PLASTIC WASTE MANAGEMENT PRACTICES IN RURAL COASTAL COMMUNITIES: A KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) ANALYSIS IN KUALA PENYU, SABAH

Dayang Masleha Binti Mohd Rahman*
Faculty of Social Science and Humanities, Universiti Malaysia Sabah, Sabah Malaysia
masleharahman@gmail.com

Mohammad Tahir Mapa
Faculty of Social Science and Humanities, Universiti Malaysia Sabah, Sabah Malaysia

Lindah Roziani Jamru
Faculty of Social Science and Humanities, Universiti Malaysia Sabah, Sabah Malaysia

Abstract: Plastic waste management poses an environmental challenge in rural coastal communities, where increasing reliance on single-use plastics is compounded by limited waste management infrastructure. In Malaysia, empirical evidence on community-level engagement with plastic waste management in such contexts remains limited. This study examines plastic waste management practices in Kuala Penyu, Sabah, through a Knowledge, Attitude, and Practice (KAP) model, with the aim of assessing the community's level of engagement in managing plastic waste. A quantitative research design was employed using a structured questionnaire administered to 100 respondents from the Kuala Penyu district. Descriptive statistical analysis was conducted using the Statistical Package for the Social Sciences (SPSS) to evaluate the levels of knowledge, attitudes, and practices related to plastic waste management. The findings demonstrate that the community exhibits a substantial level of knowledge concerning plastic waste management. Furthermore, both attitudes and practices regarding this matter are also assessed to be at a high level. Despite this generally positive profile, the results indicate a noticeable gap between knowledge and the consistent application of sustainable waste management practices. This suggests that high awareness alone does not necessarily translate into effective behavioural change, particularly in rural coastal settings where structural and logistical constraints persist. Overall, this study provides empirical insights into community-based plastic waste management in a rural coastal context. The findings may inform local authorities and policymakers in designing targeted environmental education initiatives and specific context waste management strategies that bridge the gap between knowledge and practice, thereby supporting more sustainable plastic waste management in rural coastal communities.

Keywords: Coastal Community, KAP, Plastic, Sabah, Waste Management

1. Introduction

Plastic has a long lifespan and is very versatile. Malaysia as a top consumer in Asia and was ranked the highest among the six countries analysed in terms of annual per capita plastic packaging consumption say WWF (Taylor, 2020). While National Policy such as Malaysia Roadmap toward Zero Single Use Plastics and the National Cleanliness policy aim to transition the country toward a circular economy, implementation at the local level often faces significant hurdles (Kamaruddin et al., 2022). In Sabah, these waste management challenges are remains fragmented and dependent on local authorities without creating dedicated institutions, unlike Peninsular Malaysia which has established the National Solid Waste Management Department and the Solid Waste and Public Cleansing Management Corporation (Dusim, 2025).

The prevalence of single-use plastics (SUPs), which are intended for one-time use before being discarded, represents a primary driver of this environmental crisis (Alteneiji et al., 2024). In Malaysia, an estimated 19,000 tons of solid waste are produced daily, with plastic comprising 24% of the total because plastic materials are non-biodegradable and can take up to 1000 years to degrade, they persist in the environment, causing marine pollution and threatening biodiversity (Alteneiji et al., 2024). In coastal regions, mismanaged plastic waste frequently leaks into aquatic ecosystems, where marine organism often mistake it for food, leading to illness, entanglement and death. Furthermore, the

accumulation of plastic debris in drainage systems has been identified as a major cause of urban flooding and the creation of breeding sites for disease carrying pests.

The Knowledge, Attitude, and Practice (KAP) framework offers a useful lens to assess community readiness for sustainable waste management. Previous studies in Malaysia have identified a persistent knowledge and practice gap, whereby high awareness of initiatives such as the "*no plastic bag*" campaign does not consistently translate into sustained behavioral change (Abdullah et al., 2023). Practice outcomes are often influenced by perceived convenience, availability of alternatives, institutional transparency, and enforcement consistency.

In Sabah, plastic waste management is further complicated by the vulnerabilities of rural coastal communities, where formal waste collection and sanitation services are frequently limited (Mapa et al., 2024). Although recent legislative reforms, including the Sabah Solid Waste and Public Cleansing Management Enactment 2022, provide stronger regulatory mandates (Dusim, 2025), their effectiveness ultimately depends on community level participation and compliance. Previous district-level studies in Sabah, such as those conducted in Penampang and Kundasang, indicate that while environmental knowledge may be high, consistent engagement in waste segregation and recycling remains uneven (Alias et al., 2019; Badrum & Mapa, 2020).

In this context, the present study focuses on Kuala Penyu, a rural coastal district in Sabah, to examine how community's knowledge and attitudes toward plastic pollution influence their waste management practices. By evaluating the community's readiness to engage in sustainable practice, such as source segregation and reduction of single-use plastics, this research seeks to identify institutional and structural barriers that constrain circular economy implementation in rural coastal contexts. The findings aim to provide empirical evidence to support local authorities, including the Kuala Penyu District Council (MDKP), in designing targeted educational strategies and strengthening waste management systems at the community level.

