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Assessing Solid Waste Management Practices of Shoreline Cottages in First Class Municipality Public Beach Resorts: A Quantitative Analysis in South Cebu, Philippines

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Abstract

Beach resorts are vital to the tourism industry, providing relaxation and recreation for both locals and visitors. However, the enjoyment they offer often comes at a cost to the environment, particularly in the form of solid waste. This study takes a closer look at how shoreline cottages in public beach resorts located in South Cebu, Philippines, manage their waste. Guided by the principles of the Ecological Solid Waste Management Act of 2000, the research assessed current waste generation patterns and evaluated management practices in two first-class municipalities: Argao and Dalaguete. Using a quantitative and descriptive approach, data were gathered from 68 participants, comprising business owners, resort staff, and local government officials, through surveys, interviews, and actual waste sampling. The findings reveal a noticeable difference in the amount of waste produced on busy versus unbusy days, with recyclable materials being the most common type of waste generated. While awareness of proper waste disposal is generally high, issues remain in waste segregation and consistent policy enforcement. Importantly, the study found strong correlations between the local government's waste management efforts and those of the resorts, particularly in areas like segregation, disposal, and compliance with penalties. The results highlight the need for a more integrated and collaborative approach to waste management—one that strengthens existing practices, improves compliance, and supports sustainable tourism.

1. Introduction

The state of coastal waste in the Philippines reflects a significant environmental challenge driven by a combination of ineffective waste management practices and rapid urbanization in coastal areas. Despite the implementation of the Ecological Solid Waste Management Act of 2000 (Republic Act No. 9003), which aims to promote environmentally sound solid waste management, the country continues to grapple with a persistent waste crisis. For instance, waste management awareness and practices vary widely across different coastal areas [1], illustrating a mismatch between existing laws and their effective implementation at the local level. This

discrepancy is further highlighted by the fact that local governments frequently lack the necessary resources and enforcement mechanisms to implement solid waste management policies effectively [2], [3].

The volume of waste generated is projected to increase significantly, from approximately 29,315 tons per day to an estimated 77,776 tons per day by 2025 [4]. The Philippines is identified as one of the largest contributors to marine plastic pollution globally, ranking third in the volume of plastic waste entering the oceans [2], [4]. A significant portion of the plastics waste generated in the Philippines is never collected, with estimates suggesting that between 15% to 60% of municipal solid waste goes uncollected, subsequently polluting rivers and coastal environments [5]. This waste adversely affects marine biodiversity and has detrimental impacts on local economies reliant on fishing and tourism. Furthermore, littered beaches deter tourism, which is vital to the Philippine economy, as cleanliness is a significant factor in tourist satisfaction [4], [6].

The impact of coastal waste on beach resorts and tourism in the Philippines is pronounced, with significant implications for environmental integrity, visitor satisfaction, and economic performance. Reports indicate that all surveyed beaches in regions like Barobo, Surigao del Sur, have been contaminated with plastic waste, deterring visitors and sometimes leading to shortened stays or avoidance of these areas altogether [7], [8]. This pervasive pollution directly affects the aesthetic appeal of beaches, which is critical for attracting tourists seeking clean and pristine environments. The environment in the resort is heavily influenced by the state of coastal waste. Litter accumulation not only diminishes the natural beauty of these locations but also affects the health of marine ecosystems that underpin the leisure and attraction value of these regions. The presence of marine litter has been linked to a decline in ecological integrity, with potential ramifications for local fisheries and the natural environment, both of which are integral to tourism and hospitality offerings in coastal areas [9]. Polluted beaches can contribute to poor water quality, leading to health risks for both tourists and locals, which can further discourage tourism, particularly in beach-oriented communities [8].

There is also a significant economic dimension to the waste management issue impacting tourism. Inefficient waste disposal systems result in increased operational costs for beach resorts, including higher expenditures on cleaning and maintenance [7]. In addition, degradation of beach environments can lead to reduced tourist numbers, directly affecting the revenue generated by resorts and local businesses. Studies have quantified that unmanaged waste in the Philippines not only contributes to declining health in marine ecosystems but also puts a dent in tourism revenue—losses can be substantial in coastal regions heavily reliant on this income [10]. Moreover, local communities that depend on tourism as their primary economic activity are often the most affected. Waste pollution leads to a decline in tourist numbers, which adversely impacts jobs and livelihoods associated with the tourism sector. In regions where tourism is the backbone of the local economy, such as in Puerto Princesa or Barobo, the social repercussions of decreased visitor engagement due to polluted beaches can be profound [9], [11]. This interconnectedness underscores the need for effective waste management solutions that not only address pollution but also support the sustainability and economic resilience of coastal tourism.

