



# Analyzing Behavioral Patterns in Plastic Waste Management: Towards Sustainable Environmental Practices

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**Abstract.** This research aims to examine the influence of knowledge on attitudes and behaviors in managing plastic waste. The proliferation of plastic waste in Indonesia is attributed to the environmentally unfriendly practices of its industries. The inadequate management of plastic waste sets the backdrop for this study. The limited research on participatory behaviors in plastic waste management underscores the urgency of this research. A quantitative approach was employed, involving 131 participants selected through purposive sampling based on predefined criteria. The findings indicate that knowledge directly influences attitudes but not behaviors. Attitudes fully mediate the influence of knowledge on behaviors. The implications of the study suggest strengthening attitudes through increased environmental awareness in waste management. Issues related to sustainable environment can be leveraged to enhance awareness in managing plastic waste.

**Keywords:** Plastic waste management, Knowledge, Attitudes, Environmental awareness

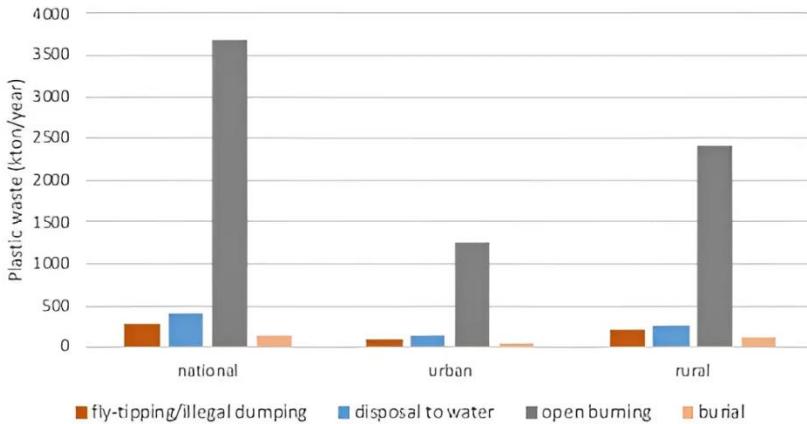
## 1 Introduction

Indonesia faces a significant challenge in plastic waste management. The country's rapid industrialization and urbanization have led to a staggering increase in plastic waste production, with data from the Central Statistics Agency indicating that plastic waste in Indonesia reaches a staggering 64 million tons. The accumulation of plastics in the marine environment has increased the global risk of water pollution, and Indonesia's coastal regions have been bearing the brunt of this crisis [1]. The uncontrolled production and the existing management capacity have brought a substantial burden on the current plastic waste management system [2]. This issue has had a negative impact on land, ecosystems, and especially the food chain and marine organisms.

The improper management of plastic waste has reduced the quality of the environment, compromised human health, and influenced economic sectors [3]. Economic activities that involve coastal areas have consistently become a major source of plastic

waste leakage, either directly or indirectly. The gravity of this issue has prompted a growing concern among policymakers, environmental activists, and the general public, who recognize the urgent need to address the plastic waste crisis in Indonesia [4].

Plastic waste poses a severe threat to environmental health and sustainability. Large pieces of plastic waste, often referred to as macroplastics, can be visibly detrimental to ecosystems. Marine animals, such as turtles, seabirds, and fish, can become entangled in discarded fishing nets or other debris [1]. Ingestion of plastic items can be fatal as animals mistake them for food, leading to injury and malnutrition. As larger plastic items degrade, they break down into microplastics, which are tiny plastic fragments less than five millimeters long. These microplastics are ubiquitous in the environment and can carry harmful pollutants that may bioaccumulate in the food chain, potentially affecting both wildlife and humans who consume contaminated seafood [5]. National summary of final destination of uncollected plastic waste in urban and rural areas depicted in Figure 1.



