

# Environmental Care Performance of Prospective Teacher in Kendari, Indonesia: Challenges and Solutions in Waste Management

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## ABSTRACT

This document discusses the importance of instilling environmental awareness in students across various educational levels, from elementary to high school. Based on a literature review, efforts to enhance environmental awareness among students have been conducted through various approaches, such as project-based learning utilizing the school environment, sustainable community science and technology education, and simple observations in elementary school settings. The research method used in this document is qualitative, with data collection through observation, interviews, and documentation. Data analysis employs concepts from Taherdoost (2020), including data entry, missing data, and data transformation. This study explores the abilities of teacher candidates in madrasah ibtidaiyah to observe and document waste management issues in their surroundings. The results indicate that the candidates can identify various problems, such as blocked drainage, waste accumulation at temporary disposal sites, and litter scattered along roads and rivers. Additionally, the candidates develop leadership skills in formulating waste management recommendations that include increasing community awareness, improving waste management facilities, reducing waste, and empowering the community. The study also suggests the need to strengthen stakeholder capacities in waste management and to integrate environmental education to foster environmental awareness among students.

**Keywords:** environment, science literacy, waste

## INTRODUCTION

Concern for the environment is expected to be a shared responsibility for all generations of the nation. According to the basic education content standards outlined in the Indonesian Minister of Education, Culture, Research, and Technology Regulation Number 8 of 2024, there is an emphasis on the importance of studying natural sciences. Key aspects to be observed include simple observations, identification of scientific questions, experiments, data processing, as well as reflection and communication of research results. Although this idea is relatively new, some experts have previously applied it, as noted by Rizkia and Khairunnisa (2021) [1], which indicates that teaching methods must adapt to the times, where both teachers and students are not just passive objects, but also active subjects in the learning process. The concept of simple observation can be developed by utilizing the environment as a learning resource [2]. Project-based learning that involves the school environment can encourage students to cultivate environmentally friendly attitudes, as demonstrated by students at MIS Handapherang [3].

The issue of ineffective waste management in Kendari and its surroundings, particularly in Konawe Selatan, is a shared responsibility among all stakeholders. Unmanaged waste piles pose negative impacts on the health of

the local community. In addition to generating unpleasant odors, poorly managed waste also disrupts the oxygen supply for residents. Furthermore, the accumulation of waste detracts from the city's beauty and, if left unaddressed, can lead to serious environmental damage. The area of focus in this study consists of wetlands and waterlogged regions with poor absorption capacity, making the involvement of various parties crucial to resolving this waste problem. Ironically, not only the government but also local researchers seldom contribute their voices and efforts in addressing this issue. Through exploration across various channels, the researchers identified two local studies in Southeast Sulawesi, Indonesia, that tackled this theme in 2021. The first, by Andriyani et al. (2021), highlighted the role of market traders in managing the waste they produce, while the second, by Hariyadi et al. (2021), assessed waste literacy among Geography students at UNS Kolaka. Additionally, some experts focus more on the attitudes of the community, ranging from elementary school students to graduate students, regarding waste management and the preservation of the environment as the habitat for all living beings.

The environmental awareness among third-grade students at SDN 12 Singkawang is considered good, with a percentage reaching 77.9%. This attitude is reflected in the students' habits of engaging in various positive behaviors, such as using the restroom properly, disposing of waste in designated areas, maintaining the cleanliness of the schoolyard, refraining from picking flowers in the garden, and avoiding stepping on the grass in school areas [4]. However, fifth-grade students at SDN 20 Bilah Barat still demonstrate a lack of understanding regarding the difference between organic and inorganic waste, with low levels of environmental awareness (reduce, reuse, recycle) ranging from 37% to 45% [5]. On the other hand, the environmental actions taken by students at SD Muhammadiyah Program Khusus Baturan, such as reforestation and cleanup activities, have yielded significant results, with the school environment—especially the garden—becoming tidy and clean, and new plants being added from reforestation efforts [6]. Environmental awareness not only fosters an understanding of the importance of preserving the environment but also enhances students' curiosity about environmental issues [7] and improves their science literacy [8]. Quantitative research by Purwono and Jannah (2020) [9] and Jannah and Purwono (2021)[10] indicates a positive relationship between the implementation of environmental education programs and naturalist intelligence concerning students' environmental awareness at MI Dwia Dasa Warasa Trawas Mojokerto.

