Guidelines for

Community-led Marine Litter Clean-up Activities in Mangroves

Indonesia

JANUS

Regional Knowledge Centre for Marine Plastic Debris

ERIA
Economic Research Institute for ASEAN and East Asia

Ministry of the Environment Japan

Guidelines for

Marine Litter Clean-up Activities in Mangroves

Indonesia

This study was conducted by JAPAN NUS Co., Ltd. (JANUS) for the Regional Knowledge Centre for Marine Plastic Debris (RKC-MPD), and ERIA (Economic Research Institute for ASEAN and East Asia).

ISBN(e-Book): 978-4-9914071-1-6

Please cite as:

ERIA (Economic Research Institute for ASEAN and East Asia), 2025. Guidelines for Marine Litter Clean-up Activities in Mangroves

Acknowledgements

This project was supported by the Ministry of the Environment of Japan in collaboration with ERIA. The contributions to the planning, preparation, and implementation of the clean-up activities in mangroves are very important for the development of the guidelines. We are grateful to the following contributors and reviewers of the guidelines:

Authors

Japan NUS Co., Ltd. (JANUS)

Keita Uchida, Consultant

Hiroyuki Ono, Consultant

Kyoko Hirasawa, Consultant

Tamayo Hashiya, Consultant

Kaede Takayama, Consultant

Yuka Yamamoto, Consultant

Reviewers and Technical Advisors

ERIA, Regional Knowledge Centre for Marine Plastic Debris

Reo Kawamura, Director

Michikazu Kojima, Senior Research Fellow

Ayako Mizuno, Program Manager

Aulia Salsabella Suwarno, Research Associate

Aulia Ulfatunnisa, Research Associate

Ivana Suradja, Research Associate

Special Thanks

North Sumatra Provincial Government (DLH)

East Kalimantan Provincial Government (DLH)

Balikpapan City Government (DLH)

Deli Serdang Regency Government (DLH)

Panca Budi Development University

CIRO WASTE

Gaesang Arifiyanto from Kelompok Nelayan Muara Margo Mulyo Maju Bersatu (4MB)

Contents

ANNEX

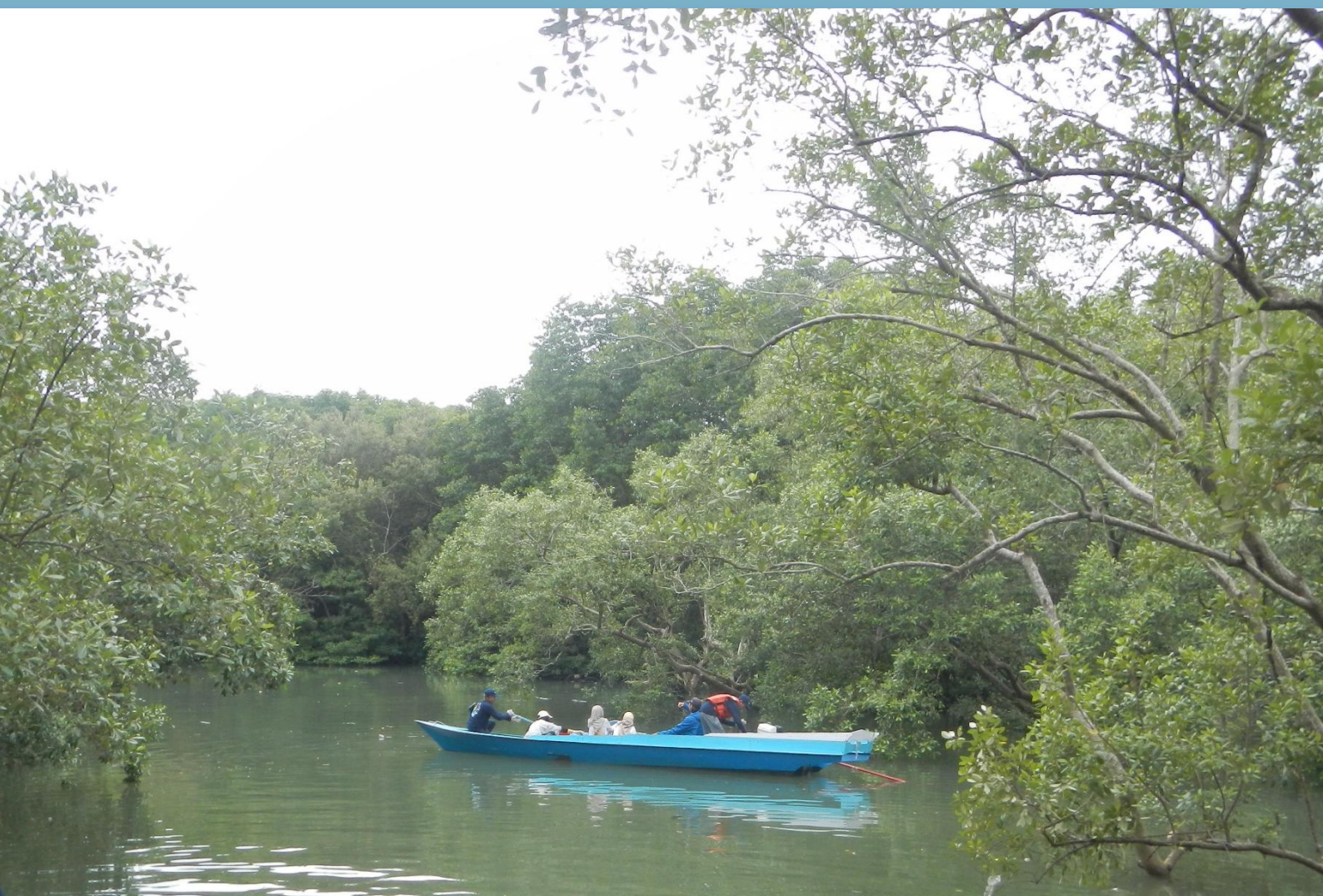
List of Figures

List of Tables

Chapter 1

INTRODUCTION

The purpose of the guidelines



1. INTRODUCTION

1.1. Background

Mangrove forests are unique ecosystems that thrive in the interface between land and sea.[1] The Indonesia-sponsored UNEA-4 resolution, "Sustainable management for the global health of mangroves", acknowledges mangroves as an important but fragile ecosystem with invaluable biological diversity. Mangrove forests have several crucial functions, including serving as natural filtering systems that can control various forms of pollution, acting as carbon sinks and reservoirs, reducing adverse impacts of climate change, and providing protection from natural disasters such as tropical storms, hurricanes, tsunamis, and coastal erosion. The resolution also encourages UN member states and relevant stakeholders to strengthen and formulate policies to prevent waste disposal into mangrove ecosystems and minimize human-induced pollution.[2]

Litter in the environment can negatively affect society, the economy, and living and non-living environment. For example, beach litter destroys landscapes, diminishing their value as tourist resources. Drifting litter threatens safe ship navigation, while sea floor litter disrupts fishing activities. There are also concerns about the impact of litter on the animals that inhabit these environments, such as those that may accidentally ingest or become entangled in the litter.

Recently, ever worsening plastic pollution in the ocean is threatening the sound ecosystem of mangrove forests. Through the "Pilot Project of Floating and Drifted Marine Plastics in Mangroves", which is an ERIA project being implemented in Indonesia from 2023-2025 with a focus on understanding and solving the litter problem in mangroves, it was confirmed that not only coastal beaches, but also mangrove forests are exposed to drifted marine plastic debris. Plastic debris entangled in small mangrove trees can inhibit their growth and negatively impact the preservation of mangrove forests for future generations. There are concerns not only about the health of the mangrove trees, but also how it could reduce the habitats available to faunal groups[3] and affect local communities that benefit from the ecosystem, both environmentally and financially. For these reasons, it is necessary to take measures to reduce marine litter, including plastics, within the mangrove forests and to contribute to the conservation and restoration of mangroves.

