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ANALYSIS OF CHANGES IN COMMUNITY BEHAVIOR IN WASTE MANAGEMENT THROUGH ZERO WASTE COMMUNITY: A CASE STUDY OF MEDAN PERJUANGAN CITY

[1] Dhio Febriansyah Lubis, [2] Dwidya Nuari, [3] Habibatul Sumardi
Geography Education/Faculty of Social Sciences
State University of Medan
Email: habibatulq@gmail.com

ABSTRACT

Indonesia's waste problem is increasingly pressing, with 69.9 million tons of waste generated by 2023, more than a third of which remains unmanaged. Medan, one of the largest waste contributors, faces two challenges: limited landfill sites and a lack of awareness of household waste sorting. This study investigates how people change their waste management practices while living in a Zero Waste community in Medan Perjuangan District. A literature review highlights that environmental knowledge, attitudes, and awareness are crucial for shaping pro-environmental behavior. The review also highlights that the Zero Waste Indonesia (ZWID) community fosters social transformation. The study used mixed methods; a total of 20 respondents were selected from the Medan Zero Waste community. Data were collected through observation, questionnaires, interviews, and document analysis. According to the study, Zero Waste principles remain ineffective, although awareness and environmentally friendly practices such as waste sorting and product reuse have increased. An effectiveness score below 50 was given to 95% of respondents, indicating that they have not yet implemented the ideal behavioral changes. The main obstacles are the habit of using single-use plastics, the lack of recycling infrastructure, and the lack of economic incentives. Zero Waste communities are crucial for driving behavioral change, but more people need to contribute through facilities, stricter regulations, and community incentive programs. To accelerate the transition to more participatory and sustainable household waste management, governments, communities, and civil society must work together.

Keywords : *Zero Waste, Waste Management, Medan Perjuangan City, Sustainable*

INTRODUCTION

Waste is a major environmental management issue in Indonesia. National waste generation is estimated to reach approximately 69.9 million tons per year by 2023, with a managed level of 66.28% and the remaining 33.72% unmanaged (Ministry of Environment and Forestry, 2023). This data is collected through the National Waste Management Information System (SIPSN). As the center of the community's economy, traditional markets are often considered a source of congestion and a major contributor to waste generation. The amount of waste in the city continues to increase daily (Azzahra & Pujihartati, 2024). This includes organic waste from leftover vegetables, fruit, and fresh food, as well as inorganic waste from plastic bags and packaging.

According to Kompas (2024), in 2023, Medan City produced 1,768 tons of waste per day, or 645,700 tons per year. This increase in waste production is due to increasing economic activity, population growth, and community consumption patterns. Because most waste is not properly managed, this problem is increasingly complex. This is due to the limited capacity of landfills and a lack of knowledge about sorting at the household and market levels. Therefore, it is crucial to analyze how community behavior changes when using Zero Waste communities to manage waste. It is hoped that this movement will encourage the community to become more active in reducing, sorting, and recycling waste at its own source, thereby reducing the burden on landfills and creating a cleaner, healthier, and more sustainable city environment.

*Corresponding author.
e-mail: habibatulq@gmail.com

The increasing trend of waste production across the country is clear. By 2022, waste volume is expected to reach 33.9 million tons, up from 29.3 million tons in 2019 (Kompas, 2023). Only 14.5% of waste is managed properly, but 49.8% is successfully reduced at source. The average annual waste volume of 62.9 million cubic meters exceeds the landfill capacity of 37.1 million cubic meters in several provinces (Kompas, 2023). This situation highlights a crisis in waste management, which requires collaboration and innovative solutions.

Zero Waste Indonesia (ZWID) was founded in 2018 and is an online community that applies the 6R principle (Rethink, Refuse, Reduce, Reuse, Recycle, and Rot) as a guideline for waste reduction (Pancar.id, 2025). Its Synergy Festival Towards a Sustainable Nation, Clothes Swap, and 30-Day Zero Waste Challenge have attracted thousands of people (Dewi Magazine, 2021; Alinear.id, 2025). The results show that changing individual behavior can be a solution.

