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COMMUNITY KNOWLEDGE AND PERCEPTIONS TOWARDS ILLEGAL WASTE DISPOSAL: A CASE STUDY OF SUNGAI BESAR COASTLINE MANGROVES FOREST IN SELANGOR, MALAYSIA

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Abstract

Mangroves around the world are under constant threat from household waste pollution. Illegal landfills were found at the Sungai Besar coastline mangrove forests near Kampung Baru Nelayan, Selangor, Malaysia. Therefore, this study aims to gauge residents' level of knowledge and perceptions on illegal waste disposal in mangrove forests. A total of 304 respondents participated in this study. The data were analysed using descriptive statistics, non-parametric methods, and linear regression. The mean knowledge score was 0.70 ± 0.09 (range: 0-1), and the mean score for perception was 4.57 ± 0.47 (range: 1-5). Further analysis revealed that occupation played a significant role in determining measured knowledge and perception among the respondents (p -value < 0.01). Government employees were found to have higher knowledge and perception scores than unemployed residents. Targeted environmental education and conservation programs directed towards unemployed residents are recommended to increase their knowledge and perception of illegal waste disposal in mangrove forests.

Keywords: Illegal landfill, illegal waste disposal mangrove forest, knowledge, perception

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INTRODUCTION

Mangrove habitats cover approximately 135,881 km² of land area, accounting for about 11.96% of the world's coastline (Bir, 2022). Mangroves provide critical services to the coastal communities such as coastal protection from erosion and serving as breeding grounds for fishes (Mat Yamin, 2019). However, mangrove ecosystems around the world face several threats such as deforestation, land conversion, unsustainable urban development, polluted water, and improper waste management (Abd Rahman & Asmawi, 2016, Friess et al., 2019; Mazelan & Yusuff, 2021).

Illegal dumpsites can be found along the Sungai Besar mangrove coastline forest near Kampung Baru Nelayan, a small village located in the district of Sabak Bernam, Selangor, Malaysia (Figure 1). Broken furniture, damaged electronic devices, porcelain, plastic bags and containers, toys, and books are among the household wastes discovered at these sites. Lack of knowledge and awareness are often cited as reasons for poor waste management attitudes and practices (Ahmad et al., 2019; Aziz, 2021; Hassan & Rosli, 2022). On the other hand, Sattayapanich et al. (2022) discovered that perceived ecological values were the strongest predictor of community participation in corporate social responsibility (CSR) mangrove forest management programs, which include planning, implementation, and monitoring.

Therefore, this study aims to assess the levels of knowledge and perception on illegal waste disposal at mangrove forests among residents of Kampung Baru Nelayan. Specifically, the present study seeks to (1) investigate the differences in mean knowledge and perception scores across demographic characteristics, (2) identify factors related to knowledge and perception scores, and (3) examine the relationship between knowledge and perception scores. Findings from this research will be compared with those from similar studies involving communities who live nearby mangrove forests.



Figure 1: Illegal dumpsite at the mangrove forest near Kampung Baru Nelayan
Source: own field observation.

RESEARCH METHODOLOGY

Study location

Kampung Baru Nelayan is located next to Sungai Besar town in the Sabak Bernam district of Selangor, Malaysia (Figure 2). This location was chosen for the study because it is the nearest community to the sites of illegal waste disposal and the mangrove forest. The sites of illegal waste disposal can be found along a small road (red oval) that connects Sungai Besar to nearby villages, residential areas, and aquaculture farms.



Figure 2: (Left) The location of Sungai Besar in peninsular Malaysia. (Right) Satellite image of Kampung Baru Nelayan and the nearest mangrove forest

Source: MapChart and Google Map.

Sample Size

According to Pusat Digital Ekonomi Kampung Baru Nelayan, the community has a population of 1,450. The required representative sample size needed to achieve the objective of this study with sufficient statistical power was calculated using the Corrected Cochran's Formula, resulting in 304 respondents with a 95% confidence level.

Research Design

The questionnaire was divided into three sections. The first section gathered demographic information from respondents, namely gender, educational level, age, and occupation type. Gender was coded as 1 for women (reference category), and 0 for men. Education was categorized as UPSR (reference category), PMR/SPM, STPM/diploma, and university degrees. Age was categorized as 18-27 (reference category), 28-37, 38-47, 48-57, and ≥ 58 . Occupation type was broken down into unemployed (reference category), government, private, housewife, self-employed, and others. 'Others' refers to respondents who do not belong to any other category, including students who are either already enrolled in a university or waiting to be enrolled.