Currently, plastic pollution in the marine environment is expected to worsen. The OECD projected in 2023 that plastic leakage into the environment is expected to reach 30 million tonnes per year by 2040, of which 9 million tonnes would end up in aquatic environments[4]. One research article points out that 7 ASEAN Member States including Indonesia are among the top 10 countries with the highest annual plastic emissions into the ocean. It also mentions that emissions from these 7 countries account for about 65% of the annual global emissions[5]. The overwhelming plastic emission indicates that, in order to reduce the negative impact of plastic pollution on the marine ecosystem, both

[1] UNEP website. "Mangrove Forest", https://www.unep.org/topics/ocean-seas-and-coasts/blue-ecosystems/mangrove-forests (accessed on 7 Sep 2024)
[2] UNEP/EA.4/L.13. https://leap.unep.org/sites/default/files/unea-resolutions/Sustainable%2520Manage.pdf (accessed on 7 Sep 2024)
[3] Kantharajan, G et al., 2018. Plastics: a menace to the mangrove ecosystems of megacity Mumbai, India. ISME/GLOMIS Electronic Journal 16 (1), 1–5.
[4] OECD (2023), *Towards Eliminating Plastic Pollution by 2024: A Policy Scenario Analysis – Interim Findings*. Paris: Organisation for Economic Co-operation and Development.
[5] Meijer, L.J.J., T. van Emmerik, R. van der Ent, C. Schmidt, and L. Lebreton (2021), More than 1,000 rivers account for 80% of global riverine plastic emissions into the ocean, *Science Advances,* 7(18).

preventive measures of plastic waste emission and clean-up measures of existing and incoming plastic litter are necessary. Mangroves have the ability to trap marine litter due to their intertwining roots. Even if marine litter does not become entangled in the mangroves, natural phenomena such as tides can carry it deeper into the areas where it is difficult for people to access. To prevent marine litter from becoming difficult to collect, it is important to implement efficient measures for cleaning floating and drifted litter in and around mangrove areas.

While more than 2,000 volunteer clean-up activities have been identified in Indonesia, most of those activities are conducted on beaches[6]. In mangrove areas, where accessibility is limited and work efficiency is low, few clean-up activities are conducted, and litter tends to accumulate. To address this issue, community-led activities are indispensable for effective clean-up efforts, and the Guidelines for Marine Litter Clean-up Activities in Mangroves have been developed to promote such activities. Furthermore, it also aims at raising the public awareness and interest of local communities and promoting proper waste management and mangrove conservation.

1.2. Purpose of the Guidelines

The outputs of the "Pilot Project of Floating and Drifted Marine Plastics in Mangrove," which was conducted from December 2022 to March 2025, are mainly twofold:

(1) Develop Guidelines for Community-led Marine Litter Survey in Mangroves in Indonesia

(2) Develop Guidelines for Community-led Marine Litter Clean-up Activities in Mangroves in Indonesia

The Guidelines for Marine Litter Clean-up Activities in Mangroves is the second output listed above, aiming to promote the clean-up activities in mangroves in Indonesia.

It is to be noted that the clean-up methodologies suggested here are, by design, not to employ any high-tech equipment or heavy machinery. Instead, the guidelines are intended to make community-led clean-up activities safe and easy, without the involvement of specialized staff or tools to ensure that the activity is conducted nationwide and to promote countermeasures.

To ensure that clean-up activities contribute sustainably to both preventing litter generation and enabling local communities to collect and remove litter pollution, these guidelines provide information about environmental education on the importance of mangrove conservation, the negative impact of marine litter on mangroves, and prevention methods (including considerations for preparing educational materials that can be adapted in other regions). Readers can also find examples of learning methods and interactive learning, which can be utilized during clean-up events.

In addition, to support the planning of clean-up activities, these guidelines provide a detailed flowchart of the actual clean-up events conducted during this project.

The guidelines aim at materializing efficient and effective clean-up activities in terms of awareness raising and protection of mangrove against drifted marine litters, thereby contributing to sustainable community-led clean-up campaigns, especially in mangrove ecosystems. Although this pilot project

[6] Ocean Conservancy. INTERNATIONAL COASTAL CLEAN-UP 2024 Report. https://oceanconservancy.org/wp-content/uploads/2024/09/ICCAnnualReport2024_Digital.pdf

was conducted in Indonesia, it is expected that the lessons learned from this project can provide useful insights to other ASEAN member states and beyond which have mangrove forest and where its conservation against plastic debris is becoming increasingly important.

1.3. Definition and Terminology

The definition of marine litter or marine debris in the guidelines is “any persistent, manufactured, or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment”[7].

1.4. Guideline Development

Compared to coastal clean-ups, mangrove clean-ups are less common due to challenges such as the muddy substrate and the presence of mangrove roots and branches. To address these challenges, a mangrove clean-up method suggested in these guidelines is based on both existing manuals[8] [9] for coastal clean-up and insights gained from interviews with people involved in mangrove clean-ups in Indonesia.

In addition, the guidelines reflect the outcome of clean-up events which were conducted as the pilot projects in Balikpapan of East Kalimantan Province and Deli Serdang of North Sumatra Province.

1.5. Scope of the Guidelines

1.5.1. Clean-up field

When conducting clean-up activities in a mangrove area, the following four situations of plastic debris (a.to d.) were observed in the mangrove area of the project sites.

a. Floating debris on the river surface.

b. Debris washed ashore, backed by mangrove vegetation in the hinterland.

c. Drifted debris that can be collected on foot during low tide but becomes floating or submerged during high tide.

d. Debris that is washed up on or entangled in mangrove trees located in areas that remain submerged even at low tide, making them accessible only by boat.

[7] UNEP. (1995). Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, United Nations Environment Programme, Nairobi.
[8] Ministry of the Environment, Japan (2011). Coastal Clean-up Project Manual
[9] Okinawa Prefectural Government. Seashore Cleaning Manual (the resident activities volume) https://www.pref.okinawa.lg.jp/kurashikankyo/kankyo/1004212/1022383/1022384/1022385/1004219.html (accessed on 26 Sep 2024)

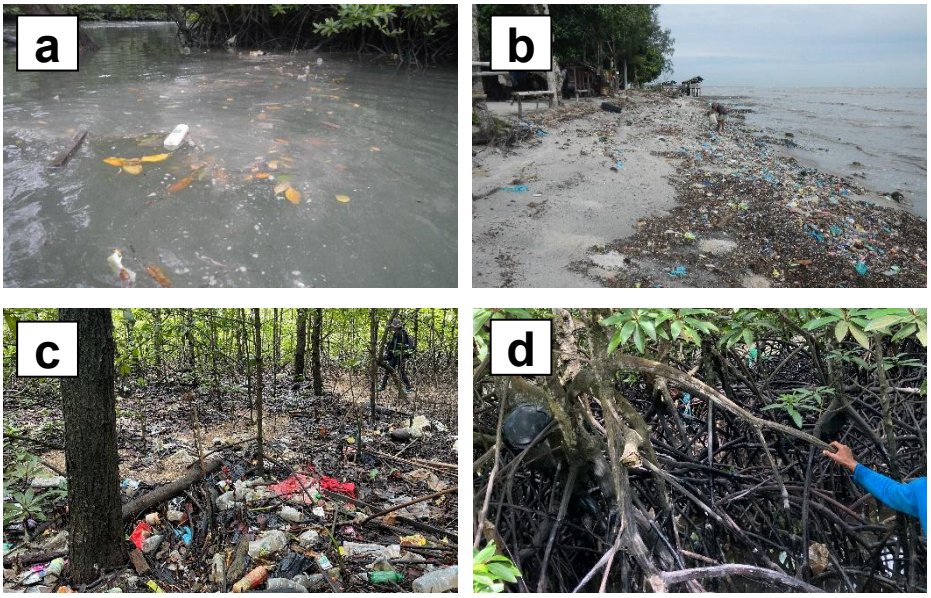


Figure 1. Four situations of plastic debris in the mangrove area of the project sites

Considering the characteristics of each field (See Table 1), these guidelines focus on river-based and easily accessible land-based clean-up activities (See a, b, and c above). As for situation “d”, collecting litter in submerged mangrove trees is much more challenging than in other situations due to limited accessibility and unstable footing. Clean-up of the litter in the situations “a”, “b”, and “c” is important to prevent marine litter from moving deeper into mangrove forests where access becomes even more difficult.