Therefore, this study aims to quantify and identify the types of solid waste generated by shoreline cottages in public beach resorts and to assess the current waste management practices in selected first-class municipalities in South Cebu. It also seeks to evaluate the level of compliance with Republic Act 9003 and propose actionable solutions for improving waste management practices toward sustainable coastal tourism. This study offers valuable insights for both local communities and government agencies working to protect coastal areas. By showing how much and what types of waste are produced, especially during peak tourist days, it highlights the need for better coordination between resort owners and local authorities. More than just managing trash, this study emphasizes the importance of making waste management a shared responsibility. The findings can help local leaders design practical, community-based solutions that not only keep beaches clean but also support sustainable tourism and protect the environment for future generations.

2. Materials and Methods

This study is a quantitative type that employs a descriptive method of research using adapted and modified survey instruments and informal interviews to describe the present situation of the shoreline cottages. Two separate beach resorts situated in two first-class municipalities in south Cebu, Philippines, namely Argao and Dalaguete, were chosen for the assessment of solid waste produced by shoreline cottages. Table 1 shows the locale of the study and the number of respondents.

Both the municipalities of Argao and Dalaguete are classified as first-class municipalities within the province of Cebu, Philippines. A town is considered a first-class municipality when its average annual income is at Php 55 million or more on average over the last four years. A universal sampling technique was used, wherein the entire population of business owners and staff, as well as the government sector, was used as respondents of the study. A total of sixty-eight (68) business owners and staff from the two beach resorts and from the local government unit (LGU) were part of this study. Business owners and staff are individuals directly managing and working in the beach park or resort. The LGU Clean and Green division is the waste management policy implementer in the municipality. Before collecting waste samples from the chosen areas, a preliminary interview was conducted in

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terms of resort profile, waste management awareness, and practices with the beach resort owners. Waste samples were measured and identified, anchored in the Waste Analysis and Characterization Study (WACS) Manual by the Philippine Environmental Governance Project. The various trash items were weighed on a scale, after which they were sorted and placed in various plastic bags. The researchers then sorted the waste into groups and evaluated it based on weight and percentage composition. The researchers gathered data for a total period of eight (8) days, that is four 4) Tuesdays and four (4) Sundays.

Additionally, statistical treatments, including Weighted Mean and Standard Deviation, were used to treat and analyze the data. Pearson Correlation using Statistical Package for the Social Sciences (SPSS) was also utilized to determine the correlation between the two variables: response of the Local Government Unit and Business Owners to the implementation of RA 9003.

Table 1 *Locale of the study*

Locale of the study	Municipality	Population	Coordinates	Respondents Category	Number
Casay Beach Park	Dalaguete	4,681	9.8215, 123.5501 (9° 49' North, 123° 33' East)	Business Owners and Staff	20
				LGU	17
Mahayahay Beach Resort	Argao	6,009	9.8747° North, 123.6081° East	Business Owners and Staff	20
				LGU	11
		TOTAL			68

3. Results and Discussions

As presented in Table 2, Casay Beach Park offers a total of eighteen cottages, while Mahayahay Beach Resort provides twenty cottages, bringing the combined total to thirty-eight (38) cottages across both public beach resorts. This information is essential for assessing the current availability and capacity of accommodation, which is crucial for planning tourism activities and enhancing visitor experience, which may have an impact on the number of beach visitors and the waste that will generate. The average weekly number of beach goers for the months of October through December 2022 was presented, with the last week of the month having the highest number of beach goers. These findings suggest that weekends and holidays are two main factors influencing the number of beach goers, which has significant consequences for beach management [12].

Furthermore, all respondents (100%) from both municipalities indicated awareness of solid waste management. This high level of awareness suggests a greater likelihood of individuals disposing of their waste in environmentally responsible ways. Such informed practices contribute to reducing pollution and conserving natural resources. This implication is supported by research findings, who reported that solid waste management awareness is positively associated with improved waste management behaviors [13].

