ORIGINAL ARTICLE

Factors affecting solid waste management on Libong Island, Kantang District, Trang Province

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ABSTRACT

The purposes of the study were to examine the context of the area and factors affecting solid waste management for residents and tourists on Libong Island. The study included three target groups: the Health Assembly steering group of 28 people selected by purposive sampling, 126 households from Villages No. 1 and No. 4 with the sample group comprising 322 people, selected by stratified sampling, in addition to 122 tourists using random accidental sampling. The research tools were questionnaires and interviews, and the data were analyzed using frequency, percentage, mean, standard deviation, and multiple regression analysis.

The study findings revealed first of all that solid waste generation on Libong Island averaged 17.25 kilograms per household per week. The largest proportion of organic waste is recycled. The important issue is that waste is only collected and transported for disposal once per week, resulting in waste accumulation, particularly during public holidays. Most residents have a lack of awareness and therefore there is limited participation in the separation of waste illegally dumped in public places, at sea, or burned outdoors. In addition, tourists also leave solid waste at tourist attractions. Second, the factors affecting solid waste management among residents of Libong Island included participation, awareness, attitudes, and knowledge about solid waste. Variables with negative predictive power included receiving information from publicity signs. These five variables were able to predict the solid waste management practices of residents by 26.6 percent (R^2=0.266). Factors affecting the solid waste management of tourists on Libong Island included awareness, level of education, and knowledge. Variables with negative predictive power included receiving information from newspapers and brochures, and occupation. These five variables were able to predict the solid waste management behavior of tourists by 35.7 percent (R^2=0.357).

Keywords:
health assembly, solid waste management, Libong Island

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INTRODUCTION

Solid waste has emerged as a major global problem, affecting both the land and marine environments. According to a World Bank report, more than 2 billion tons of solid waste is generated annually worldwide, and this is estimated to reach 3.4 billion tons by 2050.[1] The United Nations has designated waste reduction as one of the Sustainable Development Goals (SDGs) to be achieved by 2030.[2]

Similarly, Thailand faces the same problem with solid waste. In 2022, solid waste production throughout the country reached 25.70 million tons, or 70,411 tons per day, representing a 3 percent increase from 2021.[3] In this regard, 28 percent of this waste is improperly disposed of, eventually becoming a potential hazard for rivers, canals, beaches, and the sea.[4,5] Consequently, Thailand is ranked 10th in the world for releasing waste into the sea.[5]

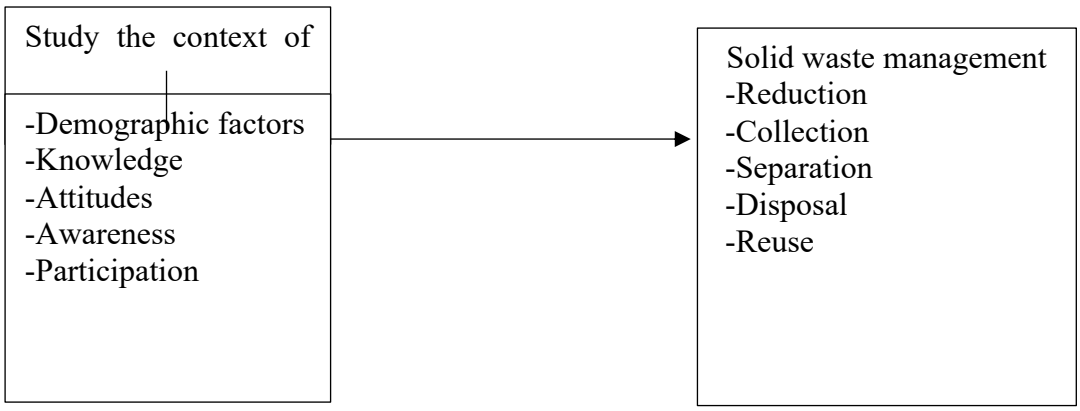
Libong Island is a famous marine tourist attraction in Trang Province, and serves as the largest dugong habitat. The local community has successfully developed the island as an attraction, which now draws increasing numbers of Thai and foreign tourists who seek natural experiences. This corresponds to the current popular trend,[6] especially during the tourist seasons or holidays. Consequently, the amount of residual waste accumulated in communities, beaches, and the sea has increased.[7,8]