Table 1. Characteristics of each clean-up field

Situations of plastic debris	Fields	Characteristics
a	River surface	– A boat and net are essential for clean-up activities. – Activities should not be conducted during low tide. – Generally, the quantity of litter collected is lower compared to land-based activities. 
b	Beach with mangroves in the hinterland	– No specialized staff or tools are required. Many existing guidelines for beach clean-ups are available.

c	Areas within mangrove forests that are relatively easy to access on foot	– No specialized staff or tools are required. – It is necessary to avoid stepping on mangrove roots, breaking the branches, or damaging planted seedlings. – Special safety management is required. 
d	Areas within mangrove forests that remain submerged even at low tide and are inaccessible on foot.	– Collecting litter entangled in mangrove roots and branches is much more difficult than in other situations as these areas remain submerged even during low tide. – Since the site is inaccessible on foot, access is typically only possible by boat. – It is recommended to prioritize alternative methods of clean-up unless the person is experienced enough to climb the mangrove trees to collect litter. – Climbing mangrove trees can be dangerous due to slippery surfaces, especially when affected by oil pollution. 

1.5.2. Targeted audience

The target audience of these guidelines include:

- Local government policymakers for their actions against marine litter including plastic pollution.
- Academic institutions for their relevant research.
- Citizen scientists concerned about the national and local environment.
- NGOs and other environmental organizations.

Figure 2. Banners showing the participation of various organizations in the clean-up event

1.6. Structure of the Guidelines

The guidelines are divided into 5 chapters, as outlined in Table 2. The guidelines start with 1. INTRODUCTION, which provides the background and purpose of the guidelines, targeted clean-up fields in the guidelines, and definitions and terminology. The users of the guidelines are invited to read 2. CLEAN-UP PLAN AND PREPARATION, 3. CLEAN-UP IMPLEMENTATION, and 4. FOLLOW UP in this numerical order, and proceed with the clean-up based on the recommendations and other information.

Each chapter is structured to align with the chronological order of the clean-up in principle. However, the education part, including how to create and explain educational materials, is consolidated in Chapter 3. This provides readers with a comprehensive overview of environmental education, which is more convenient and useful for their understanding.

The descriptions of clean-up sites can be found in Sections 1.5.1 and 2.2. Section 1.5.1 describes the characteristics of the clean-up sites covered by the guidelines, while Section 2.2 focuses on identifying more suitable locations during the preparation phase of the clean-up activities.

Chapter 5 summarizes the guidelines, enabling readers to quickly grasp the key points.

As additional resources, Annexes 1 and 2 provide educational materials on marine litter issues and the benefits of mangroves, which were used in the pilot project.

Table 2. Outline of Guidelines chapters

Chapter	Contents
1. INTRODUCTION	– Background, purpose, scope, and structure of the guidelines – Definition and terminology
2. CLEAN-UP PLAN AND PREPARATION	– How to select the clean-up location and timing – What to do for preparation (required procedures, ensuring proper waste management) – What and where to procure the tools for the clean-up – How to collaborate with local communities
3. CLEAN-UP IMPLEMENTATION	– How to conduct the clean-up in a step-by-step approach – Points to consider at each step of the clean-up – Introduction of environmental education
4. FOLLOW UP	– How to disseminate information on clean-up activities – Introduction of questionnaire examples
5. CONCLUSION	– Summary of the guidelines – Usefulness of the guidelines – Characteristics of the guidelines

Chapter 2

CLEAN-UP PLAN AND PREPARATION

How to select clean-up locations and timing

2. CLEAN-UP PLAN AND PREPARATION

2.1. Clean-up Purpose

When planning a clean-up, it is important to define its purpose from the outset. The following are potential purposes for clean-up activities in mangrove areas:

1. Improving mangrove ecosystem health
2. Preserving tourism resources
3. Mitigating impact on fisheries
4. Reducing plastic waste pollution
5. Raising public awareness on environmental issues.

Focusing on selected purpose(s) allow for targeted clean-up activities, as exemplified by the events organized in Balikpapan and Deli Serdang shown in Figure 3 and 4. The purpose of these two events was a combination of improving mangrove ecosystem health and raising public awareness. To achieve this, the organizers provided participants with information about the negative impact of plastic waste on mangroves and practical ways to reduce plastic waste in daily life, in conjunction with the clean-up activity itself. (See Annex 1 for more details on environmental education materials.)

Figure 3. Floating litter clean-up and environmental education event in Margo Mulyo, Balikpapan, East Kalimantan in August 2024

Figure 4. Beach litter clean-up and environmental education event in Serambi Deli, Deli Serdang, North Sumatra in August 2024

2.2. Key Factors for Selecting Clean-up Location and Pre-Visit of Clean-up Site

2.2.1. Key Factors for Selecting Clean-up Location

As a general rule, clean-up activities should be conducted in locations where safety can be ensured. Among the four field types listed in Table 1, types a, b, and c are to be selected as clean-up sites in principle.

Key factors to consider when selecting clean-up locations include:

- Avoid areas dominated by species with prop roots. This is because areas dominated by mangrove species with prop roots tend to have well-developed prop roots—thick, sturdy roots that extend diagonally from the trunk—creating a complex structure that is difficult for people to access. In such areas, litter often becomes trapped between the roots, making manual collection challenging. Based on a survey[10] in North Sumatra Province, Rhizophora species, which are known to have prop roots, accounted for approximately 46.7% of mangrove trees, based on density. As species composition varies across regions, identifying whether the dominant mangrove species have prop roots or not during the pre-visit is recommended to support appropriate site selection.
- It is also advisable to avoid areas where mangrove species with pencil roots grow, as there is a high risk of accidentally stepping on the roots. In the survey conducted in North Sumatra Province[10], species known to develop pencil roots, such as Avicennia and Sonneratia, accounted for approximately 10.3% of mangrove trees. This suggests that such areas can generally be identified and avoided during the pre-visit, if necessary.

Figure 5. Mangroves with prop roots

Figure 6 Mangrove with pencil roots

[10] Sipayung, A., Siregar, A.M., Hasibuan, R., & Harahap, F. (2022). Mangrove species diversity and carbon stock in silvofishery ponds in Deli Serdang District, North Sumatra, Indonesia.

- Avoid areas with dense mangrove growth, as clean-up activities may inadvertently cause damage, especially in replantation zones.

Figure 7. Mangroves replantation zones

- Select locations that prioritize participants' health and safety, avoiding hazardous sites such as nearby untreated sewage discharge.

- Prioritize areas that are accessible on foot, avoiding extremely muddy areas.

- For collecting floating litter, choose areas where boats are available, such as in fishing villages, etc.

- Select areas with nearby road access for vehicles, ideally adjacent to a road.

Imagery ©2024 CNES / Airbus, Maxar Technologies, Map data ©2024 50 m

- Confirm the availability of restrooms nearby and ensure that their use does not conflict with other activities during the clean-up.

- Avoid areas inhabited by dangerous animals such as crocodiles and harmful insects.