**Figure 1.** National Uncontrolled Plastic Waste

Accumulation of plastic waste can alter habitats both on land and in aquatic environments. In the oceans, floating plastic can create barriers and change the structure of natural habitats, affecting the organisms that rely on them for survival. The production and disposal of plastic entail significant use of finite resources, including fossil fuels. Not only does this contribute to resource depletion, but the process also releases greenhouse gases, exacerbating climate change. Plastic pollution also has negative economic impacts, particularly for communities that depend on tourism, fishing, and maritime trade [6]. The presence of plastic waste in coastal areas and the ocean can detract from the natural beauty of these environments and impede businesses operating in these sectors [7].

While considerable efforts have been made to manage the escalating amounts of plastic waste, a crucial element that merits detailed examination is the engagement of the Indonesian public in these initiatives. The importance of participative management in addressing complex global issues is evident, as it draws on the collective knowledge and actions of individuals and communities to drive substantial and lasting change [5].

The engagement of local communities, stakeholders, and the public at large is not only beneficial but necessary to ensure that the proposed solutions are culturally relevant, widely accepted, and effectively implemented.

This paper underscores the need to galvanize public participation in plastic waste management as a transformative force. Participatory approaches encompass diverse methods, from participatory action research, which has proven effective in improving engagement for local school improvement [5], to inclusive stakeholder engagement strategies, such as those applied to identify water quality monitoring needs [8]. By drawing on these participative methodologies, we can better understand the attitudes, barriers, and facilitators to public involvement in Indonesia's plastic waste management efforts. Furthermore, this analysis will illuminate how public participation can be revitalized and effectively integrated into the existing management frameworks, thereby enhancing the efficacy of strategies and fostering collective responsibility for the environment. This research paper aims to analyze the current state of plastic waste management in Indonesia, identify the key challenges, and explore potential solutions to mitigate the environmental and societal impacts of this pressing issue.

## 2 Method

The research employed a quantitative approach to investigate the influence of knowledge on attitudes and behaviors in managing plastic waste. With Indonesia as the contextual backdrop, characterized by significant plastic waste proliferation due to environmentally unfriendly industrial practices and inadequate waste management, the study aimed to address the gap in research concerning participatory behaviors in plastic waste management. A total of 131 participants were selected through purposive sampling based on predefined criteria. Data collection involved structured surveys designed to assess participants' knowledge levels, attitudes towards plastic waste management, and actual behavioral practices. Statistical analyses were conducted to examine the relationships between knowledge, attitudes, and behaviors.

## 3 Result and Analysis

The test outcomes suggest that each indicator has exhibited both validity and reliability, as delineated in Table 1.

**Table 1.** Validity and Reliability Test Result

No	Variable	Measurement	Loading factor	Cronbach Alpha
1	Knowledge	I possess knowledge regarding the environmental impact of plastic waste	0.840	0.910
2		I can identify recyclable plastics and understand the importance of proper disposal methods.	0.780	

3		I am aware of the existing plastic waste management practices	0.752	
4		I understand the detrimental effects of improper plastic waste disposal on wildlife and ecosystems.	0.883	
5		I have actively engaged in educational programs on plastic waste management.	0.880	
6		I recognize the severity of the issue of plastic pollution	0.832	0.911
7		I strongly believe in the individual responsibility to minimize plastic consumption	0.913	
8	Attitude	I am willing to invest in products with eco-friendly packaging	0.807	
9		I maintain an optimistic outlook regarding the potential reduction of plastic waste within my community.	0.903	
10		I am open to adapting my habits to minimize my contribution to plastic pollution.	0.835	
11		I actively avoid single-use plastic items in my daily life as part of my commitment to reducing plastic waste.	0.9	0.893
12		I have taken concrete steps to decrease my plastic consumption over the past year.	0.888	
13	Behavior	I consistently separate recyclable plastics from non-recyclable ones at home or in my workplace.	0.752	
14		I regularly participate in plastic clean-up initiatives or recycling programs to contribute to waste reduction efforts.	0.874	
15		I am proactive in encouraging others to adopt practices that reduce plastic waste	0.870	

**Table 2.** Direct Test Result

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV)	P Values
<b>Attitude → Behavior</b>	0.398	0.397	0.114	3.49	0.001
<b>Knowledge → Attitude</b>	0.756	0.759	0.05	15.049	0.000
<b>Knowledge → Behavior</b>	0.145	0.15	0.129	1.126	0.261

