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Community-Based Waste Management in Mosques: Zero Waste Practices at Salman Mosque, Bandung Institute of Technology

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Abstract:
This study aims to analyze a community-based waste management model through the zero-waste program at Salman Mosque ITB as an effort to address social and ecological issues caused by waste generation. The zero-waste approach is crucial because the growing population is not accompanied by adequate awareness and mindset in managing waste, resulting in the overcapacity of Final Disposal Sites (TPA). This research employs a qualitative method using field studies and literature reviews. The data were collected through observation, interviews, documentation, and literature studies from books, scientific articles, and relevant online sources. The findings reveal that the Salman Environment Rangers (Savior) community, empowered at Salman Mosque ITB, plays a central role in educating the public about waste sorting and management, as well as implementing a waste donation program to reduce the burden on TPA. The implications of this study demonstrate that a community-based approach through the zero-waste program can foster responsible consumption and production patterns and contribute to achieving the Sustainable Development Goals (SDGs). The originality of this research lies in its direct observation of community-based waste management practices in a mosque setting, which remains underexplored in the context of zero waste in Indonesia.
Keywords**:** *Community; Waste Management; Salman Mosque ITB; Zero Waste.*

Abstrak
Penelitian ini bertujuan untuk menganalisis model pengelolaan sampah berbasis komunitas melalui program zero waste di Masjid Salman ITB sebagai upaya mengatasi persoalan sosial dan ekologis akibat timbulan sampah. Pendekatan zero waste menjadi penting karena populasi yang terus meningkat tidak diiringi dengan kesadaran dan pola pikir yang tepat dalam mengelola sampah, yang menyebabkan Tempat Pembuangan Akhir (TPA) mengalami kelebihan kapasitas. Penelitian ini menggunakan metode

kualitatif dengan pendekatan studi lapangan dan studi kepustakaan. Data diperoleh melalui observasi, wawancara, dokumentasi, serta studi literatur dari buku, artikel ilmiah, dan sumber daring yang relevan. Temuan menunjukkan bahwa komunitas Salman Environment Rangers (Savior) yang diberdayakan di Masjid Salman ITB memiliki peran sentral dalam edukasi pemilahan dan pengelolaan sampah, serta pelaksanaan program sedekah sampah untuk mengurangi beban TPA. Implikasi dari penelitian ini menunjukkan bahwa pendekatan berbasis komunitas melalui program zero waste mampu menumbuhkan pola konsumsi dan produksi yang bertanggung jawab, serta berkontribusi terhadap pencapaian Tujuan Pembangunan Berkelanjutan (SDGs). Keaslian penelitian ini terletak pada pengamatan langsung terhadap praktik pengelolaan sampah berbasis komunitas di lingkungan masjid, yang belum banyak dikaji dalam konteks zero waste di Indonesia.
Kata Kunci: Komunitas; Pengelolaan Sampah, Masjid Salman IT, Zero Waste.

INTRODUCTION

The continuous growth of the human population each year significantly impacts the environment, particularly in terms of waste production. Indonesia, as the most populous country in Southeast Asia, generated approximately 19.45 million tons of waste in 2022 (Annur, 2022). Waste has now become a critical part of the global environmental crisis. Around 30% of total waste contributes to climate change and ongoing ecological disturbances on Earth (Nandy et al., 2022). The lack of environmental awareness and responsible consumption patterns alongside rapid population growth has led to an annual increase in waste volume. Lower-income communities tend to produce more organic waste, while higher-income groups contribute more metal, glass, and paper waste (Nanda & Berruti, 2021). The massive use of plastics further complicates waste management, as plastics take a long time to decompose and negatively affect both health and the environment (Pan et al., 2020; Rajmohan et al., 2019). Unfortunately, waste management efforts in Indonesia still rely on conventional practices—collecting waste from households and dumping it directly into final disposal sites without prior sorting—which has led to overcapacity in landfills (Idumah & Nwuzor, 2019; Menegaki & Damigos, 2018).