2.2.2. Pre-Visit of Clean-up Site

It is important to visit the candidate site in advance to confirm the feasibility of conducting the clean-up activity. The following elements should be considered during the site visit:

- Presence of hazardous areas; In cases where parts of the footing are missing or sharp objects such as nails are present on the handrails, participants should be cautioned accordingly during the clean-up activity.



- The amount of litter for potential collection, which determines the event scale, the waste transportation, and the waste disposal plan.



- Contingency plan for clean-up locations; depending on the weather conditions prior to the clean-up, access to the mangrove area may be difficult even at low tide. In such cases, the activity should be moved to the beach or road around the mangrove forest. Clean-ups in these areas can contribute to effective litter prevention from entering the mangrove area.

Figure 8. Mangrove forests after heavy rain

- Checking the tidal time and level to determine clean-up feasibility. Since local tidal data may not be accessible online, on-site confirmation is recommended for each event.

- Availability of parking space.
- Availability of suitable spots for registration and resting areas.
- Reviewing clean-up steps in advance; It is also recommended to review each step of the clean-up program with partners during the pre-visit to ensure smooth coordination.

2.3. Clean-up Timing

2.3.1. Clean-up timing

The following factors should be considered when selecting the ideal clean-up timing:

- Avoid the rainy season because it is difficult to safely conduct the clean-up activities with the participants (e.g. the season preferred for clean-up in Balikpapan is May-July).
- Build momentum by coinciding the timing with special occasions such as "Love the Ocean Months (*Bulan Cinta Laut*)" (May-July) for encouraging participation.
- Choose a season when significant amounts of litter typically accumulate in the area.

2.3.2. Clean-up frequency

The frequency of clean-ups should be determined by the participants themselves, based on what is sustainable and realistic for them. Maintaining a high frequency of clean-ups, where feasible, can effectively reduce the amount of litter that remains in the community.

In Indonesia, some communities have been able to conduct clean-ups as frequently as daily or every two weeks. Such consistency is often made possible through the formation of strong community ties and shared enthusiasm for environmental efforts. These communities have succeeded in building good relationships among members, allowing them to support and motivate one another.

Figure 9. Images of group clean-up activities

While it may seem easier to act individually, maintaining motivation over time can be more challenging when working alone. Forming a group and fostering a shared sense of purpose are key to continuing clean-up activities in the long run.

The use of social media applications can also be an effective tool in this regard. One example is *Pirika*[11], which is a litter picking information sharing app that allows individuals to share their clean-up activities, connect with others, and expand their clean-up network. Pirika is available in both Bahasa Indonesia and English, making it accessible to a wide range of users.

[11] Pirika website https://corp.pirika.org/en/service/pirika (accessed on 17 Jan 2025)

2.3.3. Clean-up day and time

The appropriate day and time for the clean-up depends on the participating target group. Main factors to consider when selecting the day and time include:

- Weekdays are preferable for government agencies, as they can participate as part of public service activities.
- Weekends and holidays are preferable for students and office workers.
- Important cultural events/holidays need to be considered when selecting the date for maximum community participation
- If a boat is used for clean-up, scheduling the event at high tide is necessary.
- When cleaning up litter in the mangroves, scheduling the event at low tide is preferrable.
- Timing should ensure that no multiple clean-up events take place at the same site within a short period (e.g. a few days or weeks), as earlier efforts may have already removed most of the litter, making it less effective despite gathering participants.
- In order to avoid heatstroke, scheduling the clean-up and litter collection in the morning during dry seasons is preferrable.
-

2.4. Required Procedures

The following are some of the important steps to be considered when preparing for the clean-up event:

- It is recommended to provide community leaders with a preliminary briefing regarding the upcoming clean-up activities.
- As clean-up activities may involve the use of facilities in the vicinity of the site, prior approval from the facility manager is required.

- Ensure that the collected waste from the clean-up is treated adequately, adhering to the do-no-harm principles.

2.5. Waste Transportation and Treatment

If the amount of litter collected is small, a *becak* motor or pick-up truck can be used. However, for large amounts, dump trucks will be required. In such cases, the accessibility of these vehicles to the clean-up site should be confirmed in advance.

Figure 10. Residue (left), becak motor (center), pick-up (right)

Local waste treatment/disposal systems vary by region. In general, the collected waste is first delivered to a Temporary Waste Transfer Station before being transported to one of the following destinations:

1. Delivery to a landfill

2. Delivery to a waste bank, which sorts the waste by type and delivers it to a recycling facility

3. Direct delivery to recycling facilities

Figure 11. Waste treatment facilities (left: landfill, center: waste bank, right: recycling facility)

Litter collected during clean ups is often contaminated with mud, sand and other non-recyclable materials, making it unsuitable for recycling. In such cases, Options 2 and 3 mentioned above may not be feasible.

2.6. Procurement and Preparation of Clean-up Materials and Equipment

The list of materials and equipment is shown in Table 3.

Table 3. The list of clean-up materials and equipment

Materials and equipment to collect floating litter (river, estuary)	
 Landing net	– Ideal for collecting floating litter, better than tongs or grabbers. – Easy to use with a lightweight handle. – Low-strength handles may bend during clean-up.
 Tongs  Grabber	– Tongs are useful for picking up large items that cannot be grabbed with a grabber. – A grabber can grab litter more easily than tongs. – A grabber can grab the river bottom litter if visible.
  Gloves	– Puncture-resistant gloves are desirable to prevent injury from sharp debris. – Waterproof gloves are desirable when the river water is contaminated.
 Woven sandbags	– The bag size should not be too large, considering they will be landed from the boat. – Water-permeable bags are better since floating litter is wet. – For large, low-density debris, larger bags may be more appropriate

<table>
<tr><td> 
Boat
(Boats should be chartered in cooperation with local fishermen and other stakeholders)</td><td> 
Strap
(To prevent a camera or smartphone from falling into a river)</td></tr>
<tr><td> 
Life vest
(Essential for ensuring participants' safety)</td><td></td></tr>
<tr><td colspan="2">Materials and equipment to collect drifted litter (land)</td></tr>
<tr><td> 
Tongs
(Useful for picking up hazardous items)</td><td> 
Rake
(Useful for raking small litter to improve collection efficiency)</td></tr>
<tr><td colspan="2">Gloves and woven sandbags are also needed to collect drifted litter as well as floating litter</td></tr>
</table>

<table>
<tr><th colspan="2">Materials and equipment to measure collected litter</th></tr>
<tr><td>  
Digital fishing scale</td><td>– Measure weight of collected litter.
– It is difficult to measure more than 50 kg with this digital scale. If necessary, divide the litter into smaller bags or prepare a digital scale that can measure up to 100 kg.</td></tr>
<tr><td> 
Rope
(When using a fishing digital scale to measure litter that is difficult to lift manually, tie a rope to a tree or the beam of a pavilion and hang the scale)</td><td> 
Tally counter
(To count a large number of waste without error)</td></tr>
<tr><th colspan="2">Materials and equipment for environmental education</th></tr>
<tr><td> 
Sound system, megaphone
(Essential for ensuring that all participants can hear the announcement)</td><td> 
Blue tarp, mat
(To secure a seating area during environmental education or to segregate collected litter)</td></tr>
</table>

 Educational material (Waterproof paper is recommended in case of rain.The size and thickness should be easily portable.)	 Food and beverages (Recommended safety and hydration, especially during long events)

Other materials and equipment	
 Trolley bag (convenient for carrying equipment)	 First-aid kit
 Insect repellent (Waterproof is better for when it rains)	 Poison remover
	

Stationery	Digital camera
 Waterproof shoes (when the ground is muddy)	 Raincoat (when the weather may be rainy)

2.7. Potential Partner and Role Assignment

2.7.1. Required roles in the organizing team

Within the clean-up activity's organizing team, the necessary roles and tasks listed in Table 4 should be assigned to the appropriate individuals.

