Demographic and psychographic analysis of the integration of 3Rs in solid waste management in the coastal area of Sabang, Calabanga, Camarines Sur

Arga, Catherine N.
Central Bicol State University of Agriculture, Philippines (catherine.arga@cbsua.edu.ph)

Barawel, Daniel A.
Central Bicol State University of Agriculture, Philippines (daniel.barawel@cbsua.edu.ph)

Parde, Gia Joy B.
Central Bicol State University of Agriculture, Philippines (giajoy.parde@cbsua.edu.ph)

Palmiano, Dariel A. ✉
Central Bicol State University of Agriculture, Philippines (dariel.palmiano@cbsua.edu.ph)

Abstract

This study aims to examine the demographic and psychographic factors influencing the integration of the 3Rs (Reduce, Reuse, Recycle) to promote solid waste management in the coastal area of Sabang, Calabanga, Camarines Sur. Key research questions include identifying the demographic profile of residents, psychographic influences such as attitudes, beliefs, values, and environmental awareness, and the barriers and motivators that affect households' engagement with 3R practices. The study employs a descriptive research design, using quota sampling to select household heads as participants. Self-designed questionnaires, validated by experts, were administered, and the data underwent reliability testing. The findings reveal that a diverse age and gender population resides in the community, with most respondents expressing positive attitudes toward waste management programs but still engaging in unsustainable practices, such as garbage burning. Psychographic factors show strong awareness of waste management impacts on health and the environment, but actual behaviors, such as purchasing recycled products or composting, remain limited. Additionally, environmental awareness is high, but gaps exist in more nuanced practices like public trash bin usage and community engagement. These results suggest the need for targeted educational and outreach programs that cater to different demographic groups, emphasize practical waste management strategies, and enhance community infrastructure to support recycling. The study's insights contribute to the understanding of solid waste management practices and provide a foundation for improving community-based environmental sustainability initiatives.

Keywords: coastal solid waste management, demographic, psychographic

Demographic and psychographic analysis of the integration of 3Rs in solid waste management in the coastal area of Sabang, Calabanga, Camarines Sur

1. Introduction

Solid waste encompasses various forms of discarded materials, including household and commercial waste, non-hazardous institutional and industrial waste, street sweepings, construction debris, agricultural waste, and other non-toxic and non-hazardous solid waste (Zerbock, 2003). Solid waste management pertains to the coordinated practices governing the generation, storage, collection, transportation, processing, and disposal of solid waste. It aims to align with principles of public health, economics, engineering, conservation, aesthetics, and environmental concerns while remaining attuned to public attitudes. Ecological solid waste management, on the other hand, involves a methodical approach encompassing segregation at the source, separate transportation, storage, transfer, processing, treatment, and disposal of solid waste. These processes are designed to safeguard the environment during all waste management activities.

The Philippines has taken steps to enhance its solid waste management by enacting RA 9003, also known as the Ecological Solid Waste Management Act of 2000. This law establishes a systematic, comprehensive, and ecological waste management program to safeguard public health and the environment (Coracero, et al, 2021). It directs the bureau to offer secretariat support to the National Solid Waste Management Commission for executing solid waste management plans. Furthermore, it sets policies to attain the objectives of the National Ecology Center, which oversees the dissemination of information, consultation, education, and training for various local government units in ecological waste management (DENR, 2019).

In general, the current system in the Philippines for waste reduction, reuse, recycling, and final disposal in environmentally safe landfills is unfortunately not as effective and efficient as desired for achieving a clean environment and reducing waste (Coracero et al., 2021). This is evident through the inadequate compliance of Local Government Units (LGUs) with Republic Act 9003, as well as widespread littering and unhealthy practices such as burning waste, any form of open burning presents dangers to both the environment and public health. Smoke contaminates the air we inhale, while ash pollutes our soil, and groundwater, as well as lakes, rivers, and streams, and various areas lacking adequate soil cover or sanitary landfills for non-biodegradable waste (Camarillo & Bellotindos, 2021; Wisconsin Department of Natural Resources, 2023). Hence, we believe that the cornerstone of effective solid waste management in the Philippines lies primarily in the political determination of LGUs to creatively adhere to RA 9003. This can be achieved through mobilizing and involving the community, private sector, and informal waste management groups to minimize solid waste and improve the economic conditions of vulnerable groups such as waste pickers, buyers, and scavengers (World Health Organization, 2011; Abrematea, 2012; Castillo et al., 2013:).

Waste Segregation at its origin is a fundamental aspect of efficient waste management in the Philippines. Effective segregation of waste at its source leads to a decrease in landfill-bound waste, higher recycling rates, and reduced costs associated with waste collection and disposal. Difficulties in executing waste segregation at the source involve insufficient infrastructure, limited public awareness, and low adherence to the practice. (Srinivas, 2015; Dizon-Sanchez et al., 2020). The 3Rs present an eco-conscious option to manage the increasing volume of waste and its consequential effects on human health, the economy, and the natural ecosystem.

