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Coastal Clean-Up Campaign: A Community Response to Marine Litter in Pariaman City, Indonesia

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Abstract

The coastal waste problem in Pariaman City, driven by rising plastic volumes, limited infrastructure, and disposal behaviors, threatens ecosystems and the tourism sector and requires coordinated intervention. This community service aims to implement an integrated cleanup with waste sorting and initial processing, while strengthening community capacity and environmental awareness. The "Coastal Clean-Up Campaign" applied a community-based participatory approach through coordinated clean-ups, source-level sorting, and initial composting. A total of 150 participants, including lecturers, students, village officials, and tourism stakeholders, were involved across 200-meter zones, supported by student-led scientific monitoring, before–after documentation, and the handover of bins and sorted waste to village authorities. The results indicate that the program was implemented effectively, with active stakeholder participation, visible environmental improvements, and the collection of 250 kg of sorted plastic and paper, some of which demonstrated economic value. This study presents a practical and replicable participatory model that integrates mass clean-up activities with source control, local governance support, and tourism stakeholder engagement. The findings highlight the importance of strengthening technical capacity, institutional support, periodic monitoring, and circular economy pathways to ensure sustainability. The program also increased environmental awareness and fostered local waste management groups, with outcomes that can support policy development and replication in other coastal tourism areas.

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INTRODUCTION

The solid waste problem in Indonesia has become an urgent environmental and public-health challenge. National data show that municipal waste reached approximately 35.9 million tons in 2022, with plastics representing about 18% of that total (~6.5 million tons) (Farahdiba et al., 2023). Other assessments estimate that Indonesia generates some 7.8 million tons of plastic waste annually and that between roughly 4.9 and 11.3 million tons of plastic are mismanaged each year, pointing to

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substantial leakage risks to coastal and marine environments (Frigo et al., 2025). Population growth, urbanization, and single-use consumption patterns have driven increases in waste volumes that have not been matched by management capacity (Sembiring et al., 2024). Many regions still rely on final disposal sites that are not managed hygienically, resulting in contamination of soil, water, and air. Plastic waste accounts for a large share of coastal and marine pollution due to low recycling rates and weak collection infrastructure (García et al., 2023). Negative impacts include ecosystem degradation, economic disruption in tourism and maritime sectors, and increased public-health risks (Gunarathne et al., 2024). Addressing this crisis requires coordinated action by government, educational institutions, the private sector, and communities that explicitly advances the Sustainable Development Goals, particularly SDG 14 (Life Below Water). In practical terms, community training and participatory monitoring develop local competencies for source-separation, on-site sorting, and data collection that reduce land-based inputs to the marine environment and directly support SDG 14 (Walker, 2021). Likewise, community-run waste banks, coordinated volunteer collection schedules, and evidence generated by student-led monitoring inform municipal planning and enforcement, improving urban waste services and resilience in line with SDG 11 (Sustainable Cities and Communities) (Pallegedara et al., 2024). Whereas, outreach and circular-economy pilots (composting, reuse, and market linkages for recovered plastics) lower material throughput and increase recycling rates, contributing to SDG 12 (Responsible Consumption and Production) (Nazibudin et al., 2025) through improved collection, recycling, source reduction, and hygienic final disposal.

Along the coastal zone of Pariaman City, West Sumatra, waste problems manifest as accumulations along shorelines, estuaries, and tourist areas. Tourism, fisheries, port activities, and household sources contribute to increased runoff of waste to the coast (Yuwono et al., 2025). Limited collection facilities, inadequate transport frequency, and irregular disposal practices exacerbate the situation (Voronkova et al., 2025). Marine currents and wind transport debris from other areas, further increasing the burden on local beaches. As a result, coastal aesthetics decline, biotic habitats are disturbed, and the economic potential and livelihoods of coastal communities are adversely affected. Based on the community team initial survey as prior study, situational analysis indicates the need for upstream prevention measures, infrastructure improvements, and strengthened local waste-management capacity.

