourism operations include improving economic growth, enhancing people's welfare, reducing poverty, addressing unemployment, preserving nature, promoting culture, enhancing the nation's image, fostering patriotism, strengthening national identity and unity, and promoting friendship among nations.

Considering the aforementioned tourism objectives, it is crucial for the current growth in the tourism sector to prioritize the sustainability of tourism development in Indonesia. Sustainable tourism involves the continuous growth of tourism activities, including the expansion of accommodation capacity, local population, and environmental considerations. It emphasizes that the development of tourism and new investments should not have negative impacts but rather blend harmoniously with the environment, maximizing positive outcomes while minimizing negative effects. To achieve this, the public sector has undertaken various initiatives to regulate tourism growth and prioritize sustainable tourism, ensuring the protection of crucial tourism resources and assets not only for the present but also for future generations[6].

The essence of sustainable tourism development lies in the effort to utilize natural, social, and cultural resources in a way that benefits the current generation while preserving them for future enjoyment. This requires development to meet certain criteria, ensuring long–term ecological sustainability while also being economically viable, ethically sound, and socially equitable for the people.[7] Achieving this necessitates the implementation of a good governance system that involves active participation and balanced cooperation among the government, private sector, and the public. Thus, the development of sustainable tourism can be characterized by the elaborated principles, including stakeholder participation, local ownership, sustainable resource use, alignment with societal goals, consideration of carrying capacity, monitoring and evaluation, accountability, and training and promotion.

2. Woman Empowerment

The development of tourism in the Seribu Islands, particularly on Pramuka Island, has created numerous job opportunities that can be explored by women. As more women enter the workforce alongside men, it brings attention to important gender–related issues. In recent years, analyzing gender equality within the tourism sector has become an integral part, particularly concerning tourism's potential to enhance the income of local communities[8].

There are several reasons why women play a significant role in the tourism sector as agents of empowerment. One reason is to ensure that the development of tourism, both on the mainland and in the island regions, considers the participation and perspectives of women. Policy decisions regarding the future of tourism development should reflect the opinions and contributions of various tourism stakeholders, including women. By doing so, women can fully benefit from the ongoing tourism development in Indonesia, generally and in Seribu Island specifically, which can be seen as a model for community empowerment.

Further reasons to empower women in the tourism sector are:
1. To provide a guarantee of women's rights are well accommodated, in the interests of tourism.
2. To ensure the implementation of good management of the assets of tourism in Indonesia, such as natural resources.
3. To ensure that tourism provides economic, social, and cultural benefits to all tourism stakeholders, including women.

According to Scheyvens (2000), there are four dimensions that should be examined to assess women's empowerment in tourism activities in developing countries like Indonesia. These dimensions are economic, social, political, and psychological empowerment. While discussions about empowering local communities through tourism activities have predominantly centered around economic aspects, it is important to recognize that tourism development encompasses multiple dimensions and is not solely confined to economic matters[9].

Methods of Research

This research focuses on the district of Pramuka Island in the Seribu Islands. The selection of this location was selected because it is a prominent tourist island and serves as the capital of the Seribu Islands. Most of its inhabitants are fishermen, and tourism-related businesses play a crucial role in enhancing their household income. The data collection for this study took place from February 2015 to April 2015.

The research method employed is descriptive qualitative, utilizing in-depth interviews with women entrepreneurs as key informants, as well as field observations. This qualitative descriptive approach serves as preliminary research, combining data obtained from the field with relevant theories or concepts and insights from key informants involved in the tourism sector on Pramuka Island.

The data collected for this study consists of two types: primary data obtained through in-depth interviews and field observations of women's activities in the tourism sector, and secondary data comprising relevant information already available. The collected data is analyzed in accordance with the research problem, which includes two main aspects. The first aspect aims to provide an analysis of the overall business landscape conducted by housewives on the island of Pramuka. The second aspect examines the capacity of housewives in their business endeavors, specifically focusing on three indicators: skills, knowledge, and production and capital resources.

Results

Pramuka Island, located within the Seribu Islands district and the special provincial capital of Jakarta, is recognized as a prominent tourist destination. This reputation is attributed to its abundant human resources and marine natural resources, which contribute to sustainable tourism development. Women's empowerment on Pramuka Island revolves around household-based enterprises, where the home serves not only as a place to live but also as a production hub. These home industries often originate from family businesses that are passed down through generations, ultimately becoming a means of livelihood for the surrounding islands.

During field visits to Pramuka Island, data were collected regarding various businesses operating on the island. There were 41 homestay businesses, 12 catering businesses, 8 culinary businesses, 3 tour services businesses, 4 milkfish bone removal businesses, 2 seaweed cultivation businesses, 5 breadfruit chip makers, 8 salted fish production businesses, 2 shredded fish production businesses, and 2 shellfish handicraft (souvenir) businesses.

Initially, the local residents of Pramuka Island primarily focused on selling the fish caught by fishermen, using salt as a means of preservation to extend its shelf life. As the popularity of anchovies grew, the locals began exploring ways to further preserve the fish by salting and drying them. However, for the past six years, the local government, in collaboration with tribal fisheries and marine tourism departments, has been working with tribal agencies and small to medium-sized businesses to diversify fish processing. This initiative was prompted by the abundance of fish catches through cultivation and direct fishing.

