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Local Community Awareness Based on KAP Model Towards Plastic Pollution in Mangroves Area at Tanjong Karang, Selangor

Zaidatul Fiza Mohd Fizal[a], Nurul Asyikin Ibharim[a*], Muhammad Akmal Roslani[b,c] & Nor Shafikah Idris[b]

[a]*Faculty of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor*

[b]*Faculty of Applied Sciences, Universiti Teknologi MARA, Perlis Branch, Arau Campus, 02600 Arau, Perlis, Malaysia*

[c]*Department of Forestry Science and Biodiversity, Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400, UPM Serdang, Selangor, Malaysia*

[*]*Corresponding author: nurulasyikinibharim@uitm.edu.my*

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ABSTRACT

Mangrove ecosystems are seriously threatened by plastic pollution, which serves as vital shorelines buffers, carbon sinks, and habitats for diverse marine species. This study executes the Knowledge, Attitude, and Practice (KAP) model to investigate the local community's awareness of plastic pollution in Tanjung Karang, Selangor. A quantitative approach was employed, utilizing a structured questionnaire distributed to 430 residents. This survey instrument was carefully designed to accurately capture household waste disposal habits. Descriptive and correlation analyses were used to examine the collected data and determine the degree of awareness and relationships among KAP concerning plastic waste management. The outcomes reveal a significant level of community awareness, with a strong and positive correlation among KAP of plastics waste management, with average means of 4.01, 3.95, and 3.91, respectively. This demonstrates that a solid understanding of environmental issues is closely linked to positive attitudes and proactive behaviours, underscoring the vital importance of public awareness in mitigating plastic pollution and highlighting the need for targeted educational programs and policy interventions to address this issue. The findings of this study possess significant insights for researchers, policymakers, and environmental organizations in developing community-driven strategies to enhance mangrove conservation and reduce plastic waste pollution. Ultimately, safeguarding these coastal natural resources demands long-term commitment and continuous societal participation.

Keywords: Plastic pollution; mangrove ecosystems; local community awareness; KAP model; waste management

INTRODUCTION

Mangroves are one of the most significant coastal ecosystems, prevalent in tropical regions, comprising trees and shrubs that have specialized adaptations to survive in marine and estuarine conditions (Jadin & Rousseau 2022). They provide essential ecological functions, including carbon sequestration, shoreline stabilization, and vital protection for a diverse range of marine organisms. Beyond their ecological significance, mangroves play a crucial role in maintaining the stability and sustainability of coastal environments, while also providing substantial socioeconomic benefits to coastal communities (Suratman 2008). In comparison to mangrove forests in other regions globally, Malaysia's mangrove forests exhibit significant structural complexity and species diversity, offering a distinctive habitat for numerous species while serving as a vital natural resource for humans (Ibharim et al. 2024). Despite the universal recognition of the benefits of mangroves, human activities continue to diminish mangrove populations worldwide (van Bijsterveldt et al. 2021). According to (Jambeck et al. 2015), coastal communities significantly contribute to marine plastic pollution, producing an annual inflow of 8 million tonnes. Exposure to elevated levels of plastic pollution harms mangrove health, as entangled plastics can trap mangrove seedlings and accelerate the proliferation of pathogenic bacteria (Suyadi & Manullang 2020).

Therefore, understanding the local community's role in mitigating plastic pollution is essential, as they are key stakeholders in preserving mangrove ecosystems. Their awareness and participation are essential for effective conservation initiatives, as their Knowledge, Attitudes, and Practices (KAP) directly impact the efficacy of these initiatives. The KAP model research proves beneficial in addressing plastic pollution, as comprehending the local community's KAP regarding plastic pollution can enhance awareness of their environment and foster respect for ecological issues, enabling local authorities to implement targeted mitigation strategies effectively (Coco Chin et al. 2023).

Therefore, assessing local community awareness in Tanjong Karang is crucial for efficient plastic pollution management, especially in environmentally sensitive areas. Understanding the community's KAP model regarding plastic pollution enables policymakers and environmental organizations to identify existing gaps in awareness and behavior, allowing them to address these issues more effectively. It provides critical information for developing targeted interventions, evaluating the effectiveness of existing projects, and facilitating local involvement in sustainable activities. Prioritizing community education and engagement, Tanjong Karang may significantly advance efforts to reduce plastic pollution and foster a healthier environment.