Table 4. The main roles required in the clean-up activities

Role	Task
Supervisor	– Overseeing the overall clean-up activity – Working as a liaison and coordinator with partner organizations – Making a final decision on whether to conduct the clean-up – Time management
Safety manager	– Providing emergency rescue instructions to participants – Securing communication with relevant authorities in the case of accidents or injuries – Ensuring participants' health – Providing instructions on how to handle hazardous materials
Record keeper	– Taking activity photos and videos – Recording the amount of collected litter and other data
Receptionist	– Welcoming and guiding participants – Recording the list of participants
Explanator	– Explaining the day's program to participants
Instructor	– Conducting environmental education programs for participants
Material and equipment manager	– Distributing food and drinks to participants – Preparing and distributing equipment and materials for clean-up
Waste manager	– Handover of collected waste to a transporter – Ensuring proper waste disposal

2.7.2. Arrangements with local organizations

Potential partners for the clean-up are listed in Table 5.

Table 5. Potential partners

Potential partners	How to involve partner
Local government environmental agency	– Consult on the design and planning of the activity, as well as align the purpose of the activity with local environmental policies – Request to gather participants using local government connections, such as through inter-municipal connections, women's associations (*Pemberdayaan Kesejahteraan Keluarga* or PKK), environmental action groups, local waste banks, local residents, as well as authorities under the government. – Share clean-up information such as the amount of collected litter, report, pictures, and videos produced from the activity
University	– Leverage the academic expertise – Use the clean-up activity as an opportunity for student unions related to environmental conservation to participate
Waste bank	– Hand over valuable litter collected from the clean-up activity – Request to gather participants using the waste bank connection, because some waste banks often promote public awareness of environmental conservation
Fishermen's group	– Contribute to the reduction of marine litter in the fishing area
Mangrove-based tourism facility management	– Contribute to the reduction of marine litter in the facility
Clean-up activity group	– Collaborate with existing activities and promote future activities
Student group	– Collaborate with existing activities and promote future activities

Chapter 3

CLEAN-UP IMPLEMENTATION

How to clean up litter in mangroves

3. CLEAN-UP INPLEMENTATION

3.1. Flow of Clean-up Activity

The clean-up steps and procedures may vary depending on the main objectives of the activity. In the Guidelines, activities focusing on community education and awareness raising are presented as an example.

Specifically, Figure 12 illustrates the flow of a clean-up activity designed to raise awareness about marine litter issues and mangrove conservation among local communities, with reference to past clean-up event case studies shown in Table 6. Details of the event can be found in Table 7.

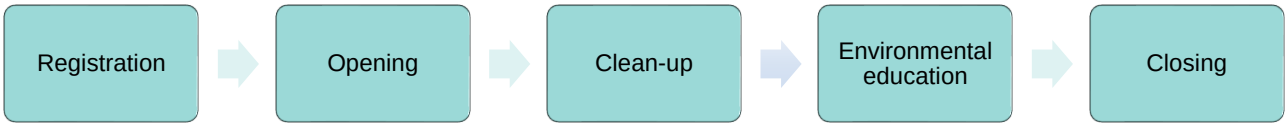


Figure 12. Simplified flow of clean-up activity

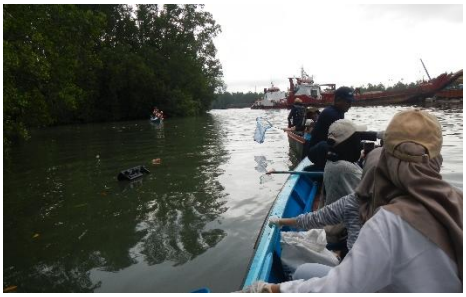
Table 6. Two examples of clean-up events in the mangrove area, with reference to case studies

Event title	Floating Litter Clean-up Event at Mangrove Estuary	Mangrove Beach Litter Clean-up Event
Date	Saturday, August 24, 2024, 8:00-12:00	Wednesday, August 28, 2024, 10:00-14:30
Location	Margo Mulyo, Balikpapan, East Kalimantan	Serambi Deli beach, Deli Serdang, North Sumatra
Organizer	JANUS & CIROES (waste bank), in cooperation with the Environmental Department of Balikpapan City	JANUS & Environmental Department of North Sumatra Province, in cooperation with Environmental Department of Deli Serdang Regency and University (UNPAB)
Participants	Local high school students, fishermen, community leaders, and East Kalimantan Province (about 30 people including organizers)	Environmental conservation groups, local residents, waste bank, women's association (PKK), (about 70 people including organizers)
Contents	– Opening remarks – Donation of trash cans to park administrator – Collection of floating litter (5 teams of 3-6 people) – Environmental education – Awards (rewards for the team that collects the most waste) – Education on waste separation by the waste bank – Questionnaire (online)	– Opening remarks – Collection of beach litter (13 teams of 5 people) – Introduction and donation of ballot trash can to beach facility manager – Environmental education including presentations by waste bank and other participants – Awards (rewards for the team that collects the most waste) – Questionnaire (paper)

Collected litter	29.02 kg (mainly plastic waste) 	877.93 kg (mainly plastic waste) 

Table 7. Detailed event flow based on Table 6

Step	To do	Notes
0	Advance confirmation	– Identify any new risks not found during the pre-visit before opening the event. For example, whether the ground at the event site became slippery due to the weather conditions. (See images below.)  
1	Registration	– Prepare the registration form for participants. – Distribute gloves if necessary. – Prepare equipment and material for the clean-up (banner, sound system, woven sandbags etc.). – (Optional) Distribute wristbands to form clean-up teams with rewards for the most litter collected.   

Step	To do	Notes
2	Opening	– Opening remarks from the event organizer, local government, local community leader etc. – Explanation on the program of the day.  
3	Clean-up	– Share information on the potential hazards, such as dangerous zones, wildlife, and hazardous litter before starting the clean-up. (See Section 2.8 for examples.) – Allocate approximately 30 minutes for litter collection (an appropriate time for the activity, based on the prior event experiences).  
4	Break	– Provide snacks and drinks. – Set the collection points for food and drink containers and packaging separately from the clean-up litter for the measurement of the amount of litter after the break.  

5	Environmental education	– Explain the importance of waste separation, recycling, and valuable waste for waste banks, local government etc. – Introduce environmental volunteer activities focusing on clean-up activities. – Materials can include: – Mini game using waste (e.g., ballot trash can). – Printed materials (See Annex 1, 2 for details).  
6	Measurement	– Prepare the equipment for the measurements. If a woven sandbag is too heavy to lift by hand, a fishing scale can be attached to a tree or other object on the beach. – Measure the weight of litter collected by each team.  
7	Reward	– Announce the total amount of collected litter. – Show recognition for the team that collects the most litter (and other teams if necessary). – Award prizes to the winning teams.  

8	Donation	– Contribution to the cleanliness of the community by donating trash cans to the clean-up area manager for example is a possibility.  
9	Assessment of the impact of the event	– Distribute the questionnaire to participants to assess the effectiveness of the event and to gather suggestions for improvement. – Questionnaire should be provided in both paper and online formats with a QR code to secure the number of respondents. (See Section 4.2 for details.)  
10	Closing	– Closing remarks from the organizer. – Take group photos to further promote clean-ups.  

11	Finish	– Check the event site to see whether there are any forgotten or discarded items. – Hand over the collected waste to the organization which will dispose of it appropriately, including waste bank, municipal waste collection, and transportation personnel. – Take "before and after" photos of the clean-up area for documentation (it may be difficult to take photos of the clean-up area in an aquatic environment such as river surface or bottom).  

3.2. Clean-up Method

Several methods of litter collection can be adapted to suit regional characteristics. For instance, in the case studies of Balikpapan and Deli Serdang, the following methods were employed.