Statistical data revealed the rising amount of solid waste on Libong Island during the 2020-2022 period. Monthly averages of 111.03 (2020), 118.66 (2021), and 143.32 (2022) tons of solid waste were produced.[9] It has been possible to collect and transport only 44.01 percent of this household waste,[7,9,10] resulting in some waste remaining on the island. Furthermore, both residents and tourists illegally dump solid waste in public areas and the sea, and burn the solid waste themselves.[7,8] This indicated insufficient waste management efficiency within the community. This situation affects human health, the environment, society, and tourism.[11,12] Moreover, it was found that the community's rubbish dumping site was near a canal that flows into the sea.[8] Therefore, there is a risk that solid waste will be washed into the sea. As a result, many aquatic animals, including dugongs, face increased injuries and deaths due to marine waste ingestion, especially plastic waste.[12,13] Marine debris also affects the marine ecosystem and food chain, and studies have found microplastics in seafood.[7,14,15,16]

A preliminary community survey has identified solid waste management issues of Libong Island. This is because the responsible agency is unable to comprehensively manage solid waste in the area in addition to the irresponsible behaviour of residents and tourists.[7,12] This finding aligns with the 10th National Health Assembly Report, which indicated that the majority of people still lack knowledge, awareness, and sustained participation in waste management.[17] Reviews of related research have identified various factors affecting solid waste management among residents and tourists including personal factors, knowledge, attitude, awareness, and participation.[18-23]

However, from a review of the research, it was found that there is still limited information on the situation of solid waste management and the factors affecting it on Libong Island, Kantang District, Trang Province, based on the importance of the aforementioned problem conditions. This prompted the researchers' interest in this study. The objective was to study the context of the area and the factors affecting solid waste management for residents and tourists on Libong Island.

CONCEPTUAL FRAMEWORK



METHODS

Study design and location

This exploratory research was conducted to study the context of the area and the factors affecting solid waste management among residents and tourists on Libong Island, Kantang District, Trang Province in 2023.

Population and sample size

1) A Health Assembly steering group of 28 people from the political, academic, and public sectors were randomly selected via purposive sampling.

2) Residents: The study population consisted of 1,966 Thai people aged 15 years and over who had lived on Libong Island for at least 1 year.[24] The sample size was calculated using the formula from Krejcie and Morgan.[25] The sample size was 322, and stratified random sampling was performed according to the village population proportion followed by systematic random sampling.

3) Tourists: The inclusion criteria for Thai tourists were individuals aged 15 years and over and had stayed in the area for at least three days. Since the tourist population size was unknown, the sample size was then calculated using Green's formula,[26] resulting in 122 tourists who were selected through accidental sampling.

4) Houses: The population of houses from village no. 1 and village no. 4 consisted of 502 houses. Following the criterion that the sample size should be less than 25% when the population is in the hundreds, 126 houses were selected, with 61 from village no. 4 and 65 from village no. 1, through simple random sampling.

Research instrument

The research instrument was divided into four parts, as follows.

Part 1: A questionnaire on the factors affecting solid waste management from the perspective of residents and tourists in Libong Island, Kantang District, Trang Province.

Part 1.1 A questionnaire to collect personal details, including age, education level, occupation, household status, monthly household income, number of household members, receiving information, social status, and community role. Characteristics include a checklist and a short answer form. Tourists were exempted from the number of household members, household status, social status, or role in the community sections.