The second section assessed respondents' level of knowledge (K) with eleven items. Responses were recorded on a binary scale with either "Yes" or "No" as the answer. The third section assessed respondents' level of perceptions (P) with ten items. Responses were recorded on a Likert scale ranging from 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). All items in the questionnaire were validated by four experts in environmental studies. The reliability of the questionnaire was tested with 30 respondents in a pilot study.

Data Collection

This survey was conducted among the residents of Kampung Baru Nelayan from November 2021 to December 2021 using a random sampling method. Due to the restricted movement and lockdowns resulting from the COVID19 pandemic, data was collected online through a self-reported questionnaire administered via Google Forms. Given the high internet usage among residents at Kampung Baru Nelayan, a link to the survey was distributed to residents via WhatsApp groups. The questionnaire was administered in both English and Bahasa Melayu.

Statistical Analysis

This study utilized descriptive and non-parametric data analyses. Linear regression was conducted to identify factors related to knowledge and perception scores, as well as the relationship between knowledge and perception scores. All analyses were conducted using IBM SPSS Statistics 26 Software.

RESULTS

Demographic Characteristics

Table 1 presents the demographic characteristics of the respondents. Out of all respondents, 159 (52.3%) were women, while 145 (47.7%) were men. In terms of age, the majority of respondents fell within the 18-27 age group (37.8%). In terms of education, most of the respondents possessed an STPM certificate or diploma. Regarding occupation type, 112 (36.8%) of the respondents identified themselves as self-employed, while only 21 (6.9%) identified as unemployed.

Assessment of Knowledge and Perception

Tables 2 and 3 present the responses to the survey questions. Most of the respondents demonstrated a strong understanding of illegal waste disposal (K1, K2), legal implications (K3), and negative impacts of illegal waste disposal on mangrove forests and human health (K5-K11). Interestingly, close to two-thirds of the respondents (61.8%) believe that illegal dumping activities at mangrove forest reserves can be controlled and avoided (K4). In terms of perception, a vast

Table 1: Respondent's Background in Kampung Baru Nelayan (N = 304)

Variable	Description	Frequency (N)	Percentage (%)
Gender	Male (ref)	145	47.7
	Female	159	52.3
Education	UPSR (ref)	42	13.8
	PMR/SPM	103	33.9
	STPM/Diploma	113	37.2
	Universiti degree	46	15.1
Age	18-27 (ref)	115	37.8
	28-37	73	24.0
	38-47	23	7.6
	48-57	68	22.4
	58 and above	25	8.2
Employment type	Government	60	19.7
	Private	18	5.9
	Housewife	61	20.1
	Self-employed	112	36.8
	Unemployed (ref)	21	6.9
	Others	32	10.5

Table 2: Responses to the questionnaire on illegal waste disposal knowledge

Statement	Frequency (percentage)	
	Yes	No
Illegal dumping is waste dumped onto public land where there is no approval license.	303 (99.7%)	1 (0.3%)
Improper waste management does not cause illegal dumping.	54 (17.8%)	250 (82.2%)
Illegal dumping of waste can lead to imprisonment not exceeding 5 years or a fine not exceeding RM500,000.	302 (99.3%)	2 (0.7%)
Illegal dumping activities at forest reserves are uncontrollable and unpreventable.	116 (38.2%)	188 (61.8%)
Illegal dumping activities have a positive impact on the environment.	32 (10.5%)	272 (89.5%)
Illegal dumping activities do not affect humans.	24 (7.9%)	280 (92.1%)
Illegal dumping can cause water pollution.	300 (98.7%)	4 (1.3%)
Illegal dumping areas can lead to Aedes breeds.	302 (99.3%)	2 (0.7%)
Illegal dumping activities can attract pests such as rats and cockroaches.	304 (100%)	-
Open burning can occur at illegal dumping areas.	301 (99.0%)	3 (1.0%)
Illegal dumping areas can cause a bad odour.	304 (100%)	-

