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Preface

Dear readers,

Environmental advocates are disappointed with the slow progress in developing an International Legally Binding Instrument on Plastic Pollution, including in the Marine Environment. The focus on preventing plastic pollution is shifting towards legacy plastics, which appear to be more achievable target for agreement. Our work to tackle marine debris inherently involves managing plastics that enter the natural environment, yet these efforts are intricately connected to the entire plastic life cycle, extending upstream to "close the tap" on the continuous flow of plastic pollution. With the hope of ensuring that the emphasis on legacy plastics doesn't serve as a pretext to sidestep discussions for a more robust binding treaty to disrupt the business-as-usual scenario, OSEAN is committed to promoting ongoing efforts against marine debris.

In this collection of articles, diverse initiatives and challenges in the realm of marine debris and plastic pollution are explored. The first article provides research updates, as OSEAN takes a proactive approach by developing a comprehensive Shoreline Marine Debris Monitoring Decision Framework for APEC, aiming to enhance global marine debris monitoring. The next article explains the substantial debris shore as an aftermath of Cyclone Biparjoy on Karachi's Clifton Beach, Pakistan, shedding light on the weathered plastics from the fisheries industry and the efforts to address this challenge.

For activity updates, OSEAN's TEN2ONE Campaign to reduce the prevalence of top marine debris items in the seas of the Korean peninsula compiled and published a booklet of Instagram-based Insta-toon and card news for widespread distribution. The International Trash Trap Network (ITTN) introduces its work to increase global cleanup efforts and engage local communities through the installation of trash traps, offering valuable data collection and outreach tools to combat the escalating plastic pollution crisis. Ocean Conservancy's annual report, #SeatheChange, underscores the persistent issue of foam plastic, particularly Expanded Polystyrene (EPS) food containers, ranking at an all-time high in the 2022 International Coastal Cleanup. Tangaroa Blue Foundation utilizes the Australian Marine Debris Initiative (AMDI) framework, leveraging citizen scientists and partner organizations, to champion large-scale change in addressing plastic pollution across Australia and beyond.

The Opinion section includes the environmental impact of cigarette filters, composed of non-biodegradable cellulose acetate, stressing the need for responsible disposal to mitigate the widespread pollution affecting marine ecosystems. Following is India's comprehensive efforts to tackle plastic pollution in marine environments, including a total ban on single-use plastics and nationwide campaigns, demonstrating a commitment to combating this issue and emphasizing the importance of global collaboration for effective solutions.

As always, OSEAN expresses its deepest appreciation for the APLM members' unwavering dedication, evident in their tireless efforts to combat marine litter. We are also grateful to our esteemed partners for their invaluable contributions to Marine Litter News. We remain steadfast in our commitment to providing impactful and informative content in the upcoming issue.

With gratitude,

Sunny Hong

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Nature-based Solution Consultant

Development of a Marine Debris Monitoring Decision Framework for APEC Economies

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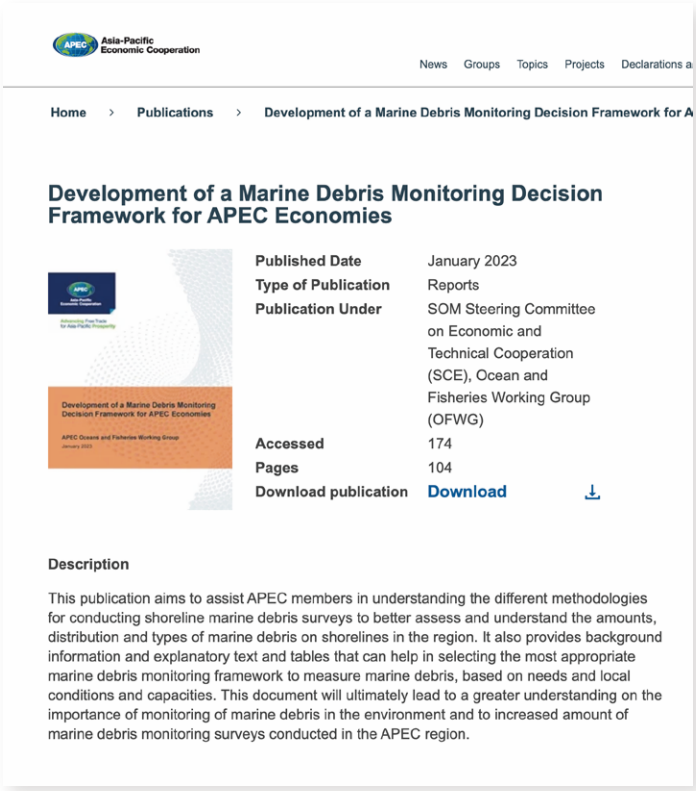
Expecting an Expansion of Coastal Debris Monitoring Initiatives in Asia-Pacific Countries

For three years, from 2020 to 2022, Our Sea of East Asia Network (OSEAN) undertook a project titled "Development of Coastal Debris Monitoring Decision Framework" commissioned by the Asia-Pacific Economic Cooperation (APEC). The report for this assignment was published this year and is now accessible on the APEC website (refer to Figure 1). The primary objective of this project was to create a practical framework that APEC countries aspiring to launch new coastal debris monitoring programs could utilize when identifying and selecting the most suitable program in line with their objectives. Additionally, it aimed to promote the efficient use of resources among APEC countries and facilitate the coordinated use of monitoring outcomes from various nations. This endeavor was a crucial component of the "APEC Marine Debris Roadmap," overseen by the U.S. National Oceanic and Atmospheric Administration.



▲ Figure 1. The 'Decision Framework Development for Coastal Waste Monitoring' Report Published on the APEC Website

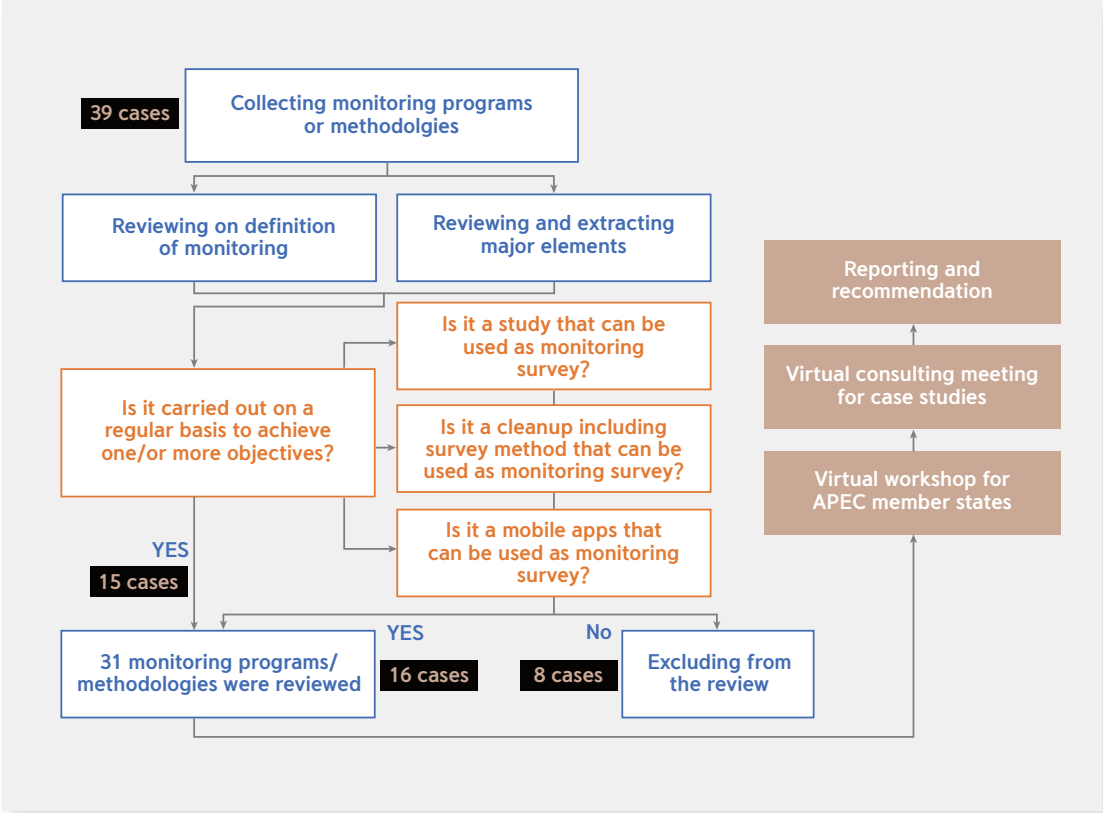
While many coastal debris monitoring initiatives focus solely on larger litter items (greater than 25mm), this project takes a comprehensive approach, considering all visible waste as macro waste, encompassing smaller debris as well. The report is divided into five chapters, each delving into specific areas:

Chapter 1: Introduction to the Research Background, Objectives, and Document Usage Methods

The issue of marine debris stands as one of the three global crises, alongside climate change and biodiversity loss. The swift economic development in the Asia-Pacific region has come at the expense of the environment, leading to environmental degradation, including marine pollution. Recent studies have highlighted that the majority of land-based marine litter finds its origins in Asian countries. Understanding the complexities of marine debris issues involves monitoring various sectors of the marine environment, including coastal regions, underwater ecosystems, and the seabed. Among these, coastal debris monitoring stands out as the most accessible and cost-effective method, primarily due to its proximity to land-based sources. However, the diverse origins, distribution patterns, and movements of litter pose challenges in establishing a standardized monitoring methodology. In this regard, this report aimed to bridge this gap by developing a decision-making framework that APEC member economies can tailor to their specific contexts, drawing upon established monitoring techniques. The objective is to enable countries to design monitoring methods suited to their unique situations, addressing the complexities posed by the diverse origins and movements of litter in marine environments.

Chapter 2: Methodology for Developing the Monitoring Decision Framework

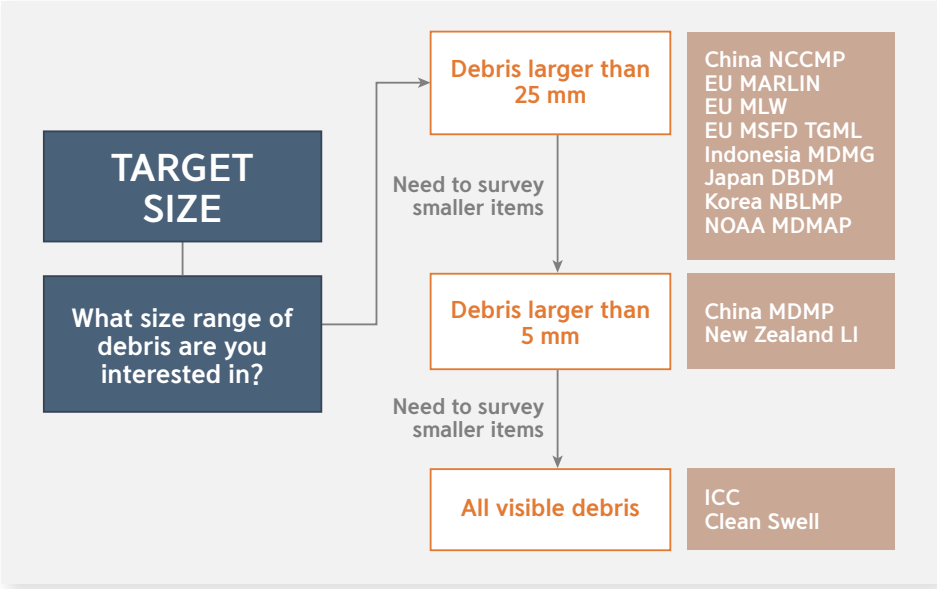
The process of developing the monitoring decision framework commenced by gathering and scrutinizing existing coastal waste monitoring methodologies. A total of 31 methodologies were meticulously examined and classified into four distinct groups: methodologies actively being implemented in 2021, concluded research methodologies, methodologies emphasizing thorough cleanups, and methodologies incorporating mobile applications. Crucial elements of these methodologies, including monitoring objectives, criteria for waste size and categories, geographical coverage, methods of data collection, and data management protocols, were extracted and utilized to formulate intermediate classification standards. For instance, the criteria for waste size and categorization were established at 2.5 cm or larger, 5 mm or larger, and all visible waste. Geographical monitoring scopes were further delineated into regional seas, domestic areas, and local regions.



▲ Figure 2. The Review Process of Existing Methodologies for Developing the Monitoring Decision Framework

Chapter 3: Provision of the Decision Framework or Decision Tree

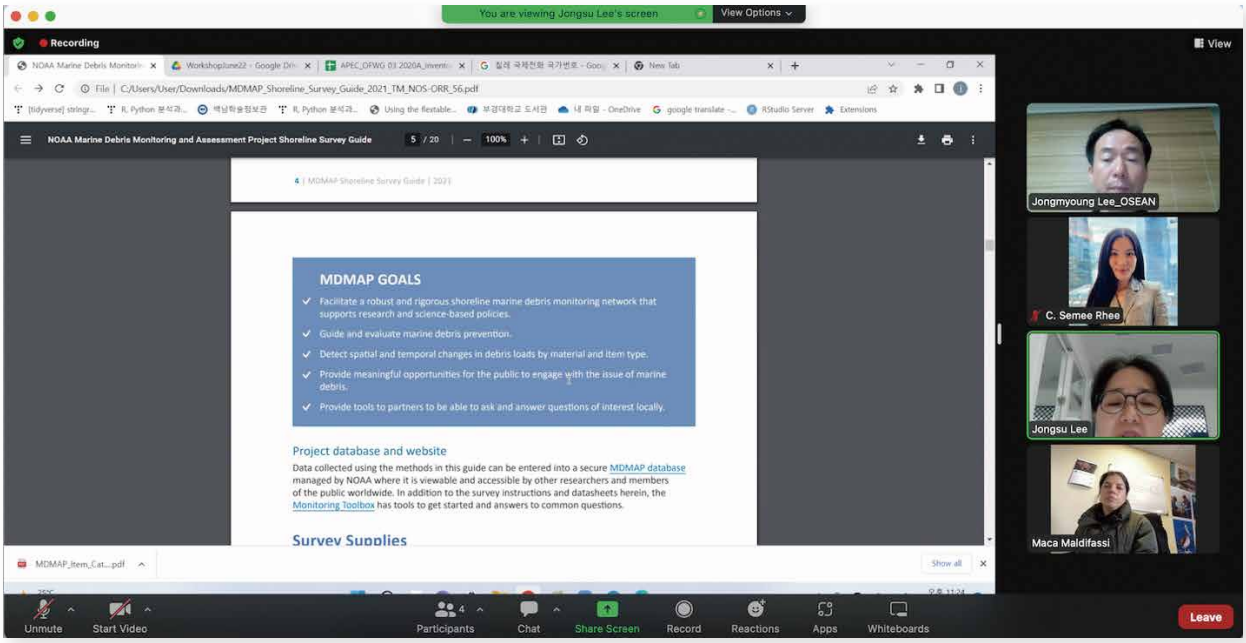
In this chapter, the features of intermediate classification criteria are elucidated to aid users in comprehending and implementing the monitoring methodologies. The methodologies under assessment were systematically restructured and classified according to predefined categories. Each step is visually represented through diagrams, facilitating users' effective understanding and application of the monitoring decision framework.