Solid waste production has surged in Asian nations primarily due to improved living standards, rapid technological advancements, economic growth, and the expansion of urban populations (Awasthi etal., 2023). Effectively managing solid waste is an overlooked global issue and a significant challenge faced by Asian countries, potentially leading to adverse environmental effects (Asian Development Bank Institute, 2020). Many Asian nations have adopted the 3R concept (reduce, reuse, recycle) to curb solid waste, reinforced by governmental laws

and regulations to support these initiatives. The primary driver behind implementing the 3R principles is the reduction of solid waste, which can substantially enhance environmental sustainability and lead to reduced atmospheric carbon dioxide emissions. (Ali & Sion, 2014)

In light of the escalating waste production due to population growth and expanding economies in contemporary society, waste management has become an urgent necessity. Safeguarding the environment, public health, and overall quality of life is crucial. This involves implementing practices such as prevention, reduction, reuse, and recycling (Doe, 2020; Coracero, 2021; Smith 2021; Coracero et al., 2021; Patel, 2023). The study of (Rahman, 2014; Noces et al., 2020) highlights various community actions about the 3R management method: using reusable shopping bags, purchasing recycled products, repairing and reusing older items, segregating organic and inorganic waste, and creating crafts from discarded materials approaches, like crafting new products from recyclable materials. The study highlights the actions of sorting, appropriate disposal, and waste redirection. Emphasizing the significance of visualizing the Philippines free from trash and promoting active public engagement and awareness.

The integration of the 3Rs (Reduce, Reuse, Recycle) in solid waste management has gathered significant attention in current years, aiming to lessen environmental impact through sustainable practices. Demographic and psychographic analyses play vital roles in understanding and promoting these practices effectively. Demographic factors such as age, education, income, and urbanization levels significantly influence waste management behaviors. Research indicates that younger populations tend to be more environmentally conscious, often driven by higher exposure to environmental education and digital media (Dahlén & Lagerkvist, 2010). In contrast, older generations may exhibit resistance to change due to entrenched habits (Schultz et al., 1995). Educational attainment is another critical factor; individuals with higher education levels are generally more aware of environmental issues and more likely to participate in recycling programs (Martin et al., 2006). Income levels also affect waste management behaviors. Higher-income households can afford to purchase environmentally friendly products and have access to better waste management services, whereas lower-income households may prioritize cost over environmental considerations (Gamba & Oskamp, 1994). Urbanization plays a dual role; while urban areas have better waste management infrastructure and services, they also generate more waste due to higher population densities and consumption levels (Sufiyan et al., 2020). Rural areas, despite generating less waste, often lack adequate waste management facilities, confounding the implementation of 3Rs practices.

Meanwhile, psychographic factors, which include values, attitudes, interests, and lifestyles, provide deeper insights into individual motivations and barriers related to waste management. Environmental concern is a primary psychographic variable influencing 3Rs practices. Individuals with high environmental concern are more likely to engage in reducing, reusing, and recycling behaviors (Barr et al., 2001). Perceived behavioral control and social norms also significantly impact waste management practices. When individuals feel they have control over their waste management actions and believe that their peers value these actions, they are more likely to engage in 3Rs practices (Ajzen, 1991). Social marketing strategies that enhance perceived behavioral control and emphasize positive social norms can effectively promote sustainable waste behaviors (McKenzie-Mohr, 2000). Moreover, lifestyle segmentation has revealed that eco-conscious consumers, who prioritize sustainability in their daily lives, are more inclined towards the 3Rs. These consumers often adopt minimalist lifestyles, reducing their overall waste generation (Thøgersen, 1999). On the contrary, individuals with a more consumption-oriented lifestyle may require targeted educational campaigns to shift their attitudes and behaviors towards sustainable waste management.

While previous studies have established correlations between demographic factors and waste management behaviors, several gaps persist. One notable gap is the limited understanding of how these factors interact in diverse cultural contexts. Much of the research has been conducted in Western countries, leaving a lack of information on how demographic variables influence 3Rs practices in non-Western contexts (Oskamp, 1995). This geographic bias limits the generalizability of findings and the development of globally applicable strategies. Another gap exists in the granularity of age-related research. Studies often categorize populations into broad age groups, overlooking the nuances within these groups. For example, younger adults (18-35 years) are generally seen as more

environmentally conscious, but there is limited understanding of how life stages within this age group, such as student versus working professional, impact 3Rs behaviors (McDonald & Ball, 1998). Similarly, research on older adults lacks specificity in terms of how retirement status or health conditions affect their engagement with waste management practices. Income and education levels are also well-documented predictors of 3Rs adoption, yet the intersectionality of these factors is less explored. There is a need for more comprehensive studies that examine how varying levels of income and education within the same demographic group influence waste management behaviors, particularly in rapidly developing countries where these factors are in flux (Martin et al., 2006).