Table 3: Responses to perception statements regarding illegal waste disposal

Statement	Frequency (percentage)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Illegal dumping can occur everywhere.	7 (2.3%)	1 (0.3%)	5 (1.6%)	68 (22.4%)	223 (73.4%)
Illegal dumping is the wrong action.	4 (1.3%)	-	2 (0.7%)	60 (19.7%)	238 (78.3%)
Maintaining the sustainability of forest reserves from illegal dumping activities is not a priority.	177 (58.2%)	75 (24.7%)	28 (9.2%)	7 (2.3%)	17 (5.6%)
Effective waste collection services can prevent illegal dumping.	1 (0.3%)	4 (1.3%)	5 (1.6%)	100 (32.9%)	194 (63.8%)
Reducing illegal dumping activities can preserve ecosystems at forest reserves.	3 (1.0%)	1 (0.3%)	4 (1.3%)	94 (30.9%)	202 (66.4%)
Water quality can be affected in illegal dumping areas.	3 (1.0%)	2 (0.7%)	4 (1.3%)	78 (25.7%)	217 (71.4%)
Open burning may occur in illegal dumping areas which can affect air quality.	5 (1.6%)	1 (0.3%)	5 (1.6%)	89 (29.3%)	204 (67.1%)
Illegal dumping areas contribute to the increase in dengue cases.	2 (0.7%)	1 (0.3%)	5 (1.6%)	102 (33.6%)	194 (63.8%)
Wild animals such as wild dogs at illegal dumping areas do not disturb the peace of the surrounding residents.	216 (71.1%)	56 (18.4%)	9 (3.0%)	4 (1.3%)	19 (6.3%)
The residents' health is not affected by illegal dumping activities.	184 (60.5%)	95 (31.3%)	13 (4.3%)	3 (1.0%)	9 (3.0%)

Majority of respondents have a favourable perception regarding negative aspects of illegal waste disposal activities (P1-P5) and the associated risks (P6-P10). The mean knowledge score was 0.70 ± 0.09 , indicating a high level of knowledge according to the Bryman and Cramer (2005) classification. The accuracy rate for the knowledge test was 92.81% ($10.21/11 \times 100$). The mean perception score was 4.57 ± 0.47 , indicating a good level of perception.

Non-parametric Analysis

Univariate statistics was conducted to determine differences in knowledge and perception scores among demographic characteristics (Table 4). The results reveal that there are no significant differences (p -value > 0.05) based on gender, education level, and age. The only demographic characteristic showing a significant difference (p -value < 0.05) is occupation. Based on mean ranks, it can be observed that those who work in the government sector achieved the highest knowledge score (mean rank = 175.30), while those who are unemployed achieved the lowest score for knowledge (mean rank = 98.19). On the other hand,

those who identified themselves as “others” attained the highest score for perception (mean rank = 179.75), while those who are unemployed received the lowest score for perception (mean rank = 79.62).

Table 4: Respondent’s Background in Kampung Baru Nelayan (N = 304)

Variable	Description	Knowledge score		Perception score	
		Mean Rank	<i>p-value</i>	Mean Rank	<i>p-value</i>
Gender	Male (ref)	144.72	0.107	147.94	0.384
	Female	159.60		156.66	
Education	UPSR (ref)	153.70	< 0.1	135.21	0.218
	PMR/SPM	140.57		148.98	
	STPM/Diploma	166.88		165.01	
	Universiti degree	142.77		145.43	
Age	18-27 (ref)	148.33	0.296	152.90	0.311
	28-37	158.99		168.44	
	38-47	125.22		130.67	
	48-57	163.86		147.33	
	58 and above	146.94		138.26	
Employment type	Government	175.30	<0.01	160.46	< 0.01
	Private	154.47		153.72	
	Housewife	156.48		152.57	
	Self-employed	144.07		153.88	
	Unemployed (ref)	98.19		79.62	
	Others	166.20		179.75	

Regression Analysis

In addition to descriptive and non-parametric analyses, regression analysis was conducted to explore the relationship between each demographic characteristic and their respective reference categories, as previously mentioned in the research design (Table 5). The results suggest that there are no statistically significant differences between males and females, primary education level and the other levels of education, and the age group of 18-27 and the other age groups, in terms of both measured knowledge and perception.