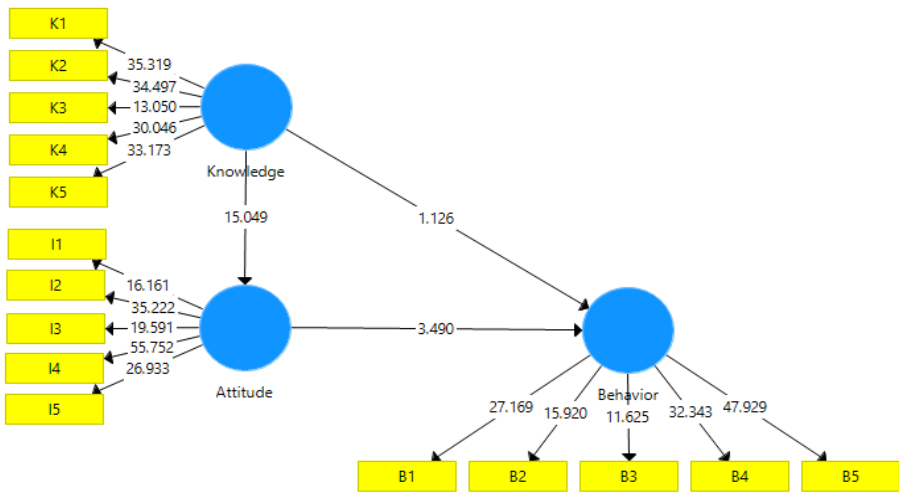


Figure. 2. Inter-Variable Testing Results

Table 3. Indirect Test Result

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
<b>Knowledge → Attitude → Behavior</b>	0.301	0.301	0.09	3.346	0.001

Tables 2 and 3 have illustrated both direct and indirect influences. The test results prove that knowledge has a direct effect on attitude. The test results also show that attitude influences behavior, while knowledge does not have a direct effect on behavior. The indirect testing indicates that attitude fully mediates the effect of knowledge on behavior.

### 3.1 Discussion

While there is a growing awareness of the environmental impact of plastic waste, research suggests that this knowledge does not necessarily translate into effective consumer behavior in managing plastic waste [9]. One study found that despite college students having a high level of knowledge about plastic waste problems, their behavior in reducing plastic usage and engaging in recycling remained relatively low [1]. This disconnect between knowledge and action can be attributed to various factors, such as the perceived inconvenience of recycling, lack of accessible recycling facilities, or the absence of clear incentives for eco-friendly behavior. Recognizability of recycled products has been identified as a potential driver for consumer acceptance and willingness to pay a premium for items made from recycled plastics. Consumers are more likely to

choose products that visibly signal their sustainability credentials, suggesting that making the recycled content of products more apparent could encourage more sustainable purchasing decisions [7]. The result show that the effect of attitude on behavior in managing plastic waste is a critical aspect of sustainable waste management initiatives. Attitude, encompassing beliefs, feelings, and evaluations, plays a pivotal role in shaping individuals' actions towards plastic waste reduction and recycling [10]. Positive attitudes towards environmental conservation and sustainable practices are likely to drive behaviors such as proper waste disposal, recycling, and reduction of single-use plastics. Ultimately, fostering a culture that values environmental stewardship and promotes positive attitudes towards waste management is essential for mitigating the impact of plastic pollution and building a more sustainable future.

The effect of knowledge on attitudes towards managing plastic waste is a pivotal aspect of environmental consciousness and behavior change. Knowledge acts as a foundation upon which attitudes are built, influencing individuals' perceptions, beliefs, and motivations regarding waste management practices. Increased knowledge about the environmental impact of plastic pollution, the benefits of recycling, and the importance of sustainable waste management practices can lead to the formation of more positive attitudes towards these issues. As the global production of plastic has increased exponentially over the past decades, the issue of plastic waste has become a pressing environmental concern [11]. Consumers play a crucial role in addressing this challenge, as their attitudes and behaviors can significantly impact the management and reduction of plastic waste [12]. Researchers have explored the connection between consumers' knowledge and their attitudes towards plastic waste [8]. According to studies, the way individuals perceive and behave regarding plastic pollution is largely determined by their understanding of the issue. Consumers who are more aware of the environmental consequences of plastic waste tend to hold more positive attitudes towards reducing their plastic consumption and engaging in pro-environmental behaviors [13].