Part 1.2 A questionnaire on knowledge was developed from Phok,[27] consisting of 20 questions that could be answered with either 'yes', 'no', or 'not sure'. To interpret the results, high

knowledge was indicated by a score of 16-20 points (correct answer score ≥ 80%), moderate knowledge by 13-15 points (correct answer score 60-79%), and low knowledge by 0-12 points (correct answer score < 60%) in line with the criteria of Bloom.[28]

Part 1.3 An attitudinal questionnaire was developed from Thabpadung,[29] consisting of 15 items measured on a five-point rating scale from 'strongly agree', 'agree', 'not sure', 'disagree', to 'strongly disagree'. Results were classified as good attitude (3.67-5), moderate attitude (2.34-3.66), and not good attitude (1.00-2.33) in line with the criteria of Best.[30]

Part 1.4 A questionnaire on awareness of waste management was developed from Phok,[27] consisting of 15 items measured on a five-point rating scale from 'strongly agree', 'agree', 'not sure', 'disagree', to 'strongly disagree'. Results were classified as high awareness (3.67-5), moderate awareness (2.34-3.66), and low awareness (1.00-2.33) in line with the criteria of Best.[30]

Part 1.5 A questionnaire on participation was developed from Kirdklinhom,[31] consisting of 12 items covering: 1) decision-making; 2) operations; 3) receiving benefits, and 4) evaluation using a five-point rating scale, ranging from 'most', 'a lot', 'moderate', 'a little', to 'the least'. This section only evaluates residents, with results classified as most participation (3.67-5), moderate participation (2.34-3.66), and little participation (1.00-2.33) in line with the criteria of Best.[30]

Part 1.6 A questionnaire on solid waste management was developed from Bualad,[32] containing 28 items across five aspects: 1) reduce; 2) collect; 3) separate; 4) dispose, and 5) reuse using a three-point rating scale from 'practice every time/regularly', 'practice sometimes', to 'never practice'. Tourists were only required to complete aspects 1-4. Results were categorised as high management (2.34-3), moderate management (1.67-2.33), and low management (1.00-1.66) in line with the criteria of Best.[30]

Part 2: In-depth interviews with the Health Assembly were developed based on Kulyanee[33] comprising three structured open-ended questions about community solid waste management.

Part 3: Survey on the total amount of solid household waste generated per week, classified as organic waste, general waste, recycling waste, hazardous waste, and infectious waste.

Part 4: Equipment used to separate solid waste such as weighing scales, shovels, gloves, masks, canvas floor coverings, black bags, and ropes.

Quality testing was performed by three experts. The questionnaire had an IOC of 0.67 – 1. Subsequently, a pilot test was conducted on Sukorn Island, yielding a Cronbach's alpha coefficient of 0.72-0.95, indicating an acceptable value.[34]

Data collection

For solid waste management, secondary data were collected from the Koh Libong Subdistrict Administrative Organisation. In-depth interviews with the Health Assembly group surveyed the total amount of household solid waste generated per week in village no. 1 and village no. 4 and checked the composition of solid waste from the waste disposal sites on Libong Island. The factors affecting the solid waste management of residents and tourists were studied using questionnaires. Before collecting the data, research assistants were thoroughly trained on the purpose of the research process. Research assistants administered the questionnaires and protected the rights of the sample groups. The research assistant also checked the questionnaires for accuracy and completeness and returned them to the researcher.

Data analysis

Data analysis was performed using IBM SPSS Statistics 26, consisting of both descriptive statistics (percentages, means, and standard deviations) and inferential statistics (stepwise multiple regression). This was performed before using multiple regression statistics. Assumptions were verified by Hair et al. (2010).[35] The significance level was set at 0.05.

Ethical approval

This study received approval from the Human Research Ethics Committee, Mahasarakham University, No. 023-016/2023. Certification date: 30 January 2023 – 29 January 2024.