Previous studies have examined waste management issues from various perspectives. First, technological approaches such as incinerators, sanitary landfills, and open dumping still dominate waste management practices in Indonesia, although these methods are not environmentally friendly and often lack waste sorting at the source (Das et al., 2019; Qamari, 2019). Second, research on the environmental impact of plastic consumption and modern technology production has shown that plastic and electronic waste pose new challenges due to their large-scale production and short lifespan (Rajmohan et al., 2019; Rautela et al., 2021). Third, several studies on community empowerment have indicated that communities hold the potential to transform social and environmental behaviors through participatory activities (Tabassum et al., 2018; Ulum & Anggaini, 2020). However, there is still a gap in integrating the zero-waste approach with community-based initiatives in religious social spaces such as mosques. Research exploring the role of religious communities in structured and sustainable waste management remains limited, even though these communities possess substantial potential to collectively shape ecological behaviors (Campitelli & Schebek, 2020; Moh & Abd Manaf, 2017).

This study aims to analyze a community-based waste management model using the zero-waste approach implemented by the Salman Environment Rangers (Savior) at the Salman Mosque of the Bandung Institute of Technology (ITB). The study explores how communities can foster waste awareness through collaboration grounded in religious values and

environmental education. The zero-waste program focuses on waste sorting at the source—households—into categories such as organic, low-value inorganic, and high-value inorganic waste, which facilitates processing and reduces the burden on landfills (Fatkhah et al., 2020). Through this approach, the study aims to contribute meaningfully to the Sustainable Development Goals (SDGs), particularly Goal 12 on responsible consumption and production (Winston, 2022).

This research is based on the argument that community-based waste management, particularly through the zero-waste concept, can serve as an effective solution to the waste crisis in urban societies. A community like Savior, which operates within the environment of Salman Mosque ITB, demonstrates that environmental movements can align with spiritual values, nurture ecological consciousness, and strengthen community resilience (Koliou et al., 2020). The main hypothesis of this study asserts that a collaboratively and participatively implemented zero-waste program by a religious community can reduce the volume of waste sent to landfills, enhance public environmental awareness, and serve as a sustainable waste management model in faith-based public spaces (Bezama & Agamuthu, 2019; Khan et al., 2019; Luttenberger, 2020; Sundana, 2019).

METHOD

The unit of analysis in this study is the community that drives the zero-waste-based waste management program at Salman Mosque, Bandung Institute of Technology (ITB), specifically the Salman Environment Rangers (Savior) community. This research focuses on the waste management practices carried out by this community, along with the social dynamics that emerge during the program's implementation. The main subjects of this study include the activities, strategies, and impacts of the zero-waste program on environmental awareness and ecological behavior within the Salman Mosque ITB community.

This study adopts a qualitative approach using a field research design, combined with library research (Lune & Berg, 2017; Prasetio, 2022). The qualitative approach was chosen because this study seeks to understand the community's social processes, values, and practices in managing waste in depth (Kustana, 2024). This method enables the researcher to explore the meanings, perceptions, and strategies employed by the Savior community in applying zero-waste principles (Maxwell, 2008). This design is the most appropriate for examining phenomena contextually and interpretively within the participatory social life of the community.

The study uses two types of data sources: primary and secondary. The primary data come from key informants directly involved in the implementation of the zero-waste program, particularly Farras Rayhan, a representative from the Savior Model Initiative. In addition, the researcher collected primary data through direct observation of the community's activities. Secondary data were gathered from supporting literature such as books, peer-reviewed journal articles, program documents, and relevant online sources discussing waste management, the zero-waste approach, and the role of communities in sustainable development.

The data collection process involved three main techniques: observation, interviews, and documentation. The researcher conducted direct observation at Salman Mosque ITB by monitoring the activities of the Savior community in implementing the zero-waste program, including waste sorting, environmental education, and social interactions among community members. The researcher also conducted an in-depth interview with Farras Rayhan as the key informant to gain insights into the background, implementation, and challenges of the program. Observation and interviews were conducted in June 2023. Documentation was used

to gather visual and written evidence, such as photographs of activities, educational infographics, and program planning and evaluation documents.

The collected data were analyzed using narrative analysis in a descriptive-systematic manner (Miles & Huberman, 2013). The researcher identified key patterns from the observations, interviews, and documentation, and organized them into a coherent narrative that illustrates the dynamics of the zero-waste program implemented by the Savior community. Data from the library research served to complement, reinforce, and broaden the understanding of field findings. The researcher validated the data through triangulation, comparing and cross-checking information from various sources to ensure high credibility in the research results (Sulastri et al., 2024).