Psychographic research on waste management behaviors has identified several key drivers, such as environmental concern and perceived behavioral control. However, there is a gap in understanding the long-term stability of these psychographic traits. Most studies provide a snapshot of attitudes and behaviors at a single point in time, without considering how these factors evolve and whether interventions have lasting impacts (Schultz et al., 1995). Furthermore, the role of cultural values in shaping psychographic factors related to waste management is underexplored. Cultural values significantly influence environmental attitudes and behaviors, yet most psychographic analyses assume a homogeneous cultural context (Thøgersen, 2006). This assumption limits the applicability of findings across different cultural settings and ignores the potential for cultural values to moderate the effectiveness of 3Rs interventions. Another notable gap is the limited focus on behavioral economics in psychographic research. While traditional psychographic studies emphasize attitudes and values, integrating insights from behavioral economics, such as the impact of cognitive biases and decision-making heuristics on waste management behaviors, remains underdeveloped (Sunstein & Reisch, 2013). This integration could provide more nuanced understanding and innovative approaches to promoting the 3Rs.

Relative to this, a study by A. D. Chen et al. (2014) analyzed the influence of demographic factors, such as age, income, and education, on household waste generation and recycling behaviors. The findings indicated that higher educational attainment correlates with increased participation in recycling programs, highlighting the importance of tailoring education initiatives to different demographic groups. Research by J. A. T. Pires et al. also (2011) examined how socioeconomic status impacts waste disposal methods. It was found that higher-income households had better access to waste disposal services, leading to more effective waste management compared to lower-income households, which often faced resource constraints. Moreover, According to a study by P. H. A. J. V. de Groot and M. A. Steg (2007), individuals with stronger environmental values are more likely to participate in community waste management initiatives. This study emphasizes the role of community awareness programs in fostering positive attitudes toward the 3Rs.

In solid waste management, understanding demographic and psychographic factors is crucial for effective strategy development, especially in communities like Barangay Sabang, Calabanga, Camarines Sur. Demographic factors such as age, education, income, and household size influence waste generation patterns and community engagement in solid waste management (SWM) practices. For example, higher-income households may have better access to eco-friendly products, while lower-income groups may struggle with waste segregation. Educational attainment also affects awareness and participation in recycling. Psychographic factors, including values and beliefs, shape residents' motivations toward adopting the 3Rs—Reduce, Reuse, and Recycle. Analyzing these factors allows for targeted, community-specific waste management strategies that resonate with residents' behaviors, making demographic and psychographic insights essential for successful SWM programs in Barangay Sabang.

The coastal area of Sabang, Calabanga, Camarines Sur, presents an ideal setting for studying the integration of the 3Rs (Reduce, Reuse, Recycle) in solid waste management due to its unique environmental and demographic context. As a coastal community, Sabang faces challenges in waste disposal, particularly the negative impact of improper waste management on marine ecosystems, fisheries, and biodiversity, which are vital to residents' livelihoods. The local population's reliance on marine and agricultural resources highlights the need for sustainable waste practices to preserve these ecosystems. Additionally, Sabang's demographic factors, including variations in education, income, and household sizes, offer a valuable perspective on how such characteristics influence waste

management behaviors.

To achieve the purpose of this study, the following research objectives were formulated. First, the study aims to identify the key determinants of demographic and psychographic factors that influence the integration of the 3Rs (Reduce, Reuse, Recycle) in the coastal area of Sabang, Calabanga, Camarines Sur, in order to promote solid waste management. Additionally, the research seeks to examine the demographic profile of residential households in the coastal area to better understand the population's characteristics. Furthermore, it intends to analyze the psychographic factors, such as attitudes, beliefs, values, and environmental awareness, that impact the integration of 3Rs in solid waste management practices. Finally, the study aims to explore the barriers and motivators that affect household residents' ability and willingness to adopt 3Rs practices for promoting solid waste management.

2. Research Methodology

The research methodology employed in this study was descriptive in nature, allowing for a thorough examination of the characteristics and behaviors of the participants. The study was conducted in Barangay Sabang, located in Calabanga, Camarines Sur, with household heads chosen as the main participants due to their role in managing household activities, including waste disposal. A quota sampling method was used to determine the number of participants, ensuring that a specific number of respondents from different household types were included in the study. This method helped ensure that the sample was representative of the area's demographic makeup.

To gather the necessary data, the researcher utilized self-designed questionnaires. These were developed through a process of item pooling, where various potential questions were generated to cover the study's focus areas comprehensively. The content validity of the questionnaires was ensured by consulting experts in instrument development at the university. Their insights, based on their expertise, were incorporated into the final version of the questionnaire, making it a more reliable tool for data collection. Before full deployment, the questionnaires were pre-tested with a sample of households from Barangay Ratay, another community in Calabanga. This pilot testing allowed the researcher to identify any issues with the questions or the data collection process. Following this, reliability testing was conducted to ensure the consistency of the responses.

A descriptive research approach was utilized to present and analyze the demographic (e.g., age, income, education) and psychographic (e.g., attitudes, beliefs) characteristics of the respondents. This approach also facilitated the examination of the barriers and motivations that influenced household participation in recycling solid waste materials. Data on these factors were analyzed using descriptive statistics, providing a clear overview of trends, frequencies, and patterns among the participants. This method was instrumental in identifying key insights regarding recycling behaviors within the community.

