JURNAL PATTOLA'
Sustained commitment to regional independence
Vol. 01, No. 01, October, 2025, pp. 018 - 029

Improving 3R based Waste Management Literacy Capacity for Fishermen and Youth in Bonde Village

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Article History:
Received:
Revised:
Accepted:

Keywords: *Waste management, sustainable environment, Karang Taruna youth, coastal communities, and capacity building.*

Abstract

Bonde Village, Majene Regency, confronts the issue of coastal environmental deterioration stemming from inadequate waste management literacy within the fishing community. This community service initiative seeks to enhance sustainable waste management by implementing the 3R (Reduce, Reuse, Recycle) principles. This activity's innovation stems from the amalgamation of interactive socialization techniques with the depiction of the Bonde Village master plan film, offering a spatial viewpoint for coastal inhabitants. The implementation strategies encompass socialization, visual education, community service initiatives (such as beach clean-ups), and assessment via pre-tests and post-tests. Quantitative data indicates a substantial enhancement in participants' comprehension: the average beginning knowledge score (pre-test) of 47.2% rose to 77.8% by the conclusion of the activity (post-test). Specifically, comprehensive understanding (score of 100%) rose from 0% to 33.3% of all participants. The findings demonstrate that the visualization-based village planning educational method effectively enhances ecological awareness and promotes active involvement among Karang Taruna youth in sustaining the coastal environment's carrying capacity.

Introduction

Waste has become one of the biggest problems in Indonesia. The amount of waste is increasing day by day. This waste is generated from household waste, hospital waste, and waste in public places (Jumarianta, 2018). If this waste is left unmanaged, it will cause flood disasters in Indonesia (Herdianto D, 2024). The Indonesian government has made efforts to

handle the growing waste problem in Indonesia (Astuti & Rokhmayanti, 2019).

The problem of trash has emerged as a global systemic dilemma that jeopardizes environmental sustainability, particularly in developing nations like Indonesia. The substantial increase in population and human activities has led to a continuous rise in trash volume, originating from residential areas, healthcare facilities, and public spaces. Failure in upstream waste management may theoretically initiate a series of detrimental environmental consequences, including soil and water contamination as well as increased flooding risks in various locations of Indonesia. The Indonesian government has implemented numerous policy instruments to address this situation; nevertheless, their effectiveness is contingent upon strong community participation at the grassroots level.

From the standpoint of sustainable environmental planning, waste management is generally classified into organic and inorganic categories. An excellent method for attaining environmental sustainability is the implementation of the 3R concept (Reduce, Reuse, Recycle). The adoption of the 3R framework not only functions as a pollution reduction mechanism but also possesses the capacity to provide economic benefits for local populations. trash management difficulties intensify in coastal regions, where marine ecosystems are particularly susceptible to plastic pollution and residential trash that can harm biodiversity and disrupt the marine food chain.

Bonde Village, situated in Pamboang District, Majene Regency, West Sulawesi, is an emerging coastal region mostly reliant on the fishing industry for its economic foundation. As a settlement predominantly comprised of fishermen, the community's everyday activities produce a substantial amount of garbage. Nonetheless, the current circumstances in the area reveal a disparity between regional development and the environmental consciousness of its inhabitants. The fishing community and youth organization Karang Taruna in Bonde Village presently possess insufficient technical expertise in the categorization and processing of organic and inorganic garbage. Consequently, unregulated garbage is frequently discharged directly into coastal zones, resulting in significant marine contamination in the area.

This action highlights the primary concern of inadequate comprehension and engagement of the Bonde Village community in trash management, which directly affects the deterioration of the coastal environment's quality. If the practice of ocean dumping persists without educational intervention, the marine ecosystem of Bonde Village would suffer irreversible damage, ultimately jeopardizing the fishermen's economy. Consequently, systematic socialization and support are essential to alter the community's behavior about 3R-based garbage management.

This community service initiative seeks to:

1. Enhance the awareness and apprehension of the fishing community and Karang Taruna youth toward the cleanliness of coastal environments.
2. Deliver a technical comprehension of techniques for categorizing organic and inorganic trash.
3. Instruct the community on the use of the 3R (Reduce, Reuse, Recycle) principle as a

strategy for sustainable and economically advantageous trash management.

Based on the description above, to achieve the expected targets, socialization is needed to increase the participation of the fishing community and Karang Taruna youth in waste management for the improvement of sustainable environmental quality (Kurniawan A & Fuaddah A, 2024).