RESULTS AND DISCUSSION

The Initial Implementation of the Zero Waste Program by the Savior Community

The research findings show that the zero-waste program at Salman Mosque ITB began in 2022 during the Ramadan activities organized by the Committee for Ramadan and Eid al-Adha Implementation (P3RI). The committee established a dedicated zero-waste division, which later evolved into the Salman Environment Rangers (Savior) community—a movement focused on waste segregation and environmental action to support the vision of an environmentally friendly Salman Mosque (Masjid Salman ITB, 2023).

Based on an interview with Farras Rayhan, a representative of the Savior Model Initiative, the community's formation stemmed from a collective awareness among students, activists, and mosque staff who shared a concern for environmental issues. This potential was then unified into a more structured and coordinated movement. Farras stated: "*We saw many people who actually cared about the environment, but their efforts were not organized. So we created Savior to facilitate that, so the movement could be structured and sustainable*" (Farras Rayhan, Interview, June 13, 2023).

Field observations and documentation reveal that Savior operates with a clear division of roles: educators, runners, and documenters. Educators deliver direct education to the public on waste sorting at designated collection points. Runners play a more mobile role, especially during the breaking of the fast, when waste volumes tend to spike. Documenters are responsible for recording all activities, both as data and visual media. This organized division of roles ensures that each stage of the initiative functions effectively.

The community's efforts extend beyond field activities. They also conduct internal capacity-building programs, including group discussions, module development, and action planning. These efforts aim to bridge theoretical understanding and practical execution. Savior also promotes inclusivity by welcoming new members from any academic discipline. Interested individuals simply register online and are required to complete a three-day zero-waste lifestyle challenge. This challenge helps build awareness and foster responsible consumption habits. Afterward, the community conducts virtual interviews to assess applicants' understanding of waste issues and management.

Successful candidates participate in an orientation session led by Salman Mosque's sanitation staff and other facilitators. These sessions cover waste management, ecological awareness, and human responsibility toward environmental stewardship. They also include interactive elements such as games, prizes, and environmental action planning to foster group identity and engagement. At the end of the orientation, members are formally welcomed and given the title "rangers," symbolizing their active role as environmental defenders in the community.

The findings reveal several key patterns. *First,* the community effectively leveraged the momentum of Ramadan to introduce sustainability values into religious practices. *Second,* Savior's participatory and flexible organizational structure created a space for students from diverse backgrounds to engage meaningfully. *Third,* the combination of educational and practical approaches grounded the program in daily life, preventing it from becoming merely ceremonial.

These results indicate that the formation of the Savior community was not only a response to the waste problem but also a strategic effort to cultivate a new, nature-conscious culture at Salman Mosque ITB. This model demonstrates how a participatory, educational, and community-based approach can offer an effective solution to environmental challenges through structured, inclusive, and sustainable action. These findings support the initial assumption that community-based waste management possesses strong transformative power—especially when it integrates religious values with ecological consciousness in everyday practice.

Waste Segregation Model in the Implementation of the Zero-Waste Program

One of the key findings in this study is the implementation of a waste segregation model as an integral part of the zero-waste program at Salman Mosque ITB. Through the Salman Environment Rangers (Savior) community, the team conducted a Pilot Model Research (RRM) from February 19 to 26, 2023. This research involved environmentally conscious volunteers and aimed to analyze the characteristics of waste within the mosque area, measure daily waste generation, calculate trash bin volume, and estimate the cost of segregated waste management (Masjid Salman ITB, 2023). The activity began with collecting data on room layouts and available facilities, followed by the placement of empty trash bags at strategic points. The team analyzed the collected waste daily to understand consumption pattern differences between weekdays and weekends.

The research data revealed that most of the waste came from congregants engaging in activities at Salman Mosque ITB, with waste types ranging from organic materials, paper, and plastic to residual waste. This finding became the basis for designing trash bins that match the dominant waste types in each mosque area. The segregation system consists of five color-coded categories as a visual education tool: blue for paper (Tetra Pak, cardboard, newspaper, duplex), yellow for bottles (plastic, cans, boxes), red for clean plastic, green for organic waste (food scraps, dry tissues, leaves), and black for residual waste (greasy paper, wet tissues, rubber) (Masjid Salman ITB, 2023).