However, there are some inconsistencies for occupational type. In terms of knowledge, being unemployed is found to be significantly different than government sector, housewives, and others; but not statistically different from the private sector and the self-employed. On the other hand, in terms of perception, being unemployed shows a significant difference compared to all the other occupation types. Furthermore, measured knowledge is found to be significantly different than measured perception (p -value < 0.0001). Regarding the Pearson correlation ($R = 0.350$), the relationship between knowledge and perception is considered statistically moderate ($R = 0.30 - 0.49$) according to the classification by Cohen (1988). The relationship is positive, as indicated by a positive value of coefficient b .

Table 5: Regression analysis

Knowledge and perception-related factors						
Variables	Knowledge score			Perception score		
	β	SE	<i>p</i> -value	β	SE	<i>p</i> -value
Gender						
Female	0.211	0.119	0.078	-0.084	0.537	0.876
Educational level						
PMR/SPM	-0.156	0.190	0.413	0.614	0.849	0.470
STPM/Diploma	0.157	0.188	0.402	0.714	0.838	0.395
University degree	-0.040	0.222	0.856	-1.357	0.989	0.171
Age						
28-37	0.154	0.156	0.324	0.1013	0.701	0.149
38-47	-0.278	0.237	0.242	-0.043	1.069	0.968
48-57	0.235	0.159	0.141	0.416	0.716	0.562
58 and above	-0.028	0.229	0.904	0.379	1.033	0.714
Employment type						
Government	0.800	0.261	0.002	6.750	1.105	<0.0001
Private	0.500	0.330	0.131	5.611	1.399	<0.0001
Housewife	0.678	0.260	0.010	6.716	1.102	<0.0001
Self-employed	0.414	0.245	0.092	6.693	1.036	<0.0001
Others	0.677	0.289	0.020	7.729	1.223	<0.0001
The relationship between knowledge and perception						
	R	R ²	β	SE	<i>t</i> -stat	<i>p</i> -value
Knowledge	0.350	0.123	1.569	0.241	6.499	<0.0001

DISCUSSION

Knowledge and Perception on Mangrove Forest Sustainability

The findings from this study suggest that, in general, the community of Kampung Baru Nelayan possesses a strong knowledge and perception regarding illegal waste disposal and its impact on mangrove forests. For comparison, a recent survey by Mazelan and Yusuff (2021) found that residents of Kuala Selangor exhibited a high level of knowledge ($n = 256$, accuracy rate = 85.3%) and awareness ($n = 256$, mean score = 4.48) concerning the impact of domestic waste disposal on the sustainability of mangrove forests. Similarly, Abdullah et al. (2021) identified a high level of knowledge ($n = 100$, total score = 80.93 ± 7.77) on the importance and sustainability of mangrove forests among respondents who lived within the vicinity of Sijangkang Mangrove Recreational Park in Kuala Langat district, as determined through in-depth interviews.

The findings from this study, along with those of Mazelan and Yusuff (2021) and Abdullah et al. (2021) suggest that communities who live or reside near mangrove forests in the state of Selangor are knowledgeable about the importance of mangrove forest sustainability and conservation, and environmental issues associated with mangrove forests such as plastic pollution, illegal waste disposal, and littering. This positive outcome may be as a result of years of environmental awareness campaigns aimed towards residents of Selangor conducted by various governmental agencies and non-profit organizations such as the Department of Environment (DOE), Selangor Forestry Department, state municipal councils, Malaysia Nature Society (MNS), and Friends of Mangrove. According to Sharma et al. (2023), environmental education is considered as one of the best approaches to solve environmental degradation issues caused by anthropogenic activities. Environmental education is essential for fostering fundamental shifts in how people think, act, and make better decisions for the environment.

The Influence of Occupation on Knowledge and Perception

Abdullah et al. (2021) examined the relationship between the level of knowledge and demographic factors. Through ANOVA analysis, Abdullah et al. (2021) determined that there are no significant differences in knowledge scores between gender, race, income, work sector (occupation), and residency. Instead, significant differences in knowledge scores were only observed for education level. Interestingly, this contradicts the findings of the current study, This finding was contrary to what was found in this study, which determined that no significant differences in knowledge scores existed based on education levels. Instead, significant differences were identified between occupation groups (Table 5).