Table 2 *The profile of the public beach resorts*

Beach Resort	Number of Cottages	Average Number of Beach goers every week (October to December)				Awareness of Solid Waste Management
		Week 1	Week 2	Week 3	Week 4	
Mahayahay Beach Resort, Argao	20	No records of number of beach goers				Aware
Casay Beach Park, Dalaguete	18	750	845	885	1 ,101	Aware

Shown in Table 3, when it comes to the perception of the group of respondents on waste management in public beach resorts among first-class municipalities in Cebu, for Argao Cebu specifically regarding collection, the computed result among the Cottage Owners and Staff resulted in a weighted mean of 3.80 with its corresponding

description of “Always” while for Argao LGU, the result was 4.00 with its corresponding description of “Always”. On the other hand, in Dalaguete, Cebu, Cottages’ Owners and Staff, the computed result has a weighted mean of 2.80 with its corresponding description of Often, and for Dalaguete LGU, the computed weighted mean is 4.00 interpreted as Always. The result revealed that the collection of solid waste in Argao, Cebu was always practiced from the perspective of both the Cottage Owners and Staff and the LGU while in Dalaguete, Cebu, the group of respondents showed different responses. The overall result for collection indicated "always" and "often" descriptions, which means regular and consistent solid waste collection practices can have positive impacts on the cleanliness and health of the shoreline environment. This research emphasizes the importance of consistent and regular solid waste collection practices for maintaining the cleanliness and health of shoreline environments. The comprehensive and structured approach proposed in the study provides valuable insights into effective waste management strategies [14].

Succeeding, in the punctuality of the LGU of both municipalities on the scheduled date and time on the collection of waste, in Argao, Cebu, the computed result among the Cottage Owners and Staff resulted in a weighted mean of 3.80 with its corresponding description of Always while for Argao LGU, the result was 3.91 with its corresponding description of Always. The computed result of Dalaguete, Cebu Cottages’ Owners and Staff has a weighted mean of 3.75 with its corresponding description of Always, and for Dalaguete LGU, the computed weighted mean is 3.95 interpreted as Always. The result showed that the LGU of both municipalities are Always following the scheduled time and date of waste collection that signifies an environmental preservation which may ensure the maintenance and cleanliness of the environment. These results are aligned with the study that emphasizes the importance of adopting sustainable waste management methods in cities located in the Global South [14]. According to their research, standard waste management procedures frequently entail handling and storing hazardous waste alongside regular residential and commercial waste. Regrettably, these actions may result in hazardous leachate emissions, air and water contamination, deterioration of land and even cause global warming. By contrast, LGUs’ commitment to timely waste collection directly mitigates these negative impacts, safeguarding both the environment and public health [15].

Table 3 *Practices in terms of collection*

Collection	Argao, Cebu				Dalaguete, Cebu			
	Cottages' Owners and Staff		Local Government Unit (LGU)		Cottages' Owners and Staff		Local Government Unit (LGU)	
	WM	Description	WM	Description	WM	Description	WM	Description
The frequency of solid waste collection practice	3.80	Always	4.00	Always	2.80	Often	4.00	Always
Following the scheduled time and date of the collection	3.80	Always	3.91	Always	3.75	Always	3.95	Always

*WM =Weighted Mean

When it comes to segregation, shown in Table 4, in Argao, Cebu, the result among the Cottage Owners and Staff resulted in a weighted mean of 3.00 with its corresponding description of Often while for Argao LGU, the result was 2.10 with its corresponding description of Sometimes. Based on the researchers’ interviews on the Argao LGU represented by the Clean and Green Management Head, there was once a strict implementation of solid waste segregation, but at present is no longer implemented in the municipality due to political concerns. In Dalaguete, Cebu for the Cottage Owners and Staff, the weighted mean is 2.20 with its corresponding description of Sometimes while for its LGU the weighted mean is 3.82 interpreted as Always. The findings highlighted the challenges faced by municipalities and beach resorts in implementing effective solid waste segregation practices. The impact of Typhoon Odette and subsequent recovery efforts have influenced waste management practices in Casay, Dalaguete. Interestingly, the results aligned with a study conducted in 2023, which proposes circular waste management principles aligned with the Sustainable Development Goals (SDGs). The study on circularity, which focuses on waste management, underscores the necessity for a transition away from the disposable economy. Through combining circular principles, waste management can become more sustainable and contribute to achieving the 2030 Agenda [16].