In an interview conducted in June 2023, Farras Rayhan explained: "*This model not only provides various types of trash bins but also creates an active education system, both through rangers on-site and through digital content on social media.*" (Farras Rayhan, Interview, June 13, 2023)

The Savior team assigned its members to each sorting station to assist and educate the public on how to correctly separate waste. They also reinforced the education through digital content, including infographics, short videos, and environmental awareness campaigns on Savior's official social media platforms, aiming to broaden public understanding.

Figure 1. Waste Segregation Bin

Source: Research Documentation, 2023.

Several prominent patterns emerged from these findings. *First,* the educational approach was both visual and direct, making it easier for the public to understand the differences between waste types. *Second,* the design of the trash bins was based on research findings on the most common types of waste rather than general assumptions. *Third,* the traditional paradigm of "mix-collect-transport-dispose" began shifting toward a "sort-process-utilize" system driven by community awareness. *Fourth,* the edutainment (education + entertainment) method successfully encouraged greater public engagement.

The data suggest that the waste segregation model at Salman Mosque ITB goes beyond simply providing trash bin infrastructure. It functions as a cultural and behavioral intervention. This implementation has shifted public behavior from indiscriminate disposal to intentional sorting and repurposing of waste. The community is currently pursuing a mid-term goal of diverting 70% of waste from ending up in the landfill (TPA), using a systematic, measurable, and collaborative approach. These findings strengthen the argument that community- and data-driven waste management offers practical and applicable solutions to local environmental challenges.

Implementation of Education and Waste Processing as Zero-Waste Action

The third piece of evidence in this study shows that Salman Mosque ITB not only provides physical facilities for waste segregation but also actively integrates Islamic values and global sustainability principles into its waste management efforts. Waste segregation at the mosque serves as a practical implementation of Islamic teachings on cleanliness and environmental stewardship. According to the mosque's internal documentation, the act of sorting waste becomes a form of da'wah (religious outreach) for congregants from various backgrounds (Masjid Salman ITB, 2023). This demonstrates that waste management is not merely a technical issue but also an integral part of religious practice.

Salman Mosque ITB also applies Sustainable Development Goal (SDG) 12, which promotes responsible consumption and production. One tangible example is the provision of drinking water refill stations at several points in the mosque to reduce the use of single-use plastic bottles. Education for the congregation serves as the main action taken before any technical steps such as sorting, measuring, managing, and processing waste. The mosque

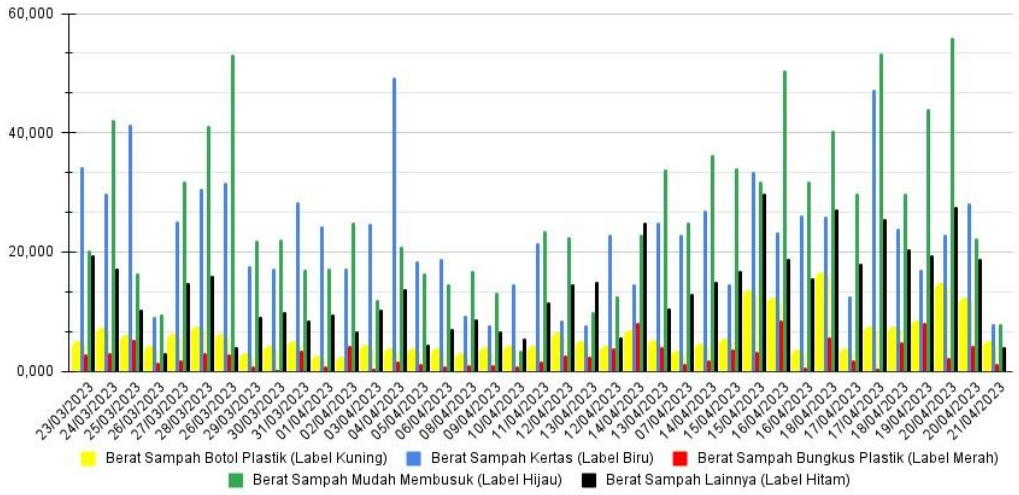
delivers educational messages verbally, especially during Ramadan. One such announcement reads:

> *"Dear congregants, Salman Mosque ITB is committed to waste segregation in its waste management… please separate your waste according to its category and remove the plastic cap from your water cup…"* (Farras Rayhan, Interview, June 13, 2023)

The mosque committee delivers this announcement based on the location of congregants—such as corridors, hallways, and staircases leading to the multipurpose building—to help guide them in disposing of their waste properly.