PROBLEM STATEMENT

Although Malaysians are increasing their knowledge of the vital significance of mangrove ecosystems and the dangers of plastic pollution, the persistent habit of indiscriminate littering in this region reflects an ongoing deficiency in environmental awareness. Plastic pollution has become a critical international concern, jeopardizing the well-being of humans and ecosystems, and posing a significant threat to coastal ecosystems, particularly mangrove forests. These ecosystems function as natural coastal barriers, enhance marine biodiversity, and facilitate carbon sequestration. Despite international initiatives to combat plastic pollution, the effects on mangrove ecosystems are inadequately researched, especially in local contexts where community knowledge is crucial for mitigation.

Research has demonstrated that, although certain community members possess a thorough understanding of the adverse impacts of unlawful garbage discharge into the environment and public health, this awareness may not invariably lead to responsible actions. Research in the Sungai Besar coastal mangrove forest close to Kampung Baru Nelayan, Selangor, identified illegal waste disposal sites (Suandi et al. 2023) and considerable disparities in people's perceptions and awareness of unlawful garbage disposal. Note that government employees, housewives, self-employed individuals, and others demonstrated superior knowledge and perception, whereas unemployed respondents scored the lowest. This gap suggests that specialized environmental awareness and preservation programs, particularly those aimed at empowering unemployed individuals, are needed. They are essential for enhancing awareness and practices related to waste disposal in mangrove forests. In the absence of action, the detrimental practice of littering in mangrove regions is expected to persist, intensifying environmental deterioration and compromising conservation initiatives.

Comprehending the awareness level within local populations is essential, as they are the principal users and custodians of natural ecosystems. Researchers frequently utilize the KAP paradigm to systematically assess the factors influencing community awareness and behaviours around plastic waste. The KAP model serves as a practical framework for evaluating public knowledge and behavioral tendencies regarding plastic waste management. This research aims to assess the local people's knowledge of plastic pollution in mangrove forests, utilizing the KAP model. The study aims to highlight the gaps in KAP, providing targeted intervention methods for enhanced waste management and conservation initiatives. The results will be beneficial for policymakers, conservation organizations, and local authorities in formulating community-driven strategies to mitigate plastic pollution and preserve mangrove ecosystems for future generations.

This model assesses the extent to which individuals' KAP influences their behavior toward environmental issues. By employing the KAP framework, investigations can pinpoint knowledge and attitude deficiencies that may hinder the effectiveness of waste management procedures.

RESEARCH QUESTIONS

1. To what extent is the local community in Tanjong Karang aware of plastic pollution?
2. How does knowledge influence the implementation of plastic pollution management practices?
3. What is the connection between an individual's attitude and their engagement in plastic pollution management within Tanjong Karang?

RESEARCH OBJECTIVES

1. To assess the degree of plastic pollution awareness amongst the local community in Tanjong Karang.
2. To examine the link between knowledge and the application of plastic pollution management practices.
3. To analyze the influence of individual attitudes on the practice of plastic pollution management in Tanjong Karang.

SIGNIFICANCE OF THE STUDY

It is crucial to have mangrove forests for sustaining coastal ecosystem stability by offering a home for diverse marine species, naturally serving to prevent coastal erosion, and facilitating carbon sequestration. Plastic contamination poses a significant threat to natural ecosystems, leading to habitat degradation, biodiversity decline, and disruptions to ecological processes. This finding is significant as it aims to assess the awareness, knowledge, and attitudes of the Tanjong Karang community regarding plastic pollution and its impact on mangrove ecosystems. By understanding these characteristics, the study can provide significant insights into the effectiveness of existing environmental awareness initiatives and identify areas that require improvement.

This study is significant as it may address critical environmental, ecological, and socioeconomic issues (John et al. 2022). Moreover, examining plastic pollution helps evaluate the harm to biodiversity and facilitates initiatives to protect various flora and fauna. By analyzing plastic pollution, researchers can assess the potential impact on ecosystem processes and develop solutions to preserve their functionality.

According to (Anthony et al. 2024), human health and livelihoods are critical. Mangroves are often closely tied to the livelihoods of coastal populations, which means that research on plastic pollution can provide valuable insights into the potential health risks to humans associated with contaminated seafood, as well as the economic implications for communities that rely on mangrove resources. However, global plastic pollution is a problem. Plastic pollution is a widespread global issue. Studying its impact on mangrove forests leads to greater knowledge of how plastics move across various ecosystems, highlighting the interdependence of environmental challenges.

The results of this study provide significant insights for policymakers, environmental organizations, and local communities. They can be utilized to formulate more impactful awareness campaigns, enhance plastic waste legislation, and promote sustainable waste management practices. The research highlights the importance of community involvement in conservation, fostering environmental stewardship.