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Moreover, the results also showed the clean and green management compliance on the emptying of waste containers in the beach resorts of Mahayahay, Argao and Casay, Dalaguete. In Argao, Cebu, the computed result among the Cottage Owners and Staff resulted in a weighted mean of 4.00 with its corresponding description of Always while for Argao LGU, the result was 3.00 with its corresponding description of Often. The computed result of Dalaguete, Cebu Cottages' Owners and Staff has a weighted mean of 2.05 with its corresponding description of Sometimes, and for Dalaguete LGU, the computed weighted mean is 3.89 interpreted as Always. The group of respondents had inconsistent response on the compliance of the clean and green in the emptying of waste containers in both beach resorts. The responses from both municipalities of Cottages' Owners and Staff are completely different to the responses of the Clean and Green Management (LGU) that showed disagreement and implied an unstable waste management in the area that is comparable to the research that describes the adverse effects of unstable waste management leading to increase environmental pollution [17].

Table 4 *Practices in terms of segregation*

Segregation	Argao, Cebu				Dalaguete, Cebu			
	Cottages' Owners and Staff		Local Government Unit (LGU)		Cottages' Owners and Staff		Local Government Unit (LGU)	
	WM	Description	WM	Description	WM	Description	WM	Description
Frequency of the practice of solid waste segregation	3.00	Often	2.10	Sometimes	2.20	Sometimes	3.82	Always
Clean and Green Compliance on the emptying of waste containers	4.00	Always	3.00	Often	2.05	Sometimes	3.89	Always

*WM =Weighted Mean

For transport and disposal, shown in Table 5 that among the group of respondents, in Argao, Cebu the data for the Cottage Owners and Staff and LGU resulted in a weighted mean of 3.75 and 4.00 respectively with its corresponding description of Always. On the other hand, in Dalaguete, Cebu for the Cottage Owners and Staff and LGU the weighted mean is 3.9 and 3.77 correspondingly interpreted as Always. The results mean that both public beach resorts have a consistent implementation of the transport or transfer of solid waste from the vicinity to its designated dumping sites leading to a controlled volume of waste in the beach resorts thus, helping facilitate effective solid waste management, which relates to the article titled "Waste Management Strategies for Sustainable Development" published in 2019 which provided insights into waste management practices, emphasizing the importance of continuous garbage transport for sustainable development. By adhering to these strategies, the beach resorts play a crucial role in maintaining environmental sustainability and promoting responsible tourism [18].

Table 5 *Practices in terms of transport and disposal*

Transport and Disposal	Argao, Cebu				Dalaguete, Cebu			
	Cottages' Owners and Staff		Local Government Unit (LGU)		Cottages' Owners and Staff		Local Government Unit (LGU)	
	WM	Description	WM	Description	WM	Description	WM	Description
The frequency of solid waste transport practice	3.75	Always	4.00	Always	3.90	Always	3.77	Always
Frequency of the practice of solid waste disposal	3.60	Always	3.64	Always	2.65	Often	3.77	Always