▲ Figure 3. Examples of Methodology Classification Based on the Size of Targeted Waste for Monitoring

Chapter 4: Introduction of Case Studies to Facilitate the Selection of Monitoring Methodologies Using the Decision Framework

Following the development of the preliminary version of the monitoring decision framework, a virtual workshop was conducted, involving APEC member countries interested in coastal debris monitoring. During this workshop, participants utilized the framework to adopt suitable methodologies. The workshop's objective was to comprehend the challenges encountered while implementing the decision framework, aid in decision-making processes, and refine the framework based on valuable feedback. Two countries, Peru and Chile, engaged in the workshop, with Peru expressing a preference for monitoring methods utilizing mobile applications for waste larger than 5 mm, and Chile seeking cost-effective and straightforward monitoring approaches. Consequently, New Zealand's Litter Intelligence and the U.S. National Oceanic and Atmospheric Administration's Marine Debris Monitoring Program (NOAA NMDMP) emerged as the most fitting methodologies for Peru and Chile, respectively.



▲ Figure 4. Virtual Workshop for Adopting Methodologies Using the Monitoring Decision Framework

Chapter 5: Recommendations and Summary of the Decision-Making Framework

In this concluding chapter, recommendations were organized based on individual elements and criteria, presented in both tabular and decision framework formats. All program-related details were compiled in an Excel spreadsheet, allowing users to conveniently explore the most relevant cases through criteria cells, "data," and "filter" functions.

This project encountered challenges due to extended timelines caused by the COVID-19 pandemic, leading to the necessity of conducting virtual workshops instead of in-person sessions. Despite these hurdles, OSEAN meticulously evaluated existing coastal waste monitoring methodologies, structured their features, and introduced easily applicable methods. This decision framework is immensely valuable, benefiting not just APEC countries but also nations worldwide, especially those with limited human resources and expertise, particularly those entering the realm of coastal waste monitoring for the first time. Furthermore, it can substantially aid in developing effective strategies to mitigate marine debris through enhanced monitoring efforts.

Accumulation of Marine Debris on Clifton Beach, Karachi Coast, Pakistan under the influence of Cyclone Biparjoy

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Introduction

Tropical cyclones in the Arabian Sea have become more frequent in the past couple of decades due to the warming of sea surface temperatures in the Arabian Sea region, enhanced by a warming climate. Cyclone Biparjoy originated over the Arabian Sea and made landfall near Jakhau Port, between Mandvi in Gujarat (India) and Keti Bandar (Pakistan) on 15th June 2023. Cyclone Biparjoy generated wind speeds of 125–135 km/h with gusts reaching up to 150 km/h by the time it reached land. Although the cyclone did not strike the metropolis of Karachi directly, it landed about 120 km southeast, coinciding with the spring tide. This resulted in massive wave action along the Karachi coast, causing inundation of the coastal areas. Due to the churning up of subsurface areas along the coastline, the garbage that had accumulated in those areas floated and massed on the beaches. Clifton, the most visited beach in the city of Karachi, was covered with piles of garbage brought by receding tides.

Clifton Beach

Clifton is a beach located within the municipal limits of Karachi facing the Arabian Sea. It stretches between Do–Darya on the east and the South Asia Pakistan Terminal (SAPT) on the west (Figure 1). It has a gentle slope and micaceous sandy beach with moderate wave action. Due to its location within the city limits and its accessibility, it is the most visited beach along the coast of Pakistan. The beach is sparingly polluted with debris left behind by the thousands of visitors who throng this beach throughout the day and night (Figure 2). The debris from this beach is generally removed by the tide and wave action; however, in some cases, when comparatively large quantities accumulate, civic authorities remove the debris using mechanical means usually once in a month. The collected debris is taken to the municipal dumpsite located in Deh Jam Chakro. A major part of the Clifton Beach remains clean and free of debris, except in the western area, which is frequented by a large number of visitors every day.

▲ Figure 1. Clifton beach located within the metropolis of Karachi

▲ Figure 2. Debris is regularly accumulating on the western part of the Clifton beach

As Cyclone Biparjoy approached, the wind increased from normal 10 to 15 knots to approximately 25 to 35 knots on 10 June 2023. This coincided with the spring tide of the month, and because of their synergetic effects, the seawater began inundating the low–lying areas along the coastline. As a result, some of the villages located along the Karachi coast experienced flooding. Simultaneously, a large scale accumulation of debris was observed in substantial piles on Clifton Beach, stretching from South Asia Pakistan Terminal (SAPT) to Do Darya (Figure 3). In most areas, the heaps were extremely large, and the entire expanse of Clifton Beach emitted a nauseating stench due to the debris.

▲ Figure 3. Debris on large scale is accumulated on Clifton Beach due to the impact of Cyclone Biparjoy

Analysis of Debris Accumulated Due to Cyclone Biparjoy

In order to determine the types of the debris that were accumulated as a result of the tide and wave action during Cyclone Biparjoy, a random analysis of the composition was conducted. The debris was collected from an area measuring 10 x 10 m^2 on Clifton Beach opposite Sea View Park (Table I). The analysis revealed that insulated material used in fishing boats (Polyurethane) dominates among the debris (43 %). The pieces of polyurethane were in the form of large sheets, some as large as 0.5 x 0.5 m^2 (Figure 4). In addition, there was an abundance of large pieces of polystyrene (Styrofoam) (27 %). Polystyrene is mainly used as insulation and packaging material. Discarded fishing nets (6 %) and plastic bags (5 %) were also present in abundance, indicating improper disposal. Other dominant materials included wicker baskets (4 %), plastic bottles (4 %), and wires/cables (3 %) which possibly originated from the weathered tyres. The remaining 8 % of debris comprised miscellaneous items, such as slippers, toys, wraps, and other unidentified items. It is also worth noting that the majority of the debris (more than 75 % of total debris) consisted of plastic, including pieces of insulated material (polyurethane and polystyrene), fishing nets, plastic bags, and plastic bottles.

Type of Debris	Percentage by weight	Remarks
Polyurethane	43	Mostly used as insulation in fishing boats
Polystyrene	27	Mostly used for the transportation of fish and other packaging
Fishing nets	6	Mainly discarded by fishermen
Plastic bags	5	(Any guess? Such as grocery stores)
Wicker baskets	4	Mainly discarded by fishermen
Plastic bottle	4	(Again, any guess? Beverage bottles?)
Wire, cables, iron strips	3	Mostly originated by decaying tyres
Others unidentified	8	Household and other unidentified items

▲ Table I. The Composition of Debris accumulated due to the impact of Cyclone Biparjoy at Clifton Beach

▲ Figure 4. Debris accumulated on Clifton Beach after Cyclone Biparjoy, consisted mainly of improperly disposed garbage

The analysis of the accumulated debris indicates that these items have been weathering in the sea for a prolonged period. Tide and wave action have dislodged them from the sea bottom and thrown them on the beach at Clifton. Due to their extended submersion and weathering on the sea bottom, this debris was coated with fine and putrefied sediments (Figure 5).

▲ Figure 5. Debris accumulated on Clifton Beach after Cyclone Biparjoy was dominated by plastic wastes

Origin of Debris

The analysis of the debris accumulated on Clifton Beach after Cyclone Biparjoy reveals that this debris did not originate locally from the Clifton area, as evident from the nature and type of debris. Most of the material, including polyurethane and polystyrene insulation material, and wicker baskets, is mainly used in the fisheries industry and is often dumped into the sea without any control (Figure 6). Such materials accumulate on the surface and sediment in Karachi Fish Harbour, which is located about 12 km west of Clifton Beach. The major circulation pattern in the sea is clockwise (Haq et al., 1978); therefore, all such debris ultimately accumulates in the sea around Karachi Port and its vicinity, not far from Clifton Beach. Some exploratory fishing surveys conducted in the area by the Marine Fisheries Department indicated the mass-scale accumulation of debris in the nearshore environment along the Karachi coast (Figure 7).