In Pariaman City, responses to marine litter have focused on practical and participatory interventions. First, mass beach-cleaning activities and volunteer programs have a direct impact on reducing visible debris (Haarr et al., 2020; Lind & Lundberg, 2024). Second, strengthening local initiatives—such as waste banks, household composting, and recycling activities—enhances citizen engagement while increasing the economic value of waste (Yandri et al., 2023). Third, support from local government policies and educational campaigns contributes to behavioral change regarding single-use plastics and improves waste collection services (Knoblauch & Mederake, 2021). In this context, the Coastal Clean-Up Campaign in Pariaman City integrates periodic shoreline clean-ups with preventive measures to reduce new debris. Events such as World Clean Up Day have attracted thousands of participants (https://www.pariamankota.go.id/), a 2024 LKKPN–Poltek KP cleanup collected about 1,539 kg of litter (https://visual.republika.co.id/), and the October 2024 "Gerakan 1491" mobilized 1,491 workers over three days to sweep multiple beaches (https://padek.jawapos.com/). Local estimates indicate that key beaches generate approximately 170.5 kg of waste per day, with plastics constituting a major component. These findings suggest that the campaign is effective in removing visible debris and supplying recyclable materials to local waste management initiatives. However, achieving sustained reductions requires continuous cross-sector coordination, the establishment of permanent post-collection infrastructure, and supportive policy frameworks (Schmaltz et al., 2020; Brouwer et al., 2023). Accordingly, the Coastal Clean-Up Campaign merits development as a mitigation strategy integrated with broader prevention and waste-management efforts.

Studies of beach-cleaning initiatives across Indonesia, such as at Kertosari Beach, Banyuwangi (Nisak et al., 2023), Ketam Beach, Pongkar Village (Dewi et al., 2022), Biluhu Timur Village, Gorontalo Regency (Husain & Saleh, 2022), Kuta Beach, Bali Province (Husnayaen et al., 2024), Lungkak Beach, Ketapang Raya Village, Keruak District, East Lombok (Suryadi et al., 2025), typically report immediate litter removal and short-term increases in public awareness. Whereas, these previous

studies are still lack of systematic post-event monitoring, longitudinal measures of behavior change, rigorous economic appraisal of reuse/recycling practices, and integration with local governance or waste-management infrastructure. For Pariaman, these gaps indicate a need for standardized post-cleanup monitoring, longer-term evaluations of behavioral and economic outcomes, and assessment of institutional arrangements to establish whether clean-up campaigns produce sustained reductions in marine litter.

Previous studies in Indonesia have examined the effectiveness of beach-cleaning actions and community-based waste-management programs. These studies generally report reductions in shoreline litter following clean-up events, but effects are often temporary in the absence of sustained follow-up mechanisms (Suhardono et al., 2024), which identify short-lived gains but do not test institutional models for maintaining outcomes over time. Research on waste-bank and composting initiatives indicates economic potential and behavioral change when accompanied by adequate training and incentives (Afnan et al., 2025), which show promise for economic incentives yet lack longitudinal evidence on whether training and incentives lead to durable market linkages and behavior change. Evaluations of plastic-reduction policies emphasize the need for enforcement and economically viable alternatives for businesses (Paneru et al., 2024), that highlight enforcement gaps but do not empirically assess the socio-economic feasibility of alternatives for small tourism enterprises. Several studies also highlight the role of environmental education in shaping long-term habits. To our knowledge, few national or international studies have integrated environmental education, student-led scientific monitoring, local-government facilitation, and economic incentive mechanisms into a single, replicable model tested in tourism-oriented coastal settings.

Despite growing literature on beach clean-ups and community waste programs, important gaps remain: a lack of localized, quantitative and longitudinal evidence in tourism-dependent coastal settings, limited integration of monitoring with institutionalization pathways, and scarce testing of economic-recovery mechanisms alongside education and student-led science. This study addresses these gaps by proposing and testing a Community-Based Participatory model, which is implemented in Pariaman City, that integrates volunteer clean-ups, source-level sorting, student-led scientific monitoring, local-government facilitation, and targeted recovery of plastic fractions. Using a mixed-methods protocol that combines systematic waste mass-and-composition measurements with pre/post surveys, stakeholder interviews, and small-scale economic-recovery trials, the research evaluates both immediate removal outcomes and the processes needed to sustain diversion. The study's contributions are threefold: it delivers rigorous empirical estimates of intervention impacts, demonstrates practical pathways for institutionalization by municipal actors, and tests scalable circular-economy linkages for tourism-oriented coastal municipalities. By providing clear metrics and actionable recommendations, the work aims to inform local policy and offer a replicable model for coastal communities seeking to move beyond episodic clean-ups toward sustained waste-management solutions