*WM =Weighted Mean

Based on the quantification (Table 6) and identification (Tables 7 and 8) of waste in the two (2) different beach resorts, Casay Beach Park and Mahayahay Beach Resort, the amount and composition generated differ on busy and unbusy days. Busy days in a beach resort meant a greater number of visitors coming than the usual non-busy days. Further, room availability and service demands are higher on busy days. For Casay Beach Park, for instance, the amount of biodegradable waste generated during busy days was 21.61 kg, compared to 16.30 kg during unbusy days. Similarly, for recyclable waste, the amount generated during busy days was 32.29 kg, compared to 23.50 kg during unbusy days. The pattern is consistent across all categories of waste, with higher amounts generated during busy days. Meanwhile Mahayahay Beach Resort, shown in the table is that on busy days, most of the waste generated in this beach resort falls under the recyclable category as well, with a total of 15.33 kg, followed by biodegradable waste with 5.39 kg, and residual waste with 2.33 kg. No special waste was generated during busy days. However, during unbusy days, most of the waste produced was recyclable waste with 7.94 kg, followed by biodegradable waste with 3.19 kg and residual waste with 1.23 kg, however, no special waste was also generated. The finding that waste generation differs between busy and unbusy days, with a higher amount of recyclable waste, carries significant implications for waste management in beach resorts. This suggests that visitor behaviour and consumption patterns influence the variation in waste generation. Study reported that tourism's impact on solid waste generation can exceed 22% of the local population's contributions to waste when accounting for seasonal fluctuations in tourist flows [19]. In fact, during peak tourist seasons, resorts can experience waste production far exceeding standard estimates, potentially leading to overwhelming local waste management systems. This seasonality is compounded by a higher concentration of visitors engaging in activities like picnicking and water sports, which generate more litter [20], [21].

Table 6 *Average solid waste generated in both public beach resorts in a month*

Type of Waste	Casay Beach Park, Dalaguete		Mahayahay Beach Resort, Argao	
	Busy Day (in kg)	Unbusy Day (in kg)	Busy Day (in kg)	Unbusy Day (in kg)
Biodegradable	21.61	16.3	5.89	3.19
Recyclable	32.29	23.5	15.33	7.94
Residual	3.99	2.54	2.33	1.23
Special	0.00	0.00	0.00	0.00
Total	57.89	42.34	23.55	12.36

On busy days, when visitor numbers are higher, there tends to be an increase in overall waste generation, including a higher proportion of recyclable waste. These findings carry significant implications for waste management strategies in beach resorts. Effective waste management must account for fluctuations in visitor volume and adapt accordingly. These findings carry significant implications for waste management strategies in beach resorts. Studies explored the interrelationship between solid waste management (SWM) plans, including recycling, and the specific targets set by the Sustainable Development Goals (SDGs). Their research emphasizes the importance of aligning SWM strategies with broader sustainability objectives [16].

Notably, recyclables such as plastic bottles, and other plastics constitute a significant portion of beach waste, with plastics exhibiting seasonal fluctuations. The finding that biodegradable waste ranks second in terms of waste generation in two beach resorts, Casay Beach Park in Dalaguete and Mahayahay Beach Resort in Argao, suggests that food waste, plant matter, and other organic materials, constitutes a significant portion of solid waste in beach resort areas. Factors such as food consumption, landscaping activities, and beach goer behaviour contribute to the generation of biodegradable waste in this setting. The finding that biodegradable waste ranks second in terms of waste generation in two beach resorts, Casay Beach Park in Dalaguete and Mahayahay Beach Resort in Argao, suggests that food waste, plant matter, and other organic materials, constitutes a significant portion of solid waste in beach resort areas. Factors such as food consumption, landscaping activities, and beachgoer behaviour contribute to the generation of biodegradable waste in these settings. Further investigated the potential pollution of lake water from the operations of beach resorts situated in Batangas, Philippines, at the local level [16]. It examined the water quality indicators at the beach resort sites and evaluated them with the standards established by the Department of Environment and Natural Resources. The governance challenges and opportunities for improving the waste management practices in the beach resorts are also highlighted. The paper mentions that biodegradable waste ranks second in terms of waste generation in beach resorts, and suggests that food waste, plant matter, and other organic materials constitute a significant portion of solid waste in beach resort areas.

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Table 7 *Breakdown of solid waste as to the waste analysis and characterization study (WACS) manual in kg in Casay Beach Park, Dalaguete*