Previous research has explored various waste management strategies, but few have focused on how urban behavior changes in densely populated areas like Medan Sunggal. Furthermore, based on the most recent data from 2019–2025, research linking zero-waste communities to household waste management performance indicators is limited.

Based on this background, this study aims to analyze the implementation of the Zero Waste principle as a community-based waste management strategy in Medan Sunggal. The research focuses on: (1) the level of community awareness, (2) the role of communities such as ZWID in strengthening Zero Waste practices, and (3) strategic recommendations to improve the effectiveness of household waste management.

LITERATURE REVIEW 1. Environmental Awareness

Environmental awareness can be defined as a state of "awareness," meaning a feeling of knowing and understanding the importance of maintaining a healthy and clean environment. This feeling is manifested through pro-environmental thoughts, attitudes, and actions carried out without coercion (Widjaja, 2021). This awareness is crucial because it helps citizens act in an environmentally friendly manner (Ajzen in Cruz, 2017). This demonstrates that environmental knowledge alone is insufficient without awareness that drives concrete action.

2. Knowledge, Attitude, and Behavior

a) Knowledge is a person's conscious understanding of something, encompassing the relationship between the subject (the knower) and the object (the known). This knowledge helps a person understand and recognize certain things. Attitudes reflect mental evaluations and primary tendencies toward an object whether positive, negative, or indifferent which then influence a person's tendency to approach or avoid that object (general psychology text).

b) Behavior is a reaction or response to a stimulus based on what a person knows and feels. Behavior can change due to adaptation to genetic and environmental factors. This component aligns with the Knowledge Attitude Practice (KAP) model in health promotion, which emphasizes that attitudes are influenced by knowledge, which in turn influences behavior.

3. Proactive Environmental Behavior

Environmental awareness is often associated with responsible and pro-environmental citizenship behavior. According to Kollmuss and Agyeman (2002), internal factors such as knowledge, attitudes, emotional involvement, and personal responsibility are key drivers. A study at the University of Medan found that, despite having adequate knowledge, students still engaged in environmentally unfriendly behavior. This indicates a gap between reality and their knowledge, resulting in a lack of information. Research conducted in 2025 found that social norms and control factors had a greater influence on the implementation of Zero Waste in everyday life.

An effective environmental management system can improve people's quality of life by encouraging recycling, promoting proper waste management, and supporting circular economic activities. According to a study by ,, to reduce pollution, improve public health, and ensure sustainable growth in Indonesia, a developing country with a large and growing population, environmental stability is crucial. To create a balance between economic development and

*Corresponding author.
e-mail: habibatulq@gmail.com

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environmental sustainability, communities must be proactive in managing waste, such as sorting, recycling, and reducing waste at the source.

4. Waste management

Under Law Number 18 of 2008 concerning Waste Management, waste is divided into two categories: household waste (and similar waste) and specific waste, which encompasses reduction and handling (e.g., sorting, collection, and processing). Government Regulation Number 27 of 2020 complements this law by specifically regulating waste, including types of waste that require special handling. These principles provide an important legal framework for the implementation of organized and comprehensive waste management.

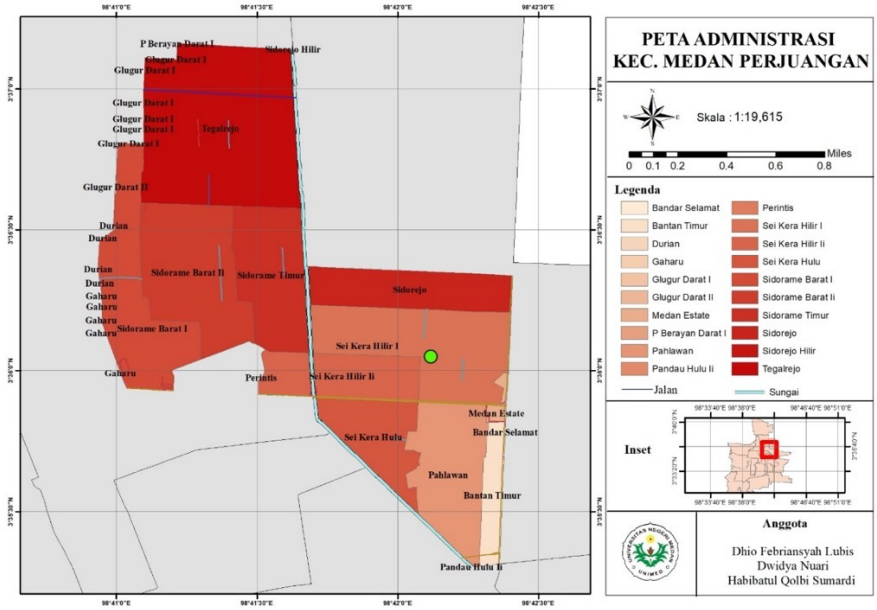
5. Zero Waste Indonesia Community (ZWID)

