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MORALITY BEFORE KNOWLEDGE

Youth perspectives on marine debris management through a community empowerment approach: A case study of a student workshop and its environmental impact

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ABSTRACT

Background: This research examines efforts to address marine waste through the perspective of the younger generation, particularly Indonesian students. The aim is to discover problem-solving concepts to reduce marine waste based on the thoughts of young people studying environmental issues. **Methods**: The methodology involves a workshop with 30 students from 10 universities in Indonesia held on Ainoshima Island, Japan. Participants conducted direct observations of marine waste on the beach, attended informational sessions, and engaged in discussions to analyze problems and propose solutions. Data were collected through beach waste surveys, questionnaires, and focus group discussions. **Findings:** The results show that participants have a high awareness of the importance of addressing marine waste issues and are willing to actively engage in efforts to tackle them. **Conclusion**: Some of the recommended proposals include community education for coastal residents, enforcement of regulations, and provision of waste management facilities in coastal areas. This study highlights the important role of the younger generation in understanding and analyzing marine waste issues, as well as their potential contributions to formulating solutions to preserve marine ecosystem sustainability in Indonesia. **Novelty/Originality of this article:** This study highlights the perspectives of Indonesian students on marine waste, offering unique, youth-driven solutions. By conducting a workshop with direct observations and discussions, it emphasizes the role of young people in addressing environmental issues and provides original recommendations for waste reduction and marine ecosystem preservation.

KEYWORDS: plastic waste; marine litter; marine waste management; environmental awareness.

1. Introduction

Global concern over the impact of plastic pollution in marine environments has significantly increased. The issue of marine waste is now viewed as a crucial matter that requires immediate attention and action. Several countries have taken proactive steps to address this problem through policies and legislation. For example, the Ministry of the Environment in Japan has initiated efforts to tackle marine waste based on the Coastal Waste Disposal and Marine Litter Promotion Act enacted in 2009 (Matsuzaki & Sato, 2018). The continuous increase in plastic production, combined with the persistent nature of this material, has led to long-term accumulation in marine ecosystems (Yamashita et al., 2016). Consequently, various marine organisms are exposed to and consume plastic particles.

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Research shows that microplastics and associated chemicals can be absorbed by organisms at lower trophic levels, such as zooplankton (Isobe, 2021).

The ecological implications of plastic pollution spreading throughout marine ecosystems are now well documented. Plastics act as vectors for various pollutants, creating new exposure pathways for marine organisms. This phenomenon has the potential to increase the pollutant burden on marine biota as the amount of plastic entering the marine environment rises (Mirasus, 2021). Future projections indicate that with the increasing rate of plastic disposal into the ocean, the pollutant burden on marine organisms will intensify. This condition is expected to exacerbate threats to the integrity and sustainability of marine ecosystems as a whole. Given the complexity and scale of this issue, a comprehensive and collaborative approach to managing plastic waste in the ocean is necessary to mitigate the long-term impacts on marine ecosystems and human health (UN, n.d.).

The current state of marine pollution due to drifting plastic waste has reached concerning levels and requires serious attention. The accumulation of plastic debris in marine ecosystems poses significant threats to environmental integrity and economic sustainability (Tekman et al., 2022). Plastic pollutants entering marine waters exhibit high persistence and are not easily degraded naturally, resulting in long-term ecological burdens. Estimates suggest that there are approximately 150 million tons of plastic waste in the global ocean, with an annual addition rate of 8 million tons. The economic implications of marine plastic pollution are multidimensional. The accumulation of plastic debris in coastal areas negatively impacts the aesthetic landscape and reduces tourism appeal, thereby harming the tourism industry. Additionally, the costs of handling and managing plastic waste become a significant financial burden for local governments. Furthermore, plastic contamination threatens the sustainability of fishery resources. Reports indicate that various marine species consume plastic particles in substantial amounts, which could potentially reduce commercial fish stocks and fishery productivity (Haward, 2018). Given the urgency of this issue, a comprehensive and collaborative approach to addressing marine plastic pollution is needed. The implementation of effective policies and technological innovations in waste management is crucial to mitigate negative impacts and preserve marine ecosystems.