Type of waste	Average volume in kilograms		Total (in kg)	Rank
	Busy day	Unbusy day		
Biodegradable				
Dry Leaves	9.19	4.70	13.89	***1***
Leftovers	7.41	5.20	12.61	***2***
Papers	0.4	0.00	0.40	5
Cartoons	4.61	4.70	9.31	***3***
Fruit Peelings	0.00	1.70	1.70	4
Total	***21.61***	***16.3***		
Recyclable				
Disposable Plates	3.25	3.10	6.35	4
Plastic Bottles	6.38	4.63	11.00	***2***
Plastic Wrappers	1.06	3.06	4.13	6
Plastic Cellophane	6.68	3.01	9.69	***3***
Plastic Spoon	0.56	0.63	1.19	9
Plastic Cup	3.86	1.56	5.43	5
Fragile Bottles	6.78	6.15	12.93	***1***
Tin Cans	2.20	1.36	3.56	7
Paper Bags	1.53	0.00	1.53	8
Total	***32.29***	***23.5***		
Residual				
Tissue	0.69	1.01	1.70	***2***
Balloons	0.13	0.13	0.25	4
Diapers	2.18	0.94	3.12	***1***
Facemask	0.05	0.04	0.09	5
Sanitary pads	0.95	0.43	1.38	***3***
Total	***3.99***	***2.54***		
Special	0.00	0.00	0.00	
Total	***0.00***	***0.00***	0.00	N/A

Table 8 *Breakdown of solid waste as to the WACS manual in kg in Mahayahay Beach Resort, Argao*

Type of waste	Average volume in kilograms		Total (in kg)	Rank
	Busy day	Unbusy day		
Biodegradable				
Dry Leaves	1.31	0.86	2.18	**2**
Leftovers	3.58	1.84	5.41	**1**
Papers	0.00	0.00	0.00	5
Cartoons	1.00	0.25	1.25	**3**
Fruit Peelings	0.00	0.24	0.24	4
Total	***5.89***	***3.19***		
Recyclable				
Disposable Plates	1.68	0.25	1.93	4
Plastic Bottles	2.93	2.18	5.1	**2**
Plastic Wrappers	0.88	0.88	1.75	5
Plastic Cellophane	2.44	1.22	3.66	**3**
Plastic Spoon	0.25	0.00	0.25	8
Plastic Cup	0.85	0.73	1.58	6
Fragile Bottles	5.5	2.19	7.69	**1**
Tin Cans	0.69	0.33	1.01	7
Aluminum Food Storage	0.13	0.00	0.13	10
Cloth	0.00	0.18	0.18	9
Total	***15.33***	***7.94***		
Residual				
Tissue	0.30	0.25	0.55	**2**
Charcoal	0.00	0.13	0.13	6
Diapers	1.45	0.50	1.95	**1**
Facemask	0.35	0.15	0.5	**3**
Sanitary pads	0.23	0.05	0.28	4
Tenfoils	0.00	0.15	0.15	5
Total	***2.33***	***1.23***		
Special	0.00	0.00	0.00	
Total	***0.00***	***0.00***	0.00	N/A

Comparing the waste composition, the predominance of recyclable plastics in both Cebu resorts reflects the global trend of plastics constituting a major share of tourism-related waste in Finland [22]. It highlighted plastic and packaging materials as dominant waste types in resort areas. Furthermore, the significant presence of biodegradable waste (e.g., food leftovers, dry leaves) in the Cebu study is consistent with research in the Philippine beach resorts, which reported organic wastes as a major component due to food consumption and landscaping activities [23]. Additionally, the presence of residual waste, albeit in lower quantities compared to recyclable and biodegradable waste, suggests that not all waste generated in the beach resorts can be effectively recycled or composted. This residual waste often consists of items such as plastic wrappers, foam products, cigarette butts, and other miscellaneous items like diapers, face masks and many more. A study that supports this finding investigated solid waste management practices of personnel and owners of Panglao inland and beach-front resorts in the Philippines [22]. It reveals that both types of resorts generate several kinds of waste and are conscious of the SWM practices, particularly on the segregation of waste, but this is not strictly followed. He also noted that the residual waste often consists of items such as plastic wrappers, foam products, cigarette butts, and other miscellaneous items.

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The findings of this study further reflect a strong relationship between the volume of waste generated and the local population size of the beach resort areas. Mahayahay Beach Resort in Argao, with a population of approximately 6,009, and Casay Beach Park in Dalaguete, with around 4,681 residents, both showed a notable increase in waste generation during busy tourist days. When visitor numbers spike, especially during weekends or holidays, the local infrastructure, originally designed for the resident population, becomes overwhelmed. This mismatch between permanent population and peak demand waste generation emphasizes the need for scalable and responsive waste management systems in coastal areas.