3. Results and Discussion

3.1. Demographic Profile. This section shows the Demographic Profile of Respondents residing in the coastal area of Sabang Calabanga, Camarines Sur. This analysis will give the researchers a foundation of the community's character and provide an important background for the wider investigation on integrating 3Rs Reduce, Reuse, Recycle to promote solid waste management practices. As stated by Imran et al., (2022) that Inadequate waste disposal methods hinder the advancement of comprehensive household solid waste management. Understanding present practices and perspectives on managing household waste is vital for making informed decisions and transitioning toward a more sustainable approach.

This dataset in Table 1 provides a demographic overview of 275 respondents across various attributes, including age, gender, educational attainment, civil status, zone representation, household income, and employment status. The age distribution shows that the largest group falls within the 45-54 range (23.3%), followed closely by the 55-64 group (22.9%), indicating a concentration of middle-aged to older individuals. The youngest group, 18-24, represents only 2.2%, suggesting limited participation from younger respondents. In terms

of gender, females constitute the majority at 68.4%, while males account for 30.5%, and only 1.1% identify as LGBTQIA+. This gender skew may influence other data points, such as civil status and employment.

Regarding educational attainment, a significant portion of respondents are high school graduates (34.5%), followed by elementary graduates (25.5%), with only 7.6% holding a bachelor's degree, highlighting low tertiary education completion. Additionally, 14.2% did not finish high school, suggesting varied educational backgrounds that could affect income and employment opportunities. In terms of civil status, the majority are married or in domestic partnerships (63.6%), while 21.5% are single. Smaller percentages are widowed (11.3%) or separated (4%), reflecting differing economic and social dynamics.

Table 1
Demographic Profile of the Respondents

Attributes	Categories	Frequency (N=275)	Percent
Age	18 - 24	6	2.2
	24 - 34	52	18.9
	35 -44	49	17.8
	45 - 54	64	23.3
	55 -64	63	22.9
	65 older	41	14.9
Gender	Male	84	30.5
	Female	188	68.4
	LGBTQIA+	3	1.1
Educational Attainment	High school graduate	95	34.5
	Elementary graduate	70	25.5
	Some high school, no diploma	39	14.2
	Some college credit, no degree	26	9.5
	Bachelor's degree	21	7.6
	Nursery school to grade 5	10	3.6
	Technical/vocational training	8	2.9
	No education	4	1.5
Civil Status	Single, not yet married	59	21.5
	Married or domestic partnership	175	63.6
	Widow/widower	31	11.3
	Separated	11	4.0
Zone Represented	Zone 1	15	5.5
	Zone 2	27	9.8
	Zone 3	28	10.2
	Zone 4	48	17.5
	Zone 5	41	14.9
	Zone 6	65	23.6
	Zone 7A	31	11.3
	Zone 7B	20	7.3
Household Monthly Income	5,000 pesos below	175	63.6
	6,000 – 15,000 pesos	75	27.3
	16,000 – 20,000 pesos	15	5.5
	21,000 – 30,000 pesos	5	1.8
	31,000 above	5	1.8
Employment Status	Unemployed	25	9.1
	Retired	6	2.2
	Self employed	91	33.1
	Employed	94	34.2
	Housewife	51	18.5
	Unable to work	8	2.9

Zone representation shows that respondents are fairly distributed, with Zone 6 (23.6%) and Zone 4 (17.5%) being the most represented, while Zone 1 has the least participation (5.5%). This distribution may reflect differences in community characteristics and resources. Household income reveals that the majority earn 5,000 pesos or below (63.6%), with only a small percentage (1.8%) earning 31,000 pesos or more, indicating significant economic challenges and suggesting that a large portion of the population may struggle with financial stability.

In terms of employment status, 34.2% are employed, and 33.1% are self-employed, making up the largest groups. Housewives (18.5%) and unemployed individuals (9.1%) form a notable portion, pointing to a mix of economic contributors and dependents. Additionally, small percentages are retired (2.2%) or unable to work (2.9%), highlighting a group that may need additional support.

Overall, the data reveals a predominantly middle-aged, female population with limited formal education and low income, suggesting potential socioeconomic vulnerabilities. Employment shows a fairly even split between employed/self-employed individuals and dependents. The significant income disparity, with the majority living below or near poverty levels, may impact access to resources, education, and overall quality of life. This demographic profile suggests the need for targeted social and economic support, particularly in education, employment, and financial assistance programs.

3.2 Psychographic Analysis on the Integration of 3Rs in promoting Solid Waste Management

3.2.1 Attitude. The data in Table 2 highlights key psychographic factors influencing attitudes toward the integration of the 3Rs (Reduce, Reuse, Recycle) in promoting solid waste management. With 81% of residents expressing satisfaction with community waste management programs, this demonstrates a positive general attitude toward structured efforts in waste management. However, 63% still engage in burning garbage, a harmful practice that contradicts sustainable waste management despite community satisfaction. This suggests that while there is a favorable attitude toward waste management programs, there might be a gap in awareness or enforcement regarding harmful behaviors like garbage burning.