RESULTS

1. Contextual Study of the Situation of Solid Waste Management on Libong Island, Kantang District, Trang Province.

According to the report on the amount of solid waste generated on Libong Island in 2022, the average monthly waste production was 143.13 tons.[9] Households that received waste transportation service for disposal by the Koh Libong Subdistrict Administrative Organisation accounted for 44.01 percent.[7,9,10]

In-depth interviews, revealed that Libong Island faced increasing amounts of solid waste every year. The Subdistrict Administrative Organisation struggles with waste collection, due to insufficient staff and the frequent breakdowns of solid waste collection trucks. In addition, the solid waste remains in smelly rubbish incinerators which malfunctioned. As a result, rubbish collectors must burn it outdoors. Most people neither separate nor dispose of their own rubbish properly and instead burn it. Solid waste is illegally dumped in the sea and in public places. Shops continue to use foam as a food container. Some tourists throw away solid waste at attractions they visit.

A preliminary survey on the amount of solid waste indicated that the rate of solid waste generation in the Libong Island area was 17.25 kilograms per household per week, as shown in Table 1.

Table 1. Average amount of solid waste produced per household per week, classified by area type in Village No. 1 and Village No. 4 on Libong Island, Kantang District, Trang Province, (n=126)

Solid waste	Average quantity (kg)	Percent of total waste
1. Organic waste	3.0	17.39
2. General waste	7.49	43.42
3. Recycling waste	5.10	29.57
4. Hazardous waste	0.76	4.40
5. Infectious waste	0.90	5.22
Total	17.25	100.00

Organic solid waste constituted the largest proportion of the waste, followed by other types of solid waste. From a survey of the composition of solid waste at disposal sites, food waste comprised the greatest amount at 44.78 percent, followed by plastics and foam at 28.53 percent, and paper at 7.27 percent, as shown in Table 2.

Table 2. Composition of solid waste at the disposal site on Libong Island, Kantang District, Trang Province

Group type of solid waste	Type of waste	Average weight as a percentage of total waste
Organic waste	1.1 Food waste	44.78
	1.2 Garden waste	3.54
General waste	2.1. Plastics and foam	28.53
	2.2 Textile	3.61
	2.3 Residual	1.00
Recycling waste	3.1 Paper	7.27
	3.2 Glass	3.92
	3.3 Rubber	3.22
	3.4 Metal	1.22
	3.5 Wood	0.96
Hazardous waste	4.1 Spray can/Battery	1.12
Infectious waste	5.1 Used nappies	0.83

Most of the residents and tourists in the sample were 41-59 years old, had employment as labourers, earned 600-10,000 baht per month, and received information from radio/television. In addition, the residents had households with 4-6 members, family status as a member of the household, were members of the general public, and had a secondary education level. Meanwhile, tourists had a primary school education level, as shown in Table 3.

Table 3. Demographic characteristics of residents and tourists

Variables	Residents (n=322)		Tourists (n=122)	
	n	Percentage	n	Percentage
Age (years)				
< 21	41	12.73	2	1.64
21-40	104	32.30	47	38.53
41-59	152	47.21	53	43.44
≥ 60	25	7.76	20	16.39
	Mean = 40.62, S.D. = 13.97		Mean = 44.04, S.D. = 13.99	
Level of education				
Primary education	103	31.99	43	35.24
Secondary education	152	47.20	39	31.97
High vocational certificate	21	6.52	33	27.05
Bachelor's degree or higher	46	14.29	7	5.74
Occupation				
Labourer	71	22.05	39	31.97
Agriculture	66	20.50	30	24.59
Trading career/ Private employee	50	15.53	27	22.13
Fisherman	48	14.91	0	0
Unemployed	42	13.04	3	2.46
Student	35	10.87	9	7.38