The general objective of this community service is to improve coastal cleanliness and environmental quality and to reduce waste accumulation in Pariaman City, through a Community-Based Participatory model that integrates community action, student-led scientific monitoring, local-government facilitation, and tourism-stakeholder engagement. Operational objectives are: (1) to implement an integrated clean-up intervention combining mass collection, source-level sorting, initial processing (including composting), and targeted recovery of selected plastic fractions; and (2) to strengthen community capacity and environmental awareness via participatory training, outreach, and education. Measurement indicators and methods are specified to render these objectives operational: (a) waste removal; total mass removed (kg); (b) diversion and recovery materials redirected to recycling, composting, or waste-bank channels; (c) community engagement; number of participants, demographic profile, tracked via attendance registers; (d) behavioral and awareness change and documentation.

METHOD

The community service activity employed a Community-Based Participatory approach (Ison et al., 2024). The Community-Based Participatory Research (CBPR) approach was chosen because marine litter is a socio-ecological problem linked to local behaviors, livelihoods, and traditional

knowledge. CBPR involves local stakeholders in designing, implementing, and evaluating interventions, making actions such as mass clean-ups, source sorting, and composting more appropriate and sustainable. This approach is particularly relevant to Pariaman City because it engages fishers, tourism actors, and coastal communities, builds local capacity, fosters ownership, and supports citizen-science monitoring. Community-Based Participatory methods combine active community participation with an action–reflection cycle, integrating practical solutions (mass clean-ups, source-level sorting, composting) with scientific data collection for evaluation and continuous improvement. Participants comprised the Poltek Pelayaran Sumbar community service team (lecturers and students), village officials, and coastal community members including tourism stakeholders with total number 150 participants. The distribution of participants can be seen in the Table 1.

Table 1. Participants Distribution

No.	Participant Group	Selection Criteria	n	% of total
1	Lecturers of Poltek Pelayaran Sumbar	Member of community service team; directly involved in project design/oversight	10	6.7%
2	Students of Poltek Pelayaran Sumbar	Enrolled students assigned to community service activities and data collection	50	33.3%
3	Village officials	Elected or appointed village staff from host villages in Pariaman; involved in coordination/permits	10	6.7%
4	Fishers (coastal community)	Active fishers or fishery workers who operate in local coastal waters	30	20%
5	Coastal residents	Residents living in coastal zones whose livelihoods or daily life interact with the shore	30	20%
6	Tourism stakeholders	Local actors dependent on coastal tourism or beach-related services	20	13.3%
TOTAL			**150**	**100%**

The lecturing team designed and led the intervention (agenda planning, outreach, and monitoring). Students participated in the beach clean-up, some of them are the Person in Charge (PIC) for documenting the process through photography and video. Village officials acted as the official liaison between the service team and the community, providing permission, administrative support, mobilizing local resources, and coordinating resident participation (announcements, clean-up schedules, and selection of focus locations). Community participants, including tourism stakeholders, actively engaged in field actions (collective clean-up, source-level waste sorting, collection, and transport). Participant activities were coordinated through a structured field management system led by the community service team from Poltek Pelayaran Sumbar. Before the field activities, participants received a short briefing on task procedures, safety guidelines, and waste-sorting methods, after which they were organized into small working groups supervised by assigned facilitators (lecturers, students, and village officials). This coordination mechanism ensured that collective clean-up, source-level waste sorting, collection, and transport were conducted systematically and safely in the coastal areas of Pariaman City. The flowchart of community service program is presented in Figure 1.