Method

A. Place and Time

The service activity was carried out in the integrated tourism area (Bonde Village multipurpose building) in Bonde Village, Pamboang District, Majene Regency, West Sulawesi Province. This activity was conducted on Sunday, June 11, 2025, starting from 09:00-15:00 WITA (Central Indonesia Time). The schedule of events can be seen in Table 1.

Table 1. Activity Schedule (Sunday, June 11, 2025)

No	Pukul (WITA)	Agenda
1	09:00-09:30	Participant Registration
2	09:30-09:40	Pre-test (Distributing questionnaires before the socialization material presentation)
3	09:40-09:50	Welcoming remarks by the committee chairperson
4	09:50-11:00	Material: 1. Waste management in improving sustainable environmental quality 2. Presentation on 3R principles 3. Screening of the Bonde Village masterplan video By: Reza Reski
5	11:00-11:10	Post-test (Distributing questionnaires after the socialization material presentation)
6	11:10-11:20	Closing and group photo
7	11:20-14:00	Implementation of program activities by conducting social service with the community and Karang Taruna youth of Bonde Village

B. Target Audience

This socialization program was focused on the fishing community and Karang Taruna youth. After the implementation of this activity, it is hoped that the community can maintain environmental quality to remain sustainable and can improve the community's economy

through the implementation of 3R principles.

C. Type of Activity

This community service activity is related to socialization on waste management to support sustainable environmental quality and economic improvement for the community in Bonde Village.

D. Activity Technique

In this activity, the service team focused on two community groups, namely, the fishing community and Karang Taruna youth, by holding direct socialization on how to manage waste by applying the 3R principles. The service method went through several stages:

1. First, we collaborated with the Bonde Village government regarding managing permits for the program activities to be implemented.
2. Second, carrying out the service on the agreed-upon day and presenting material on good waste management and the importance of maintaining the surrounding environmental quality.]
3. Third, providing questionnaires before and after (pre-test and post-test) the socialization material presentation.
4. Fourth, conducting social service activities.

E. Evaluation Method

The success indicator was measured by distributing a questionnaire in the form of 6 multiple-choice questions. This questionnaire was given before (pre-test) and after (post-test) the material delivery to measure the level of knowledge of the community and Karang Taruna youth about the importance of waste management to encourage sustainable environmental quality. The questionnaires distributed before and after the lecture contained the same questions. Activity monitoring was based on the post-test results. The achievement of the activity was providing knowledge, turning "not knowing" into "knowing" after the lecture (material delivery) was conducted; the community came to understand how to manage waste properly.

1. Questionnaire Instrument Indicators The evaluation instrument uses a closed questionnaire designed to measure participants' level of understanding of the three main pillars of sustainable waste management. The indicators used in the six questionnaire items are as follows:

No	Evaluation Indicators	Quesitions	Measurement Objectives

1	Environmental Awareness	1&2	Measure concern for cleanliness and the dangers of coastal pollution.
2	Conceptual Understanding	3&4	Measures knowledge of the 3R principles (Reduce, Reuse, Recycle)."
3	Technical Skills	5&6	sures practical ability in sorting waste and recycling techniques.

2. Validity of the Instrument
   Due to the restricted target group (N=6), instrument validity employed Content Validity instead of the Cronbach's Alpha statistical test. The instrument was established by expert judgment, wherein the questions were tailored to align with the Bonde Village Master Plan and national waste management standards. This guaranteed that the questionnaire items aligned with the supplied materials.
3. Data Analysis (Pre-test and Post-test)
   The data obtained from the pre-test and post-test 7 were analyzed using quantitative descriptive methods and Normalized Gain Score (N-Gain) calculations. The N-Gain theory (Hake, 1999) was used to measure the effectiveness of the material in improving participants' knowledge using the following formula:

$$g = \frac{X_{post} - X_{pre}}{X_{max} - X_{pre}}$$

Description:
g: N-Gain Score
Xpost: Final test score
Xpre: Initial test score
Xmax: Ideal maximum score (6 points)

Effectiveness criteria are divided into three categories: High ($g > 0.7$), Medium ($0.3 \leq g \leq 0.7$), and Low ($g < 0.3$). In addition, affective behavioral changes were mapped through direct observation during social service activities in coastal areas to verify the correlation between theoretical understanding and actual actions.

Result

A. Results Analysis

1. Examination of Enhanced Community Awareness

The socialization program resulted in a substantial enhancement of knowledge

among the fishing community and Karang Taruna adolescents in Bonde Village. Data obtained from pre-test instruments indicated that, prior to the intervention, most participants possessed a poor comprehension of sustainable waste management. This aligns with the premise that human factors are primary determinants of environmental quality, wherein the cleanliness of a region is significantly influenced by the population' level of awareness.