Environmental awareness is a collective responsibility that aligns with the functions, roles, and positions of individuals within society. It is essential to monitor environmental attitudes among students at the junior high school level. For instance, the environmental attitudes of students at SMPN 20 Depok show high levels of knowledge and concern for environmental issues [11]. Meanwhile, at SMPN 13 Pontianak, data on students' attitudes toward environmental conservation reveal significant differences between the experimental class, which implements environment-based learning, and the control class that uses conventional methods. The research findings indicate that the experimental class exhibits a higher level of environmental preservation awareness, reaching 29% compared to the control class [12]. Additionally, the implementation of sustainable community-based science and technology education has also proven effective in enhancing environmental awareness among students at MTsN 1 Ponorogo (Rahmah et al. 2021) [13].

Similarly, high school students also have a responsibility toward the environment. Research by Qodriyanti et al. (2022)[14] shows that environmental awareness among students at MAN in Jakarta is at a moderate level, with several aspects needing attention, including: 1) students' attitudes toward environmental balance and change, 2) students' concerns about activities that may cause air, soil, and water pollution, 3) students' knowledge of waste management, and 4) factors influencing environmental awareness, including adaptation and mitigation strategies for environmental changes. At SMAN 5 Banjarmasin, students' environmental awareness is manifested through the "Clean Friday" program conducted regularly, the establishment of a waste bank by teachers and students, and the provision of cleaning facilities in the school environment. However, these initiatives are still considered relatively ineffective [15]. The concept introduced by Adawiah (2020) was later modified into a zero-waste lifestyle during the "Clean Friday" activities at SMAN 1 Baros, providing students with hands-on experience in caring for the environment [16]. Additionally, problem-based learning in high schools in Bandung has shown an increase in students' environmental awareness, reaching 95%, although their commitment to environmental issues remains low, around 55% [17] - [18]. Research on student participation in extracurricular scouting activities also indicates an increase in environmental awareness among students at SMAN 88 Jakarta [18].

Research on environmental awareness among university students has revealed various findings. For instance, according to Haryadi et al. (2021) [19], environmental literacy among Geography Education students at USN Kolaka falls into the moderate category, with scores ranging from 63.3% to 81%. Meanwhile, Andini (2018)[20] found that Geography Education students at STKIP Ahlussunah Bukittinggi exhibited higher environmental awareness in open spaces compared to when they were introduced to the environment in enclosed spaces. Learning in open environments is an extension of contextual-based learning that can be adapted into an ecotourism model, aimed at fostering students' environmental awareness to live in harmony and balance with nature. This concept also has the potential to provide additional benefits, such as improving the living standards of the surrounding community [21]. Furthermore, a study by Khanafiyah and Yulianti (2013)[20] indicates that environmental physics education using problem-based instruction is effective in enhancing environmental awareness among students. The psychomotor aspects of students also contribute to environmental action through project-based learning, particularly in addressing water and air pollution, which strengthens their concern [23]. Additionally, student involvement in mapping local potentials for sugarcane management as a renewable energy source in Jember can stimulate their environmental awareness [24].

Environmental awareness among postgraduate students in Jakarta demonstrates good knowledge, with 50%-58% of respondents acknowledging that their attitudes towards maintaining environmental quality are inadequate, and 53%-65% admitting this. However, the level of concern for the environment remains low, ranging from 40% to 53% [25]. Public environmental attitudes can be improved through community engagement, a willingness to pay more, and broader pro-environmental behaviors [26]. In Malang, both rural and urban communities show a fairly high level of concern, as evidenced by their tendency to purchase food with eco-friendly packaging. Urban residents are more adept at sorting waste by type compared to their rural counterparts [27]. Additionally, within the campus environment, maintaining environmental awareness among the academic community is closely related to sustainable development insights, as demonstrated by Abdullah et al. (2020)[28] at FKIP Unsyiah Aceh. Based on these findings, this article will emphasize indicators related to efforts to protect the environment in line with the capacities of prospective teachers at madrasah ibtidaiyah in Southeast Sulawesi, focusing on: 1) the ability of prospective teachers to observe and document the condition of waste disposal sites around them, and 2) the development of leadership skills among prospective teachers in addressing waste issues in the future and formulating easily adaptable management recommendations.