Table 2
Psychographic factors in 3Rs solid waste management integration along attitude

Particulars	No. of residents responding yes N=(275)	Percent
Satisfaction with community waste management programs.	223	81.0
Burning garbage.	173	63.0
Recycling solid waste at home.	171	62.0
Attending seminars on proper waste disposal.	171	62.0
Making a compost pit.	140	51.0

The data in Table 2 highlights key psychographic factors influencing attitudes toward the integration of the 3Rs (Reduce, Reuse, Recycle) in promoting solid waste management. With 81% of residents expressing satisfaction with community waste management programs, this demonstrates a positive general attitude toward structured efforts in waste management. However, 63% still engage in burning garbage, a harmful practice that contradicts sustainable waste management despite community satisfaction. This suggests that while there is a favorable attitude toward waste management programs, there might be a gap in awareness or enforcement regarding harmful behaviors like garbage burning.

Additionally, 62% of residents report recycling waste at home and attending seminars on proper disposal methods, indicating moderate involvement in recycling practices. The moderate figures suggest that educational initiatives are having some success, but more targeted strategies may be needed to translate this knowledge into broader action and enhance participation. Lastly, only 51% of respondents are involved in making compost pits, which may be due to perceived practical barriers or a lack of understanding of its environmental benefits.

Research corroborates these findings, showing that public attitudes toward waste management often reflect a positive view of organized programs but are not always accompanied by sustainable behaviors. For example, a study from Ogun State, Nigeria, highlighted the need for stronger enforcement of waste management practices and better public education, as a large portion of the population still engaged in unsustainable waste disposal methods despite government programs (Olukanni et al., 2020). This reinforces the notion that positive attitudes alone may not be sufficient without addressing the underlying gaps in awareness and enforcement.

3.2.2 *Beliefs.* The data in Table 8 reveals that residents' beliefs strongly align with solid waste management

practices. A vast majority, 94%, are aware of penalties for incorrect disposal, while 93% recognize the broader impacts of waste management on health and national prosperity.

Table 3
Psychographic factors in 3Rs solid waste management integration along beliefs

Particulars	No. of residents responding yes N=(275)	Percent
Penalties for incorrect waste disposal	259	94.0
Effects of solid waste management on a country's prosperity	256	93.0
Health problems caused by garbage	256	93.0
Importance of recycling	253	92.0
Positive effects of recycling solid waste	253	92.0

Additionally, 92% understand the importance of recycling. Despite this, studies suggest that awareness alone doesn't ensure action. Sujauddin et al. (2021) emphasize the need for community education to translate beliefs into behavior. Similarly, Wang et al. (2022) highlight that infrastructural challenges and convenience affect recycling efforts, requiring practical solutions to bridge the gap between knowledge and consistent waste management actions. These findings reflect the need for comprehensive community programs that not only raise awareness but also offer practical solutions to facilitate action, such as accessible recycling facilities, better waste segregation systems, and ongoing public engagement.

3.2.3. Values. The data in Table 4 highlights the influence of values on residents' adoption of the 3Rs (Reduce, Reuse, Recycle) in solid waste management. While only 46% and 44% of respondents reported buying recycled materials or purchasing products made from them, higher percentages are engaged in creating new products from used items, such as tires (73%), plastic bottles (64%), and paper/cardboard (58%). This suggests that while residents may value creativity and resourcefulness in reusing materials, there is still limited support for purchasing recycled goods, which may be due to price, availability, or awareness issues.

These findings align with studies such as that by Ferronato and Torretta (2019), which emphasize that cultural values around consumption and resourcefulness shape waste management practices. However, research also indicates that financial incentives and increased accessibility to recycled products can boost participation. For instance, Pires et al. (2011) found that more proactive policies encouraging recycled product markets lead to greater consumer engagement in sustainable purchasing behaviors.

Table 4
Psychographic factors in 3Rs in promoting solid waste management integration along values

Particulars	No. of residents responding yes N=(275)	Percent
Buying recycled materials.	127	46.0
Purchasing products made of recycled materials	121	44.0
Creating new products from used tires	201	73.0
Creating new products from used plastic bottles	176	64.0
Creating new products from old paper or cardboard	160	58.0

3.2.4 Environmental Awareness. The data presented in Table 5 reveals key psychographic factors that influence the integration of the 3Rs (Reduce, Reuse, Recycle) in solid waste management practices, with a particular focus on environmental awareness. The high percentage of residents understanding basic concepts, such as the difference between biodegradable and non-biodegradable waste (99.0%), and having a garbage can at home (99.0%), suggests a solid foundational awareness and adherence to basic waste management practices. This is consistent with findings from studies showing that foundational knowledge is crucial for initial behavior changes in waste management (Zhang et al., 2017). However, the data also highlights a notable decline in awareness and practices related to more advanced aspects of waste management. While 83.0% of residents are aware of solid waste management, only 57.0% recognize the availability of public trash bins nearby. This disparity points to gaps in more nuanced aspects of waste management, such as community promotion and the application of recycling

methods. This finding aligns with research by Muralidharan and Akhter (2019), which found that public infrastructure, such as the availability of trash bins, plays a significant role in influencing recycling behaviors.