Ainoshima Island is a remote island located north of Kyushu, also known as a popular tourist destination called Cat Island. It has a small population that is frequently visited by tourists to enjoy nature and fishing. The population in Ainoshima consists of 89 residents, primarily fishermen, most of whom are over 60 years old. In 2020, the island still had an elementary school with eight students, but due to considerations regarding the local conditions, the school was closed, and the students were transferred to the city of Kitakyushu. Currently, the school serves as an evacuation site for residents in case of disasters (Weekender, 2022).

Although Ainoshima does not have public facilities for tourists, its beauty and natural atmosphere attract many visitors who come just to enjoy the scenery and the sound of the waves. Tourists can travel back and forth in one day by taking a boat with a capacity of 50 people. The coastline of Ainoshima features high cliffs made of granite and sandy beaches with fine sand and coral. Along the shore, there is a wide variety of marine debris that has washed ashore. The location of Ainoshima makes it highly susceptible to receiving waste carried by currents from nearby countries, as shown in Figure 1, which depicts Ainoshima from Google Maps along with photos of the debris on the beach. This research aims to find problem-solving concepts regarding how to reduce marine waste, as conceived by the younger generation currently studying environmental issues. After participating in a workshop with environmental experts at Kitakyushu University, the participants are expected to develop an action plan for addressing marine waste problems on small islands in Indonesia. Ainoshima serves as a model island facing marine waste challenges.

Fig. 1. Ainoshima Island as seen on Google Maps and photos of debris on the beach

2. Methods

2.1 Participants

This study involved 30 students from 10 universities in Indonesia as workshop participants, consisting of 23 males and 7 females. Two professors from Kitakyushu University served as resource persons to explain the issues related to plastic waste and its management. Additionally, four Indonesian students pursuing their Master's and Doctoral degrees at Kitakyushu University acted as tutors during the training. Participants were selected using purposive sampling to ensure a diverse representation of the younger generation.

2.2 Workshop

This research included the delivery of material in the form of a workshop for the participants. The workshop participants were invited to tour Ainoshima Island and observe the waste along the beach. For data collection purposes, participants were divided into six groups, with each group consisting of five students. The material provided includes several aspects related to marine litter, as shown in Table 1. The theme of the workshop is "How to Reduce the Amount of Beach Waste." The workshop was held on Ainoshima Island, Kokura Kitakyushu, Japan.

Table 1. Workshop material

No	Workshop schedule
1	Introduction Ainoshima Island
	History of Ainoshima Island
2	Marine litter
	Where does marine litter come from
3	Analysis
	What needs to be done
4	How to reduce beach waste
	What can we do

2.3 Data collection

2.3.1 Data collection of waste types

Data collection activities were conducted by walking along the beach on Ainoshima Island, covering a quarter of the island starting from the right side. Many piles of waste were

found along the shore, originating from the sea. The waste varied in shape and type, with most of it being plastic waste.

2.3.2 Data from focus group discussion (FGD) workshop

Data collection in this study involved a group discussion forum. Workshop participants discussed strategies to reduce waste in the sea, guided by two professors who are experts in waste management. The participants were divided into small groups, and the results of the discussions were written on paper. Some participants also drew maps and objects to make their ideas easier to understand.

The integration of Focus Group Discussions (FGD) in the workshop created a more comprehensive and in-depth learning experience. FGD allowed for active participant involvement, encouraging dialogue among participants. This interaction helped generate new and creative ideas while also enabling the collection of qualitative data.

2.3.3 Methods and technologies for collecting waste samples

Monitoring surveys were conducted along the beaches on three sides of Ainoshima to determine the quantity, type, and composition of waste washed up on the shore. This survey included the quantity and type of waste, composition, and the country of origin for PET bottles (where the bottles were produced) (Yaakop, 2023), etc. The results of the waste survey conducted over one day are summarized in Figure 2 below.