Variables	Residents (n=322)		Tourists (n=122)	
	n	Percentage	n	Percentage
Government employee	10	3.10	14	11.47
Income/Month (baht)				
No income	57	17.70	5	4.10
600-10,000	185	57.45	59	48.36
10,001-20,000	64	19.88	26	21.31
≥ 20,001	16	4.97	32	26.23
	Mean = 8,348.32, S.D. = 7122.54		Mean = 15,713.93, S.D. = 14,184.15	
Number of household members				
1-3	68	21.12	0	0
4-6	231	71.74	0	0
7-9	23	7.14	0	0
	Mean = 4.52, S.D. = 1.43			
Receiving information				
Radio/television	114	35.40	39	31.97
Public health officer/ Public health volunteers	65	20.19	23	18.85
Subdistrict Administrative Organization	56	17.39	17	13.93
Group discussion/ community forum	28	8.70	7	5.74
Publicity signs	19	5.90	11	9.02
Newspapers/brochures	19	5.90	8	6.56
Website	11	3.42	17	13.93
Household status				
Household members	213	66.15	-	-
Head of household	93	28.88	-	-
Resident	16	4.97	-	-
Social status and role in the community				
General public	269	83.54	-	-
Volunteers	13	4.04	-	-
Headman/assistant village headman	9	2.80	-	-
Civil servants/local government employees	9	2.80	-	-
Subdistrict Administrative Organization members	8	2.48	-	-
Village committee	6	1.86	-	-
Occupational groups in the community	6	1.86	-	-
Religious leader	2	0.62	-	-

Based on the questionnaire responses, both residents and tourists demonstrated a moderate level of knowledge about solid waste and a good attitude. The sample was also found to have a high level of awareness, moderate solid waste management practices, and a moderate level of participation in solid waste management, as shown in Table 4.

Table 4. Mean and standard deviation for the level of knowledge, attitude, awareness, participation, and solid waste management of the residents and tourists on Libong Island, Kantang District, Trang Province

Variables	Residents (n=322)			Tourists (n=122)		
	mean	S.D.	level	mean	S.D.	level
Knowledge	15.24	3.04	moderate	14.35	3.21	moderate
Attitude	3.93	0.38	good	3.68	0.38	good
Awareness	3.96	0.49	high	3.72	0.42	high
Participation	3.27	0.74	moderate	-	-	-
Solid waste management	2.11	0.22	moderate	2.24	0.22	moderate

The questionnaire responses of residents and tourists revealed that the sample group had a moderate level of solid waste reduction and collection. The residents also showed a high level of waste separation and disposal, and a moderate level of reuse in solid waste management. Tourists had a moderate level of separation and disposal in solid waste management, as shown in Table 5.

Table 5. Mean and standard deviation for the level of solid waste management of the residents and tourists on Libong Island, Kantang District, Trang Province

Type of solid waste management	Residents (n=322)			Tourists (n=122)		
	mean	S.D.	level	mean	S.D.	level
Reduction	2.19	0.31	moderate	2.27	0.41	moderate
Collection	2.19	0.30	moderate	2.12	0.23	moderate
Separation	2.51	0.41	high	2.32	0.43	moderate
Disposal	2.39	0.33	high	2.32	0.27	Moderate
Reuse	2.33	0.42	moderate	-	-	-

2. Factors affecting solid waste management among residents and tourists on Libong Island, Kantang District, Trang Province

2.1 The analysis of factors affecting the solid waste management of residents on Libong Island, Kantang District, Trang Province found that the variables that can predict the solid waste management of residents in Libong Island consist of knowledge, attitude, awareness, and participation. Variables with negative predictive power include receiving information from publicity signs. These five variables were able to predict the solid waste management practices of residents by 26.6 percent (R^2 =0.266) with statistical significance at the 0.05 level, as shown in Table 6.