Sustainable Living Indonesia (founded in 2018) focuses on providing education, collaboration, and information about a low-waste lifestyle that avoids single-use plastics and hard-to-recycle materials. A study by Brawijaya (2023) showed that ZWID on social media has brought about real changes in society, such as the implementation of the 5R principles, a more environmentally friendly mindset, and a greater sense of responsibility towards waste. Communities like ZWID help people change behavior through education and digital collaboration. This community demonstrates a positive transformation from theory to reality .

METHOD

This study was carried out in Medan City, North Sumatra, with a specific focus on the area of Jl. Gurilla No. 109, Sei Kera Hilir I, Medan Perjuangan District. Three separate sessions of fieldwork were conducted in 2024, on November 11, November 18, and November 25. To ensure data accuracy, observational consistency, and validation of findings at the study location, these regular visits were conducted.

***Figure 1** , Research Location Map*



This study employed a mixed-methods approach, which combines qualitative and quantitative techniques, to better understand how household waste management practices have changed in communities implementing zero-waste projects. Although quantitative data alone may be able to capture structured indicators such as knowledge, attitudes, and behavioral patterns, it may not be able to fully reveal the underlying motivations, lived experiences, and sociocultural contexts that influence these behaviors. This is the rationale behind the combination. In order to better understand the motivations, difficulties, and perceptions that community members encountered when implementing

*Corresponding author.
e-mail: habibatulq@gmail.com

zero-waste practices, the qualitative strand of this study sought to better understand the quantitative strand, which was designed to measure knowledge, attitudes, and behavioral dimensions in a systematic and structured manner using a standardized questionnaire (Sugiyono, 2021; Yusnidar et al., 2022).

According to the demographic and sampling principles described by Riduwan (2020), the study concentrated on a relatively small community of twenty people, all of whom were selected as respondents using a thorough sample technique to attain full representativeness of the study population. The data collection techniques were meticulously triangulated to boost credibility. These included in-depth interviews to capture subjective experiences and personal narratives, participant observation to document behavioral patterns in real-life scenarios, and document analysis to supplement and strengthen primary data sources.

The quantitative tool was a 30-item questionnaire that systematically addressed the three main aspects of waste management knowledge, attitudes, and behavior. Responses were quantified using a five-point Likert scale, where 1 indicates strongly disagree and 5 indicates strongly agree. This allowed for the assessment of the level of intensity and variance across multiple constructs. To ensure rigor, the instrument's reliability was assessed using Cronbach's Alpha; the result was 0.70, showing a sufficient level of internal consistency. Additionally, waste management and social research experts evaluated the items to guarantee their representativeness and relevance, using expert judgment to evaluate the content validity (Lestari & Prasetyo, 2023).

The qualitative data was processed using Miles, Huberman, and Saldaña's (2014) interactive model. Data reduction (condensing and selecting key information), data display (organizing results in a systematic way), and conclusion drawing/verification (developing thematic interpretations and validating patterns) are its three iterative phases. The quantitative data was assessed using the Tscore transformation, which standardizes the distribution and permits insightful score interpretation. $T = 50 + 10 \times (XI - X/S)$ is the formula. The results were then separated into two categories: ineffective if the score was below 50 and effective if the score was above 50. This dual analytical approach ensured that the findings were both empirically and socially important by allowing the study to quantify behavioral change and place it within the lived experiences of the community.