Fig. 2. Types of waste found on Ainoshima

Based on the feedback gathered from the workshop participants, they stated that the waste found on the beach originates from fishing boats discarding fishing gear and tools, as

well as food packaging and plastic drink bottles. Data was collected based on the participants' activities. After the workshop's initial presentation by the first resource person, an introduction to types of waste, beach waste, and plastic waste was conducted, followed by the next phase involving active participation from the attendees. Participants analyzed the waste condition on the beach and collected it. They then analyzed the origin of the waste by examining the labels on the waste packaging. The analysis began with identifying the types of waste, followed by determining where they came from and estimating why the waste was discarded, as well as how the waste ended up on the beach in Ainoshima.

A structured questionnaire was developed to assess the participants' thought patterns regarding waste that originates from the sea and washes up on the beach. The questionnaire covered topics such as the participants' understanding of marine waste issues, their perceptions of potential actions that could be taken to address these problems, and their willingness to engage in initiatives aimed at solving marine waste and coastal environmental issues. Two types of data were collected: the questionnaire given to workshop participants, which included open-ended questions, observational results, and focus group discussion outcomes. Additionally, participants were asked to create an action plan to address the waste issues on Indonesian beaches.

2.4 Data analysis

The data collected from the workshop participants' feedback, the distributed questionnaires, and the action plans written by the participants were analyzed. The analysis employed data mining techniques. Focus group discussions (FGDs) among groups were recorded and analyzed using qualitative content analysis to answer the research question, which is how to reduce beach waste. The Role of the Younger Generation in Efforts to Understand and Analyze Beach Waste Issues in Indonesia.

3. Results and Discussion

3.1 Workshop implementation

The workshop took place over one day on Ainoshima Island, a small island located about a 20-minute ferry ride from Shingu Port on the outskirts of Fukuoka City3. The island is famous as a “cat paradise” with a population of approximately 150-200 free-roaming cats, making it one of the six places where cats are more attractive than other tourist attractions.

The first session of the workshop begins with presentations from two resource persons who give a comprehensive overview of the condition of Ainoshima. They may discuss the history of the island, its ecosystem, and the environmental challenges it faces, including the problem of beach litter. In the second session, participants conducted field observations along the coastline of Ainoshima. They observe the type and amount of litter present, while discussing and listening to further explanations from the resource persons. This activity provided a first-hand understanding of the impact of litter on the coastal environment and marine life. The third session was an interactive discussion where participants exchanged ideas on effective ways to reduce beach litter. They also develop concrete action plans to address the issue. These discussions may include waste management strategies, community education programs and beach clean-up initiatives. This workshop not only provides insight into the waste problem on Ainoshima, but also encourages active participation in finding solutions. By combining theory, field observation, and action planning, the workshop aims to empower participants in their efforts to preserve this unique island environment (Figure 3).

Fig. 3. Shows photos of the workshop activities of the participants

Figure 4 is a drawing written by each group about efforts to reduce marine debris. In this activity, each group of 4 members was tasked with thinking of solutions to reduce marine litter. Each group member was asked to draw their ideas on paper and then present them to the whole group. This visual brainstorming process resulted in a wide variety of drawings illustrating different approaches to tackling the marine debris problem. The drawings covered various aspects, from waste collection methods, waste management systems, to public education campaigns.