The efficacy of teaching via lectures, master plan video presentations, and conversations is evidenced by the post-test outcomes in Table 2.

Table 2. Comparison of Pre-test and Post-test Results

Achievement Indicators	Description of Changes
Increased Understanding	100% of participants experienced positive changes in answering knowledge indicators.
Mastery of 3R Material	Significant improvement in understanding the principles of Reduce, Reuse, Recycle as a solution for waste management at the household level.
Awareness of Marine Pollution	Growing awareness of the dangers of dumping waste in coastal areas, which has been a common practice in Bonde Village.

This improvement proves that the visual communication strategy through the Bonde Village masterplan video is effective in attracting interest and facilitating the absorption of complex material related to waste management. This supports the research by Kurniawan & Fuaddah (2024), which emphasizes the importance of community empowerment to achieve sustainable waste management.

2. Application of the 3R Principle in the Context of Coastal Environments

The implementation of the 3R concept (Reuse, Reduce, Recycle) in Bonde Village is not solely a technical endeavor, but a strategic measure to preserve the carrying capacity of the coastal ecosystem. The village, reliant on the fishing industry, faces threats to its environment and fishermen's productivity due to the accumulation of inorganic trash in the water.

Community service initiatives conducted in coastal regions exemplify the application of theoretical concepts into practical execution. This activity represents the initial measure in reducing the quantity of garbage entering the maritime environment (marine debris). Implementing integrated waste management at the village level is essential to avert environmental catastrophes, including flooding and extensive water contamination.

3. Obstacles to Engagement in Environmental Planning

Notwithstanding the enhancement in cognitive quality among participants, the attendance of merely six individuals signifies difficulties in community engagement. In regional planning theory, involvement is essential for the sustainability of environmental

initiatives. This diminished excitement suggests sociocultural impediments or a deficiency in communal recognition of the significance of sustained environmental quality. This is a crucial reminder for the village administration to enhance local trash management policy, acknowledging that while the central government has exerted significant effort to tackle national waste challenges, its efficacy remains contingent upon local participation. Assistance for waste management efficacy is crucial to harmonize the principle of environmental sustainability in urban and rural settings.

(Figure 1. Socialization of the 3R (Reduce, Reuse, Recycle) framework as a strategy for mitigating marine pollution on the coast of Bonde Village)

(Figure 2. Material 2 presentation)

(Figure 3. Master plan video presentation)

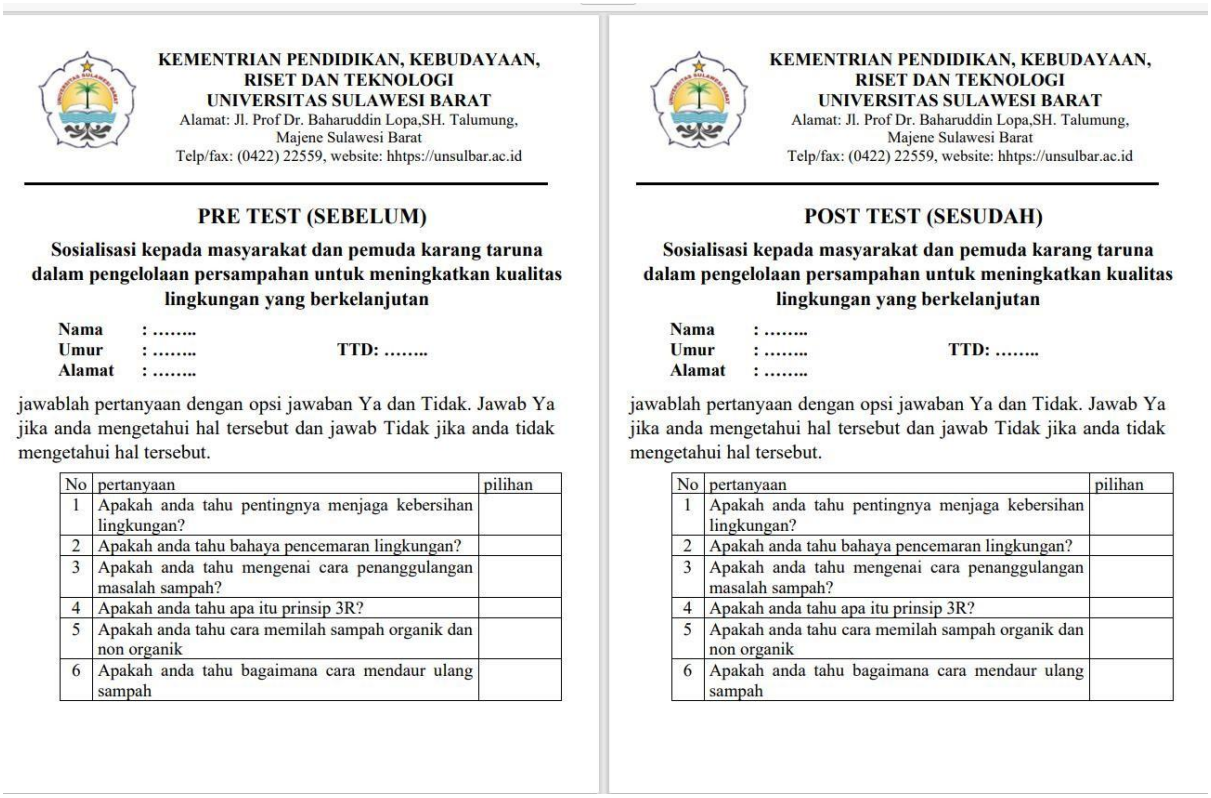
(Figure 4. Photo of the service team and socialization participants)