RESULTS AND DISCUSSION

This study aims to analyze changes in community behavior related to waste management through the Zero Waste community in Medan Perjuangan, Medan. Data collected from interviews, observations, and questionnaires show that the program has encouraged greater awareness of sustainable waste practices, including waste separation, recycling, and reduced use of single-use plastics. Community members reported stronger commitment to collective action, such as participating in waste banks and composting activities, while also showing improved knowledge and attitudes toward environmental responsibility. However, the findings also indicate that some challenges remain, particularly related to limited resources, entrenched daily habits, and the need for stronger institutional support to sustain long-term behavioral change.Based on data collected through interviews, observations, and questionnaires, several key findings reflecting changes in community behavior can be summarized as follows:

Table 4.1 Respondent Identity

NO	NAME	AGE	LAST EDUCATION	GENDER
1	Adelina Sitanggang	45	Bachelor of Economics	Woman
2	Enjeli Oktavia	20	High school or equivalent	Woman
3	Nurul Ariffah	21	High school or equivalent	Woman

*Corresponding author.
e-mail: habibatulq@gmail.com

4	Adibya	21	High school or equivalent	Woman
5	Princess Nasution	21	High school or equivalent	Woman
6	Haikal Haqi	22	High school or equivalent	Man
7	Indra Harahap	55	High school or equivalent	Man
8	Riski Saragi	23	S1	Man
9	Faris Aqmal	25	S1	Man
10	Amanda Melisa	42	Bachelor of Communication Science	Woman
11	Fitra Kusuma	35	High school or equivalent	Woman
12	Abraham Putra	27	High school or equivalent	Man
13	Tegar Ardana	23	High school or equivalent	Man
14	Dhiki Maulana	22	High school or equivalent	Man
15	Little Sister	21	High school or equivalent	Woman
16	Naya Zafira	20	High school or equivalent	Woman
17	Sofyan Surya	48	Bachelor of Communication Science	Man
18	Ricky Sukma	29	High school or equivalent	Man
19	Kurniawan Saragi	33	High school or equivalent	Man
20	Kristin Sitio	27	S1	Woman

Source: (Author)

The demographic table presented above provides detailed identity information of the twenty research respondents who participated in this study. The characteristics include their names, age range (20–55 years), highest level of education, and gender distribution. The data show that the majority of respondents had completed high school or an equivalent level of education, while in terms of gender composition, twelve respondents were female and eight were male. This demographic profile is not merely descriptive but plays a crucial role in contextualizing the findings, as differences in age, gender, and educational background often influence individual perceptions, decision-making processes, and behavioral adaptations. By understanding these demographic dimensions, the analysis of behavioral change in relation to waste management practices within the Zero Waste community in Medan Perjuangan becomes more grounded and comprehensive. Moreover, the composition of respondents demonstrates that the Zero Waste community is able to attract participation across diverse groups within the community, highlighting its inclusiveness and its potential for broader social engagement.

The results of the quantitative analysis, however, reveal a concerning trend. Of the twenty members assessed, as many as 95% obtained an effectiveness score below 50, while only 5% achieved a score above the threshold. This distribution clearly indicates that the adoption and implementation of the fundamental zero-waste principles reduce, reuse, and recycle remain far from optimal, despite the existence and growth of the community structure itself. Such results suggest that while awareness and membership may be present, actual behavioral transformation and consistent practice still face significant obstacles.

These findings resonate with those of previous studies. For instance, Devitasari and Kokoh (2024) reported that the Zero Waste program in Tambaksari Village was also deemed ineffective. They attributed this ineffectiveness to several structural and operational shortcomings, including the limited availability of organic waste management facilities, inadequate monitoring and evaluation

*Corresponding author.
e-mail: habibatulq@gmail.com

systems, and the absence of a sustainable incentive model that could motivate long-term community participation. Similarly, Sudiyanto and Magfirah (2025) reinforced this perspective by emphasizing three critical determinants for enhancing the success of zero-waste initiatives: (1) sustained and active participation from community members, (2) robust support from local government policies, and (3) innovative approaches to waste bank management that encourage economic and social benefits for participants.