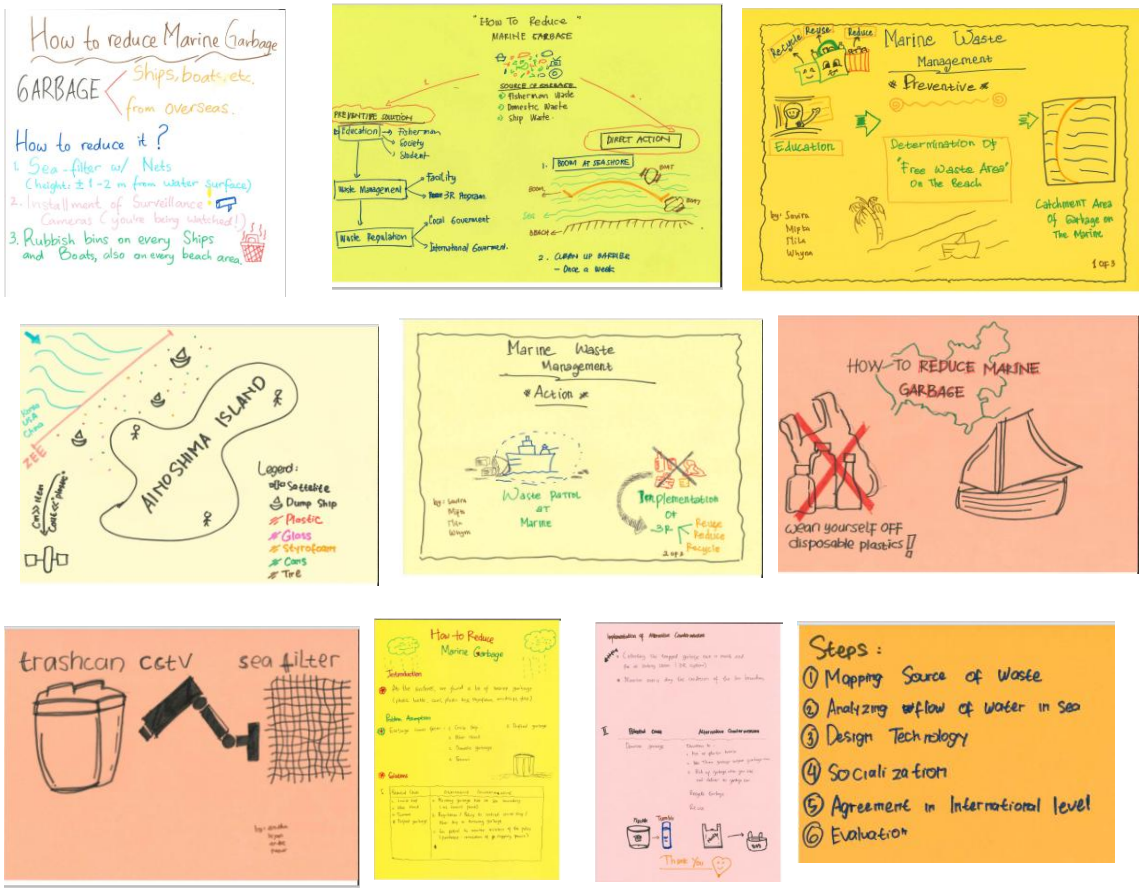

Fig. 4. Illustrates the results of the workshop participants' discussion on the sources of marine debris

After all presentations were completed, the group held a discussion to summarize the main points of the ideas that had been presented. From the discussion, three important points were successfully formulated. Point 1 is Waste Segregation, all waste should be segregated according to its type to facilitate recycling and further processing. The pictures show various methods of waste sorting, including the use of different colored bins for different types of waste. Point two is regulation, creating and enforcing rules that prohibit dumping waste into the ocean. Some of the images illustrate beach littering ban boards and patrol boats monitoring illegal dumping activities at sea.

While point 3 is Community Education, where we must implement environmental education programs to increase public awareness about the impact of marine debris and the importance of keeping the environment clean. The pictures show school counseling activities, social media campaigns, and beach clean-up events with the community. In addition to the three points above, the 3R concept (Reduce, Reuse, Recycle) was also a central theme in many of the images presented. The pictures illustrated various ways to reduce the use of single-use plastics, reuse items that are still usable, and recycle waste into new useful products. This activity demonstrated that through collaboration and creativity, a group of individuals can come up with innovative ideas to address complex environmental issues such as marine debris. A visual approach in the form of drawings proved effective in facilitating the communication of ideas and creating a shared understanding of possible solutions.