▲ Figure 6. Floating debris at Karachi Fish Harbour showing dominance of polyurethane and polystyrene sheets

▲ Figure 7. Exploratory trawling undertaken along the coast is dominated by plastic and other debris

Under the influence of spring tide and intensive wave action of the Cyclone Biparjoy, the debris originating from Karachi Fish Harbour and adjacent areas, which accumulated in the nearshore environment, is agitated and ultimately washed ashore on Clifton Beach. A similar accumulation of debris was reported by Gandhi et al. (2021) from Silver Beach, Cuddalore, Southeast coast of India, after Cyclone Nivar in November 2020. They observed that the major debris accumulated after the cyclone was dominated by plastics, including polystyrene, polyethylene, polypropylene, nylon, and polyvinyl chloride. Similarly, Lo et al. (2020) observed the deposition of marine debris dominated by plastic on the beaches of Hong Kong after Typhoon Mangkhut in 2018.

Fate of the Debris

Due to the concerns of the citizens of Karachi, especially the residents of the nearby area, civic authorities collected a portion of the debris deposited by Cyclone Biparjoy on Clifton Beach. A major part of this debris was transported to the municipal dumpsite at Deh Jam Chakro. However, the majority of the debris was washed away by the sea during ebb tides. Approximately 15 days after Cyclone Biparjoy, Clifton Beach returned to its previous condition, with only small-scale debris visible in patches on the beach.

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Protect Ocean from Marine Debris!

Publication of TEN2ONE Campaign Booklet – Compiling Instagram Cartoon and Card News in Korea

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OSEAN is currently undertaking a TEN2ONE Campaign to protect the ocean from marine debris. The primary objective of this campaign is to reduce the volume and impact of the top ten marine debris items polluting the seas of Korean peninsula. These items include plastic bags, ropes, fireworks debris, plastic bottles and caps, fishing debris, eel traps, cords, Styrofoam buoys, food packaging vinyl, and cigarette butts, with the aim of reducing their prevalence by one tenth. The second phase of the campaign, generously sponsored by Force Team, led by Representative Junghoon Park, was initiated in April 2023. The TEN2ONE campaign strategically raises public awareness about marine debris, primarily by utilizing Instagram postings that feature cartoons and card news. These postings have been compiled into a booklet for wider distribution.

▲ Promotional poster on the TEN1ONE Campaign

The overall plot of the Insta-toon weaves a virtual narrative that addresses and resolves marine debris-related incidents. It revolves around four main characters, including marine species. To supplement the cartoon, detailed explanations about each marine debris item not covered are provided in the format of card news. Both the Insta-toon and card news are published on OSEAN's official Instagram account (@osean_net). Further, these contents consolidated into a booklet, available for educational purposes and distributed for free upon request from partner organizations. The distributed booklets find versatile use in schools, local children's centers, and various organizational activities. Interested parties can download the booklet from OSEAN Website (www.osean.net), and is only allowed for educational and nonprofit purposes. The OSEAN team hopes that the booklet will be effectively utilized across diverse educational settings, and extend our gratitude to the Force team for their invaluable sponsorship.

The International Trash Trap Network: Connecting Local Solutions to Tackle Global Plastic Pollution

Hannah De Frond | Coordinator, International Trash Trap Network, Canada | Hannah.defrond@utoronto.ca

▲ The ITTN is a network of local groups using trash traps to increase global cleanup efforts.

Globally, plastic pollution in freshwater, marine, and coastal ecosystems is increasing. An estimated 82–358 trillion plastic particles weighing 1.1–4.9 million tonnes are currently afloat in the world's oceans (Eriksen et al., 2023). Further, it has been estimated that if we continue business as usual, up to 90 million tons of plastic waste could contaminate aquatic ecosystems by 2030 (Borrelle et al., 2020). To solve this global crisis, a combination of reducing plastic waste, improving waste management, and environmental cleanup is needed (Borrelle et al., 2020). While preventing future plastic pollution through waste reduction and management must be prioritized, cleanup is still needed to remove existing pollution and to establish monitoring and awareness-raising tools to inform prevention efforts. Cleanups around the world are collecting millions of pounds of waste each year (Ocean Conservancy, 2021), but to make a measurable difference now and into the future, we need to increase cleanup efforts worldwide by orders of magnitude.

Trash traps are technologies designed to clean up and divert plastics and other anthropogenic waste from coastlines and waterways. They are an important addition to community cleanups, able to function 24 hours a day, seven days a week, collecting waste of all sizes, including microplastics, which are often challenging to collect by hand. In addition to cleaning up trash traps can become focal points for local education, raising awareness of plastic pollution, and acting as sampling and monitoring tools for local data collection to inform upstream solutions to plastic pollution.

In recognizing the value of trash traps, the International Trash Trap Network (ITTN)[1] was formed in 2021 through a collaboration between the University of Toronto (U of T) Trash Team[2] and Ocean Conservancy[3]. The ITTN aims to substantially increase global cleanup efforts and quantify our collective impact as part of the International Coastal Cleanup™[4]. We also aim to bring together local stakeholders to build trash-trapping programs that engage the community and collect data to inform upstream solutions. The network currently consists of 80 traps across the United States, Canada, and Taiwan that collectively captured and diverted 208,998 kgs of anthropogenic debris (including plastics) in 2022. Each year, we aim to expand our network and increase our impact. Interested? Learn more below!

Beginning a Trash Trap Project

Thorough planning is an essential step to ensure that trash trapping programs have a positive impact and long-term success. We created an ITTN project checklist that can be used as a step-by-step guide for a successful project, from identifying the best location for device installation to considering local stakeholders and their roles in the project. This also includes making sure that the project does not have negative consequences for nature or the local community. There are many trash traps to choose from, and our device directory contains information on dozens of devices with a variety of uses, scales, and costs and even inspiration to create your own custom trap. This can be used to inform your decision on the most suitable trap for your local scenario.

Collecting Data

Data collection is an essential component to quantify your impact and inform pollution prevention efforts. Plastic pollution may be a global crisis, but there is no one-size-fits-all strategy, and we need locally informed solutions (Borrelle et al., 2020). By recording the waste each trash trap captures and the most common waste items found, we can identify local sources of pollution to inform upstream solutions. The ITTN has developed data collection protocols for harmonized data collection across traps worldwide. These methods allow users to record simple data (weight) and detailed data (weight, item categories, and counts). Every year, data collected by groups in the ITTN is shared as part of the International Coastal Cleanup™ report[5] and is added to the global TIDES database. Through this public database, trash trap data can be used for local, regional, and global research, education, and to inform policies. We also provide local data reports to each group in the network to encourage the use of their data to inform local action.

▲ The U of T Trash Team is recording data from their Seabin

[1] https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/trash-trap-network/

[2] https://uofttrashteam.ca/

[3] https://oceanconservancy.org/

[4] https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/trash-trap-network/

[5] https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/annual-data-release/

Use Your Trap to Increase Awareness Through Education and Outreach

Trash traps have the unique potential to become centerpieces for education and outreach. By communicating how they work and about the waste they collect, we can show the public how plastic pollution is reaching our local waterways and that cleanup can be part of the solution. Throughout the network, many groups use trash traps and the waste they collect for this purpose, including public events for waste sorting and data collection, visual artworks made from trash, and educational programs for youth. By taking advantage of trash traps and plastics to create visual impact, hands-on learning opportunities, and community collaboration, we can provide individuals with the knowledge and inspiration to reduce plastic pollution in their local communities and waterways. Alongside gaining inspiration from network members, the ITTN has a poster and flyers that can be used to share information on the network, an educator's guide for trash trap-based educational activities, and an educational workbook for participants.

▲ Volunteers are sorting through trash at the 2023 Baltimore Waterfront Partnership's Dumpster Dive Event.

Connecting With the Network

The ITTN is a platform for groups around the world to share knowledge as trash-trapping efforts grow. To facilitate knowledge sharing among different stakeholders, we host virtual workshops, including guidance for successful projects and local examples. Network members can also connect via our Facebook page. Throughout the year, the ITTN shares member newsletters about trash-trapping research, resources, and other opportunities. If you are interested in joining the network, please visit our website to download our resources and contact us for any further information.

If we truly combine our efforts to increase the amount of plastic waste cleaned up around the world, we can make a measurable difference. And we can do it better together.