3.2.1. Clean-up method and precautions in situation a in Table 1 (Floating debris on the river surface)

(1) Boarding a boat

- It is recommended to wear a life vest.
- Choose the appropriate boat for the clean-up activity. Motorboats can move over a wide range of clean-up areas but may not reach the exact location of the floating litter. On the other hand, rowboats move slowly but can approach floating litter even when the water level is not high.

(2) Locations to target for clean-up

- Focus on the areas where litter tends to accumulate.



- Litter may also be abundant at the point where the tide turns back, and near the source of litter runoff.


- Litter may drift to the center line of the stream.

- While navigating by boat, look for floating litter in the direction of navigation.
- When moving against the navigation direction, watch your rear to avoid hitting your head on tree branches.
- Exercise caution to avoid entanglement in fishing lines, hooks, or other debris caught in mangrove branches and roots.


(3) Collecting floating litter

- Use a landing net or similar tools.


- Refrain from leaning too far out of the boat to prevent the risk of falling into the water.
- For distant floating litter, use an oar to bring the litter close to the boat.


- Put collected litter in woven sandbags to easily carry it out of the boat.
- If the collected litter contains a lot of water, drain it to reduce its weight.



(4) Going ashore

- Carefully disembark from the boat with the assistance of the staff at the disembarkation point.
- Hand over woven sandbags containing collected litter to the staff waiting onshore.


3.2.2. Clean-up method and precautions in situation b and c in Table 1 (Debris washed ashore, as well as tide-dependent debris that is accessible on foot only at low tide)

Several beach clean-up manuals have been developed such as those listed below, and the methods for collecting litter on land in mangrove areas are generally similar.

- Organizing Your Own Event Guidelines for the General Public[12] (European Union, 2024)
- Organizing A Clean-up Event Practical Guideline[13] (European Union, 2024)
- A Roadmap for Creating Your Behavioral Change Campaign[14] (Kemenko Bidang Kemaritiman dan Investasi, nd)
- Coastal Clean-up Project Manual [8] (Ministry of the Environment, Government of Japan, 2011)

For mangrove-specific clean-ups, keep the following points in mind to ensure participants' safety while protecting the mangrove ecosystem:

- Do not collect natural objects that are part of the ecosystem, such as mangrove seeds.


- Apply caution not to break the roots or branches of the mangrove as much as possible.
- Use a saw or knife to collect ropes or plastic bags entangled in branches and roots. Be careful not to damage branches and roots when cutting the waste.
- Remind participants to stay with the group to avoid getting lost in the mangrove forest.

[12] EU website https://oceans-and-fisheries.ec.europa.eu/document/download/80fa666a-08a2-48be-bc34-739d0dcf7601_en?filename=2024-eu-beach-cleanup-guidelines-general-public_en.pdf (accessed on 17 Jan 2025)
[13] EU website https://oceans-and-fisheries.ec.europa.eu/document/download/4dc69a87-a148-415c-825e-d51cc96db2f0_en?filename=2024-eu-beach-cleanup-guidelines-institutional-partners_en.pdf (accessed on 17 Jan 2025)
[14] Ministry of Maritime Affairs and Investment of the Republic of Indonesia website https://maritim.go.id/konten/unggahan/2020/05/Playbook_Stop_Littering_EN.pdf (accessed on 26 Sep 2024)

Figure 13. About 180° view in mangrove forest

- If the ground is muddy, rubber boots should be used.
- Avoid bare feet or wearing flip-flops, as glass fragments, fishhooks, and other sharp debris may be on the ground, and such debris may be invisible beneath fallen leaves, mud, and other ground covers.

3.3. Education

Clean-up activities are effective for removing waste that has already leaked into mangrove areas. However, they are not sufficient to reduce the total amount of mismanaged waste. In order to tackle the problem at its source, it is essential to prevent waste leakage from land-based activities. One of the most effective approaches to achieve this is through environmental education that raises public awareness and encourages behavioral change.

To support this purpose, educational materials were developed as part of this project (see Annex 1 and 2). The materials aim to help participants understand the significance of mangrove and coastal conservation, the causes and impacts of plastic pollution, and the actions they can take in their daily lives. The following sections provide guidance on the suggested content and recommended practices for designing and delivering effective educational materials.

3.3.1. Suggested Content for Educational Materials

To ensure that educational materials are effective in promoting awareness and action, it is recommended that they include the following elements:

- **Introduction to mangrove ecosystems**
  Explanation of mangrove functions such as coastal protection, carbon storage, biodiversity support, and their role in filtering pollutants.
- **The marine litter problem**

Description of the growing issue of plastic pollution, its sources, and how it reaches mangrove and coastal areas.

- **Impacts on mangroves**
  Visual or textual examples of how plastic waste affects mangrove ecosystems by entangling roots, suppressing seedling growth, and degrading habitat quality.
- **Current conditions and data**
  Summary of survey results on litter composition and density in mangrove areas. The data indicated that most of the waste originated from daily life, such as shopping bags and food containers, highlighting the direct link between everyday behavior and plastic pollution.
- **What individuals and communities can do**
  Practical actions to reduce waste generation, such as proper waste management, minimizing single-use plastics, participating in clean-ups, and supporting recycling initiatives.
- **Positive messaging to inspire action**
  Use of familiar examples, local references, and success stories to help participants see the issue as personally relevant and solvable. Introducing fun and engaging tools—such as mobile apps that gamify litter collection—can also motivate participants to continue clean-up activities in their daily lives.

3.3.2. Methods and Tools for Education Delivery

Educational activities can take place in both indoor and outdoor settings. Based on experience from this project, the following approaches and considerations are recommended when designing and delivering materials:

[Shape and material]

- Ensure the materials are portable and easy for participants to take away to prevent littering on site.
- When displaying or distributing paper materials outdoors, waterproof paper material is recommended in case of rainy weather.

[Font and size]

- Select a font size that is easily readable when projected on the screen or displaying the materials outdoors.
- Prepare materials in two languages, English and the local language (especially for international collaborations).

[Contents]

- For non-expert audiences, use simple explanations and avoid technical terms.
- Reduce text on the educational materials and incorporate more images and figures to enhance accessibility, especially for children and people who may have difficulty reading the text.

- Include just one salient point in each slide.
- Use a simple and easy-to-understand design. (See Figure 14.)
- Incorporate examples of participants' familiar places, feedstock, etc. (See Figure 14.)
- Explain the content in an interactive and participative way. (See “Your turn” in Figure 14.)

Figure 14. Part of the environmental educational material

[Consideration of rights]

- Respect the copyrights of images and figures. If you use copyright-free content, abide by the terms of use.
- Avoid using identifiable images of people. If you use these images, kindly ensure that you have obtained their permission beforehand.
- Provide attribution for images and figures that contain the copyrights of others.

[Others]

- Encourage participants to take educational materials home by placing a QR code on the materials for a website where the photos of the clean-up are shared after the event. (See ANNEX 1, 2.)

Figure 15. Example of using a QR code for clean-up photo sharing

In addition, a typical flow for environmental education using collected litter is as follows:

- Spread out the collected litter on a blue tarp.
- Identify what types of litter have been collected and learn about their sources.
- Learn what types and conditions of waste can be accepted by the waste bank and the recyclers and what kind of waste will be rejected.
- Learn how to segregate waste.
- Practice segregation of litter on the blue tarp.

Figure 16. Presentation of accepted waste types by the waste bank (left) and waste sorting by participants (right)

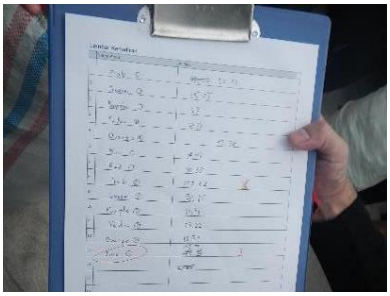
The environmental education program may include presentations on waste issues and actions by local government, the waste bank, and environmental protection groups.