As discussed previously, respondents in the government sector attained the highest score for knowledge and second highest score for perception (Table 5). This finding was in line with observations reported in Pour et al. (2023), who discovered that government servants ($n = 21$) tend to appreciate forest ecosystem services (FES) more than other sectors based on a study conducted at the Hara Biosphere Reserve mangrove forest in the Persian Gulf. Specifically, this study also highlighted that government servants value mangrove forests as a solution to natural hazard mitigation (score = 90.5%). Furthermore, Pour et al. (2023) showed that there were significant variations in perceptions of mangrove forest services across different occupations.

Pour et al. (2023) concluded by stating that locally adjusted education and conservation programs should be developed based on the perceptions of the locals towards mangrove forests. This suggestion could be applied to the Sungai Besar mangrove forest and Kampung Baru Nelayan community as well. As evidenced in Table 5, it is apparent that there were significant variations in

perceptions on the negative impacts of illegal waste disposal on mangrove forests across different occupations. Therefore, targeted education and conservation programs, especially for the unemployed members of the community, are recommended to improve their knowledge and perception.

The Association between Knowledge and Perception

In general, knowledge has a positive impact on human attitudes, willingness, perceptions, and practices within forest management and sustainability (Min et al., 2018; Gebregziabher & Soltani, 2019; Liu, 2020; Lucungu et al., 2022; Pour et al., 2023). As demonstrated in this study, the regression analysis indicated a significant and a positive yet weak correlation between respondents' knowledge of illegal waste disposal and their perceptions towards illegal waste disposal in mangrove forests. This generally followed similar trends established in prior studies. In terms of occupation, government employees, housewives, self-employed, and "others" who received high scores for knowledge also received high scores for perception. Similarly, unemployed respondents who received low scores for knowledge also received low scores for perception.

Recommendations from other studies

As stated earlier, this study recommends the implementation of targeted education and conservation programs for unemployed members of the community, to improve their knowledge and perception on illegal waste disposal and its impact on mangrove forests. However, past studies on mangrove forest conservation show that attention and involvement from other segments of society are equally important for effective preservation methods. For example, Kusin et al. (2019) states the importance of active participation from minority groups of the local communities, younger generations, and education institutions in the conservation and management of river and mangrove ecosystems in Kong Kong Laut, Johor, Malaysia. On the other hand, Sunoto et al. (2020) stated the need for the authorities to engage a broader range of communities near mangrove forests instead of only relying on fisherman, as demonstrated in their study in Kampung Sungai Melayu, Johor, Malaysia. In view of urban and regional planning, these recommendations highlight the challenges faced by authorities in designing and implementing successful mangrove forest management and conservation programs with significant contributions from communities and stakeholders. For this, authorities must device strategic plans to increase environmental awareness of this issue among the society and local communities, and to encourage them to actively take part in preserving mangrove forests.

Limitations of the study

The scope of this study is limited to assessing the levels of knowledge and perception on illegal waste disposal at mangrove forests among the residents of Kampung Baru Nelayan. However, this study does not examine the causes of illegal landfills at the mangrove forests. Furthermore, this study does not examine the level of attitude and practice of the local community towards illegal landfill. Further research is needed to highlight these issues.

CONCLUSION

This study has successfully assessed the level of knowledge and perception regarding illegal waste disposal in mangrove forests among the residents of Kampung Baru Nelayan. In general, the respondents exhibit a good level of knowledge of the negative consequences of illegal waste disposal on the environment and human health. They also demonstrate a good perception on the importance of sustaining and preserving mangrove forests by reducing illegal waste activities at the forests. The knowledge and perception scores among the respondents vary significantly among different occupational groups. Government employees, housewives, self-employed, and “others” achieved high scores for both knowledge and perception, while unemployed respondents obtained the lowest scores for both knowledge and perception.

Based on these findings, targeted education and conservation programs, especially for the unemployed members of the community, are recommended to improve their knowledge and perception on illegal waste disposal at mangrove forests. Authorities and program coordinators are advised to plan and design their mangrove forest education and conservation programs carefully, with effective communication tools and comprehensive outreach efforts to address challenges faced by the community near mangrove forests. This is essential to improve their understanding on mangrove forest sustainability and management.

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Imroatu Soleheh Suandi, Mohamad Faiz Zainuddin, Latifah Abdul Manaf, Faridzah Jamaludin, Siti Munirah Mohd
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