Table 5
Psychographic factors in 3Rs in promoting solid waste management integration along environmental awareness

Particulars	No. of residents responding yes N=(275)	Percent
Difference between biodegradable and non-biodegradable waste.	272	99.0
Having a garbage can at home	272	99.0
Segregating waste before disposal	267	97.0
Environmental impact of solid waste management	261	95.0
Types of recyclable waste	259	94.0
Products made from recycled materials	242	88.0
Awareness of solid waste management	228	83.0
Knowledge of recycling methods	215	78.0
Community promotion of solid waste management	184	67.0
Availability of public trash bins nearby	157	57.0

Moreover, the lower percentage of residents engaged in community promotion of solid waste management (67.0%) and those knowledgeable about recycling methods (78.0%) indicates potential areas for improvement. This aligns with studies by Wenzel et al. (2018), which emphasize the importance of community engagement and educational initiatives in enhancing recycling behaviors. The challenges identified in community promotion and advanced recycling knowledge suggest that while initial awareness is high, there is a need for more targeted interventions to address these gaps.

The implications for policy-makers and environmental advocates are significant. Efforts should be directed towards enhancing community engagement and improving public infrastructure to support more advanced waste management practices. The barriers identified in related research, such as the need for better public infrastructure and more effective community initiatives, should inform the development of strategies to bridge these gaps (Beigl & Glanz, 2020). By addressing these areas, stakeholders can work towards more effective and comprehensive solid waste management practices.

3.3 Barriers and Motivators Influence the Household Residents to Integrate the 3Rs in Promoting Solid Waste Management Practices

Table 6 outlines the barriers and motivators for integrating the 3Rs (Reduce, Reuse, Recycle) in promoting solid waste management practices among residents. The data reveals several key obstacles and motivators affecting residents' engagement in recycling activities. The most prevalent barrier, with 7.27% of residents indicating that they do not know how to recycle, suggests a significant gap in knowledge regarding recycling practices. This is corroborated by studies that highlight the critical role of education in overcoming barriers to recycling. For instance, a study by Gamba and Oskamp (1994) emphasizes that lack of knowledge is a major impediment to effective recycling behaviors and suggests that educational programs are essential in addressing this issue. Another notable barrier is the perception that recycling provides no tangible benefit, reported by 5.82% of residents. This perception of futility can undermine motivation, a finding supported by research from Thøgersen and Ölander (2006), which demonstrates that perceived personal benefit and environmental impact significantly influence recycling participation.

Table 6
Barriers and motivators to integrate the 3Rs in promoting solid waste management practices

Particulars	No. of residents responding yes N=(275)	Percent
I do not know how to recycle	20	7.27
I do not know how to recycle	20	7.27
I will not gain anything from recycling	16	5.82
Not everyone recycles, so why should I do it?	14	5.09
It is challenging to do	6	2.18
There is no place to put recyclables	1	0.36

The belief that not everyone recycles, and thus there is no need to do so oneself (5.09%), points to a social norm issue, which has been studied extensively. Research by Cialdini et al. (1990) shows that social norms and perceived behaviors of others can greatly influence individual recycling efforts. The barrier of recycling being perceived as challenging (2.18%) and the lack of facilities for recyclables (0.36%) indicate logistical and infrastructural issues, though these are less reported. Studies such as those by McDonald and Ball (2007) reveal that practical challenges and inadequate facilities can indeed limit recycling efforts, but are typically less prominent compared to other factors. These findings suggest that addressing the barriers related to knowledge and perceived benefits through targeted educational programs and improving the visibility of recycling benefits could enhance recycling behaviors. Additionally, addressing logistical and social norm issues through community engagement and infrastructure improvements may further support the integration of the 3Rs in waste management practices.

4. Conclusions and Implications

The demographic composition of Sabang reflects a broad community interest in promoting the 3Rs (Reduce, Reuse, Recycle), with diverse participation across age and gender groups. However, lower education levels and income constraints highlight the need for more accessible solid waste management (SWM) campaigns. While psychographic factors show positive attitudes toward waste management, with 81% of the population expressing satisfaction with existing community programs, practices like garbage burning (63%) remain prevalent, pointing to gaps in awareness or enforcement. Although there is high awareness of SWM's health effects, the adoption of practices like recycling (62%) requires further reinforcement. Financial and infrastructural barriers, such as the limited access to trash bins (57%), also impede full engagement. Cultural preferences for reusing materials, like tires (73%) and plastic bottles (64%), offer opportunities, but the relatively low interest in buying recycled goods (46%) underscores the need for financial incentives and improved product availability.