Contact us: info@trashtrapnetwork.org
Download our free resources: http://trashtrapnetwork.org/
Join our Mailing List: https://bit.ly/Join-the-ITTN
Join our Facebook Group: https://www.facebook.com/groups/trashtrapnetwork

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Latest International Coastal Cleanup Report Highlights Global Trends & Problematic Foam Plastic

Sarah Weller | Senior Manager, International Coastal Cleanup, Ocean Conservancy, U.S | sweller@oceanconservancy.org

In September, Ocean Conservancy released an annual report titled ***#SeatheChange***[1], displaying results, stories and global trends from the 2022 International Coastal Cleanup (ICC). Ocean Conservancy is a U.S. based non-profit, non-governmental organization that works to protect the ocean from today's greatest global challenges. Partnerships are integral to this work and the annual International Coastal Cleanup which celebrated its 37th year in 2022, is a prime example of the positive impact we have as a global community combatting marine debris and plastic pollution.

As with past ICC Reports, this edition showcases the Ocean Trash Index, a breakdown of cleanup data collected by hundreds of thousands of citizen scientists across the globe. In 2022, nearly 470,000 volunteers joined in what is the world's largest single-day volunteer effort for the ocean, removing 3.7 million kilograms of debris from waterways and shorelines. Through volunteer data cards and the Clean Swell[2] mobile application, volunteers logged over 15.5 million individual trash items. From rivers in landlocked nations to the coasts of nearly every continent, we can truly envision and #SeatheChange for our blue planet.

▲ Global Top Ten items collected during the 2022 International Coastal Cleanup season

[1] https://oceanconservancy.org/wp-content/uploads/2021/09/Annual-Report_FINAL_Digital.pdf

[2] https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/cleanswell/

A popular trend that is tracked each year is the global top ten list of items collected, by count. In 2022, food containers (such as clamshell and take-away containers) made of expanded polystyrene (EPS), more commonly known as "foam" ranked the highest in recorded history at #7. Plastics continue to dominate the top items plaguing our shores worldwide and EPS is a particularly problematic type of plastic. The Report shares a story on how the material is used in floating docks, and Ocean Conservancy also released a second report in conjunction with the ICC Report, titled *What the Foam?!: How to Keep Plastic Foam Foodware Out of Our Ocean*[3], which urges for the phasing out of foamed plastic, starting with single-use foodware items.

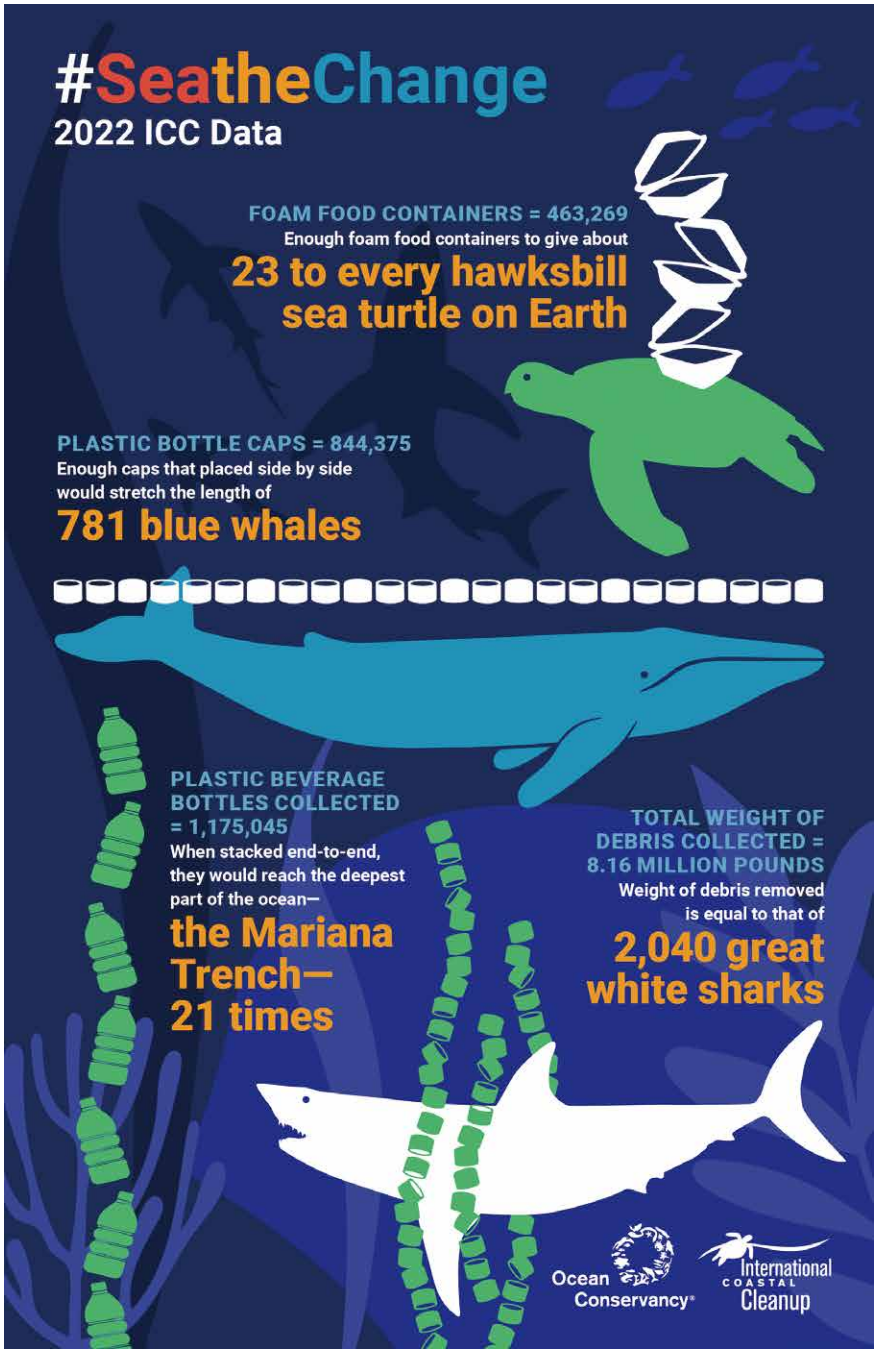
#SeatheChange also features milestones and stories from cleanups worldwide, acknowledging the network of ICC Coordinators who represent hundreds of organizations that dedicate resources and time in hosting cleanups for the ICC. The ICC is growing – exemplified by a story around the burgeoning network of cleanups in the Arctic – and also driving change – exemplified by stories of successful policy change, in particular around smoking bans on beaches. All are invited to read the articles within the full report and discover the library of past year's reports[4] as well.

▲ Cleanup volunteer in Hong Kong. Photo courtesy of Hong Kong Cleanup

▲ Picking up a piece of foamed plastic, EPS. Photo courtesy of Ocean Conservancy

[3] https://oceanconservancy.org/wp-content/uploads/2023/09/What-the-Foam_REPORT_0911-2023_TFS-Ocean-Conservancy.pdf

[4] https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/annual-data-release/



▲ Graphic from the #SeatheChange Report, displaying 2022 ICC results with social math.

While cleanups alone will not solve the global marine debris crisis, Ocean Conservancy and experts agree that they are an important piece to the solution set. The International Coastal Cleanup continues to be a beacon for community engagement around the issue and a driving force for real change thanks to the data collection and ongoing dedication by cleanup volunteers worldwide.