Other than that, the findings are particularly relevant to engineers and urban planners involved in coastal infrastructure and sustainable waste management systems. Understanding the behavioral patterns of local communities enables the development of adaptive waste facilities, efficient disposal systems, and public amenities that promote the sustainable conservation of mangrove ecosystems.

SCOPE OF THE STUDY

This study focuses on local community awareness, as measured by the KAP Model, regarding plastic pollution in the Tanjung Karang mangrove area. This research also examines the interconnection between KAP within the local community concerning plastic pollution in mangrove environments. Note that this study focuses on respondents from the local community living in Tanjung Karang, Selangor. Quantitative methodologies were employed for this study, using an online questionnaire as a medium to collect responses from 430 respondents. The data and information received were recorded in a Google Form and will be further evaluated using SPSS software.

LITERATURE REVIEW

DEFINITION OF MANGROVE ECOSYSTEM

Mangroves are predominantly located in tropical and subtropical coastal areas worldwide, thriving in intertidal zones where saline and freshwater waters meet. These unique and highly specialized ecosystems comprise trees and shrubs that can withstand salt and thrive in the vicinity of tropical and subtropical coasts, typically in brackish or saline tidal waters (Zakaria & Rajpar 2015). These hardy plants are distinguished by their deep, convoluted root systems, which are frequently exposed and serve as anchors in the soft, unstable soils of intertidal zones (Kathiresan & Bingham 2001). Mangroves play a crucial ecological role by acting as natural coastal buffers, preventing coastline erosion, and mitigating the effects of tsunamis, storm surges, and rising sea levels (Koh et al. 2018). Additionally, mangroves serve as a crucial habitat for a broad spectrum of marine, terrestrial, and avian species, supporting complex food webs and providing spawning and nursery areas for fish, crabs, and various other aquatic organisms

(Ibharim et al. 2015).

Furthermore, mangroves are crucial in addressing climate change because they are highly effective carbon reservoirs (Omar et al. 2016), storing significant amounts of CO_2 in their biomass and waterlogged soils. These ecosystems also support the lives of local communities by providing resources such as timber, fuel, and fish, while promoting sustainable tourism and conservation projects (Polidoro et al. 2010). Nonetheless, mangroves are imperilled by deforestation, coastal development, and climate change, underscoring the critical need for their protection and restoration to ensure the health of both local and global ecosystems.

PLASTIC POLLUTION

Plastic pollution is an enduring, large-scale contaminant, and its ubiquitous presence has emerged as a significant environmental issue (Adyel & Macreadie 2021). Since the introduction of plastics to the market in the 1950s, plastic production and ocean pollution have risen exponentially, with a global output of 359 million tons in 2018, resulting in a projected 14.5 million tonnes ending up in marine environments, posing severe threats to ecosystems and biodiversity (Wayman & Niemann 2021). The quantity of plastic waste contaminating the environment is increasing at an alarming rate, with an estimated 14.5 million tonnes entering marine ecosystems each year (Cappa et al. 2023). This growing influx of plastic debris poses severe threats to marine biodiversity, disrupts aquatic food chains, and contributes to long-term ecological degradation. Without effective waste management and global intervention, plastic pollution will continue to accumulate, exacerbating environmental and socioeconomic challenges worldwide.

According to (Jambeck et al. 2015), coastal communities are among the primary contributors to marine plastic pollution, collectively releasing about 8 million tons of plastic waste into the ocean annually. Inadequate waste management systems, high plastic consumption, and the direct disposal of waste into waterways primarily drive this significant influx. As these communities are situated near shorelines, improperly managed plastic waste is easily transported by tides, currents, and winds, further exacerbating marine pollution. Without effective intervention, the continuous accumulation of plastic debris poses a significant threat to marine biodiversity, disrupts ecosystems, and impacts those whose livelihoods depend on coastal resources.