The research aims to enhance awareness and involvement of prospective teachers in environmental management through project-based education. It is expected that prospective teachers will develop their observation and documentation skills regarding the environmental conditions around them, as well as formulate effective recommendations for addressing waste management issues. Additionally, it is crucial to integrate environmental education into their curriculum to instill an environmental care attitude in future students. Through a collaborative approach with the community, prospective teachers can become agents of change who promote environmental awareness and sustainable waste management practices, thereby creating a cleaner and healthier environment for future generations.

## RESEARCH METHODS

The method used in this research is a qualitative research methodology [29]–[33]. Data were collected through observation, interviews, and documentation techniques. Observations and documentation were conducted on environmental cleanliness at several locations in Kendari City and South Konawe. The focus areas for observation in Kendari City included blocked drainage next to Ma'had Al Jamiah IAIN Kendari, Baruga Market, the waste disposal site on Jl. Kapten Piere Tendean, and the catchment area of the Wanggu River. In South Konawe Regency, observations were carried out at Ranomeeto Market.

**Table 1: Distribution of Participants in the Observation Group**

No	Observation Site	Members (Anonymous)	Date of Observation
1	Drainage Channel Next to Ma'had IAIN Kendari	Nur, Yin, Romi, Res, Wulan, Febri (6 people)	October 9 – December 24, 2023 Observation during the dry and rainy season

2	Waste at Baruga Market, Kendari City	Risal, Misda, Hilda, Mun, Mar, Dila (6 people)	November 10 – December 10, 2023
3	Waste at Ranomeeto Market, South Konawe Regency	Tri, Alfi, Mita, Sri, Wan, Lis, Tina (7 people)	November 16, 2023
4	Waste Along Jl. Kapten Tendean, Baruga, Kendari City	Silfi, Ade, Acil, Liati, Nisa, Tifli (6 people)	-
5	Waste in the Wanggu River Catchment Area, Kendari City	Yanti, Sanah, Maq, Yati, Wati, Ani (6 people)	November 1 – 4, 2023 morning and afternoon
	Total	37 people	

Source: Documentation Data, 2023

The participants in this study consist of 37 prospective elementary school teachers from the State Islamic Institute of Kendari, class of 2022, who are currently taking the Science 2 course in MI/SD during the third semester of the 2023-2024 academic year. The age range of the participants is between 21 and 22 years, with a gender composition of 5 males and 32 females. The participants are further divided into six groups (Table 1) with anonymized names. The data analysis technique employed the concepts developed by Taherdoost (2020) [34], involving data entry, handling missing data, and data transformation. Data entry was performed by inputting coded data, while handling missing data occurred after data entry was complete, eliminating any noise present in the dataset. Data transformation involved identifying findings that corresponded with one another. The presented data were triangulated with interviews from informants representing traders, specifically Mrs. IS (anonymized name), a 35-year-old woman, and Mr. Ahmad (anonymized name), a 45-year-old man who serves as a representative of the waste disposal staff at Pasar Baruga in Kendari.

Environmental performance is assessed by considering several aspects, including the intention to refuse or minimize waste, beliefs about socially responsible behavior regarding waste, perceptions of expectations from close peers about socially responsible waste behavior, and the perceived level of self-control to engage in environmentally supportive social behavior. Prospective madrasa teachers need to cultivate and develop this environmental performance early on to effectively implement it in the field in the future [35]. This article presents a descriptive and qualitative analysis of the environmental awareness performance of prospective madrasa teachers based on field findings. Observations were conducted by photographing the environmental conditions surrounding the activities of the prospective teachers, detailing the observations, and identifying various aspects, from human activities that generate waste to the roles of waste management staff and the conditions of temporary waste collection sites. This information is expected to provide deeper insights into environmental performance and awareness among prospective elementary madrasa teachers (Table 2).

To enhance environmental awareness performance among prospective madrasa teachers, it is crucial to align waste management solutions with their capacities. This can be achieved through educational programs focused on waste management, active participation in recycling activities, and the use of simple technologies to reduce waste impact. With these steps, prospective madrasa teachers can actively contribute to maintaining the cleanliness of their surroundings and serve as good role models for their students. Active involvement of prospective teachers in field learning is also important to ensure that the knowledge gained is well retained in their memory [2], [8], [11], [15], [16], [27], [36].

Prospective madrasah teachers have a responsibility as agents of change regarding environmental awareness. By implementing good waste management practices, they can inspire students and the surrounding community to care for the environment. Through awareness and concrete actions, prospective madrasah teachers can contribute to saving the environment for a better future (Table 3) [5], [6], [14], [27], [37]–[40].