Tabel 2. Alternative countermeasure from potential cause

Potential cause	Alternative countermeasure
Cruise ship	Floating garbage net at sea boundary (at several points)
Other Island	Regulation/policy to restrict cruise ship/ other ship in throwing garbage
Domestic garbage	Sea patrol to monitor violation of the policy
	Education for citizen for not use plastic bottle and throw to sea
	Recycle garbage
	Reuse eco bag
Tsunami	3R
Drifted garbage	Collecting the trapped garbage once a mont and put at sorting center
	Monitoring every day the condition of the sea boundary

Marine debris comes from a variety of sources and requires a variety of responses. Cruise ships are one of the main contributors, so the installation of floating trash nets at the sea border at several strategic points can be an effective solution. In addition, there is a need for regulations and policies that restrict the dumping of garbage by cruise ships and other vessels. Domestic garbage is also a serious problem. To address this, marine patrols are needed to monitor violations of the garbage disposal policy. Educating the public about the dangers of using plastic bottles and dumping garbage into the ocean is also important. Encouraging waste recycling and reusing reusable bags can reduce the amount of trash that ends up in the ocean.

Natural disasters such as tsunamis can bring large amounts of trash into the ocean. Consistent application of the 3Rs (Reduce, Reuse, Recycle) principle can help reduce the volume of waste that could potentially be washed out to sea during a disaster. To deal with drifting garbage, it is necessary to collect garbage trapped at the sea borders regularly, for example once a month, and bring it to a sorting center. Daily monitoring of the condition of the sea borders is also important to detect any accumulation of debris early. By implementing these measures in an integrated manner, it is hoped that the problem of marine debris can be addressed more effectively, protecting marine ecosystems and maintaining the sustainability of the aquatic environment. From the feedback gathered from the workshop participants, they indicated that the litter on the beach comes from fishing boats that discard fishing gear, as well as food packaging waste and plastic drinking bottles.

Table 3. Results of the workshop participants' group discussion on marine litter issues

Group A	Group B	Group C
Design technology for cathcing marine litter	Waste patrol at marine litter in the sea	Patrol boats with a CCTV system to monitor ships that dispose of waste
Group D	Group E	Group F
Satellites that can monitor floating debris and observe	Catchment area of garbage on the marine	The creation of boats that can filter waste from the surface of the sea

During the workshop, the six participating groups were asked to discuss the issue of marine litter and propose solutions. Group A came up with the idea of designing advanced technology equipped with sophisticated sensors to catch marine litter. Group B suggested patrolling the sea to catch those illegally disposing of trash from ships. Similarly, Group C proposed using patrol boats fitted with CCTV cameras to monitor and prevent illegal dumping. Group D advocated for satellite technology capable of detecting floating debris and analyzing its flow from origin to endpoint. Group E suggested implementing barriers or fences around catchment areas to contain marine garbage. Finally, Group F combined various ideas to propose patrol ships that could filter trash from the sea surface. These innovative solutions emerged from the workshop discussions.

Table 4. Technology used to solve marine litter problems

Group A	Mapping source of waste sea, and make some report for every cityzen Analyzing flow of water in sea Socialization about marine litter Agreement in International level Evaluation and FGD with citizen
Group B	Collecting the trapped garbage once a month and put at sorting center Monitor every day the condition of the sea boundary
Group C	Monitoring for temporary time
Group D	Implementation reuse, reduce and recycle Imformation rural of marine litter
Group E	Use sattelite for monitor dump ship Free waste area on the beach
Group F	Sea filter with big nets di permukaan laut untuk sampah mengapung Installment of surveillance cameras Rubbish bins on every ships and boats, also on every beach area

After the workshop discussions, each group further developed their ideas into structured proposals for new technologies to address the marine litter problem. The proposed technologies included: Group A focused on mapping the sources of waste in the sea and reporting by every citizen. The collected data would be analyzed to understand flow patterns, followed by widespread socialization. This group also suggested international collaboration and concluded with evaluations and focus group discussions by citizens. Group B proposed a technology for collecting waste in bags monthly, which would then be sorted at a central facility. They also aimed to develop daily monitoring technology to identify the boundaries of sea waste.