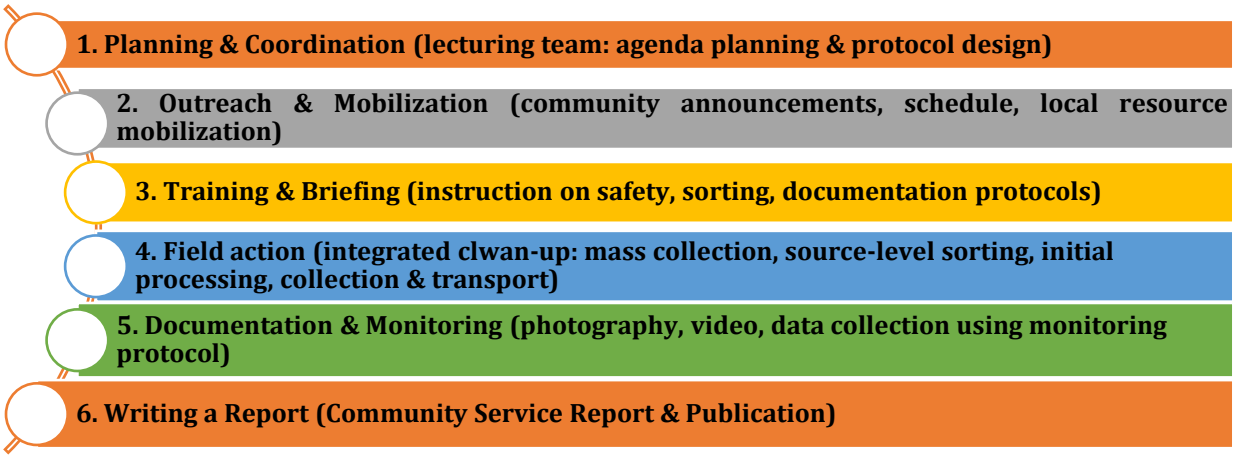

Figure 1. Flowchart of Community Service Program

Figure 1 explains that the first stage of this Community Service activity was Planning & Coordination, involves the lecturing team and stakeholders developing the event agenda, defining objectives, and designing standardized monitoring and safety protocols to ensure coherent implementation. Then, the Outreach & Mobilization stage activates local networks through targeted announcements, scheduling, and the mobilization of community resources and volunteers to secure broad participation. During Training & Briefing, participants receive concise instruction on safety procedures, waste-sorting categories, and documentation methods so that field activities are conducted safely and data are collected consistently. The Field Action stage executes the integrated clean-up, mass collection, source-level sorting, initial on-site processing, and organized collection and transport, linking volunteer effort to material flows. Documentation & Monitoring requires systematic photography, video, and quantitative data collection following the predesigned monitoring protocol to enable objective assessment of intervention outcomes. Finally, writing a Report synthesizes the operational data, qualitative observations, and lessons learned into a community-service report and dissemination outputs that support accountability, knowledge transfer, and potential publication.

RESULTS AND DISCUSSION

The Coastal Clean-Up Campaign community service activity in Pariaman City was implemented on 1 August 2025, beginning at 8am and continuing until completion. The event commenced with an opening and agenda briefing by the service team, followed by remarks from village officials or a local government representative, the field clean-up action, and a formal closing. The opening ceremony, in which the Head of the Community Service Team delivered the agenda briefing that formally initiated the Coastal Clean-Up Campaign, is shown in Figure 2.

Figure 2. Opening of the activity by the Head of the Community Service Team

The head of the service team officially opened the event and welcomed all participants. In the opening remarks, the head explained the activity flow, which included a briefing, allocation of work areas, collection and sorting activities, and a short reflective session. The opening concluded with an appeal for active participation and attention to safety during operations. Figure 3 illustrates the sorting bins handed over by the service team to community and local officials; each bin contains designated compartments for organic waste, paper, and plastic, in accordance with the agreed technical protocol.

Figure 3. Sorting bins for coastal waste

Following the opening, large black plastic bags were distributed to the service team, students, and community participants. Participants were instructed to collect waste within the predetermined area extending 200-metres to the left and 200-metres to the right of the assembly point. Each group was tasked with systematically covering the assigned section to avoid omissions. The logistics team and field supervisors monitored collection activities and assisted participants requiring additional tools. Field operations were organized into 15 working groups (≈10 participants per group), each overseen by one field supervisor; a total of 15 supervisors (6 lecturers, 6 senior students, and 3 village officials), with an eight-person logistics team supplying tools, PPE, collection bins, and transport from Poltek Pelayaran Sumbar. Monitoring combined standardized group checklists and waste-tally sheets, spot-checks and photographic documentation by supervisors, real-time coordination via WhatsApp and walkie-talkies, and a daily debrief to reconcile collection totals and resolve operational issues in the field in Pariaman City. Collection began on the coordinator's signal and proceeded under safety supervision. All collection results were recorded by the data team for subsequent weighing and analysis. Photographic documentation of the coastal clean-up activities conducted by students and by the community service team is presented in Figures 4 and 5, respectively.