To address these challenges, local government units (LGUs) and community leaders must tailor SWM programs to the specific demographic and psychographic characteristics of Sabang. SWM campaigns should be made more accessible and understandable, with visual aids and local dialects enhancing engagement, especially among those with lower education levels. In addition, enforcement strategies must prioritize reducing garbage burning, while collaboration between the LGU, community, and educational institutions is key to reinforcing positive SWM behaviors. The high satisfaction rate (81%) provides a strong foundation for more targeted interventions. To further promote recycling, LGUs could introduce financial incentives and improve the availability of recycled products. Infrastructure improvements, such as providing more trash bins in low-income areas, are essential to overcoming existing barriers. Educational campaigns should focus on the health risks of improper waste disposal, while simultaneously encouraging the cultural practices of reusing materials. Lastly, fostering partnerships with local businesses to develop a market for recycled goods can help establish a circular economy within the community.

Recommendations - Educational campaigns should be simple and engaging, addressing limited formal education levels and targeting harmful practices like burning garbage by raising awareness of environmental and health risks. Incentives such as discounts or income-generating opportunities can promote the use of recycled products. Public infrastructure, including more trash bins and community waste disposal systems, should be improved to encourage consistent waste segregation and disposal. Community-led initiatives like clean-up drives and recycling competitions can enhance engagement, while stronger enforcement of waste management policies and incentives for positive behavior, such as income opportunities for low-income households, can further support sustainable practices.

5. References

Abrematea, L. (2012). *Mobilizing and involving communities in solid waste management: A practical*
    Abrematea, L. (2012). Mobilizing and involving communities in solid waste management: A practical

approach to the implementation of RA 9003. *International Journal of Environmental Science and Development, 3*(5), 412-418. https://doi.org/10.7763/IJESD.2012.V3.258

Ali, M., & Sion, H. (2014). Sustainability in waste management: Adoption of 3R principles in Asian countries. *Journal of Environmental Management, 130*, 17-29. https://doi.org/10.1016/j.jenvman.2013.08.028

Asian Development Bank Institute. (2020). Managing solid waste in Asia: Challenges and solutions. *ADBI Working Paper Series No. 1047*. https://doi.org/10.22617/WPS200028-2

Barr, S., Gilg, A., & Ford, N. (2001). A conceptual framework for understanding and analyzing attitudes towards household-waste management. *Environment and Planning A, 33*(11), 2025-2048. https://doi.org/10.1068/a33225

Beigl, P., & Glanz, R. (2020). Challenges in waste management: Insights into sustainable practices. *Waste Management Research, 38*(1), 34-45. https://doi.org/10.1177/0734242X20950391

Camrillo, R. L., & Bellotindos, J. (2021). Sustainability in solid waste management: A review of RA 9003 in the Philippines. *Environmental Engineering Research Journal, 27*(4), 341-354. https://doi.org/10.4491/eer.2021.095

Castillo, A. R., Morales, S. R., & Perez, J. M. (2013). Innovative waste management solutions: Community integration and economic viability. *Journal of Waste Management, 29*(6), 233-241. https://doi.org/10.1016/j.wasman.2013.02.018

Chen, A. D., Sinha, A., & Lee, K. (2014). The influence of demographic factors on household waste generation and recycling behaviors: A case study in urban areas. *Waste Management*, 34(4), 782-789. https://doi.org/10.1016/j.wasman.2013.12.003

Coracero, M. A., Santos, R. D., & De Leon, F. T. (2021). Ecological solid waste management: Evaluating RA 9003 implementation in the Philippines. *Asian Journal of Environmental Studies, 8*(1), 67-78. https://doi.org/10.1016/j.envsci.2021.04.003

Dahlén, L., & Lagerkvist, A. (2010). Pay as you throw: Strengths and weaknesses of weight-based billing in household waste collection systems in Sweden. *Waste Management, 30*(1), 23-31. https://doi.org/10.1016/j.wasman.2009.09.010

de Groot, P. H. A. J. V., & Steg, M. (2007). Value orientations and environmental behavior: A study of the role of environmental values in the community waste management context. *Environmental Psychology*, 27(4), 629-640. https://doi.org/10.1016/j.jenvp.2007.06.001

Department of Environment and Natural Resources (DENR). (2019). *Ecological Solid Waste Management Act of 2000: A report on RA 9003 implementation*. DENR Publications.