Moreover, providing accessible and comprehensible information about the effectiveness of sustainable practices and the collective impact of individual actions can empower individuals to make informed choices and cultivate attitudes aligned with environmental conservation goals. The impact of knowledge on behavior in managing plastic waste is a critical consideration in fostering sustainable waste management practices. While knowledge is often perceived as a precursor to behavior change, its direct influence on actual behavioral outcomes can be nuanced and multifaceted. On one hand, individuals who possess comprehensive knowledge about the environmental consequences of plastic pollution and the importance of sustainable waste management practices are more likely to engage in behaviors that align with this knowledge. Despite being aware of the environmental implications of plastic pollution, individuals may still engage in unsustainable behaviors due to various factors such as convenience, social norms, and economic constraints. For example, individuals may continue to use plastic bags or bottles out of habit or because alternatives are not readily available or affordable. Moreover, knowledge alone may not always be sufficient to overcome barriers to behavior change. Psychosocial factors, such as attitudes, beliefs, values, and social influences, also play a significant role in shaping behavior [5], [8], [14]. Therefore, interventions aimed at promoting sustainable behaviors should consider not only increasing

knowledge but also addressing these underlying factors. To effectively translate knowledge into behavior, interventions should employ multifaceted approaches that target cognitive, affective, and contextual dimensions. Educational campaigns can provide information about plastic waste and its environmental impact, while simultaneously addressing attitudes, motivations, and social norms related to waste management. Providing accessible alternatives, infrastructure, and incentives can also facilitate the adoption of sustainable behaviors.

Consumer behavior regarding plastic waste is a complex phenomenon, influenced by various psychological and contextual factors. Attitude, a key psychological construct, plays a crucial role in shaping consumers' intentions and actions towards plastic waste management [15]. Extensive research has explored the impact of attitude on consumers' behavior patterns in the context of plastic waste. Studies have shown that consumers' attitudes towards products made from recycled plastics can significantly influence their perceptions and purchasing decisions. Specifically, the perceived quality and recognizability of these products have been identified as important factors affecting consumer attitudes and behaviors [16]. Additionally, studies have highlighted the discrepancy between consumers' environmental attitudes and their actual behaviors regarding the use of disposable plastic tableware. While many consumers express concern about plastic pollution, they often fail to translate these attitudes into meaningful actions to reduce their plastic consumption.

## 4 Conclusion

This research sheds light on the intricate relationship between knowledge, attitudes, and behaviors in managing plastic waste. Our findings indicate that while knowledge directly influences attitudes, its impact on behaviors is mediated by attitudes. This suggests that possessing knowledge about plastic waste management alone may not suffice to drive tangible behavioral change. Instead, attitudes play a crucial role in translating knowledge into action. The implications of these findings are significant for policy-makers, environmental practitioners, and educators. Efforts to promote sustainable waste management should not only focus on increasing knowledge but also on shaping attitudes towards environmental conservation. Educational campaigns and awareness-raising initiatives should aim to not only provide information about the environmental consequences of plastic pollution but also to foster positive attitudes and a sense of responsibility towards waste reduction and recycling. Furthermore, interventions should be multifaceted, addressing not only cognitive aspects but also affective and contextual factors influencing behavior. Strategies that leverage social norms, provide accessible alternatives, and incentivize sustainable practices are essential for creating an enabling environment for behavior change. Ultimately, by integrating knowledge dissemination with attitude formation and behavior change interventions, we can effectively tackle the challenge of plastic waste pollution and move towards a more sustainable future. This research underscores the importance of holistic approaches in addressing complex environmental issues and emphasizes the role of individual actions in contributing to collective efforts for a cleaner and healthier planet.

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