(Figure 5Beach clean-up activities as a direct implementation of organic and inorganic waste separation)

B. Activity Evaluation

The community service program, in the form of socialization and social service, received a very good response from the Bonde Village community. Through this service program, the community gained knowledge and awareness of the importance of waste management to encourage sustainable environmental quality and how to apply 3R (Reuse, Reduce, Recycle). This can minimize the reduction of waste use and waste disposal into the sea, thus maintaining environmental preservation.

Viewed from affective and cognitive aspects, the socialization and social service participants have understood the importance of waste management and how to apply 3R (Reuse, Reduce, Recycle) to encourage sustainable environmental quality in Bonde Village. The success rate of this activity can be measured from the results of the questionnaire distributed before and after the material presentation. Figure 6 shows the questionnaire sheet distributed before (pre-test) and after (post-test) the material delivery. The questionnaire results regarding the importance of waste management to encourage sustainable environmental quality and how to apply 3R (Reuse, Reduce, Recycle) can be seen in Table 2.



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PRE TEST (SEBELUM)

Sosialisasi kepada masyarakat dan pemuda karang taruna dalam pengelolaan persampahan untuk meningkatkan kualitas lingkungan yang berkelanjutan

Nama : ……..
Umur : …….. **TTD:** ……..
Alamat : ……..

jawablah pertanyaan dengan opsi jawaban Ya dan Tidak. Jawab Ya jika anda mengetahui hal tersebut dan jawab Tidak jika anda tidak mengetahui hal tersebut.

No	pertanyaan	pilihan
1	Apakah anda tahu pentingnya menjaga kebersihan lingkungan?	
2	Apakah anda tahu bahaya pencemaran lingkungan?	
3	Apakah anda tahu mengenai cara penanggulangan masalah sampah?	
4	Apakah anda tahu apa itu prinsip 3R?	
5	Apakah anda tahu cara memilah sampah organik dan non organik	
6	Apakah anda tahu bagaimana cara mendaur ulang sampah	

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POST TEST (SESUDAH)

Sosialisasi kepada masyarakat dan pemuda karang taruna dalam pengelolaan persampahan untuk meningkatkan kualitas lingkungan yang berkelanjutan

Nama : ……..
Umur : …….. **TTD:** ……..
Alamat : ……..

jawablah pertanyaan dengan opsi jawaban Ya dan Tidak. Jawab Ya jika anda mengetahui hal tersebut dan jawab Tidak jika anda tidak mengetahui hal tersebut.

No	pertanyaan	pilihan
1	Apakah anda tahu pentingnya menjaga kebersihan lingkungan?	
2	Apakah anda tahu bahaya pencemaran lingkungan?	
3	Apakah anda tahu mengenai cara penanggulangan masalah sampah?	
4	Apakah anda tahu apa itu prinsip 3R?	
5	Apakah anda tahu cara memilah sampah organik dan non organik	
6	Apakah anda tahu bagaimana cara mendaur ulang sampah	

(Figure 6. Questionnaire distributed before and after the socialization material delivery)

Table 2. Pre-test and post-test questionnaire results

No	Participant	Pre-test	Post-test	Notes
1	Kisman	1 Yes 5 No	4 yes 2 no	There is a change
2	Syarif	3 Yes 3 No	5 yes 1 no	There is a change
3	Muh. Iqbal	5 Yes 1 No	All yes	There is an increasing change
4	Hamka	2 Yes 4 No	4 Yes 2 No	There is a change
5	Saipul . q	2 Yes 4 No	3 Yes 3 No	There is a change
6	Halil	4 Yes 2 No	All yes	There is an increasing change

Based on the results of questionnaires given to six respondents (representatives of

fishermen and Karang Taruna), a comparative analysis was conducted between the level of knowledge before (pre-test) and after (post-test) the presentation of the material. The success indicator was measured based on the percentage of "Yes" answers to six key questions regarding waste management and the 3R principles.