Table 6. Results of multiple statistical analyses of factors affecting the solid waste management of residents on Libong Island, Kantang District, Trang Province, (n=322)

Predictors	B	S.E.	Beta	t	*ρ*-value	Collinearity Statistics	
						Tolerance	VIF
Constant	0.939	0.139		6.740	0.001*		
Participation	0.126	0.016	0.399	8.108	0.001*	0.959	1.042
Awareness	0.095	0.029	0.201	3.294	0.001*	0.621	1.611
Attitude	0.084	0.036	0.138	2.306	0.0221*	0.646	1.548
Receiving information from publicity signs Reference group = radio/television)	-0.160	0.066	-0.118	-2.432	0.016*	0.989	1.011
Knowledge	0.010	0.004	0.127	2.295	0.022*	0.757	1.322
$R = 0.516$; $R^2 = 0.266$; Adjusted $R^2 = 0.255$; $F = 22.930$; ρ-value = <0.001; Std. Error of the Estimate = 0.203							

**Significant values < 0.05, tested by stepwise multiple linear regression analysis.*

2.2 The analysis of factors that affect the waste management of tourists on Libong Island, Kantang District, Trang Province found that the variables that can help predict the waste management of tourists on Libong Island consist of awareness, education level (bachelor's degree or higher, high vocational certificate), and knowledge. Variables with negative predictive power include receiving information from newspapers or brochures, and occupation (students). These five variables were able to predict the solid waste management of tourists by 35.7 percent (R^2 =0.357) with statistical significance at the 0.05 level as shown in Table 7.

Table 7. Results of multiple statistical analyses of factors affecting the solid waste management of tourists on Libong Island, Kantang District, Trang Province (n=122)

Predictors	B	S.E.	Beta	t	*ρ*-value	Collinearity Statistics	
						Tolerance	VIF
Constant	1.257	0.157		8.018	<0.001*		
Awareness	0.212	0.048	0.395	4.385	<0.001*	0.687	1.455
Newspaper/brochures (Reference group = radio/television)	-0.303	0.076	-0.332	-3.987	<0.001*	0.804	1.244
Student (Reference group = Agriculture)	-0.287	0.073	-0.333	-3.931	<0.001*	0.779	1.283
Bachelor's degree or higher	0.163	0.045	0.322	3.650	<0.001*	0.719	1.390

Predictors	B	S.E.	Beta	t	*ρ*-value	Collinearity Statistics	
						Tolerance	VIF
High Vocational Certificate (Reference group = Primary education)	0.248	0.084	0.255	2.961	0.004*	0.753	1.329
Knowledge	0.013	0.006	0.182	2.031	0.045*	0.695	1.439
$R = 5.98$; $R^2 = 0.357$; Adjusted $R^2 = 0.324$; $F = 10.646$; *ρ*-value = 0.001; Std. Error of the Estimate = 0.1864							

**Significant values < 0.05, tested by stepwise multiple linear regression analysis*

DISCUSSION

1. Contextual Study of the Situation of Solid Waste Management on Libong Island, Kantang District, Trang Province.

Libong Island is renowned for its beautiful beaches, many natural tourist attractions, accommodations, and convenient transportation. The area around Libong Island has an abundance of sea grass resources, making it Thailand's largest dugong habitat. As a result, more tourists are visiting the island seeking authentic natural experiences and learning about the local lifestyle. However, when the number of tourists increases, it causes increased waste accumulation in the area.[36-38] This is particularly evident during the weekends and holiday seasons. Libong Island's community still has many problems with solid waste management, such as the lack of personnel, budget, materials, and equipment for operations in addition to limited strict law enforcement, similar to the problems faced by other communities in solid waste management.[31,37-39]

2. The study of the factors affecting the solid waste management of residents and tourists on Libong Island, Kantang District, Trang Province found that:

Knowledge had a statistically significant positive effect on waste management for both residents and tourists. This can be explained by the fact that residents and tourists are able to have accurate knowledge of solid waste management from various channels that can be easily and quickly accessed. Sota[40] explains that knowledge is the result of education and learning, or from hearing, thinking, and practising, including from experience. Therefore, residents and tourists having knowledge from more accurate data has a positive effect on solid waste management. This finding is consistent with other studies which also found that knowledge has an effect on solid waste management.[11,19,23,29,41-43]