Figure 17. Presentations by participants

It may also include the introduction of engaging and creative approaches to promote proper waste disposal, allowing participants to gain hands-on experience. For example, in the case studies, the ballot trash can, which is the trash can with the voting system, was used. Participants can throw their disposable lunch box to vote on the answer to the question, "Which do you like better, fish lunch or chicken lunch?". The goal was to make the act of voting enjoyable enough to encourage appropriate waste collection, thereby reducing the waste leakage into the environment.


Figure 18. Ballot trash can (Participants who prefer chicken throw the lunch box in the right side of the bin)

3.4. Record keeping



Recording participant numbers and collected waste visualizes the impact of clean-up activities, boosts community awareness, and builds a sense of achievement. It also encourages long-term local engagement and motivates more volunteers to join by showing the effectiveness of collective action.

The following are the major items recorded:

- The date
- The location
- Name of the organizer/supervisor
- The number of participants
- Name of participants and organizations
- The amount of litter collected
- Pictures and videos of each step of the activity

Chapter 4

FOLLOW UP

4. FOLLOW UP

4.1. Information sharing

Sharing information about clean-up activities is crucial for building momentum to address marine litter problems, including plastic pollution. Below are examples of effective ways to disseminate information:

- Social media can be effective in spreading information widely, especially to the younger generation.
- It is also a good idea to disseminate information using hashtags that are usually used by each participating organization or by the clean-up event.

Source: Instagram post of CIRO Waste (left image), Instagram story of UNPAB (right image)

Figure 19. Examples of disseminating clean-up activities using social media (left: event in Balikpapan, right: event in Deli Serdang)

- Prepare a platform for sharing images from the activity, accessible via a QR code or URL provided after the event. This encourages participants to share their clean-up experiences on social media, helping to build momentum for marine litter reduction.

- Local newspapers can be effective in reaching people who do not have access to online media and are interested in local news such as local authorities.

GAWI MANUNTUNG

Japan Nus Co. LTD Datang Lagi ke Mangrove Margo Mulyo

Beri Edukasi Penanganan Sampah Laut

Pemilahan sejak awal menjadi hal penting yang harus dilakukan dalam mengatasi masalah sampah, khususnya di kawasan perairan mangrove.

BALIKPAPAN - Kawasan mangrove Margomulyo, milik Pemkot Balikpapan, Kalimantan Timur, masih menghadapi masalah rutin yang belum terpecahkan, yakni tumpukan sampah.

Terkait hal itu, tim Japan Nus Co. LTD (Janus) kembali mengunjungi kawasan tersebut, Sabtu (24/8). Sebanyak empat orang dan didampingi satu orang penerjemah bahasa.

Japan Nus Co. LTD merupakan konsultan swasta dari Jepang, yang bergerak di bidang energi, ilmu sosial, serta lingkungan yang bertujuan memberikan solusi untuk masalah lingkungan yang terjadi dalam skala global.

Pada kesempatan ini, tim Janus mengambil sample sampah di perairan mangrove menggunakan perahu nelayan setempat. Kedatangannya didampingi Dinas Lingkungan Hidup Kalimantan Timur, Lurah Margo Mulyo Aji Syarifah Nur Alifah, Ciroes dan para nelayan Margo Mulyo, serta para pelajar tingkat SMA di wilayah Balikpapan.

Selain menyampaikan presentasinya mengenai edukasi pemilahan sampah dan pengelolaannya untuk kelestarian mangrove, juga menyosialisasikan aplikasi Pirika dari Janus tentang aplikasi pengumpulan sampah dan kontribusi sosial terbesar dunia.

Lurah Margo Mulyo Aji Syarifah Nur Alifah mengatakan, kedatangan Janus untuk yang kedua kalinya itu dapat mempelajari cara menjaga kebersihan lingkungan wilayah pesisir dan mengurangi dampak negatif pada ekosistem mangrove Margo Mulyo.

"Tentunya ini melibatkan berbagai pihak serta meningkatkan dan menjaga kelestarian lingkungan. Dukungan tersebut akan memberikan dampak positif secara luas dan menjamin keberlangsungan hidup mangrove dan ekosistemnya di masa depan," pungkasnya. (pms/ind)

SUPRIYONO LUPUS
@queenzallkalila0917

JAGA LINGKUNGAN : Lurah Margo Mulyo Aji Syarifah Nur Alifah (tengah, jilbab merah) bersama tim Janus dan dukungan dari berbagai pihak untuk menyosialisasikan program penanganan sampah mangrove di Kelurahan Margo Mulyo.

Source: Kaltim Post (29/8/2024)

- Websites can be effective in reaching people who are searching the Internet for clean-up information. An international organization's website can promote cooperation with foreign groups.

Figure 20. Clean-up event report on the ERIA website

Source: ERIA website (https://rkcmpd-eria.org/plastic-waste-and-mangrove/detail/community-clean-up-campaign-tackles-marine-plastic-waste-in-indonesian-mangroves)

- Videos can be effective in raising public awareness by editing and showcasing recorded data from the activities. One challenge in promoting clean-up activities is the presence of negative perceptions of clean-up activities, as observed at the pilot project sites. For instance, some people expressed skepticism, believing that no one would voluntarily clean up their neighborhood. To change these negative perceptions, videos featuring diverse groups enjoying clean-up activities can be an effective way to shift their mindset. The following is an example of videos for public awareness. The concept of the video is to encourage people to take action, such as by participating in the clean-up.

Source: Ciro Waste (https://www.youtube.com/watch?app=desktop&v=l3irZLVm5BM)

Figure 21. Example of using video to spread the clean-up activities in the community

- Organizing a workshop with national and international organizations involved in mangrove conservation and marine litter issues would be beneficial for sharing information and exchanging ideas.

4.2. Analysis of Questionnaire

Questionnaires can be useful for evaluating the effectiveness of the clean-up and improving future clean-ups. They can be distributed in two formats: online, using QR codes and smartphones, or printed on paper and collected at the site. The choice of formats should be based on the demographics of the participants and local conditions, such as internet connectivity, which may be poor on the beach.

The following are some examples of questions and answers. (See Table 8, Table 9, Figure 22 and Figure 23.) Question 1 and 2 show whether the clean-up event raised participants' awareness of waste management.

Table 8. Results of the questionnaire at the Balikpapan clean-up event, 2024

Q1			
Did your participation in this event increase your awareness about the importance of separating waste for proper disposal, recycling, and reuse?			
A	I am very aware of that.	7	58%
B	Greatly improved	4	33%
C	Increased	1	8%
D	No changes	0	0%
E	Decreased	0	0%
Total		**12**	**100%**

Note: Total does not equal 100% due to rounding.

Q2			
After this event, what would you like to implement/add to your waste management habits? (Multiple answers are allowed)			
A	Separate waste in the kitchen/house	8	19%
B	Participate in similar clean-up events	9	21%
C	Talk about this event to friends/family	5	12%
D	Publish photos about today's events on social media	5	12%
E	Clean rivers, beaches, or roadsides (alone or with friends/family/colleagues without a community-organized event)	9	21%
F	Use the Pirika application	7	16%
G	Other: …… [please specify]	0	0%
Total		**43**	**100%**

Notes:

1. Pirika was not used in the clean-up site because only floating river litter was collected in the event.
2. Total does not equal 100% due to rounding.