Figure 4. Coastal clean-up activity by students

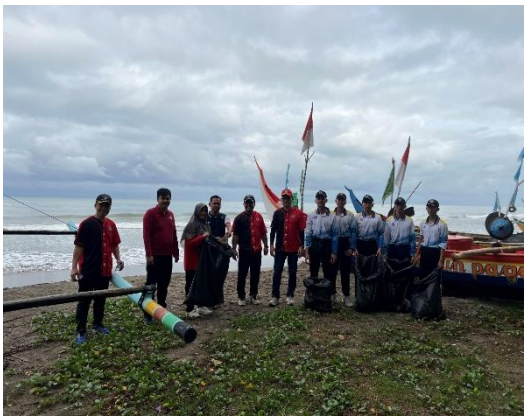

Figure 5. Coastal clean-up activity by the community service team

The assembly point was selected at a central tourism area frequently visited by tourists and characterized by high footfall. This site also hosts a morning or pop-up market that operates briefly each morning (approximately 1–3 hours), creating potential for waste entering the coastal zone. Its strategic location and high activity level made it ideal for outreach and behavior-change education. Activities at the assembly point provided direct interaction with tourism actors and vendors identified as local waste sources. In addition to collection, the team conducted brief educational engagement with vendors and visitors to raise awareness. Focusing on this point was expected to produce a multiplier effect on waste-management practices along the coastline. The assembly point chosen for the campaign, a centrally located tourism area with high pedestrian traffic and an adjacent morning pop-up market used for outreach and behavior-change engagement, is shown in Figure 6.

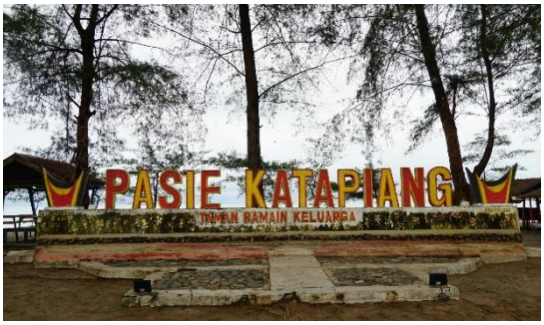

Figure 6. Assembly point for the community service activity

After approximately two hours of collective work, participants returned to the assembly point to consolidate and hand over the collected waste. Sorted waste was transferred to the local apparatus for processing under the guidance of the service team. Organic waste was directed to a pilot composter installed on site for compost production. Plastic waste was further sorted for sale as recyclable material, providing economic value for the local community. All subsequent handling processes were supervised by village official authorities to ensure safety and compliance with local regulations. Figures 7 and 8 depict the site appearance immediately before and after the clean-up activity, respectively, thereby illustrating the campaign's observable, short-term effect on litter reduction and site condition.