This pollution disrupts the delicate biological balance of the mangrove ecosystem. It poses significant threats to its biodiversity, as plastic entanglement, and ingestion impact more than 800 marine species. Plastic pollution poses a significant threat to marine organisms, causing damage through suffocation, entanglement, and ingestion, while also disrupting essential biological processes such as growth, reproduction, and metabolism, ultimately leading to long-term ecological imbalances and jeopardizing the survival of numerous marine species (Mason et al. 2022). In conjunction with population expansion, Malaysia has taken several steps to address plastic pollution in mangrove regions, recognizing the vital importance of these ecosystems. The government initiated the "Roadmap to Zero Single-Use Plastics 2018–2030," designed to systematically eradicate single-use plastics across the nation by 2030 (Ministry of Energy, Science, Technology, 2018). The strategy addresses critical issues, including insufficient public awareness, low recycling rates, and the need for enhanced waste management infrastructure. A primary concern in mangrove conservation is the accumulation of plastic waste, which endangers biodiversity, disrupts the ecological balance of these ecosystems, and diminishes their ability to serve as natural coastal defenders. In response to this escalating issue, Malaysia has prioritized sustainable waste management by advocating alternatives to single-use plastics, promoting biodegradable and compostable products, and implementing stricter laws on plastic waste disposal.

LOCAL COMMUNITY AWARENESS

Raising community awareness is crucial for the adequate protection and long-term sustainability of mangrove ecosystems, which serve as natural barriers against coastal erosion and act as significant carbon sinks to mitigate climate change. It provides critical habitats that support a diverse range of marine species, thereby ensuring ecological balance and the livelihoods of coastal communities. Their decline is frequently attributed to human activities, rendering community involvement crucial (Mia et al. 2022). Other than that, research indicates that public engagement and awareness are crucial elements in the conservation of mangrove ecosystems. Research conducted in Kuala Selangor, Malaysia, highlighted the importance of enhancing knowledge among local populations to combat mangrove forest degradation. The study emphasized that enhancing community awareness and perspectives regarding mangroves can lead to more effective conservation initiatives (Abd Rahman & Asmawi 2016). Moreover, the International Union for Conservation of Nature (IUCN) emphasizes that local communities are at the forefront of mangrove conservation and restoration efforts. The IUCN underscores the importance of community-driven actions in safeguarding these essential

ecosystems (Rodríguez et al. 2010). By cultivating environmental knowledge and encouraging active involvement, communities can assume stewardship of mangrove protection, guaranteeing the sustainability and resilience of these ecosystems for the benefit of future generations. Numerous countries have evaluated local community awareness regarding plastic pollution in mangrove regions (Jadin & Rousseau, (2022); Mazelan & Yusuff, (2021); Misni et al. (2022). These studies demonstrate varying degrees of public comprehension of plastic waste management, influenced by factors such as education, socioeconomic status, and access to information. Meanwhile, a study in Nigeria examined local community KAP on microplastic pollution and its ecological health consequences, underscoring the need for further public education on the environmental effects of plastic waste (Omoyajowo et al. 2022).

THEORY OF THE KAP MODEL

According to (Kang & Bagaoisan, 2024), the KAP Model serves as a theoretical foundation that explains the development of human behaviour change through three sequential stages: knowledge acquisition, attitude formation, and adoption of practice. Initially, individuals acquire knowledge, which includes information and understanding gained through education and experience. Their knowledge serves as the basis for forming attitudes, which are defined as stable psychological states that reflect an individual's feelings, beliefs, and evaluations regarding a particular subject or issue. Subsequently, these attitudes influence the development of practices, which are the actual behaviours and actions performed by the individual in a given context. The KAP model posits that increasing an individual's knowledge leads to the formation of positive attitudes, which in turn promote the adoption of desired practice changes. For example, in health education, increasing awareness of a disease (knowledge) can lead to a positive view of prevention (attitude), ultimately resulting in the implementation of preventive measures (practice). Comprehending the interconnections among these components is essential to designing efficient strategies that promote beneficial behaviours and reduce negative ones. The KAP survey has become a prevalent method for examining human behaviour influenced by environmental factors. Research by (Ruess & Lindner, 2023) indicates a correlation between knowledge awareness, attitudes, and practices, with knowledge serving as a crucial element in the development of a future smart city. Simultaneously, the KAP model has been widely employed to assess awareness, particularly in Thailand (Arttachariya, 2021), Kathmandu (Tharu & Shrestha, 2022), and the United Arab Emirates (Alteneiji et al. 2024). Meanwhile, a study in Malaysia employed the KAP model to evaluate the public's comprehension and behaviours regarding plastic pollution, revealing that although there was a general awareness of the problem, there was a deficiency in practical measures to alleviate pollution (Omoyajowo et al. 2022).

KNOWLEDGE

This component assesses community understanding of mangrove ecosystems and the effects of plastic pollution. A study conducted at Sijangkang Mangrove Recreation Park in Malaysia employed a cross-sectional survey to assess community awareness of mangrove deterioration and pollution. The findings revealed varying levels of awareness, underscoring the need for educational programs to enhance comprehension of the ecological significance of mangroves and the detrimental effects of plastic waste (Abdullah et al. 2021).