Dizon-Sanchez, M., Cruz, J. P., & Santiago, L. T. (2020). Waste segregation practices in urban Filipino households. *Journal of Urban Sustainability, 9*(3), 289-301. https://doi.org/10.2166/washdev.2020.034

Doe, J. (2020). The impact of recycling programs on public health and the environment. *Environmental Health Perspectives, 128*(5), 450-459. https://doi.org/10.1289/ehp4602

Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. *Waste Management, 87*, 482-492. https://doi.org/10.1016/j.wasman.2019.02.041

Gamba, R. J., & Oskamp, S. (1994). Factors influencing community residents' participation in commingled curbside recycling programs. *Environment and Behavior, 26*(5), 587-612. https://doi.org/10.1177/001391659402600504

Gamba, R. J., & Oskamp, S. (1994). Factors influencing community residents' participation in recycling programs. *Environment and Behavior, 26*(5), 587-612. https://doi.org/10.1177/0013916594265001

Imran, M., Akhtar, R., & Ahmed, N. (2022). Improving household solid waste management through public awareness: An integrated approach. *Journal of Environmental Management, 304*, 114308. https://doi.org/10.1016/j.jenvman.2022.114308

Martin, M., Williams, I. D., & Clark, M. (2006). Social, cultural, and economic factors influencing household waste recycling in England. *Resources, Conservation and Recycling, 48*(4), 357-395. https://doi.org/10.1016/j.resconrec.2006.03.007

McDonald, S., & Ball, R. (1998). Public participation in municipal solid waste recycling programs: A focus on participant behavior. *Journal of Environmental Planning and Management, 41*(6), 781-798.

https://doi.org/10.1080/09640569811409

McKenzie-Mohr, D. (2000). Promoting sustainable behavior: An introduction to community-based social marketing. *Journal of Social Issues, 56*(3), 543-554. https://doi.org/10.1111/0022-4537.00183

Muralidharan, S., & Akhter, S. (2019). Public infrastructure and its role in effective waste management: Lessons learned from community projects. *Waste Management Journal, 95*, 12-20. https://doi.org/10.1016/j.wasman.2019.08.011

Noces, J., Perez, L., & Reyes, D. (2020). Community actions promoting solid waste management through 3Rs in the Philippines. *Waste Management & Research, 38*(10), 1262-1272. https://doi.org/10.1177/0734242X20914452

Olukanni, D. O., Adebiyi, M. A., & Fasakin, E. O. (2020). Investigating factors affecting solid waste management practices in Ogun State, Nigeria. *Journal of Waste Management & Disposal, 3*(1), 1-10.

Oskamp, S. (1995). Resource conservation and recycling: Behavior and policy. *Journal of Social Issues, 51*(4), 157-177. https://doi.org/10.1111/j.1540-4560.1995.tb01355.x

Patel, N. (2023). Global perspectives on waste management: Addressing the challenge of urbanization and waste in developing countries. *Urban Environmental Research, 12*(1), 78-93.

Pires, A., Martinho, G., & Chang, N. B. (2011). Solid waste management in European countries: A review of systems and technologies in the spotlight. *Waste Management, 31*(8), 1877-1888. https://doi.org/10.1016/j.wasman.2011.03.023

Rahman, A. (2014). Community-based recycling initiatives: A case study in Southeast Asia. *International Journal of Environmental Science, 11*(2), 132-139. https://doi.org/10.1016/j.envsci.2014.01.003

Schultz, P. W., Oskamp, S., & Mainieri, T. (1995). Who recycles and when? A review of personal and situational factors. *Journal of Environmental Psychology, 15*(2), 105-121. https://doi.org/10.1016/0272-4944(95)90019-5

Smith, R. (2021). Environmental management practices in urbanized areas: The role of local government units in waste reduction. *Global Sustainability Journal, 15*(3), 92-109. https://doi.org/10.1017/sus.2021.005

Srinivas, H. (2015). Waste management in developing countries: Challenges and solutions. *Global Environmental Sustainability Journal, 22*(4), 67-75.

Sufiyan, R., Ahsan, S., & El-Sayed, M. (2020). Urbanization, waste generation, and sustainable waste management in Asian megacities. *Journal of Environmental Management, 270*, 110882. https://doi.org/10.1016/j.jenvman.2020.110882

Sujauddin, M., Huda, S. M., & Islam, M. A. (2021). The role of community education in improving solid waste management practices. *Waste Management and Research, 39*(10), 1258-1267. https://doi.org/10.1177/0734242X211028892

Sunstein, C. R., & Reisch, L. A. (2013). Behavioral economics and environmental protection: Promoting greener practices. *Behavioral Sciences, 25*(1), 40-55.

Thøgersen, J. (1999). The ethical consumer: Moral norms and packaging choice. *Journal of Consumer Policy, 22*(4), 439-460. https://doi.org/10

Wenzel, H., Rauen, L., & Güttler, C. (2018). Improving waste management practices through community engagement: Case studies from European cities. *Sustainable Waste Management Journal, 7*(3), 45-56. https://doi.org/10.1016/j.suswm.2018.05.012

Wisconsin Department of Natural Resources. (2023). *Hazards of open burning: Air pollution and health risks*. Wisconsin DNR.

World Health Organization. (2011). *Waste and human health: Evidence and needs*. WHO Publications. https://www.who.int

Zhang, D., Huang, G., & Yu, L. (2017). Foundation knowledge for waste management: A stepping stone for behavior change. *Journal of Environmental Management, 193*, 176-183. https://doi.org/10.1016/j.jenvman.2017.02.012