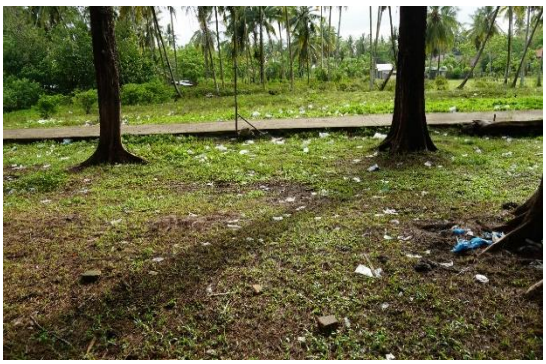

Figure 7. Site appearance before the activity

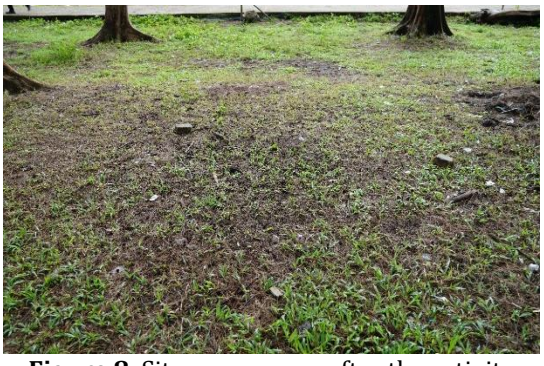

Figure 8. Site appearance after the activity

The event concluded with an informal session in which participants shared refreshments as appreciation for their involvement. During this period, brief exchanges took place among participants, village officials, and the service team concerning field experiences. A group photograph of all participants and stakeholders was taken as part of documentation and community building. The formal closing, delivered by the coordinator, included expressions of gratitude, a summary of the day's achievements, and instructions for follow-up. Organizers distributed contact information for ongoing communication and reminded participants of the composter monitoring schedule and subsequent activities. The event closed with the expectation that coastal clean-up actions would continue through active community involvement and support from local authorities. Figure 9 presents a group photograph of the community service team together with all participants and stakeholders, taken during the closing session as part of event documentation and community-building.

Figure 9. Documentation of the community service team and all participants

The activities carried out on August 1st 2025 proceeded according to the planned schedule, commencing at 8am and continuing until completion, and comprised an opening session, the clean-up operation, and a closing. The opening by the Head of the Community Service Team provided a clear framework so that all participants understood the sequence of activities and the safety standards applied. Remarks delivered by a representative of the village officials reinforced the legitimacy of the event and facilitated the involvement of local officials (Collier, 2020; Kenny et al., 2023). The systematic event structure facilitated inter-group coordination, enabling orderly field operations. The availability of before-and-after photographic documentation demonstrates visual change at the site as evidence of initial achievement (Pinardo-Barco et al., 2023). Overall, the initial implementation created an administratively and socially conducive foundation for collective action in the field.

The ceremonial handover of two sorting bins by the community service team constituted an important moment for instilling a shared commitment to source-level sorting. Although the number of bins was symbolic, the technical explanation of the function of each receptacle (organic, paper, plastic) helped participants and village officials understand the expected sorting practices (Macklin et al., 2023). This symbolic act also functioned as a public communication tool that reinforced the program's message to vendors and visitors at the site (Tan et al., 2023; Linder et al., 2023). Initial responses from the community and tourism actors to the handover were positive, reflected in eager uptake of responsibility for the facilities. However, this experience also highlighted the need for follow-up actions in the form of maintenance and ongoing education so that the bins do not become merely decorative items (Rosenthal & Linder, 2021; Soon, 2024). Thus, the bin handover is an effective preliminary strategy when accompanied by a maintenance and monitoring agenda.

The distribution of large black plastic bags to all participants demonstrated adequate logistical preparedness and attention to operational needs in the field. An organized distribution process ensured that each group received sufficient equipment to cover their designated collection area. The assignment of a 200-metre working area to the left and right of the assembly point provided clear operational boundaries, allowing the scope of the clean-up to be calculated and monitored (Andriolo

et al., 2024; Trujillo et al., 2024). Segment-based allocation also facilitated data teams in recording group-level results and analyzing the spatial distribution of waste. The presence of a logistics team and field supervisors strengthened safety oversight and enabled rapid resolution of technical issues (Frantzi et al., 2021). From a management perspective, this phase demonstrated effective coordination among elements, contributing to efficient field implementation (Power, 2022; Esmail et al., 2023).

Collection commenced on the coordinator's signal and continued for two hours under a structured mass-cleaning mechanism. Each group worked systematically through its assigned sector to minimize omissions and increase operational effectiveness (Solbakken et al., 2022; Buijs et al., 2024). Supervision by the field team reduced safety risks, while recording by the data team enabled quantitative documentation for subsequent analysis (Sugiyama et al., 2022; Gacutan et al., 2024). The activity also demonstrated collaboration among students, the community service team, and local residents, indicating strong social capital (Collier, 2020; Hagedoorn et al., 2021). Throughout the process, communication between groups functioned smoothly, allowing for rapid reallocation of resources or technical assistance when required (Kotsonis, 2022; Power, 2022). Consequently, the collection phase confirmed that planning and field execution complemented each other in achieving the program's objectives.