ATTITUDE

Attitudes assess community sentiments and attitudes towards mangrove conservation and plastic pollution. A study in Kuala Langat, Malaysia, evaluated local perceptions regarding the importance and viability of mangrove ecosystems. The study indicated that whereas many community members acknowledged the significance of mangroves, others remained apathetic or uninformed, implying that opinions are shaped by individual beliefs, cultural values, and access to environmental education (Abdullah et al. 2021).

PRACTICE

This element assesses the actual behavior of community members regarding waste removal and environmental care. A case study in Sungai Besar, Selangor, Malaysia, examined community activities about illicit garbage dumping in mangrove forests. The study revealed that, despite a degree of knowledge, inadequate waste disposal methods continued, exacerbating mangrove degradation. The report advocated for specialized environmental education and conservation initiatives to encourage proper waste management practices (Abdullah et al. 2021).

HYPOTHESIS DEVELOPMENT

Awareness of the local community towards plastic pollution in the mangrove area is assessed in the context of this study using three variables: knowledge, attitude, and practice.

Plastic pollution in mangrove ecosystems is a growing environmental concern, with inadequate waste disposal contributing to habitat degradation and a decline in biodiversity. Therefore, understanding the perceptions and management strategies of local populations regarding plastic waste is essential for developing effective conservation strategies. This study applies the KAP model to assess the relationship between awareness levels and behavioral responses toward plastic pollution in Tanjong Karang's mangrove areas.

Existing literature suggests that increased environmental understanding often contributes to more effective waste management behaviours (Suandi et al. 2023). Individuals with greater awareness of plastic pollution's ecological impact are more likely to embrace appropriate disposal methods. Research has demonstrated that attitudes significantly influence behaviour, as positive perceptions about environmental protection often translate into active participation in conservation efforts (Adyel & Macreadie, 2021). Thus, examining the relationship between KAP can provide insightful information about how awareness influences the behaviours of sustainable local communities.

In accordance with this framework, the subsequent hypotheses are proposed (FIGURE 1):

H1: There is a significant relationship between knowledge and the practice of plastic pollution management.
H2: There is a significant relationship between individual attitudes and the practice of plastic pollution management.

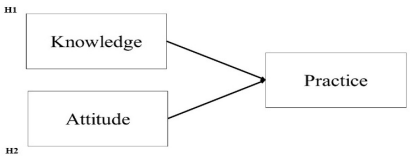

FIGURE 1. A Diagram of Hypotheses Based on the Proposed Framework.

METHODOLOGY

RESEARCH DESIGN

This study employs a quantitative methodology, utilizing a questionnaire as the primary data collection instrument. The study utilized a purely quantitative approach to provide statistically credible data on awareness and behavioral patterns within a community environment. This type is utilized because it is suitable for the targeted population sample in this study, considering the time constraints and limitations (Mohajan 2020).

POPULATION SAMPLING

The respondents of this study were from the local community of Tanjong Karang, Selangor. The area was chosen because it is a region far from urbanization in Selangor, as well as a marine zone rich in natural environments and marine industries. The population of the targeted region is estimated to be around 4,979 people. The minimum sample size suggested by (Krejcie & Morgan, 1970) based on the population figure is 388 respondents. Note that respondents were selected randomly and without replacement from the total population of residents in the area using simple sampling. Simple random sampling was used to ensure that each residence had an equal chance of being selected. This technique improves sample representativeness and reduces sampling bias.

Participants were chosen from diverse age ranges, professions, and genders to represent the community's variety.

STUDY INSTRUMENT

This study employed a survey as an instrument to collect data through a face-to-face survey. The questionnaire was divided into four parts: Part A, B, C, and D. Part A contained the respondents' demographic background, including their gender, age, occupation, monthly income, level of education, marital status, family size, and length of residence. Part B was adopted and modified from (van Bijsterveldt et al. 2021), which consists of 14 items in this section. It determines the knowledge of the local community about pollution in mangrove areas. This section utilizes a five-point Likert scale to assess respondents' perceptions, ranging from (1) completely unaware, (2) slightly aware, (3) moderately aware, (4) well-informed, to (5) highly knowledgeable. Part C was adopted and modified from (Adyel & Macreadie, 2021), which consists of 10 items in this section. Determines the attitude of the local community about pollution in mangrove areas. This section employs five different Likert scales to solicit respondents' perceptions: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, (5) strongly agree. Part D was adopted and modified from (Suandi et al. 2023), which consists of 13 items in this section. It demonstrates the practices of local communities regarding pollution in mangrove areas. This section employs five different Likert

scales to solicit respondents' perceptions: (1) never, (2) rarely, (3) sometimes, (4) always, (5) very often.