Taken together, the results from Medan Perjuangan align with broader patterns observed in other regions, underscoring that community-driven initiatives alone are insufficient unless supported by adequate facilities, policy frameworks, and incentive mechanisms. The demographic diversity of respondents shows potential for inclusivity, but the low effectiveness scores highlight the need for structural improvements and sustained intervention. This suggests that while the Zero Waste community has successfully mobilized participation from different social groups, its long-term effectiveness will depend on the integration of local policies, infrastructural support, and innovative incentive models to bridge the gap between awareness and actual behavioral change.

The implementation of the Zero Waste program in Medan Perjuangan has faced a number of significant challenges, resulting in outcomes that fall short of expectations. Several interrelated reasons explain why the program has not yet achieved its intended objectives. First, community waste-sorting practices remain partial and inconsistent. Although some residents attempt to separate waste at the household level, this is not done systematically, largely because many individuals do not fully grasp the importance of indiscriminate sorting for effective waste reduction. A gap persists between knowledge and practice: while the majority of community members acknowledge the harmful impacts of plastic waste, they struggle to translate this awareness into concrete daily habits, such as consistently reducing plastic use or segregating organic and inorganic waste.

Second, the absence of adequate infrastructure continues to be a fundamental barrier to progress. The proper distribution and processing of sorted waste is hindered by limited access to supporting facilities, including dedicated landfills, composting units, and recycling networks. Without these facilities, community efforts to separate waste become unsustainable, as residents have no reliable channels through which sorted waste can be processed. This infrastructural deficit not only reduces efficiency but also discourages households from persisting with sorting practices.

Third, sustaining community motivation has emerged as a critical challenge. After the initial enthusiasm associated with the launch of the program, levels of participation tend to decline over time. Research indicates that without meaningful social or economic incentives, residents gradually lose interest, as daily waste management requires effort that is not immediately rewarded. As noted by Adifa and Wibero (2023), Zero Waste programs are more likely to achieve long-term success when they are supported by a combination of social recognition and financial benefits, such as incentives for recycling, access to waste banks, or reductions in utility fees.

Fourth, entrenched cultural habits, particularly the reliance on single-use plastics, remain difficult to alter. Single-use packaging has become deeply embedded in local lifestyles, especially in practices related to shopping and food consumption. Changing these habits requires strong and sustained interventions that go beyond short-term campaigns, addressing both behavioral norms and the structural availability of alternatives.

Beyond these immediate obstacles, the success of Zero Waste initiatives in Medan Perjuangan is further shaped by broader contextual factors that are social, economic, and cultural in nature. From a social standpoint, norms in urban settings such as Medan Perjuangan often prioritize convenience and time efficiency, with single-use packaging viewed as a practical choice that saves effort. This tendency is reinforced by weak supervision and the absence of strong sanctions for violating environmental hygiene regulations, which reduces the perceived urgency of compliance.

From an economic perspective, behavior does not always align with levels of education or awareness. For instance, Butarbutar's (2023) study in Jambi City revealed that individuals with higher levels of formal education still engaged in environmentally harmful practices such as littering. This finding highlights that education alone is insufficient to foster sustainable waste management behavior unless accompanied by social support mechanisms, habitual reinforcement, and consistent institutional interventions.

*Corresponding author.
e-mail: habibatulq@gmail.com

From a cultural perspective, contrasting experiences from other regions illustrate the importance of local practices and traditions. In Sukunan, Yogyakarta, Smol et al. (2020) documented how established community practices of reusing goods, resource-sharing within families, and valuing frugality played a pivotal role in strengthening Zero Waste efforts. These cultural values provided a natural foundation for behavioral change. Conversely, in Medan Perjuangan, cultural norms appear to lean more toward consumerism, convenience, and disposable consumption. The rapid pace of consumption, combined with limited recycling infrastructure and high waste volumes, has created additional obstacles to embedding sustainable practices.