Group C suggested a technology to determine the temporary settling times for floating waste, aiding in more targeted cleanup efforts. Group D proposed a three-pronged approach focusing on reuse, reduce, and recycle, along with digitizing information related to rural marine litter. Group E continued to explore satellite monitoring to track dumping ships, with the goal of keeping beaches clean from trash. Group F created a concept for a sea filter using large nets to sieve floating trash from the ocean surface and proposed installing surveillance cameras to monitor the areas. These innovative technological solutions reflect each group's commitment to solving the issue of marine litter effectively.

3.2 Results of the questionnaire

In the Structure section of Table 5, 10 questions were asked to the participants after the workshop, It shows the percentage of answers for various levels of agreement, namely very agree, agree, maybe, not agree very not agree. From the responses, it was found that most of the statements showed a high level of agreement (very agree or agree) among the respondents. Statements 4-8 showed 100% strong agreement (SS), indicating unanimous support for these ideas. Statement 2 on sources of marine debris showed the most mixed responses, with some disagreement. Statements 9 and 10 on regulations and education showed strong but not unanimous support. Meanwhile, the main finding of this workshop was that there was a strong consensus that marine debris is harmful and damaging to marine ecosystems. From this statement, all respondents agreed on the need to protect and safeguard the ocean, as well as take responsibility for, and also participate in, reducing marine debris. In addition, strong support for marine legal regulations and environmental education related to marine and marine debris are important. In statement 2, the source of marine debris was the only topic with significant disagreement, indicating uncertainty or differing views on the marine debris issue. But in the final results, the survey showed that there was a high level of awareness and concern for marine debris among the respondents, with strong support for action to address the problem

Tabel 5. Results of the questionnaire after workshop

No	Question	SS	S	Maybe	TT	TS	STS
1	I believe that marine litter is very dangerous	70%	30%	0	0	0	0
2	Marine litter comes from people throwing waste into the sea	57%	13%	5%	8%	0	17%
3	Marine litter can harm the ecosystem of marine creatures	95%	5%	0	0	0	0
4	Plastic waste can be consumed by marine organisms	100%	0	0	0	0	0
5	We must protect the sea from litter	100%	0	0	0	0	0
6	Everyone is responsible for the cleanliness of the sea	100%	0	0	0	0	0
7	I want to participate in activities that can reduce marine litter	100%	0	0	0	0	0
8	I encourage others not to throw waste into the sea	100%	0	0	0	0	0
9	I think there should be legal regulations governing marine debris.	80%	20%	0	0	0	0
10	I think there is a need for environmental education about marine debris for the community.	75%	25%	0	0	0	0

3.3 Action plan

In 2019, the No. 2 country that generated the most coastal debris was Indonesia (Lapietra et al., 2022). However, Indonesia has implemented the National Action Plan for Marine Debris Management (RAN PSL) by 2025 (Ministry of Environment and Forestry, 2023) Indonesia has a goal to reduce marine plastic debris by 70%. Its work program includes: Increase stakeholders' environmental awareness, Improve land and coastal/sea waste management. Strengthen funding, institutions, supervision, and law enforcement to manage waste, and support research and development to solve the problem.

Plastic waste enters Indonesia's oceans every year, estimated at 600,000 tons (Lotulung, 2023). Major rivers in Indonesia such as the Brantas River, Ciliwung River, Citarum River, and Progo River are among the 20 most polluted rivers worldwide (Lotulung, 2023). This workshop serves as a model to address the problem of coastal debris in Indonesia. Some of

the action plans to be implemented in Indonesia, as written by the group of workshop participants in Table 6.