DATA COLLECTION

The data for this research were obtained from both primary and secondary sources, utilizing a structured approach. The primary data was collected through surveys distributed to selected respondents. Meanwhile, secondary data were sourced from academic journals available on platforms such as Google Scholar, Scopus, Science Direct, Emerald Insight, the UiTM journal portal, and other relevant databases. Additionally, further data collection involved observations, statistical records, and direct input from respondents to incorporate the latest insights relevant to this research.

STATISTICAL ANALYSIS

This study employed descriptive and correlation analyses to evaluate respondents' KAP regarding plastic pollution awareness across local communities in Tanjung Karang, Selangor. The gathered data were entered into and analyzed with SPSS software. A correlation study was conducted to determine the relationship between the variables.

LIMITATIONS

The findings may be affected by social desirability bias, wherein people respond in a manner they perceive as socially acceptable rather than reflecting their actual behaviour (Krumpal, 2013). This applies to the majority of self-reported surveys initially. Notwithstanding this limitation, the questionnaire was structured to ensure anonymity and had a substantial sample size to mitigate the effects of this concern.

DATA ANALYSIS AND RESULTS

RESPONSE RATE

Questionnaires were used for data gathering, provided via an online platform, and supplemented with paper forms used by the local community in Tanjong Karang, Selangor. The online and print questionnaires were disseminated to examine the correlation between the respondents' KAP regarding local community awareness of plastic pollution. Remarkably, 430 replies were gathered for this inquiry, surpassing the aim of 388 respondents.

RELIABILITY TEST

The reliability test is a method utilized to evaluate the consistency of the measurement scale. The Cronbach's Alpha coefficient functions as a quantitative measure to evaluate the extent of internal consistency (Cronbach, 1951). All variables must not exhibit a Cronbach's Alpha coefficient that exceeds 0.7 (Nunnally, 1978).

TABLE 1. Reliability Test

Variables	Cronbach's Alpha	No. of items
Knowledge	0.916	14
Attitude	0.846	10
Practice	0.870	13

TABLE 1 illustrates the values of Cronbach's Alpha. The Cronbach's Alpha for local community knowledge on plastic contamination in mangrove regions is 0.916, demonstrating a high degree of reliability. Similarly, the Cronbach's Alpha for thoughts concerning plastic pollution in mangroves is 0.846, confirming that this independent variable displays good reliability. The Cronbach's Alpha for appropriate community practices concerning plastic pollution in mangroves is 0.870, indicating a high degree of reliability for the dependent variable. Overall, the data suggest that all variables exhibit excellent reliability.

LEVEL OF LOCAL COMMUNITY AWARENESS

A descriptive mean assessment was used to evaluate the level of awareness about plastic pollution in mangrove regions among native communities, focusing on their KAP in Tanjong Karang, Selangor. The mean score levels utilized in this study are displayed in TABLE 2. The study's findings suggested that knowledge of plastic pollution in mangrove areas across all three variables reached its peak, with a mean value ranging from 3.68 to 5.00 (Kamaruddin, & Yusoff, 2019). The community residing in Tanjong Karang, Selangor, demonstrates a commendable degree of KAP to combat plastic pollution in mangrove regions in their daily activities. This study indicates that community knowledge of plastic pollution in mangrove regions is deemed high.

dThis is likely due to their proximity to and daily interaction with the mangrove ecosystem, which heightens their awareness of environmental concerns. This heightened awareness may also have resulted from prior participation in environmental campaigns, coastal cleanup initiatives, and local educational endeavors by Non-Governmental Organizations (NGOs) and educational institutions (Jusoh et al. 2018). Despite these positive results, plastic pollution remains evident throughout the mangrove area. This

illustrates a prevalent issue in environmental studies: possessing extensive knowledge and a positive disposition towards the environment does not necessarily result in consistent environmentally responsible behaviour. This disparity may arise from issues related to human behavior and infrastructure, such as insufficient waste collection systems or recycling facilities, or difficulties in accessing these resources. Cultural norms and practices may also play a role. For instance, individuals within the community may persist in disposing of waste in environmentally detrimental manners due to longstanding habits or the absence of legal repercussions.