## DISCUSSION

Based on the research results presented in Table 2, qualitative data analysis regarding waste management issues



in several locations reveals several findings. Around the Ma'had IAIN Kendari, there are blockages in the drainage systems due to the accumulation of waste such as dry leaves, branches, and plastic. In the Baruga Market of Kendari City, the temporary waste disposal site (TPS) lacks separate bins for sorting organic, inorganic, and other hazardous waste, resulting in a disorganized and scattered appearance of waste around the TPS. In the Ranomeeto Market of South Konawe Regency, the TPS also does not provide waste separation, its capacity has exceeded limits, and the surrounding drainage system is not functioning properly. Along Captain Tendean Street in Baruga, Kendari City, there are no TPS, leading to waste scattered along the roadside. A similar situation is found in the Wanggu River area of Kendari City, where there is an accumulation of plastic waste and household waste along the riverbank and under the bridge.

**Table 2: Observation Data for Each Group**

No	Observation Site	Observation Results
1	Drainage Channel Next to Ma'had IAIN Kendari	Blockages in the downstream drainage channels occur due to the accumulation of waste such as dry leaves, tree branches, and plastic waste (observations were conducted during the dry season when the drainage was dry). The drainage is obstructed by soil, stones, wastewater from surrounding buildings, as well as the absence of absorption wells or proper drainage systems, especially in areas of the road that are in poor condition and heavily trafficked.
2	Waste at Baruga Market, Kendari City	Temporary waste collection points (PSS) are available in the market area, where waste is deposited. There are no separate trash bins, but there is a cleaning staff assigned to each section. Each vendor pays a waste fee, and garbage trucks routinely collect waste from the temporary collection points. The waste collection staff use basic personal protective equipment.
3	Waste at Ranomeeto Market, South Konawe Regency	The PSS does not provide waste separation, and although the waterproof PSS containers are made of metal, they are difficult for the waste staff to empty. The containers are located by the roadside, making it challenging for the public to access the road during waste collection by trucks. The drainage around the PSS containers is not functioning properly, causing litter to be blown around by the wind and accumulate in the nearby drainage. The waste exceeds the capacity of the PSS containers, and a foul odor can be detected from the PSS from as far as 500 meters away.
4	Waste Along Jl. Kapten Tendean, Baruga, Kendari City	There are no PSS containers available, and waste is scattered along the roadside for about 50 meters. During the observation, information was obtained from the local community that cleaning staff routinely collect waste in the area every morning and evening. The drainage in the surrounding area is not functioning properly.
5	Waste in the Wanggu River Catchment Area, Kendari City	No PSS containers were found at the observation site. There was no scattered waste around the riverbank. However, plastic waste and household garbage were found grouped together and discarded near the banks of the Wanggu River and under the Wanggu Bridge. During the afternoon observation at around 4:30 PM WITA, fresh waste materials and household garbage were discovered due to activities by the local community near the Wanggu River. There is an accumulation of waste in the Wanggu River, the water flow is slow, and the scenery is unappealing. The water has a brownish-yellow color due to the presence of sediment and waste, and a strong garbage odor permeates the observation area.

Source: Documentation Data, 2023

The findings presented in Table 2 indicate several implications related to waste management issues: 1) blockages in drainage systems that lead to waste accumulation can result in flooding during the rainy season; 2) waste scattered around the temporary waste disposal sites (TPS) creates poor aesthetic impacts and can become breeding grounds for disease vectors; 3) TPS capacity exceeding the quota of waste generated, combined with

poorly functioning drainage systems, can cause environmental pollution; 4) waste scattered along the roadside can hinder public access and diminish aesthetic value; 5) the accumulation of waste along the riverbank and under bridges can contribute to water pollution and disrupt water flow.

This finding creates an irony around us, considering the mandate of Law Number 18 of 2008 (Law 18/2008), which is the legal regulation in Indonesia governing waste management. This law includes provisions on waste management, the division of authority, and the organization of waste management throughout Indonesia. It was formulated in response to population growth and changes in consumption patterns that have led to increased volume, types, and characteristics of increasingly diverse waste. Furthermore, the waste management practices that have been implemented so far do not align with environmentally sound methods and techniques, resulting in negative impacts on public health and the environment. Therefore, this law aims to regulate waste management comprehensively and integratively, taking into account economic, health, and environmental aspects.