Attitudes had a statistically significant positive effect on residents' solid waste management. This can be explained by the fact that residents have a sense of agreement that a clean and orderly community is important. Solid waste will affect health, the environment, and ecosystems.[11-12,44] Marine animals, including dugongs, which are the symbol of Trang Province, are likely to die in greater numbers due to waste pollution, which results in fewer tourists and reduces residents' income. By thinking using reason in that matter, if a person has a rational belief that the behaviour to be performed will be correct in the picture, then that person will be more willing to perform that action, consistent with previous research studies that have found that attitude has an effect on solid waste management.[11, 19- 20,42-43,45-46]

Awareness had a statistically significant positive effect on solid waste management among both residents and tourists. This can be explained by the fact

that most residents and tourists have a high level of awareness of the solid waste problem, which shows concern about the possible impacts on the environment of Libong Island. Therefore, if an individual is not aware, the environment will be destroyed, tourist numbers will decrease, and residents' incomes will decrease, which will affect their own lives and society as a whole. This is consistent with Petcharat,[47] who argued that awareness is a behaviour that shows the emergence of knowledge of a person, or the person shows a sense of responsibility for various problems that occur. The results of this study are consistent with past studies.[21-22,43,46,48]

Participation had a statistically significant positive effect on solid waste management among residents. It can be explained that this may be due to the management of solid waste in Libong Island in the past. The community recognised the necessity and importance of waste management. Residents have begun to create solid waste management projects and activities arising from the community itself or from external agencies. Household representatives are involved in solving the waste problem that will occur by using the method of talking to organise meetings to exchange ideas, and encourage people to take action together. This corresponds to the concept of 4-step participation,[49] resulting in participation having an effect on solid waste management, which is similar to past studies.[11,19]

Level of education had a statistically significant positive effect on tourists' solid waste management. This can be explained by the fact that educational level is an important element that can change a person's behaviour. The results of education will make a person knowledgeable, increase awareness, develop skills, and result in behavioural changes that are necessary to understand the health risks that arise from having certain behaviours, leading to behavioural changes.[50] This study found that the educational level of associate's degree and bachelor's degree or higher among tourists has a positive impact on solid waste management. The results of this study are similar to previous studies.[22,43,46,51-52]

Occupation had a statistically significant negative effect on tourists' solid waste management. This may be explained by a person's occupation, which is related to their education level. This is because education helps humans gain knowledge and develop themselves, which can in turn increase job opportunities and problem-solving skills and the desire to share happiness and good for society. Therefore, if tourists have a high level of education, they are likely to have a good career, increasing their chances of benefiting themselves and others as well as being responsible for society and the environment. This includes waste management at tourist attractions. The results of this study found that tourists' occupations as students were negatively related to solid waste management. This is consistent with Naquin et al.[53] who found that students expressed concern about global warming and environmental concerns at approximately 50%. However, in contrast to Bishoge et al.[54] it was found that 79.8% of secondary school students in Tanzania understood that environmental health management is a practice for evaluating and controlling environmental factors that may affect health.

Receiving information has a negative effect on solid-waste management among both residents and tourists. This may be explained by the fact that many types of public relations media exist. Similar to the results of the study, it was found that residents and tourists received the most of the information from radio and television. This is a driving force that affects solid-waste management behaviour.

It was found that residents received the least information from publicity signs at 3.10 %, while tourists received the second-least information from newspapers or brochures at only 6.56 %. Receiving such news therefore had a negative effect towards solid waste management. It may therefore be necessary to select media to suit each individual.[55] Today, communication via social media is appropriate because most residents and tourists use mobile phones.[56]

RECOMMENDATIONS

Communities should organise activities or develop solid waste management models that increase their knowledge, attitudes, and awareness. Residents and tourists should be actively involved at each step. To achieve sustainability of activities, the amount of solid waste and its impact on health and the environment should be reduced. The Subdistrict Administrative Organisation should increase the number of personnel, ensure adequate waste management equipment, and strictly enforce the law. There should be a variety of communication channels, emphasizing online media, to ensure quick and efficient reach to the target groups.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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