Additionally, a brief discussion with a local Forestry Department official suggested that a substantial portion of the plastic waste observed in mangrove regions originates from illegal immigrants. Without adequate waste disposal infrastructure, these villages often discharge their waste directly into the river. This suggests that local populations are not solely responsible for environmental degradation. Hence, solutions must also consider the involvement of additional stakeholders and the challenges of enforcement.

Research from various fields reveals identical trends. A national material-flow study in Thailand indicated that, despite considerable environmental awareness in coastal catchments, ongoing plastic pollution persists due to inadequate waste collection and disposal infrastructure. This occurs notwithstanding the increasing environmental awareness (Kamsook et al. 2023). Research in the Philippines has shown that while coastal communities recognize the impact of plastic waste, economic constraints and informal settlements lead to non-compliance with proper disposal methods (Jambeck et al. 2015). The regional parallels underscore that knowledge alone is insufficient to resolve environmental issues without the promotion of infrastructure and the implementation of policies. These geographical parallels underscore that knowledge alone is insufficient to resolve environmental issues without the development of infrastructure and the implementation of effective policies.

TABLE 2. Level of Local Community Awareness

Variables	Cronbach's Alpha	No. of items
Knowledge	4.01	High
Attitude	3.95	High
Practice	3.91	High
Overall	3.96	High

HYPOTHESIS TESTING

Since it was determined that the sample gathered for this study was normally distributed, parametric methods were utilized to test the variables. To study the link between attitudes towards plastic pollution in mangroves, knowledge about it, and associated activities, the Pearson correlation technique was employed.

TABLE 3. Correlation of Knowledge and Practice of Plastic Pollution in Mangroves

		Knowledge Towards Local Community on Plastic Pollution in Mangroves	Practice Towards Local Community on Plastic Pollution in Mangroves
Knowledge Towards Local Community on Plastic Pollution in Mangroves	Pearson Correlation	1	.878**
	Sig (2-tailed) N		.000
		430	430
Practice Towards Local Community on Plastic Pollution in Mangroves	Pearson Correlation	.878**	1
	Sig (2-tailed) N	.000	
		430	430

Note: **. Correlation is significant at the 0.05 level (2-tailed)

According to TABLE 3, the Pearson correlation between Knowledge of Plastic Pollution in Mangroves and Practices Regarding Plastic Pollution in Mangroves demonstrates a robust positive correlation ($r = 0.878$, $p < 0.05$) with a highly significant p-value of 0.000. It signifies that an increase in the local community's knowledge about plastic pollution correlates with enhanced strategies for dealing with plastic waste in mangroves. This demonstrates a heightened understanding that the environmental ramifications of plastic pollution are directly linked to more effective waste disposal and conservation practices. The sample size of 430 renders the conclusion statistically trustworthy, underscoring the significance of educational programs in shaping community practices. Nonetheless, despite the robust association, it is crucial to acknowledge that this does not confirm a causal relationship, as additional external factors may also influence both knowledge and practice.

According to TABLE 4, the correlation findings between the community's knowledge (attitude) and

practices about plastic pollution in mangroves indicate a robust positive link. The Pearson correlation coefficient for both attitude and practice are substantial, with values of (r = 0.872) for attitude and (r = 0.851) for practice regarding plastic pollution. This suggests that as the community's perspective on the issue of plastic pollution in mangroves becomes increasingly positive, their efforts to alleviate plastic pollution also improve.

Both correlations are statistically significant, indicated by p-values of (p 0.001), demonstrating a strong and meaningful association between attitude and practice in resolving this environmental issue. The strong link suggests that enhancing community education and attitudes may result in more effective plastic management.

TABLE 4. Correlation of Attitude and Practice of Plastic Pollution in Mangroves

		Knowledge Towards Local Community on Plastic Pollution in Mangroves	Practice Towards Local Community on Plastic Pollution in Mangroves
Knowledge Towards Local Community on Plastic Pollution in Mangroves	Pearson Correlation	.872**	.851**
	Sig (2-tailed)		.000
	N	430	430
Practice Towards Local Community on Plastic Pollution in Mangroves	Pearson Correlation	.878**	1
	Sig (2-tailed)	.000	
	N	430	430

Note: **. Correlation is significant at the 0.05 level (2-tailed)

According to (Jakučionytė-Skodienė, & Liobikienė, 2022), the strong correlations among KAP can be attributed to the mutual reinforcement of these elements through repeated exposure to formal experiences, including educational programs and campaigns, as well as informal experiences, such as daily observations of pollution effects. Individuals with higher levels of understanding possess the capacity to exert influence over their peers or family members, fostering a positive social norm that promotes the adoption of sustainable behaviours. This aligns with the Theory of Planned Behaviour, which posits that behavioural intentions are shaped by knowledge, attitudes, and perceived norms (ElHaffar et al. 2020).