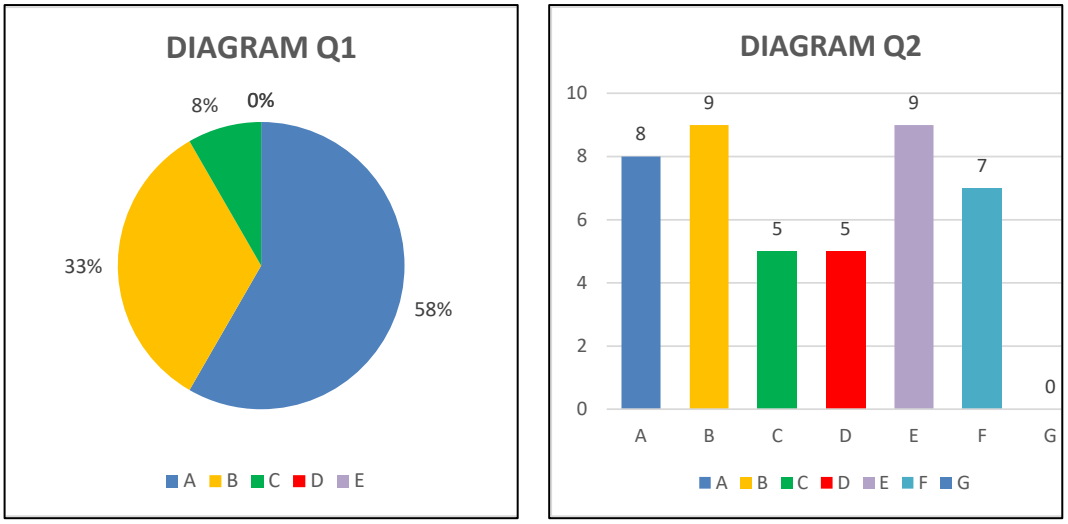


Figure 22. Results of the questionnaire at the Balikpapan clean-up event, 2024

Table 9. Results of the questionnaire at the Deli Serdang clean-up event, 2024

Q1			
Did your participation in this event increase your awareness about the importance of separating waste for proper disposal, recycling, and reuse?			
A	I am very aware of that.	33	51%
B	Greatly improved	21	32%
C	Increased	8	12%
D	No changes	3	5%
E	Decreased	0	0%
Total		**65**	**100%**

Q2			
After this event, what would you like to implement/add to your waste management habits? (Multiple answers are allowed)			
A	Separate waste in the kitchen/house	25	39%
B	Participate in similar clean-up events	12	19%
C	Talk about this event to friends/family	17	27%
D	Publish photos about today's events on social media	3	5%
E	Clean rivers, beaches, or roadsides (alone or with friends/family/colleagues without a community-organized event)	7	11%
F	Use the Pirika application[1]	0	0%
G	Other: …… [please specify]	0	0%
Total		**64**	**100%**[2]

Notes:

1. Pirika could not be used in the clean-up site due to poor internet connection.
2. Total does not equal 100% due to rounding.

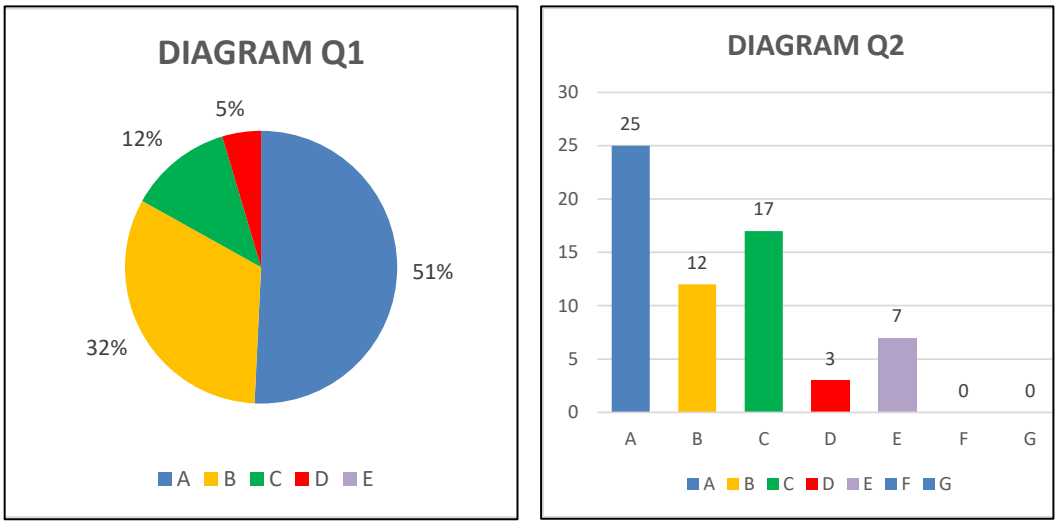


Figure 23. Results of the questionnaire at the Deli Serdang clean-up event, 2024

Question 3 asked clean-up participants to suggest ways to raise public awareness about plastic waste management. Their responses provide insights for improving the effectiveness of clean-up events including environmental education.

Table 10. Suggestions from clean-up participants to raise public awareness about plastic waste management

Q3	
Do you have any suggestions to raise public awareness regarding plastic waste management? (Free answer)	
Education including clean-up events and proper waste management	13
Improvement of waste collection and disposal systems	7
Collaboration among diverse groups	4
Promotion of 3Rs	3
Others (Support for clean-up, Talk about the clean-up event, Fines or penalties)	3

Note: Summarized by similar answers

The most prevalent suggestion was for local communities to educate residents on clean-up and proper waste management to enhance awareness. The findings indicate that the preferred approach to reducing waste generation is integrating environmental education with clean-up activities.

The second most common suggestion was to improve the waste collection and disposal system. If the system is not properly established, there is a concern that litter collected during clean-up activities may not be properly transported or disposed of, potentially re-entering the environment. It is therefore considered that improving the waste management system is a prerequisite for making clean-up activities an effective marine litter reduction measure.

Collaboration among diverse groups was also highlighted as crucial for promoting clean-up activities, which might have a negative image. Involving a diverse group of people engaging in clean-up activities can help foster a positive perception of picking up litter. The video shown in Figure 19 will help promote this positive image because it shows diverse groups enjoying the clean-up event.

5. CONCLUSION

Cleaning up mangrove forests, where litter tends to accumulate, plays a vital role in conserving the marine environment, preserving mangroves, and maintaining their ecosystem services, including coastal protection, fisheries, and tourism. These efforts also offer direct benefits to local communities.

However, clean-up activities in mangrove ecosystems in Indonesia remain limited, likely due to the following factors: inadequate waste disposal practices, low public awareness about environmental pollution, lack of knowledge required for clean-up activities, negative perceptions of clean-up activities, lack of funding, limited appreciation for nature, and weak community engagement.

Therefore, the guidelines aim to promote sustainable community-led clean-up activities by summarizing the following information on clean-up activities in mangrove areas.

- **Clean-up Flow**: The guidelines outline the clean-up steps aimed at raising awareness about marine litter and mangrove conservation among local communities.
- **Clean-up Method**: This guideline outlines two practical cases for community-led clean-up activities.
    - Case 1: Floating debris in rivers ➔ Clean-up is conducted using nets and boats to collect floating debris near riverbanks.
    - Case 2: Drifted debris in accessible mangrove ground areas ➔ Clean-up is conducted manually in accessible mangrove forests, following simple precautions described in Section 3.2. “Clean-up method” above.). For more detailed procedures, please refer to the “Guidelines for Community-led Marine Litter Survey in Mangroves”
- **Useful Educational Materials**: Educational materials that can be widely used are attached to the guidelines (both the English and Indonesians are available). These materials include information such as the benefits of mangroves, the current status of plastic pollution in mangroves, the negative impact of marine litter on mangroves, and countermeasures to reduce litter in the environment (including the Pirika application). The guidelines also describe how to create effective educational materials.
- **Educational Video on Clean-up Activities**: To improve the image of clean-up activities, a video showing the joyful clean-up activities in mangroves by various organizations has been created. It will help to promote the clean-up activities in Indonesia.

Although the guidelines are tailored for Indonesia, many aspects are applicable to mangrove regions in other countries. It is hoped that the implementation of clean-up activities based on the guidelines will advance marine litter countermeasures and mangrove conservation initiatives globally.