Table 6. Action plan

No	Action plan
1	Environmental education regarding waste for communities living by the beach, as there is a possibility that a significant amount of plastic waste is disposed of by these communities into rivers and flows into the sea.
2	Outreach programs for communities about waste and its effects on the ocean.
3	Imposing penalties for those who dispose of plastic waste into the sea.
4	Establishing strict regulations for communities and fishermen who throw plastic or organic waste into the sea.
5	Campaign activities to discourage littering in the sea aimed at traders and the general public.
6	Providing trash bins along the beach, with a waste disposal fee for each visitor.

3.4 Analysis of results

Based on the narrative provided, here is the analysis of the workshop results concerning the issue of marine waste on Ainoshima Island. The workshop took place over one day and was divided into three main sessions: the Presentation of Ainoshima's Condition, where two speakers explained the state of Ainoshima; Field Observation, where participants observed waste along the Ainoshima coastline while discussing and listening to the speakers' explanations; and finally, Discussion and Action Planning, where participants engaged in discussions to find solutions for reducing beach waste and developing an action plan. From the problem identification results, workshop participants identified several primary sources of beach waste on Ainoshima, including marine waste from cruise ships, debris from nearby islands, domestic waste, tsunami debris, and waste carried by currents.

Proposed solutions to address this marine waste issue include several suggestions from workshop participants, such as installing waste-collecting nets at the sea boundaries, regulations to limit waste disposal from vessels, sea patrols to monitor violations, and community education regarding plastic usage and waste disposal. Implementing the 3R principles (Reduce, Reuse, Recycle) (Critchell et al., 2019), routinely collecting trapped waste, and daily monitoring of sea boundary conditions can be proposed solutions to this problem. In terms of technological innovations, workshop participants also proposed several technological innovations to address marine waste issues, such as designing technologies to capture marine waste, including patrol boats equipped with CCTV systems, satellites to monitor floating debris, and ships designed to filter waste from the water's surface.

Meanwhile, the action plan for marine waste in Indonesia, considering that Indonesia is the second-largest country in the world in terms of beach waste, includes specific plans formulated by participants to be implemented in Indonesia (Kusumawati et al., 2020). These plans include environmental education for coastal communities, outreach about the impact of waste on the ocean, the imposition of sanctions for those who litter the sea, the establishment of strict regulations regarding waste disposal into the sea, anti-littering campaigns, and the provision of trash bins along the beach with a fee system (Râpă et al., 2024).

In these cases, communities are the populations that bear the brunt of the impacts of plastic waste, yet their voices are often overlooked in discussions on the issue. The injustice caused by plastic waste and pollution, especially how it disproportionately affects vulnerable groups at every stage of the plastic life cycle. Therefore, there is a need for laws and policies that regulate this issue. Such legislation is aimed at various stakeholders, both governmental and non-governmental, to address these injustices (Calil et al., 2021).

This workshop serves as a potential model for addressing beach waste issues in Indonesia, utilizing a comprehensive approach that encompasses education, regulation, and

technological innovation. It appears that educational efforts are needed to address the problem of coastal debris, education has been recognized as a potential tool to raise awareness and address the problem of marine debris. An integrative, student-centered educational intervention has been designed and implemented with promising results (Bettencourt et al., 2023).

Communities participated in beach cleanup activities to apply learning directly (Permana, 2022). This educational intervention was shown to be effective in improving community literacy on marine debris and can be adapted for other areas of education (Ahmad-Kamil et al., 2022). Environmental education is needed by the community because education can bring us closer to the environment (Mejía Cáceres et al., 2024). To be able to form an environmentally conscious society, it is necessary to reorganize the environmental education system that can form a society that can live in an era of ecological damage (Perkins, 2024). Several studies have examined the role of environmental education and community action in addressing marine debris, pollution, and encouraging pro-environmental behavior. The following Table 7 summarizes key findings from studies on this topic.