Next, the team performs a "measuring" action by collecting daily data on waste weight throughout the month of Ramadan. Volunteers record this data through Google Forms, logging both the weight and the sorting quality of each waste category. The results are visualized in *Figure 2. Waste Generation Fluctuation at Salman Mosque ITB during Ramadan 2023*.

Figure 2. Waste Generation Fluctuation at Salman Mosque ITB during Ramadan 2023



Source: Research Documentation, 2023.

The figure shows a fluctuating pattern: high at the beginning of Ramadan, lower in the middle, and rising again toward the end. After segregation, the waste is stored in a temporary holding area before further processing. The blue-category waste (paper) and yellow-category waste (bottles and cans) are sold to recyclers. The green-category waste (organic) is composted using five composting drums and compost pits located in the mosque's courtyard. This process is also supported by Black Soldier Fly (BSF) bioconversion technology in collaboration with the Sabuga Waste Management Center. Meanwhile, the red (clean plastic) and black (residual) waste, which cannot be processed, is transported to the landfill.

Another significant finding is the mosque's *"waste donation"* program, which reflects how Islamic values can be transformed into environmental action. In response to a fatwa from the Indonesian Ulema Council (MUI) regarding environmental issues, Salman Mosque initiated this program to encourage the community to donate clean, recyclable waste—such as bottles, paper, and cans—as a form of ongoing charity (*amal jariyah*). The mosque sells this waste to the Sadang Serang Main Waste Bank, and the proceeds support mosque operations. The program effectively attracts public participation by framing waste as something valuable and worthy of being "offered" in a religious context.

From these various data points, several key patterns emerge. *First,* education serves as the foundational pillar of every waste management process. Without strong education, people tend to be confused or indifferent about the segregation system. *Second,* the systematic and digital data collection process simplifies evaluation and decision-making. *Third,* cross-

institutional collaboration—with religious authorities (MUI), academic institutions (Sabuga), and recycling communities—amplifies the impact of the program. *Fourth,* the religious framing of the "waste donation" program proves to be a socially effective strategy that engages people of all ages and backgrounds.

The implications of these findings show that Salman Mosque ITB has successfully transformed itself from merely a place of worship into a religion-based environmental education center. Waste management is no longer seen as solely the responsibility of the government or sanitation workers, but rather as a form of collective worship. The zero-waste program at Salman Mosque ITB serves as an inspiring model that other places of worship can replicate. By combining spiritual, technical, and educational approaches, this program demonstrates how small, consistent, and collective actions can significantly reduce waste volume and contribute to achieving the SDGs at the local level.

Discussion

This study reveals that the community-based waste management model at Salman Mosque ITB has been implemented holistically through educational, technical, and religious-value-based approaches under the Zero Waste program. Key findings include a color-coded waste sorting system, a drinking water refill program, active congregation education, systematic waste volume measurement and recording, independent organic waste processing, and the execution of a "waste donation" initiative. These efforts not only represent effective waste management practices but also instill spiritual values as part of environmentally responsible behavior.

These results highlight the interconnection between religious values, environmental awareness, and community participation. Continuous education plays a central role in encouraging active participation from the congregation. Delivering environmental messages within a religious context—such as during Ramadan announcements and through the waste donation program—fosters emotional connection and spiritual responsibility in waste management. The reduction in unsorted waste volume also stems from the availability of proper physical facilities (such as separated bins), well-organized digital tracking systems, and the presence of supporting partners, including recyclers and waste banks. This aligns with core Zero Waste principles, which emphasize source reduction, reuse, recycling, and maximum resource recovery (Khurshid et al., 2024; Laštůvka et al., 2016; Zaman, 2015).