The choice of an assembly point at a central tourism area that also hosts a morning market was a strategic decision that increased the program's potential educational impact. The location was not only easily accessible to participants but also a meeting place for small businesses and tourists who could become agents of behavioral change (Li et al., 2021). The presence of a short-duration but intensive pop-up market elevates the risk of runoff to the coast, making intervention at this point both relevant and well targeted (Zhao & Cheng, 2024). By locating activities in a high-traffic area, messages about sorting and waste reduction reached primary waste generators, vendors and visitors (Crespi-Vallbona & Noguer-Juncà, 2024). However, the temporary character of the market requires rapid and practical communication strategies so that messages can be absorbed in a short time frame (Fazal-e-Hasan et al., 2024; Wang & Yang, 2025). Therefore, the assembly point is effective as a catalyst for behavior change if it is followed by consistent follow-up actions.

Brief educational engagements conducted by the team with vendors and visitors added value to the clean-up intervention by not only removing litter but also building awareness. Direct interaction enabled the team to deliver practical, context-specific messages on sorting and single-use waste reduction (Rabiu & Jaeger-Erben, 2024). Vendor responses varied: some were enthusiastic and attempted to place waste in sorting bins, while others required further support to change business practices. Short education sessions should be regarded as an initial step that must be reinforced with training modules and periodic monitoring to achieve more permanent behavioral change (Parajuly et al., 2020; Xiao et al., 2023). The success of education efforts also depends on involvement of village officials in enforcing local agreements. Thus, the combination of field action and brief education constitutes a comprehensive approach that nevertheless requires continuity (Lane et al., 2024; Leknoi et al., 2024).

The post-action handling phase demonstrated a planned mechanism for post-event management, namely the handover of sorted waste to village officials for further processing. The volume of waste collected (plastic and paper) was 250 kg. Directing organic waste to the pilot composter and sorting plastic for sale added ecological and economic value to the collected material (Velis et al., 2022; De Boni et al., 2022). This practice creates opportunities for local economic empowerment through the utilization of plastics as recyclable commodities with market value (Pardo et al., 2024). The use of a pilot composter is a positive step toward closing the organic loop; however, scalability and long-term sustainability of composting require technical support and ongoing management. Overall, the post-action mechanism illustrates an attempt to integrate environmental and economic aspects but also calls for strengthening environmentally sound practices (Lu et al., 2022).

Activity documentation which are before-and-after photographs and data team records of collection results, constitutes an important asset for evaluation and final reporting. Visual evidence strengthens claims of site improvement, while weighing and compositional data enable more detailed quantitative analysis (Fraisl et al., 2022; Sun & Zainal, 2024). These data can be used to measure intervention effectiveness, plan resource allocation for subsequent events, and develop

program success indicators (O'Grady & Mangina, 2024). Furthermore, documentation supports dissemination of results to broader stakeholders as proof of the community service team's contribution (Limani et al., 2024; Lehtinen & Aaltonen, 2024). Compliance with recording procedures demonstrates implementation professionalism and facilitates the production of outputs such as policy briefs and datasets (Choo et al., 2020; Lush et al., 2024). Therefore, documentation is foundational to accountability and replication of the activity**.**

Activity documentation (before-and-after photographs and data-team collection records) formed the basis for evaluation and final reporting. Photographs were timestamped and geotagged to provide visual proof of site improvement, while standardized field forms recorded group-level weights, material categories, and disposal routes. Supervisors cross-checked photographic evidence against daily weigh-in sheets and transfer receipts, and all records were uploaded to a central database during daily debriefs to ensure completeness. Measured indicators included total mass removed (kg); diversion and recovery (mass and counts of materials sent to recycling, composting, or waste-bank channels); and ambient litter density (items per m^2) obtained from standardized transects and quadrats at post-intervention and at 3- and 6-month follow-ups. Community engagement was tracked via attendance registers with basic demographic information, and behavioral/awareness change was assessed with brief pre/post questionnaires and observational notes. Field activities were coordinated through short briefings and small supervised working groups to ensure systematic coverage, safety, and consistent data collection in Pariaman City with support from Poltek Pelayaran Sumbar. Opportunities for exchange during informal gatherings and group photographs reinforced social bonds and fostered a sense of joint ownership of the outcomes (Sextus et al., 2024). The involvement of the village official as a continuing manager is a key factor to ensure that results are not ephemeral but can be integrated into local agendas. The existence of agreed communication mechanisms and a composter monitoring schedule at closing signals the program's potential for continuity (Nathaniel et al., 2023; Gurholt & Lund, 2025). However, to secure continuity, clear incentive mechanisms or resource support from the village are necessary. Thus, community participation is an important asset that must be transformed into a more formal management structure (Robinson et al., 2021)**.**