One of the main fish species processed on the island is milkfish, which is cultivated in sea ponds and harvested approximately three months later. After the harvest, the fish is filleted, and the bones are carefully removed from the body to the tail. This process is carried out using simple equipment such as tweezers. The fish is then cleaned, packaged, and vacuum-sealed to maintain its freshness.

The process of filleting fish and removing bones is carried out hygienically by working mothers, who wear gloves and headgear. The de-boned milkfish is marketed not only in Indonesia but also internationally, in Singapore and Malaysia, making it a popular souvenir among tourists visiting the Seribu Islands, particularly Pramuka Island. The milkfish can remain frozen for up to three months and can last for 8 hours at room temperature. The bone removal process is managed by a group, producing approximately 40 kilograms of fish ready for the market each day. The de-boned fish is favored by tourists and can be purchased at a price of 55,000 Rupiahs per kilogram.

As a favored tourist destination in the Seribu Islands, Pramuka Island is not only known for its processed fish products but also offers homestays as accommodation options for tourists. Homestays are local residents' homes that are rented out to tourists, and there are also designated accommodations specifically built for tourists. There are a total of 41 homestay entrepreneurs on Pramuka Island, offering a total of 48 units, with 10 of them being owned by women.

These homestay owners have registered with the tribal housing agencies and the Seribu Islands tourism department. They have undergone socialization and training in tourism and homestay management, with 80% of homestay management being carried out by women. The prices for lodging vary based on the number and size of rooms in a house, ranging from 350,000 Rupiahs to 800,000 Rupiahs per night. The rooms are equipped with beds, mattresses, air conditioning, and bathrooms. There are also lodging houses that consist of three bedrooms, a living room, and a bathroom, all equipped with air conditioning. The weekly earnings from homestays range from 8 million to 10 million Rupiahs.

In addition to the thorn removal business and homestays, women on Pramuka Island are also engaged in catering services. The catering business was initially started by Abdullah's mother in 2004, and now there are 10 mothers involved in catering activities. The number of catering businesses has increased in line with the development of Pramuka Island as a major tourist destination in Jakarta.

The managers of catering businesses have received training and preparation from the Seribu Islands tourism sub-department on preparing food for tourists. The women cook the menu orders in their own homes and deliver the completed dishes to the lodgings. The menu options include seafood dishes cooked with various spices, such as grilled grouper, fried shrimp, crab dip dessert, sweet and sour squid, and more. The buffet menu prices range from 30,000 Rupiahs to 100,000 Rupiahs per pack. The capital for managing the catering business is obtained from government assistance through revolving funds, and some entrepreneurs have started their businesses with private capital. The daily profits of catering businesses can reach 700,000 Rupiahs to three million Rupiahs.

In addition to catering services, women on Pramuka Island also engage in culinary and snack businesses by operating stalls that offer Seribu Island specialties, such as fish balls, shrimp meatballs, mpek-mpek fish, fish dumplings, grilled squid satay, and other processed foods. These culinary businesses complement the existing catering services, making it convenient for tourists to try various unique culinary delights of Pramuka Island. There are 8 women involved in the culinary industry, with capital sourced from the local government and private funds. These culinary entrepreneurs have received training from the tribal government agencies and marine fisheries.

Tourists visiting Pramuka Island are captivated by the stunning underwater scenery, and besides diving, they can also enjoy snorkeling and banana boat rides. To enhance their experience, tourists often avail the services of professional tour travel agencies and tour guides. Most travel tour services on the island are provided by knowledgeable young women who have been trained in tourism and travel management by the local government. They offer competitive Seribu Island tour packages, surpassing those offered by more mainstream tour agencies in Jakarta.

These tour providers handle the distribution of accommodations and offer menu options according to the packages they provide. The price range for tour packages to Pramuka Island varies from 350,000 Rupiahs to 1 million Rupiahs per person per night.

As one of Jakarta's favorite tourist destinations, Pramuka Island also offers complementary tourism options, such as souvenirs and mementos to enrich the travel experience. Featured souvenirs from the island include salted fish, shredded fish, seaweed dodol, breadfruit chips, and shell souvenirs. The shell souvenir business has been pioneered by the housewives of Pramuka Island since 2007. They create various products using shells, including lanterns, glass frames, room dividers, pencils, tissue boxes, and hair clips.

The Seribu Islands Regional Government has provided training and capital to develop the shell souvenir business, including guidance on marketing these souvenirs to other areas in Indonesia. These souvenirs not only support tourism on Seribu Island but also serve as tokens that tourists can bring back for their families and friends. In addition to shell souvenirs, tourists can also purchase breadfruit chips, shredded fish, salted dried fish, seaweed dodol, and fish nuggets. These souvenirs are produced daily by the housewives on the island.

Conclusion

Based on the information provided, women's empowerment in the Pramuka island of the Seribu Islands district appears to have promising prospects in terms of actualization, technology, economics, and ecology. Women actively participate in managing lodging, catering, culinary businesses, and souvenir production, while also balancing their domestic responsibilities.

Through interviews, observations, and secondary data analysis, it can be concluded that women have a significant presence in the tourism sector on Pramuka island. They are actively engaged in various daily activities and have equal opportunities to utilize available resources for the development of their tourism-related endeavors. The support of marine natural resources, environmental quality, and the local community contributes to the promotion of sustainable tourism, ensuring its enjoyment for future generations.

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