From a strategic perspective, the implementation at Salman Mosque ITB reflects the 7Rs principle—Reduce, Reuse, Recycle, Refuse, Repair, Rethink, and Replace—which forms the foundation of modern Zero Waste management (Palaq et al., 2024). This strategy has proven effective in promoting waste reduction behavior and strengthening community resilience to environmental issues. Educational efforts and community involvement also serve as key success factors, supporting arguments by Zaman (2014) and Palaq et al. (2024) that stakeholder and local community engagement are vital for sustaining waste management systems.

Compared to previous studies, the community-based waste management model at Salman Mosque ITB displays unique characteristics. For instance, Yuliana (2019) found that community participation typically increases when economic incentives are offered. However, in this context, participation is primarily driven by spiritual values, such as *sedekah* and *amal jariyah*. This finding reinforces the idea that religion-based approaches can serve as effective alternatives for raising environmental awareness. It complements the work of Ebrahimi and North (2017), which emphasized the role of institutions in fostering a sustainability culture in

campus waste management. Located within an educational environment, Salman Mosque plays a similar role by integrating environmental education into religious and social activities.

The significance of these findings lies in the realization that waste management is not merely a technical or administrative matter—it can also serve as a spiritual and social movement. The "waste donation" program, for example, delivers a transformative message: waste is not just a by-product to be discarded but a valuable resource when managed properly. Beyond reducing landfill-bound waste, the program also contributes to mosque operations and strengthens social ties among community members. This aligns with the social and environmental benefits of the Zero Waste movement, as mentioned by Bogusz et al. (2021), who stated that such programs can enhance community quality of life and promote sustainable living.

However, several critical reflections also emerge from the implementation. Despite intensive education efforts, not all congregants fully understand proper waste sorting, as seen in the subjective evaluations of waste separation quality. Additionally, the self-managed organic waste processing system may face technical and operational challenges if waste volume increases. These issues indicate that while religious community-based approaches hold great potential, they still require structural support and continuous technical assistance to avoid stagnation. As Khurshid et al. (2024) also noted, Zero Waste implementation often encounters challenges related to technical, logistical, and regulatory aspects.

Based on these findings, several policy actions could be considered. These include expanding educational outreach through digital media and regular training, forming a cross-generational Zero Waste volunteer team within the mosque, and strengthening collaborations with environmental organizations, universities, and local governments for community-based waste management. Furthermore, replicating the Salman Mosque model in other mosques would help scale up the eco-friendly mosque movement nationwide. This aligns with the experience of Chinese cities in building Zero Waste Cities, where strategic success depends heavily on policy support and cross-sector collaboration (Meng et al., 2021). Therefore, mosques can evolve beyond being places of worship into sustainable centers for environmental and social transformation within the future Zero Waste framework.

CONCLUSION

This study demonstrates that the community-based waste management model implemented at Salman Mosque ITB through a Zero Waste approach has successfully created a system that is not only technically effective but also socially and spiritually strong. The main findings reveal that the integration of religious values, environmental education, infrastructure support, and strategic partnerships has fostered a collective awareness among congregants to manage waste sustainably. Programs such as color-coded waste sorting, refill stations, waste donation (*sedekah sampah*), and independent organic waste processing serve as concrete examples of a participatory and measurable waste management strategy. The active involvement of the mosque community in these initiatives illustrates the significant potential of religious institutions as driving forces for environmental behavior change.

The scientific contribution of this research lies in the development of a community-based waste management model that merges technical and spiritual approaches within the Zero Waste framework. This study offers a new perspective: religious values can serve as a powerful foundation for promoting environmental sustainability, particularly in worship-based community contexts. Additionally, the study enriches Zero Waste literature by introducing the religious dimension as a crucial element in shaping a holistic and context-sensitive management system. This approach also provides inspiration for the development

of community-based public policies that leverage local values to strengthen environmental program implementation.

However, this study has certain limitations in its scope and methodology. It focuses solely on a single location—Salman Mosque ITB—so applying the findings to other communities must be done cautiously. Moreover, the qualitative method used did not explore quantitative data such as the exact amount of waste reduction over a specific period. Therefore, future research should expand the study area to include other mosques with different characteristics and combine both quantitative and qualitative approaches to provide a more comprehensive and in-depth understanding of the effectiveness of the community-based Zero Waste model across various social and cultural contexts.

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