The norms established by Government Regulation Number 81 of 2012 on Household Waste and Similar Waste, hereinafter referred to as PP 81/2012, as an implementation of Law 18/2008, have not achieved the expected targets. The norms in PP 81/2012 require: 1) increased environmental awareness among the public regarding the importance of environmentally sound waste management. The community is expected to better understand how to sort waste, reduce single-use plastic consumption, and recycle; 2) improved facilities and infrastructure for waste management, such as temporary disposal sites, recycling facilities, and educational programs implemented by local governments; 3) waste reduction to make waste management more efficient and focused, thereby decreasing the volume of waste sent to landfills; 4) reduction of environmental impacts through better waste management to minimize negative effects on the environment, such as soil and water pollution; 5) community empowerment by encouraging active participation in waste management, including involving residents in recycling programs and environmental campaigns.

According to Fua et al. (2018), there are several environmental conservation actions that can be implemented through an Islamic education approach in schools, namely: 1) integrating Islamic education with environmental education to foster environmental awareness among students. Islamic education is based on normative theological principles derived from the Quran and Sunnah, which teach the importance of harmony between humans and the environment; 2) developing positive character traits in students through Islamic education, such as creativity, discipline, responsibility, and cooperation in environmental management. These traits can serve as a foundation for students to adopt environmentally friendly behaviors; 3) wisely utilizing Islamic concepts related to environmental management, such as understanding the environment as God's creation that must be preserved, and appreciating progress as a sign of God's power; 4) making schools a model for environmental education based on Islamic education that can be applied in daily life; 5) enhancing ecological sensitivity and problem-solving skills related to environmental issues among students through the integration of Islamic and environmental education.

Adapting the views of Fua et al. (2018) in the Science II lectures for prospective primary school teachers is expected to reflect the condition of unmanaged waste in their surroundings. This concept can serve as an effective approach to foster environmental awareness among future teachers and encourage environmental conservation actions, starting with themselves, their homes, and the broader community. It is hoped that they can become pioneers in demonstrating environmental conservation efforts in the future. This article also aims to cultivate and build the awareness of prospective primary school teachers to develop a positive attitude, or eco-spirituality, which is a spiritual concern for nature, rather than merely possessing knowledge. They are also expected to have planning, performance, and active participation in waste management efforts that support environmental conservation in their vicinity (J. La Fua, Nurlila, et al., 2018; J. La Fua, Rahma, et al., 2018).

**Table 3: Data on Environmental Awareness Performance for Each Group**

No	Observation Site	Recommendations
1	Drainage Channel Next to Ma'had IAIN Kendari	1. For higher education institutions, the routine of maintaining campus cleanliness in this area should not be limited to open areas accessible to the public; regular

		<p>cleaning should also be conducted in enclosed areas, such as the drains in the back of the dormitory that are not accessible to the general public.</p> <p>2. For the management of the dormitory, it is important to pay attention to the cleanliness of the drainage systems. Additionally, monitoring the activities of students in promoting a waste-free environment should be conducted to create a more pleasant atmosphere that supports the learning environment for students.</p>
2	Waste at Baruga Market, Kendari City	<p>1. The provision of standardized waste bins for collecting organic and inorganic waste should be implemented. These bins should be durable and equipped with covers to reduce the spread of foul odors.</p> <p>2. Active participation from market traders needs to be enhanced, not only by paying cleanliness fees but also by sorting the organic and inorganic waste they produce, and ensuring that waste is not scattered around their stalls.</p> <p>3. Authorities responsible for managing the drainage systems around the market should promptly repair damaged drains and address blockages caused by waste, soil, and other materials by assigning cleaning personnel to the area.</p> <p>4. Awareness campaigns should be conducted to inform all market stakeholders that maintaining cleanliness is a shared responsibility.</p>
3	Waste at Ranomeeto Market, South Konawe Regency	<p>Enhancing waste management knowledge for the surrounding community, along with providing facilities such as standardized waste bins that include separate sections for organic and inorganic waste.</p>
4	Waste Along Jl. Kapten Tendean, Baruga, Kendari City	<p>1. The provision of standardized waste bins to store organic, inorganic, and other hazardous waste.</p> <p>2. Raising community awareness regarding the management of the waste they generate.</p> <p>3. Cleaning personnel, especially those who are volunteers from the local community, should be equipped with adequate personal protective equipment.</p> <p>4. A review of the fee of IDR 4,000 per stall in the Baruga Market of Kendari City for the temporary waste disposal area along this location is necessary.</p>
5	Waste in the Wanggu River Catchment Area, Kendari City	<p>1. The Kendari City Government is expected to provide standardized waste bins in densely populated areas along the Wanggu River.</p> <p>2. Strengthening the capacity of civil society along the Wanggu River to raise awareness about cleaning and maintaining the cleanliness of the river from waste, as well as ensuring they have adequate waste management knowledge.</p> <p>3. Awareness campaigns on waste management in the Wanggu River area should start at the grassroots level, focusing on active participation in maintaining personal cleanliness, home cleanliness, and the cleanliness of the surrounding environment.</p>