DISCUSSION

The results revealed that the local community in Tanjung Karang, Selangor, is well aware of the impact of plastic pollution on mangrove ecosystems. The outcomes reveal that residents possess a strong understanding of the environmental consequences of plastic pollution, accompanied by positive attitudes and responsible practices regarding plastic usage and disposal. Their proactive engagement in waste management suggests a growing consciousness of the need to protect mangrove ecosystems from pollution. This heightened awareness and responsible behavior are crucial in mitigating the negative consequences of plastic pollution, underscoring the importance of community involvement in sustainable environmental conservation efforts.

This finding aligns with a comprehensive survey conducted in Malaysia, which analyzed knowledge and attitudes within the country. A KAP survey on plastic pollution indicated that participants typically had a thorough understanding of the issue and made commendable efforts to mitigate its consequences (Coco Chin et al. 2023). The survey indicated that higher knowledge levels were correlated with more proactive attitudes and activities aimed at reducing plastic waste.

Research examining community awareness of home trash disposal in the Kuala Selangor mangrove forest revealed that locals recognized the significance of efficient waste management and its direct impact on the sustainability of the mangrove ecosystem. The community's acknowledgment of the detrimental impacts of improper garbage disposal underscores the effectiveness of current environmental education initiatives in the area. Other than that, this survey highlights the growing environmental awareness among Malaysians, particularly regarding the preservation of vital mangrove ecosystems from plastic waste (Mazelan & Yusuff, 2021).

The findings indicate a connection between community awareness and the KAP model (Mahat et al. 2019). Awareness of plastic pollution has a significant impact on the community's waste management practices among residents. Therefore, enhanced synchronization of knowledge and attitudes will yield an effective strategy. This indicates that increased knowledge among individuals fosters more favourable sentiments. Consequently, public awareness and comprehension of plastic pollution in mangrove ecosystems should be continuously strengthened

through various channels, including mass media, social media platforms, and other educational resources. Governments, NGOs, and other accountable bodies are tasked with educating the public about the escalating plastic pollution in mangrove regions and its proper management. Consequently, this comprehended information will foster attitudes that heighten concern for plastic pollution in mangrove regions.

To turn awareness into practice, local authorities needed to implement specific measures, including the establishment of more accessible recycling facilities, particularly in informal areas. Infrastructure deficiencies continue to impede behavioral change in numerous coastal and low-income communities (Lestari, & Trihadiningrum, 2019). Consequently, environmental modules can be incorporated into school curricula to instill enduring values, as environmental education has demonstrated lasting impacts on pro-environmental attitudes in young learners (Mangindaan et al. 2022). These structural supports may facilitate the transition from knowledge to practice, ensuring that environmental attitudes are converted into sustainable actions (Kodikara et al. 2017).

CONCLUSION

The outcomes of this study reveal that the local community in Tanjong Karang, Selangor, demonstrates a high level of awareness regarding plastic pollution control in mangrove areas. The study highlights a substantial and positive correlation between KAP, suggesting that individuals with better awareness are more likely to engage in responsible waste management practices. These results highlight the significance of community involvement in mitigating plastic pollution and preserving mangrove ecosystems. Furthermore, the insights gathered from this research can provide a significant reference for future investigations and aid in the development of more effective policies and efforts aimed at reducing plastic waste in mangrove habitats. Strengthening awareness and promoting sustainable practices among local populations will be crucial for ensuring the long-term preservation of these critical coastal ecosystems.

This study primarily examined the awareness and behavioral aspects of the local community. However, it is also crucial to recognize that structural factors, including waste management infrastructure and spatial planning, significantly influence conservation outcomes. For example, regions lacking adequate waste collection systems often endure ongoing pollution, despite heightened environmental awareness. Future research should investigate long-term behavioral changes and the influence of infrastructure on sustainable waste management in coastal and mangrove-dependent regions. Examining the interplay between sustainable urban planning, formalized zoning, and integrated waste management systems, along with community-driven initiatives, would provide a comprehensive perspective on mangrove conservation. The conversion of environmental attitudes into sustainable activities can be facilitated by certain structural supports, which may ease the shift from knowledge to practice.

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DECLARATION OF COMPETING INTEREST

None.

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