The latest in the Australian Marine Debris Initiative® Data Collection App

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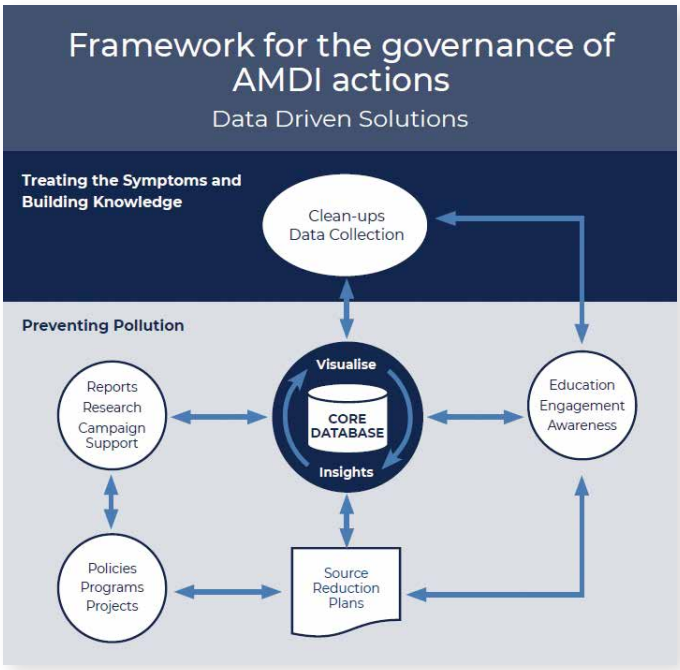
Australian Marine Debris Initiative (AMDI) is a network coordinated by Tangaroa Blue Foundation, an organization at the forefront of marine debris prevention and removal. With thousands of individual citizen scientists and over 3,000 partner organizations spanning Indigenous groups, industry, and government, the on-ground network works to eliminate debris, record data in the AMDI Database, reduce waste, and drive environmental change.

The AMDI framework (Figure 1) provides a structure to support governance, monitoring, and measurement of plastic actions. It centers around the shared AMDI Database, which contains vital information such as trends in plastic pollution across Australia, consolidated findings from academic research, social perceptions, behavioral change, education materials, source reduction plans, and supporting documents to create lasting change.



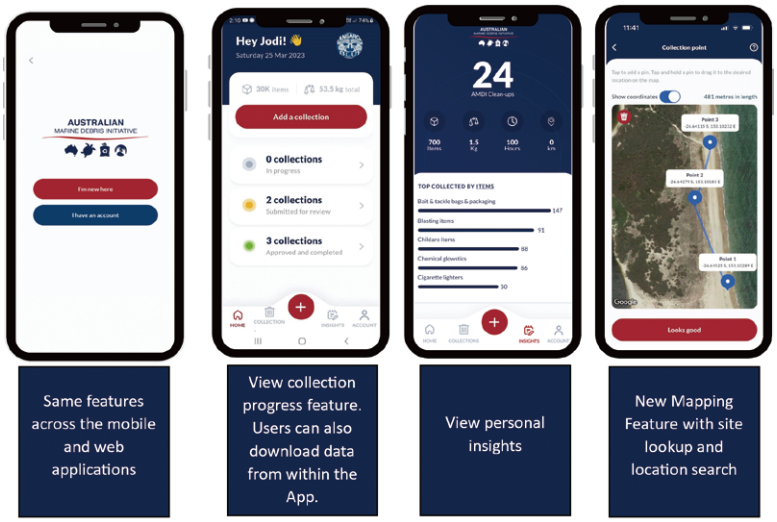
▲ Figure 1. The AMDI framework shows how collaboration and activities between members drive evidence-based insights.

The AMDI network brings together prominent members from various sectors to create a unified voice that engages with policy and decision-makers. We provide evidence-based insights and facilitate interventions on multiple scales.

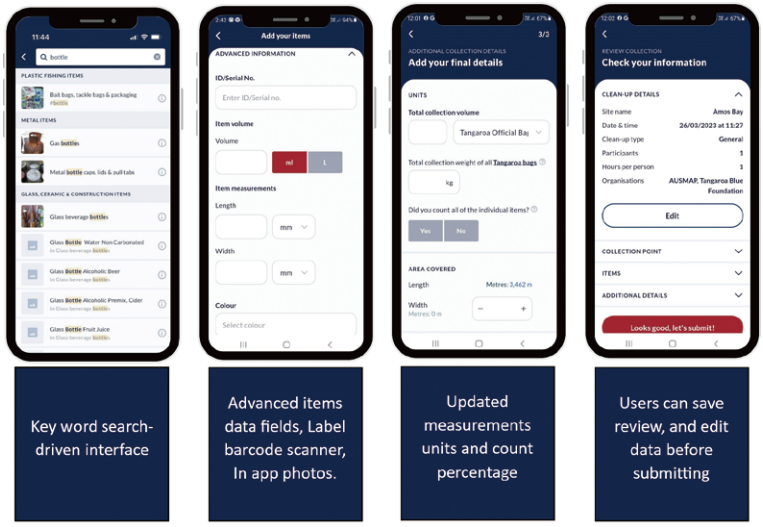
By coordinating the AMDI Database with records beginning from 2004, we provide valuable evidence and resources that empower communities and inform decision-makers to safeguard coastal environments. With over 24,000,000 items logged within the AMDI Database, Tangaroa Blue Foundation continues to champion large-scale change through industry and government collaboration.

The original AMDI Data Collection App (AMDI App) was designed in 2018 to provide an efficient and freely accessible tool for citizen scientists to record and map marine debris findings within the AMDI Database. It allows data to be entered consistently and standardized from anywhere in the world.

The first version of the AMDI App was designed to integrate with a Postgres database, capturing temporal and spatial data and providing a standard methodology for marine debris classification. In 2021, with consultation from our network partners, the AMDI App evolved to a modernized app user interface and user experience with improved searching, data–capturing, warehousing, and management capacity (Figure 2). Another exciting new feature is the ability for users to download the data they have submitted to the AMDI Database directly through the AMDI App (Figure 3).



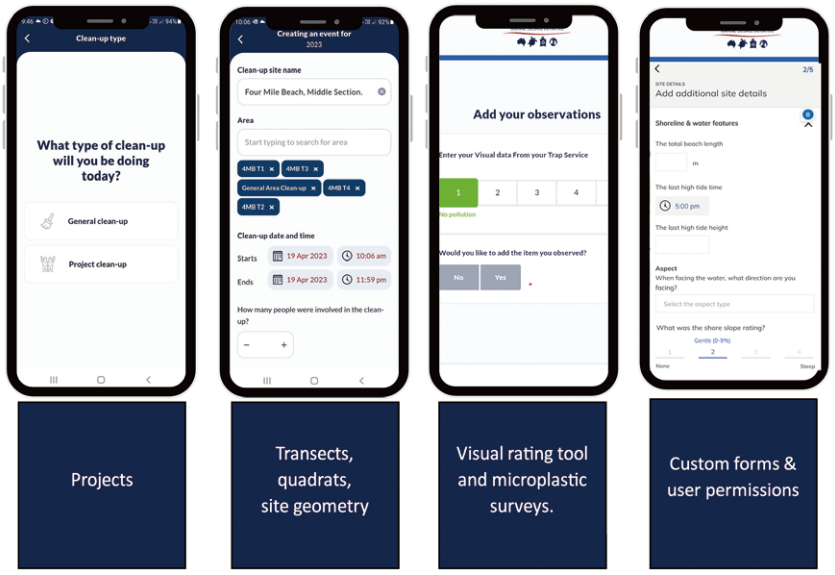
▲ Figure 2. New AMDI Data Collection App user interface.



▲ Figure 3. Some of the features of the new AMDI Data Collection App.

This data set fills significant marine debris knowledge gaps for Australia, and we are working on integrating the United Nations marine debris coding, facilitating standardization across countries, and supporting each country's reporting on its UN Sustainable Development Goal obligations. We can also integrate additional languages to increase the AMDI App's accessibility in countries outside Australia.

To complement the AMDI App, we've introduced the AMDI Super Admin, an administrative software console tailored to meet the diverse marine debris project requirements. Our consultative process determined that specific projects, e.g., research and government monitoring, may require additional marine debris data information not currently available in the AMDI Database. AMDI has accommodated this by developing a Project workflow. The Projects feature allows organizations conducting marine debris projects to specify data types and organizational access levels. Project data is owned by the Project owner/organization and not the individual user. Projects have an approval process and configuration of collection periods, approvals phases, and cycles mapped out in consultation with the project manager. The Project feature enables detailed data capture through advanced item attribution features and additional geospatial layers for transects and quadrat monitoring research (Figure 4).