Source: Documentation Data, 2023

The environmental awareness performance of prospective primary school teachers (Table 3) can be presented in nine main themes, each assigned a specific code. First, the cleanliness routines in enclosed areas. Maintaining cleanliness in enclosed spaces, such as the drainage behind the ma'had, is an important step to reduce waste accumulation and ensure a clean environment. In set theory, we can represent this set as (A), with elements consisting of routine cleaning activities. For example, (A) may include elements like 'cleaning the drainage every morning' or 'collecting waste from enclosed areas.'

Second, monitoring waste-free movement activities by students. This monitoring can be represented in set (B), where the elements in (B) might involve tasks such as 'supervising waste sorting' or 'conducting cleanliness

patrols.' Thus, (B) represents a set of activities related to cleanliness supervision and monitoring. The findings from sets A and B align with character education focused on environmental awareness through science learning integrated with environmental values. Environmental awareness performance is best applied through direct field learning, such as field studies, the use of video learning media, and the implementation of teaching models like Project-Based Learning (PjBL) and Contextual Teaching and Learning (CTL), which contribute to the development of science education that integrates character education focused on environmental care [20], [39], [44], [45].

Third, the provision of standardized waste containers. Standardized Temporary Waste Collection Bins (PSS) can be identified as set (C). The elements in (C) include PSS bins that meet specific cleanliness and capacity standards. For example, (C) may contain elements such as 'PSS bins with a minimum capacity of 1 m<sup>3</sup>' or 'PSS bins made from durable materials.' The environmental care character represented in set (C) provides recommendations regarding the facilities and infrastructure that need to be strengthened to support effective waste management [5], [19], [28], [46].

Fourth, the active participation of market traders in waste sorting. The participation of market traders in waste sorting can be represented by set (D). The elements in (D) include activities such as 'separating organic and inorganic waste' and 'using appropriate waste bins.' Thus, (D) represents a set of actions taken by market traders in collaboration with volunteer environmental cleanliness officers. However, according to Shodiq et al. (2020), consumer attitudes in the market also contribute to the volume of waste generated, especially when consumers choose packaging that is not environmentally friendly.

The provision of standardized waste bins is essential as an initial step toward effective, efficient, and environmentally friendly waste management. Based on interviews with traders at Pasar Baruga in Kendari, Indonesia, it was found that generally, the waste produced by these traders is not sorted into organic and inorganic categories as required[1]. This is primarily because the waste collection system consists of a single bin with limited capacity, leading traders to dispose of all their waste together into the temporary waste collection bin. This single waste bin cannot accommodate the daily output of approximately 1,850 kg of waste. The temporary waste collection facilities are limited to one single bin, one waste truck, eight waste carts, and a team of four personnel at the disposal site, along with seven waste cart operators, which are insufficient to manage the waste generated by Pasar Baruga. Waste collection staff perform routine disposal to the final waste disposal site twice a day, in the morning and afternoon. Each day, they can only manage about 80% of the waste, resulting in an accumulation of approximately 20% of waste that remains uncollected. This accumulation leads to further piling up, compounded by the condition of the fleet, which requires regular maintenance[2].

Fifth, the repair of damaged and clogged drainage systems. This repair can be identified as set (E). The elements in (E) include actions such as 'cleaning the drainage' and 'repairing leaking gutters.' Thus, (E) represents a set of activities focused on infrastructure repair. Findings in set (E) indicate the need for repairs to damaged and clogged channels, whether due to physical deterioration or waste accumulation. This recommendation is related to providing additional supporting facilities and infrastructure for local governments, particularly in areas designated as temporary waste collection sites. This concept can support efforts to maintain environmental health [47]. Urban waste management is indeed a crucial issue, especially concerning the limitations of facilities, land, and human resources. These challenges hinder efforts to improve environmental and community health [48], [49].