Compare with the previous studies, the finding of this research that student-led monitoring and stakeholder engagement produced reliable field data and strengthened local involvement are consistent with recent reviews highlighting the value of citizen-science approaches for marine-litter monitoring and community engagement (Peacock et al., 2025). Previous reviews show that citizen science delivers extensive, spatially detailed datasets useful for identifying debris composition and sources, which supports local decision-making (Kawabe et al., 2022). Educationally focused interventions, where students participate in hands-on monitoring and classroom activities, have been shown to increase knowledge, intentions, and reported behaviors, reinforcing the value of student participation in our activity (Bettencourt et al., 2023). Case studies combining open-source technology and volunteer monitoring also demonstrate improved data resolution and practical pathways for data collection and transfer. At the same time, recent reviews caution about methodological inconsistencies, data-quality concerns, and the need for harmonization and sustained support to translate volunteer data into policy action, thereby contributing empirical evidence that structured, student-led CBPR can produce both credible monitoring data and sustained community engagement (Corbau et al., 2025).

The high participation and positive uptake observed in Pariaman mirror results from community studies that identify perceived capacity, resources, and clear organization as key drivers of effective beach-cleanup engagement. This high participation is supported by quantitative metrics collected during the campaign, with 150 participants, 250 kg of collected waste, and 200 meters work zone to the left and right starting point area. The integrated operational sequence used, mass collection, source-level sorting, initial composting, and data-driven evaluation, aligns with framework-based assessments that show structured, stepwise cleanup strategies improve feasibility and measurable outcomes as stated before, including waste total removal (kg), diversion and recovery materials, number of participants, and behavioral and awareness change in documentation. In short, the activity demonstrates considerable potential as a socio-environmental intervention that can be further developed.

CONCLUSION

The community service activity yields several conclusions. First, the Coastal Clean-Up Campaign in Pariaman City was implemented as planned with active participation from lecturers, students, village officials, tourism actors, and residents, indicating strong social capital for collective action. Second, based on field findings, it is recommended to strengthen the pilot composter's capacity through technical training and operational monitoring to ensure compost quality and scalability of the unit. The successful and participatory implementation of the Coastal Clean-Up Campaign carries direct operational implications, including prioritizing technical capacity building (composting training, sorting governance, field safety) and the development of standard operating procedures (SOPs) for periodic monitoring so that emergent practices do not remain one-off actions. From a policy and scale perspective, these findings imply the need to institutionalize the activity by establishing permanent sorted-waste collection points, scheduling regular clean-ups in the village agenda, and allocating small maintenance funds; such measures will enhance program continuity and legitimacy. Recommendations for coastal communities are to continue source-level sorting using the provided bins (organic, paper, plastic) and to deliver organic waste to the pilot composter unit or designated compost collection points. For village officials, it is recommended to formalize permanent sorted-waste points and schedule periodic clean-ups and composter monitoring within the village agenda. For the higher-education community service team, the activity should be adopted as a pilot project and followed by continued capacity transfer through technical training modules (composter operation, sorting, data recording), together with delivery of user-friendly monitoring templates and SOPs to local managers.

AUTHORS CONTRIBUTIONS

BR contributed to the conceptualization of the community service program, project supervision, coordination with local stakeholders, and manuscript review. AW and RR contributed to the design of the Coastal Clean-Up Campaign activities, community engagement, and field coordination during the implementation. KA and SYS contributed to data collection, documentation of activities, and management of waste sorting and recording processes. AA contributed to environmental monitoring, data compilation, and preliminary data analysis. MAPN contributed to the development of the methodological approach and interpretation of community-based participatory practices. MFA contributed to data analysis, visualization of results, and improvement of the analytical framework. MRPS contributed to the literature review, drafting of the manuscript, and language editing.

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