According to the theory of planned behavior (Ajzen, 1991), human behavior is fundamentally shaped by intentions, which in turn are influenced by three key factors: attitudes toward the behavior, subjective norms, and perceived behavioral control. The results of this study resonate with this theoretical framework as well as with broader strands of environmental behavior theory. In the case of Medan Perjuangan, public education initiatives have gradually succeeded in cultivating more favorable attitudes toward environmental protection, particularly in terms of raising awareness about the negative impacts of plastic waste and the benefits of sustainable waste practices. Nevertheless, the persistence of unfavorable social norms such as the widespread reliance on single-use packaging and the perception that waste management practices are complicated and time-consuming continue to act as barriers to consistent behavioral change. This indicates that while attitudes may be shifting, subjective norms and perceived behavioral control remain weak, thereby reducing the likelihood of sustained pro-environmental intentions being translated into consistent action.

Although the program has demonstrated a relatively low level of effectiveness overall, evidence suggests that incremental changes have emerged which could provide a foundation for future improvements. For instance, some households have begun to adopt composting practices and have experimented with sorting waste into organic, inorganic, and recyclable categories. These practices, though not yet widespread, represent important behavioral footholds that could be scaled up through supportive interventions. Likewise, observable shifts in patterns of consumption such as the growing use of cloth bags, stainless steel drinking bottles, and reusable food containers illustrate that segments of the community are willing to move toward more sustainable alternatives when such options are made available. These early signs of change suggest that targeted campaigns and incentive programs could help to accelerate adoption and normalize environmentally friendly practices across the broader community.

To strengthen the Zero Waste ecosystem, Sudiyanto and Magfirah (2025) highlight the need for a multi-stakeholder approach that brings together local governments, educational institutions, businesses, and community leaders. Such collaborative governance can foster a supportive environment in which sustainable waste practices are reinforced at multiple levels of society, thereby enabling individual behavioral changes to coalesce into a broader cultural shift. Coordinated efforts can also ensure that technical, economic, and social aspects of waste management are addressed simultaneously, reducing the risk of fragmented or short-lived outcomes.

The research findings suggest that the strategy should encompass four key steps to enhance the effectiveness of the Zero Waste movement in Medan Perjuangan. First, increase the intensity and quality of education by prioritizing habit formation through hands-on practice, rather than just knowledge. Second, establish an adequate waste management system, including an integrated landfill and organic processing facilities. Third, utilize waste banks or programs provided to households to provide cash incentives. Fourth, incorporate local cultural principles that support sustainability and resource conservation. There is a greater opportunity to improve the performance of the Zero Waste movement through a comprehensive and collaborative approach to achieving the goal of sustainably reducing waste volume at the source.

CONCLUSION

Waste management behavior in Medan Perjuangan has improved thanks to education and outreach within the Zero Waste community. Circular economy principles have encouraged increased environmental awareness, including reducing the use of single-use items and implementing household waste sorting and composting systems. However, effectiveness measurements indicate that

*Corresponding author.
e-mail: habibatulq@gmail.com

approximately 95% of respondents have not yet achieved the 50% effectiveness target. This indicates that behavioral change is still in its early stages and has not yet made significant progress. Limited supporting facilities and the habit of using single-use plastic remain major obstacles hindering Zero Waste efforts.

The government, communities, and civil society must work together to accelerate behavioral change. Training on composting and household waste sorting can be discontinued, direct mentoring programs can be implemented, and local education campaigns can be strengthened. Meanwhile, local governments must strengthen policies to reduce single-use plastics, increase recycling facilities, and encourage households to adopt sustainable waste management practices. This collaboration is expected to encourage more effective behavior and more sustainable, engaged, and efficient waste management in Medan Perjuangan.

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We extend our deepest gratitude to all members of the Medan Zero Waste Community (Kepul) for their support and participation in this project. We appreciate the time, thoughts, and experiences you have shared, as they have significantly enhanced our understanding of how to manage household waste according to zero-waste guidelines. The success of this study depends on the community's extraordinary contributions and passion for protecting the environment and raising public awareness. We hope this enthusiasm and hard work will continue to grow towards a cleaner and more sustainable environment.

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*Corresponding author.
e-mail: habibatulq@gmail.com