Sixth, socialization and raising awareness. This activity can be associated with set (F). The elements in (F) include activities such as 'holding seminars on waste management' and 'educating the community about the impact of waste on the environment.' Thus, (F) represents a set of socialization and education efforts. Seventh, enhancing community knowledge in waste management. This enhancement can be represented by set (G), which includes elements such as 'conducting waste management training' and 'distributing informational brochures on recycling.' Therefore, (G) represents the body of knowledge acquired by the community [46], [50]–[52].

Eighth, the provision of personal protective equipment for cleanliness officers. This personal protective equipment can be identified as set (H). The elements in (H) include items such as 'masks' and 'rubber gloves.' Thus, (H) represents a set of protections for cleanliness officers. Research data indicate that not all cleanliness



officers observed in the field have adequate personal protective equipment [53], [54]. Nevertheless, experts' attention to the importance of self-protection for cleanliness officers in performing their duties remains limited. Most experts emphasize the importance of involving all parties in maintaining the cleanliness of the surrounding environment [20], [47], [55].

Ninth, the evaluation of cleanliness fees at Baruga Market in Kendari City. This evaluation process needs to involve all relevant stakeholders, including local government, market management, traders, volunteers, and cleanliness officers, to ensure that waste management at the temporary collection site is effective, efficient, and supports the cleanliness of the market, environment, and nearby rivers [56]. The waste management system at Baruga Market is still inadequate, as all waste is disposed of in containers without separating organic and inorganic waste. However, waste collection at Baruga Market has been functioning well, thanks to the cooperation between cleanliness officers and traders. The waste transportation, though, remains inefficient, as officers only use push carts. The Temporary Waste Collection Site (TPS) at Baruga Market also does not meet requirements, as there are no containers for traders' waste, leaving the TPS as an open, vacant area that results in littering. On the other hand, traders' participation in providing waste bins is commendable, with nearly all traders having their own waste storage containers. Additionally, traders are prompt in paying cleanliness fees at Baruga Market, with all of them contributing daily fees to the management. Lastly, traders actively participate in maintaining cleanliness at Baruga Market by cleaning their selling areas every day. Market management has also implemented the 'Clean Thursday' program to ensure the market area remains clean [57].

The importance of environmental awareness and community participation in maintaining environmental sustainability is highly relevant in the context of education. Furthermore, efforts should be made to utilize e-governance and digital technology to monitor and report environmental issues, providing concrete examples of how future teachers can leverage technology in environmental education [58]. Community involvement in environmental decision-making is also a crucial aspect that can be incorporated into teaching methods for prospective teachers. Through the strategies outlined in this article to address challenges in environmental management, future teachers can adapt these approaches within their educational programs to enhance environmental awareness among students. Thus, this article offers valuable insights and a strong foundation for developing the concept of environmental care performance among future educators.

## CONCLUSION

Prospective elementary school teachers have demonstrated their ability to observe and document the conditions of waste collection sites in their surroundings. They successfully identified various waste management issues at several locations, such as clogged drainage systems, waste accumulation around temporary collection sites, capacity exceeding quotas, and litter scattered along roads and rivers. The prospective teachers were also able to document these findings effectively, allowing for further analysis regarding the implications and impacts of waste management issues.

In addition, these prospective teachers have developed leadership skills in formulating waste management recommendations that can be easily adapted in the future. They can create recommendations based on their findings, which include raising community awareness, improving waste management infrastructure, waste reduction, minimizing environmental impact, and community empowerment. Furthermore, they can integrate the Science II curriculum for elementary schools with themes related to the environment and environmental education to cultivate environmental awareness among students and foster positive character traits that form the basis for environmentally friendly behaviors.

This article suggests several recommendations for stakeholders to focus on improving waste management infrastructure by local governments/stakeholders, enhancing community participation and awareness, and strengthening the capacity of stakeholders in waste management at various observed locations.

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## FOOTNOTES

[1] An interview was conducted with Mrs. IS (name anonymized) on November 30, 2023. She is a 35-year-old woman who works as a vegetable trader at Pasar Baruga in Kendari, Indonesia.

[2] An interview was conducted with Mr. Ahmad (name anonymized) on November 30, 2023. He is a 45-year-old man. The interview was semi-structured and took place while Mr. Ahmad was on a break, overseeing the garbage truck fleet that transports waste from the collection bins at Pasar Baruga in Kendari to the final disposal site.