▲ Figure 4. New AMDI Data Collection App Project feature enables more data features and customisation to suit project data collections.

The AMDI Super Admin also accommodates diverse data aspects, such as microplastics and reporting requirements, including government reporting and the United Nations Sustainable Development Goals.

While the AMDI Super Admin is a new addition to the Tangaroa Blue Foundation software suite, we are excited about its potential to enable partners and researchers to contribute data to the AMDI Database, simplify data access, and report for organizations without needing specialist code or GIS software. If you have any questions about customizing the AMDI App for marine debris data collection in your country, please contact data@tangaroablue.org.

Learn more about the AMDI App: https://amdi.tangaroablue.org/
Download it on Apple platforms: https://apps.apple.com/tt/app/amdi-data-collection/id1408112211
Download it on Android platforms: https://play.google.com/store/apps/details?id=org.tangaroablue.amdi2&hl=en&gl=US

Microplastic and the Cigarette, from Bangladesh experience

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Microplastics are by no means a recent phenomenon. When plastic particles become exceedingly small—1/16th of an inch or even smaller)—they are referred to as microplastics. Larger than this, they are no longer called microplastics; instead, they are referred to as mesoplastics. These mesoplastics fall within the range of 5 to 10 centimeters or one-sixteenth of an inch to one-sixth of an inch. Understanding these names and dimensions will help you grasp the whole concept.

Terming the present "plastic civilization" or "plastic society" is not at all an exaggeration. We encounter plastic in our daily lives, whether we like it or not, we are consistently in the vicinity of plastics. This leads us to many questions about where these plastics come from and how we recognize them as plastics.

Today, the topic of this piece will be how many people recognize cigarette buds as plastics.

Cigarettes, or smoking, deeply intertwines with our lives, chosen or not. We no longer debate their health aspects, yet smokers bear responsibility. The individual harm is catastrophic for the planet, emphasizing the environmental damage caused. Neglecting the health aspect of cigarettes is unacceptable; it's about the entire picture.

▲ Photo: Muhammad Mostafigur Rahman

In today's market, cigarettes typically include a filter, tobacco, and a paper wrapper. While tobacco's history dates back to around 6000 B.C with its first association believed to be with Native Americans, the initial use differed[1]. The modern cigarette, featuring a filter, emerged in the 1950s, replacing rod-shaped, filter-less versions[2]. Despite tobacco's long history, cigarette prevalence surged during and after the first and second World Wars. Soldiers received cigarettes in their rations during these periods, a practice that endured, leading to a presumed gradual rise in cigarette users, especially post-World Wars.

[1] https://tobaccofreelife.org/tobacco/tobacco-history/

[2] https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf

In that era, most cigarettes lacked filters, a trend observed in Bangladesh a few years back. The harmful nature of cigarettes has been widely acknowledged, gaining increased attention since the early 1900s[3]. Diverse arguments surround this issue, notably the misconception that cigarette filters, often thought to be biodegradable, actually contain cellulose acetate, a form of plastic, challenging their natural decomposition.

So, what is cellulose acetate?

Cellulose acetate is a man-made semi-synthetic material produced from wood pulp, similar to how paper is made. Wood pulp, in a liquid state, undergoes treatment with acetic acid, acetic anhydride, and sulfuric acid. Despite claims that acetate is derived solely from wood pulp, it often involves the addition of other compounds, molecules, or desired substances, making it not entirely natural[4]. Its usage traces back to Europe in the 19th century, gaining popularity in the United States during the 20th century. Considered a second skin, acetate succeeded rayon in this role.

The concept of adding a filter to cigarettes, like a cigarette holder, is based on the idea that it might reduce health risks associated with smoking. However, the effectiveness of this is debatable[5].

To make cigarettes slightly safer, tobacco or cigarette companies initially attempted various materials in the filters. The idea was to reduce the quantity of tobacco or tar. However, in the end, cellulose acetate, a type of plastic, became the chosen material for the filter. Today, cigarette filters are essentially made from cellulose acetate, which is considered non-biodegradable.

There is a misconception that these filters are biodegradable or can break down naturally, but the reality is that cellulose acetate doesn't readily decompose in the environment. It was once thought that the filter material might blend with the environment or biodegrade, but this idea is only partially true[6,7].

The problem lies here, in the numbers.

▲ Photo: Muhammad Mostafigur Rahman

Smokers worldwide purchase and use nearly 6.5 trillion (6.5 million million) cigarettes each year, resulting in the disposal of approximately 180 billion cigarette filters daily[8]. Have you ever wondered where this vast number of cigarette filters or cigarette remains end up after flicking the last ash? These disposal habits have been so ingrained in us that it has been given a name. It's called "Anthropogenic litter"[9], which essentially means wherever you throw it, it's normal.

Once these filters reach water bodies – rivers, canals, ponds, or seas – their sheer quantity is immense, yet comprehensive information on the extent of the issue is scarce.

[3] https://www.scielosp.org/article/bwho/2005.v83n10/799-800/

[4] Material Guide: What Is Acetate, and Is It Eco-Friendly?

[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2031383/pdf/pubhealthreporig00141-0030.pdf

[6] https://www.nationalgeographic.com/environment/article/cigarettes-story-of-plastic

[7] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4129234/

[8] https://www.sciencedirect.com/science/article/abs/pii/S0956053X21003147?via%3Dihub

[9] https://www.sciencedirect.com/science/article/abs/pii/S0013935119300787

In 2020, the International Coastal Cleanup collected nearly 1 million cigarette filters in a single day, focusing solely on coastal or sea areas frequented by people[10]. In 2021, during the International Coastal Cleanup in Bangladesh, a striking 11,780 cigarette filters were gathered in a day, surpassing the quantities of other types of waste.

The shape of cigarette filters poses a major problem. When discarded in soil, water, or on the beach, they take a long time to break down. Even when they do, the process is incomplete. The paper wrapper is removed, leaving fibers that linger, especially in water. Over time, heat and forces contribute to their breakdown, generating micro and mesoplastics if undis-solved[11].

Plastic, in general, poses environmental challenges, with smaller shapes being more hazardous. The tiny fibers from cigarette filters can easily enter freshwater and marine ecosystems, significantly contributing to marine debris. This is a critical issue associated with cigarette filters. Despite increased recycling efforts, an estimated 75% of filters are not recycled, and complete reuse of the remaining 25% remains impractical[12]. In our country, individuals aged 15 and above consume around 744 cigarettes per person annually[13]. Considering this high consumption on a global scale, the concern over cigarette filter recycling becomes even more pressing[14].

What can be done?

Despite overlooking it for an extended period, we are now intensively examining the environmental impact of cigarette filters. Plastics and plastic-like materials we discard, many of which have circular economic value or recyclability, can be easily collected, sold, and reused. However, for certain small plastics such as mini packs, lens protectors, and cigarette filters, the collection, sale, and reuse of such waste are nearly nonexistent.

Cigarettes aren't a recent invention; they've been part of consumption for thousands of years. While we've used tobacco for ages, a cigarette essentially remains tobacco. It's a matter of shame, and we, as individuals, share in this shame. Avoiding smoking may not be entirely practical, but neglecting a task as easy as proper disposal of cigarette buds is our fault.

Your involvement in this effort is crucial. While government and cigarette companies hold some responsibility, many tasks cannot be accomplished solely by institutions. If you believe in the significance of this cause, kindly avoid disposing of cigarettes whenever feasible.

Society only changes through our say. Finding our own solutions to a smoke-free or pollution-free world is up to our own discretion.