Table 7. Summary of key studies on environmental education and community action

Authors	Key findings
Ballard et al. (2017)	Some youth did not perceive the broader societal or ecological impact of their work, pointing to the importance of linking their scientific activities with real-world outcomesls or explanations.
Sinha et al. (2024)	Analyzed stakeholders' roles, including marginalized groups, in environmental projects using tools like mobile apps, drones, and campaigns.
Landon-Lane (2018)	Voluntary CSR measures such as the PSC can aid in reducing plastic pollution, but government regulation and NGO partnerships are essential for long-term success.
Kelly et al. (2022)	There is a lack of effective engagement strategies that help youth cope with climate anxiety, overcome nature disconnectedness, and develop critical thinking skills. strategies to empower young people: Active, dialogue-based science learning; Connection to nature; and Critical thinking skills.
Hartley et al. (2021)	Intergenerational learning can be a powerful tool to accelerate community-level action to address marine debris.
Chen & Ganapin (2016)	Emphasizes the need to connect community-based actions with regional governance to address issues like coastal degradation, pollution, and unsustainable fisheries at a larger scale.
Bettencourt et al. (2023)	After the intervention, students showed increased intentions to adopt pro-environmental behaviors, such as reducing plastic use and properly disposing of waste. The beach clean-up activity helped reinforce these intentions by providing a real-world context for the issue.
Wosnick et al. (2024)	Qualitative assessments of current waste management practices and explored the impacts of increasing urbanization and tourism on waste production.

4. Conclusions

Marine environmental education for the younger generation is a crucial component of global aquatic ecosystem conservation efforts. The urgency to instill awareness and a deep understanding of marine environmental issues in the next generation cannot be overlooked, given their vital role as future agents of change. The main focus of this educational process is to provide a comprehensive understanding of the complexity of marine ecosystems and the various threats they face, with a particular emphasis on the significant impacts that accumulated trash has on marine life.

Recent studies have shown that early exposure to marine environmental knowledge can substantially increase ecological awareness and encourage pro-environmental behavior among young people. Through an integrated pedagogical approach that combines theoretical learning with practical experience, young people can gain a holistic understanding of the interconnectivity of marine ecosystems and the urgency of conserving them.

Furthermore, research underscores the importance of encouraging active participation of young people in marine conservation initiatives. Direct involvement in activities such as beach cleanups, water quality monitoring or public education campaigns not only deepens their understanding, but also fosters a sense of ownership of the marine environment.

Increasing knowledge about marine ecosystems and their functions, as well as providing hands-on experience, enables young people to develop innovative and sustainable solutions to ocean problems. With the strong knowledge and fresh perspectives they bring, young people have the potential to accelerate progress in global ocean conservation.

In addition, their involvement in these activities can foster a sense of responsibility to protect the ocean, develop skills to address marine environmental issues, and ensure that future generations can enjoy marine resources. By understanding and learning about the challenges facing the marine environment, young people have the potential to become effective agents of change in preserving marine ecosystems and reducing the negative impacts of marine debris.

This study also highlights the important role of the younger generation, particularly students, in understanding and analyzing the issues of plastic waste present on beaches, especially concerning the plastic waste in the coastal environment of Indonesia. During this workshop, it was found that participants were aware of the importance of addressing the issue of beach waste, faced by both Japan and Indonesia, and were willing to actively engage in efforts to tackle this problem. The activity-based workshop approach proved to be highly effective in encouraging participants to critically examine the causes of plastic waste on beaches, propose solutions, and develop an action plan for their involvement. This workshop underscores the valuable contributions that participants can make in shaping an action plan for the future sustainability of the ocean and beaches in Indonesia.

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Author Contribution
All authors contributed equally to this research. They participated in conceptualization, data collection, analysis, and manuscript writing. Each author played a significant role in ensuring the accuracy and validity of the study's findings.

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