Table 9 *Level of compliance of LGU (Clean and green management) Argao provision or statement as to the Republic Act 9003*

Argao Local Government Unit (Clean and Green)			
Provision as to:	Weighted mean	Standard deviation	Interpretation
Segregation	1.00	0.00	Fully not compliant
Collection	4.00	3.46	Compliant
Transportation	4.27	3.77	Compliant
Disposal	3.73	3.22	Compliant
Fines and penalty	1.00	0.00	Fully not compliant
Crime and offenses	1.00	0.00	Fully not compliant

Table 10 *Level of compliance of LGU (Clean and green management) Dalaguete provision or statement as to the Republic Act 9003*

Dalaguete Local Government Unit (Clean and Green)			
Provision as to:	Weighted Mean	Standard Deviation	Interpretation
Segregation	3.18	2.70	Neither/not Compliant
Collection	4.00	3.46	Compliant
Transportation	4.00	3.46	Compliant
Disposal	4.00	3.46	Compliant
Fines and penalty	3.47	2.97	Compliant
Crime and offenses	1.35	0.97	Fully not compliant

For the level of compliance, shown in Table 9 and 10 the results suggested that both Argao and Dalaguete prioritize compliance in the collection, transportation, segregation and disposal, while neglecting fines and penalties and crimes and offenses, which are both non-compliant. This implies that the owners and LGU are not taking the necessary action to ensure compliance with regulations related to fines, penalties, and offenses. It is recommended that both owners take the necessary steps to ensure compliance with all regulations to ensure their operations are in line with the law. Taking everything into consideration, a unified approach that considers the complete management of waste process, from the collection to transport and disposal, should be implemented to efficiently handle solid waste sustainably in nations undergoing development. Effective communication and education should also be a part of this strategy to encourage compliance among cottage owners and reduce the harmful impacts of waste on the natural environment and the general welfare. This finding is consistent with the concept of integrated sustainable waste management, which involves a comprehensive approach to managing solid waste sustainably. It encompasses all stages from generation to disposal, emphasizing efficient resource utilization. Several studies have applied and advocated for ISWM in developing countries, highlighting its benefits and challenges [24]. Lastly, in both Municipalities, based on the data in Table 11, in the provision of segregation, disposal, penalties and fines, and criminal offenses, respectively, there is a high significant correlation ($p = <0.001$), the two variables, hence the null hypothesis is rejected. The highly significant relationship suggests a strong association between the actions and policies implemented by the LGU and the behaviours and practices of the resort owners across these four aspects. Conversely, the lack of significant relationship in the collection ($p = 0.800$) and transport ($p = 0.913$) between the responses of the LGUs and the owners of public beach resorts with the provisions of collection and transport under Republic Act 9003, made it to accept the null hypothesis.

Table 11 *Correlation on the perceived level of compliance of LGU (Clean & green management) and cottages owners and staff as to the Republic Act 9003*

Provision	Environment	Respondent group	Mean	SD	F	p-value	Interpretation
1. Segregation	Mahayahay, Argao	Owners	1	0	93.058	<0.001	Highly Significant
		LGU	1	0			
		Total	1	0			
	Casay, Dalaguete	Owners	1.25	0.44			
		LGU	3.18	0.64			
		Total	2.14	1.11			
2. Collection	Mahayahay, Argao	Owners	4.45	0.51	0.064	0.8	Not Significant
		LGU	4	0			
		Total	4.29	0.46			
	Casay, Dalaguete	Owners	4.5	0.51			
		LGU	4	0			
		Total	4.27	0.45			
3. Transport	Mahayahay, Argao	Owners	4.5	0.51	0.012	0.913	Not Significant
		LGU	4.27	0.47			
		Total	4.42	0.5			
	Casay, Dalaguete	Owners	4.25	0.44			
		LGU	4	0			
		Total	4.14	0.35			
4. Disposal	Mahayahay, Argao	Owners	3.65	0.49	51.529		Highly Significant
		LGU	3.73	0.47			
		Total	3.68	0.48			
	Casay, Dalaguete	Owners	2.4	0.5			
		LGU	4	0			
		Total	3.14	0.89			
5. Fines and Penalties	Mahayahay, Argao	Owners	1	0	369.336	<0.001	Highly Significant
		LGU	1	0			
		Total	1	0			
	Casay, Dalaguete	Owners	1	0			
		LGU	3.47	0.51			
		Total	2.14	1.29			
6. Criminal Offense	Mahayahay, Argao	Owners	1	0	16.959	<0.001	Highly Significant
		LGU	1	0			
		Total	1	0			
	Casay, Dalaguete	Owners	1	0			
		LGU	1.52	0.51			
		Total	1.24	0.43			