[10] https://oceanconservancy.org/wp-content/uploads/2021/09/2020-ICC-Report_Web_FINAL-0909.pdf

[11] Occurrence, characterization, partition, and toxicity of cigarette butts in a highly urbanized coastal area. Christiane Freire Lima, Mariana Amaral dos Santos Pinto, Rodrigo Brasil Choueri, Lucas Buruaem Moreira, Ítalo Braga Castro, Instituto do Mar, Universidade Federal de São Paulo, Santos, Brazil

[12] https://www.sciencedirect.com/science/article/abs/pii/S0269749119364693

[13] https://en.wikipedia.org/wiki/Tobacco_consumption_by_country

[14] https://www.nationalgeographic.com/environment/article/cigarettes-story-of-plastic

Marine Litter: An Emerging Threat – Solutions, Initiatives & Implementations in India

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Tackling plastic in marine environments is the most challenging task for many nations globally. The harmful effects of these materials over time not only affect marine life but also human life.

Plastics are invented for their enormous benefits to humankind. However, their non-degradable nature, worldwide excessive production, and severe mismanagement of the generated plastic waste are the prime reasons for the uncontrolled propagation of these materials in marine environments. The on-course environmental degradation of plastics into macro-meso-micro-nano forms can interfere with marine life, enter the food chain, and ultimately adversely affect human health and the oceanic environment.

Plastics highly pollute the entire aquatic zone on the earth. According to UNEP reports, plastic pollution will be three times the current levels in water bodies worldwide by 2040[1]. Since this problem is common to every nation on this planet, a combined and collective effort from all the nations is immensely required to combat this emerging plastic pollution threat. Almost all countries have set targets and goals to reduce plastic usage and control the litter problem to protect their ecosystems globally. One hundred seventy-five nations from UNEA agreed to "End Plastic Pollution" by entering a legally binding agreement by 2024[2].

In India, the population is at its all-time high, and accordingly, the needs, demands, and consumption are also peaking. Therefore, the simultaneous waste generation is also more when compared to the other countries. India generates nearly 4 million tons of plastic waste annually, and only 30 % is recycled. A substantial chunk of the generated waste is significantly mismanaged, which is the prime reason for the contribution of Plastic pollution in India. Further, the mismanaged plastic waste ends in aquatic bodies and finally empties into oceans[3a,b].

[1] https://www.nationalgeographic.com/science/article/plastic-trash-in-seas-will-nearly-triple-by-2040-if-nothing-done

[2] https://www.unep.org/news-and-stories/press-release/historic-day-campaign-beat-plastic-pollution-nations-commit-develop

[3] a) INNOVATION IN PLASTICS The Potential and Possibilities. A report by Marico Innovation Foundation. b) Swachh Bharat Mission (Urban) Plastic Waste Management Issues, Solutions and Case Studies. A report by Ministry of Housing and Urban Affairs, Govt. of India.

[4] Ban on Single Use Plastics, MoEFCC, GOI, https://pib.gov.in/PressReleasePage.aspx?PRID=1882855; https://pib.gov.in/PressReleasePage.aspx?PRID=1837518

[5] Swachh Bharat Mission, https://swachhbharat.mygov.in/

[6] Misson LiFE, https://missionlife-moefcc.nic.in/

With these alarming signals, India imposed a total ban on single-use plastics (SUPs) from July 2022 to curb plastic pollution. Further, from December 2022, manufacturing, stocking, import, distribution, and sales of SUPs were prohibited all over the country[4]. In addition, the Government and other regulatory bodies are continuously making thematic policies for plastic pollution to create mass awareness in the public. Among these, Swachh Bharat Mission (One Step Towards Cleanliness)[5], Mission LiFE (Lifestyle for Environment)[6], and Swacchata hi Seva (Cleanliness is Service)[7] are some of the initiatives gained high momentum to spread mass awareness by conducting nationwide campaigns.

Marine Aquarium & Regional Centre (MARC-ZSI) is one of the regional centers of the Zoological Survey of India, and a subordinate agency under MoEF&CC-GoI is actively involved in spreading awareness through these campaigns and reaching all sections of the public. Primarily through Mission LiFE, we reached various academic institutes. We made students a part of these campaigns by conducting public rallies to mass campaign the themes of Mission LiFE to achieve the goals of a sustainable environment. We worked several mass awareness events at different places (including Govt. offices, hotels, tourist spots, buses, railway stations, hospitals, colleges, schools…etc.) (Figure 1). Throughout the campaign, we spread the message Reduce-Reuse-Refuse-Recycle to control the usage of plastics and proper disposal of garbage by careful segregation from the household level of every individual. Through Mission LiFE, we interacted with small-scale shoreline vendors (Snacks, fruit, juice, ice cream, coconut, and other miscellaneous sellers). We made them understand the repercussions of plastic waste on the oceanic environment. A pledge-taking program was also conducted at the end of each event for responsible citizen behavior toward the oceans.

▲ Figure 1. Glimpses of Mission LiFE activities undertaken by MARC-ZSI, Digha

[4] Ban on Single Use Plastics, MoEFCC, GOI, https://pib.gov.in/PressReleasePage.aspx?PRID=1882855; https://pib.gov.in/PressReleasePage.aspx?PRID=1837518

[5] Swachh Bharat Mission, https://swachhbharat.mygov.in/

[6] Misson LiFE, https://missionlife-moefcc.nic.in/

[7] Swachhata Hi Seva (SHS) campaign, https://swachhbharatmission.gov.in/shs2023/SHS2023/index.aspx

As a part of G20, India organized a mega beach cleanup event nationwide on 21–May–2023. MARC Digha partnered with local governing agencies and conducted a mass beach clean–up event along Digha beach (Figure 2)[8,9].

▲ Figure 2. G20 Mega beach cleanup event organized by MARC–ZSI along Digha beaches on 21.05.2023

On World Environment Day, MARC–ZSI conducted a one–day seminar titled "Beat the Plastic Pollution." Several lectures on the Impacts of Plastic Pollution on Oceans were delivered, and a beach trash cleaning event was organized during the event (Figure 3).

[8] MoEFCC (2023). G20 Report on Actions Against Marine Plastic Litter. Fifth Information Sharing Based on the G20 Implementation Framework. Ministry of Environment, Forest and Climate Change, New Delhi, India. 1st Edition. 575 pp.

[9] G20 Mega Beach Clean Up campaign, https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1926081 https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1925423

▲ Figure 3. World Environment Day 2023 celebrations and one-day seminar events conducted by MARC, ZSI, Digha

Swachhata Hi Seva (Cleanliness is Service to Nation), a nationwide campaign titled "Garbage Free India," was implemented from 15-Sept to 2-Oct-2023. On 01-10-2023, MARC-ZSI organized a mega beach clean-up event along the Digha beach areas by teaming up with colleges and local governing bodies (Figure 4). Nearly 150 participants, including government officials, students, marine police, and tourists of Digha, participated and collected 100 Kg of marine litter (Figure 5). A selfie point was installed for self-awareness among citizens to achieve a litter-free marine environment.

▲ Figure 4. Swachhata Hi Seva (Garbage free India) campaign conducted at Old Digha beach on 01.10.2023

▲ Figure 5. Visuals of cleaning activities undertaken and marine trash handover to DSDA waste disposal units during SHS event

Conclusions

Marine litter management is still a big challenging task for many global nations. Many countries have banned SUP usage; however, the laws and regulations are not very effective in completely eradicating SUPs. For an efficient curb of plastic pollution :

a) The imports and exports of SUPs should be strictly monitored.
b) Educating rural communities is vital for controlling plastic waste at a grassroots level.
c) Hefty fines should be imposed for those businesses violating the rules framed for the usage of SUP in urban areas.
d) Investments in developing waste management infrastructure in rural and urban areas is vital to control the plastic spread in ecosystems.
e) Inculcation of the effects of plastic pollution on ecosystems in academic curriculums will create awareness at the student level.
f) Museums, zoos, aquariums, science centers, and other knowledge parks also have tremendous access to mass awareness of plastic threats among citizens.
g) Every individual must adopt sustainable lifestyles to create an eco-friendly environment.

Finally, oceans connect all countries; synergistic and strategic alliances between world economies are immensely needed to address global plastic problems efficiently.

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