Table 2. Descriptive Statistical Analysis of Pre-test and Post-test Results

Evaluation Parameters	Pre-test Results	Post-test Results	Significance of Improvement
Average Knowledge Score	47,2%	77,8%	+30,6%
Participants with a Score of 100%	0 (0%)	2 (33,3%)	+33,3%
Total Number of "Yes" Answers	17	28	+64,7% (dari total jawaban)

The data shows a substantial cognitive shift. Before socialization, public knowledge was below 50% (47.2%), confirming that initial awareness of waste management was still low. However, after intervention through lectures and video visualization, the average score increased to 77.8%. This increase of 30.6 percentage points proves that participatory education methods are effective in transferring technical knowledge about sorting organic and inorganic waste to fishing communities.

C. Achieved Outcomes

The outcomes achieved from the community service activity include several types, namely:

1. For participants, the achieved outcome is an increase in the training participants' understanding of waste management in improving sustainable environmental quality and how to apply 3R. This is seen from the evaluation results on waste management and 3R application through the questionnaire and the evaluation from answering questions before and after the test was conducted.
2. For the service team, the achieved outcome is in the form of a service report and a service journal.

Conclusion

Based on the results of community service activities in Bonde Village, Majene Regency, several key points can be concluded that are in line with the program objectives:
Improved Cognitive and Affective Capacity: The outreach activities successfully increased the understanding of the fishing community and Karang Taruna youth regarding post-consumption waste management. Based on the evaluation instrument (Table 2), there was a

shift in the level of knowledge from the "don't know" category to the "know" category, especially in the aspects of sorting organic and inorganic waste and applying the 3R (Reduce, Reuse, Recycle) principle.

Coastal Environmental Mitigation Actions: The implementation of social service activities in coastal areas had a direct impact in minimizing the volume of waste that could potentially pollute the marine ecosystem. This shows that education accompanied by field actions is effective in fostering short-term environmental awareness among coastal communities.

Method Effectiveness: The use of audio-visual media through the screening of master plan videos and interactive presentations proved to be effective in attracting participants' interest in discussion, so that material on sustainable environmental quality was well received.

Reflective Analysis and Discussion of Participation

Although the activity ran smoothly from a technical standpoint, the attendance of only six participants indicated a low level of enthusiasm among the wider community. From a regional planning perspective, this phenomenon cannot be viewed solely as a lack of awareness, but needs to be analyzed critically:

1) Structural and Economic Barriers: Given that the majority of the community are fishermen, the low attendance was most likely influenced by the opportunity cost of fishing time conflicting with the time of the activity. In participation theory (such as Arnstein's Ladder), low involvement often occurs when programs are top-down and do not fully address the urgent economic needs of the community.
2) Environmental Literacy Gap: The continued practice of dumping waste into the sea shows that environmental issues in Bonde Village have become a behavior that has been internalized for generations. The low level of enthusiasm reflects that the community does not yet see waste management as a productive solution with direct economic value.
3) Implications: This implies that it will be difficult to achieve environmental sustainability by relying solely on sporadic socialization. A more intensive community-based approach is needed to change the community's perception from waste as a burden to waste as a resource.

Recommendations and Program Sustainability

1) Development of a Coastal Waste Bank Model: To increase enthusiasm, future programs must integrate 3R management with economic incentives, for example through the establishment of a Waste Bank managed by Karang Tarun. This is in line with the concept of circular economy in environmental planning.
2) Strengthening Local Regulations (Villages): Follow-up is needed in the form of drafting Village Regulations (Perdes) on coastal waste management to provide a legal framework for the community and reduce the habit of dumping waste into the sea permanently.
3) Sustainable Assistance: Given the obstacles to participation that were encountered, future activities should use a door-to-door approach or be integrated into regular community meetings (such as fishermen's groups) to ensure wider educational reach without disrupting the productive time of the community.

4) Integration of Appropriate Technology: Development of tools for processing organic waste into compost or animal feed at the village level to provide concrete solutions for household waste.

Acknowledgements

All praise and gratitude to Allah SWT who has provided ease so that the author could complete this journal. The author also extends the greatest thanks to the supervising lecturer, the Bonde Village community, and friends who helped so that the author could complete this service journal.

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