The findings of research conform to the research outcome that evaluated and identified the problems and issues encountered by the resort owners and the local government unit in complying with the environmental laws and regulations [23]. They found that the resort owners faced challenges such as lack of proper facilities, equipment, and personnel, as well as low in understanding and participation of the guests and staff. They also found that the local government unit had difficulties in monitoring and enforcing the compliance of the resort owners, as well as providing adequate support and incentives. They recommended that the resort owners should adopt more proactive and innovative approaches to reduce, reuse, and recycle their waste. They also suggested that the local government unit should strengthen its coordination and collaboration with the resort owners, as well as other stakeholders such as the DENR, the Department of Tourism, and local communities [23].

The study provides further evidence that the actions and policies implemented by the LGU, and the behaviours and practices of the resort owners are strongly associated with the provision of segregation, disposal, penalties and fines, and criminal offenses under Republic Act 9003. It also supports the hypothesis that the compliance of the LGU and the owners with the provisions of collection and transport might be influenced by other factors, such as their commitment to environmental preservation and awareness of the impacts of waste material pollution on the condition of aquatic ecosystems and human society. It also offers some possible explanations for the different motivations and strategies of the LGU and the owners in complying with the Republic Act 9003, such as their resources, incentives, and priorities.

4. Conclusions and Recommendations

This study revealed that while public beach resorts in the first-class municipalities of South Cebu generally comply with the basic aspects of solid waste management—such as collection, transportation, and disposal—significant gaps remain, particularly in waste segregation. Compliance with legal provisions under Republic Act 9003 is inconsistent, especially when it comes to implementing penalties and addressing criminal offenses related to waste management. Moreover, waste generation was observed to be considerably higher on busy days, with recyclable materials comprising the largest portion, followed by biodegradable and residual waste. These findings highlight the need for more effective and sustainable waste management strategies. To improve current practices, several solutions are recommended. First, there is a need to implement a more comprehensive and consistent waste segregation program. This includes providing clearly labeled bins and regularly monitoring compliance among resort staff, vendors, and visitors. The role of local government units (LGUs) is also crucial; stronger political will and institutional support are necessary to revive and sustain effective waste policies, especially in areas where enforcement has waned due to political issues.

Enacting and enforcing local ordinances that specify clear penalties for non-compliances will also help ensure that waste management rules are taken seriously. Given the seasonal nature of tourism, it is essential to develop flexible waste management plans that can scale up during peak periods. This involves increasing the frequency of waste collection and allocating additional resources during busy days. Capacity building should also be prioritized. Providing training for both LGU personnel and resort staff can help strengthen awareness and skills related to sustainable waste handling. Additionally, establishing recycling incentive schemes and creating partnerships with local recyclers can encourage better waste segregation and resource recovery. Tourists should also be part of the solution. Waste education efforts—such as visible signage, orientation sessions, and awareness campaigns—can help guide visitors toward responsible disposal practices.

Finally, all these efforts should be guided by an Integrated Sustainable Waste Management (ISWM) approach, which promotes a systems-based strategy involving all stakeholders from waste generation to final disposal. By taking these steps, the public beach resorts in South Cebu can significantly reduce their environmental impact, promote cleaner and safer coastal areas, and strengthen their position as sustainable tourism destinations. A collaborative approach among LGUs, business owners, and local communities is essential to protect natural resources and ensure long-term benefits for both the environment and the local economy.

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Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Marjorie Romaguera;* ***data collection:*** *Juan Jr. Albiso, Juriza Sardido, Marjorie Romaguera;* ***analysis and interpretation of results:*** *Marjorie Romaguera, Juan Jr. Albiso, Juriza Sardido;* ***draft manuscript preparation:*** *Gladys Jane Remolino, Mary Ellen Camarillo, Vevencio Alonso Jr., Liez Gonzales, Michael Camello. All authors reviewed the results and approved the final version of the manuscript.*

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