2. Materials and Method

2.1 *Research Instrument and Data Collection*

In order to satisfy the objective of this research, a quantitative research was held. The design applied for this approach was cross sectional as the study relied on existing variations and data collection was at one point at times. The study was conducted in Kuala Penyu, a rural coastal district located in the Interior Division of Sabah, Malaysia. Kuala Penyu is one of the 27 districts in Sabah and is situated 100 kilometres from Kota Kinabalu, the state city. As a coastal rural district, the area presents unique infrastructural challenges in waste management. Data collection was carried out in December 2025.

2.2 *Questionnaire Design*

The questionnaire was divided into four sections, which are Section A is demographic background of the respondents, Section B measured respondents knowledge, Section C was attitudes and Section D is practices related to plastic waste. Items in Section B,C and D were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was adapted and modified from established instruments used in previous studies, particular those by Alteneiji et al. (2024), Badrum (2023), Chin et al. (2023), Khanam et al. (2019), Swesi et al. (2019) to ensure suitability to the rural coastal context of Kuala Penyu and to reflect the specific objective of this study.

2.3 *Data Analysis*

Descriptive analysis like percentage, mean and standard deviation was done by SPSS software, also the actual data were collected through random sampling technique. Before conducting descriptive statistics, reliability test was carried out in order to examine the consistency of questions. The minimum 0.70

Cronbach Alpha implies the reliability of the instrument that is suitable and satisfactory for social sciences (Hair et al., 2019).

3. Findings and Result

Table 1 summarises the demographic profile of the respondents. Among the 100 participants, 42% were male, while the largest proportion (43%) were aged 24 years and below. Regarding housing status, 49% of respondents resided in their own homes.

Table 1: Basic statistics of demographic respondents (n=100)

Variable	Category	n
Gender	Male	42
	Female	58
Age	Below 24 years old	43
	25-39 years old	26
	40-59 years old	23
	60 and above	8
Residential Status	Lived in their own homes	49
	Resided with family member	41
	Renting	9
	Lain-lain	1

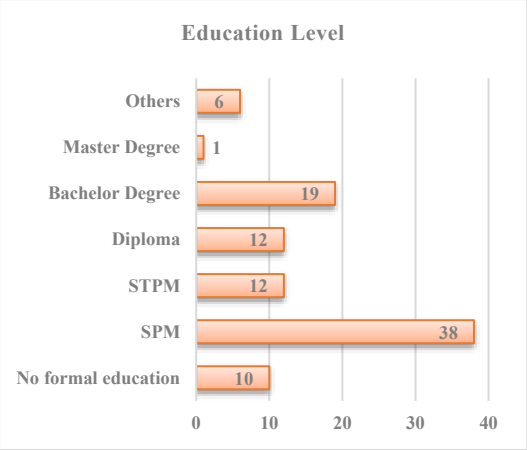


Figure 1: Education levels of respondents

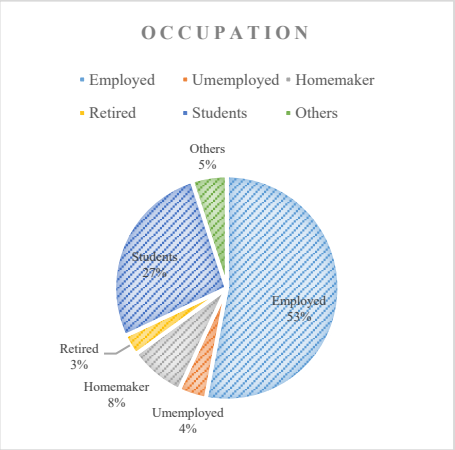


Figure 2: Occupation of respondents

In this study, the Cronbach's alpha values were 0.787 for Knowledge, 0.684 for Attitude, and 0.746 for Practice. Based on the reliability proposed by Dalyanto et al., (2021), Cronbach's alpha values between 0.60 and 0.80 are considered reliable, while values above 0.80 indicate very reliable instruments. All three constructs fall within the "*reliable*" category, as their values exceed the 0.60 threshold. These findings indicate that the measurement instrument demonstrates acceptable internal consistency and is suitable for assessing the KAP of the community regarding plastic waste management.

Figures 1 and 2 illustrate the education level and occupation of the respondents. The majority of respondents had completed secondary education (Sijil Pelajaran Malaysia, SPM), representing 38 individuals, followed by those with a Bachelor's degree (19 respondents). Smaller proportions held Sijil Tinggi Persekolahan Malaysia (STPM) and Diploma qualifications (12 respondents each), while 10 respondents reported having no formal education. In terms of occupation, more than half of the respondents (53%) were employed, making it the largest group, followed by students (27%). The remaining respondents were homemakers (8%), unemployed (4%), retired (3%), and others (5%). Overall, the findings indicate that the sample was predominantly composed of secondary-educated and economically active individuals.

Table 2: Five-point Likert Scale with mean range and verbal interpretation for KAP analysis

Range of value (mean)	Interpretation
4.01 – 5.00	Very high
3.01 – 4.00	High
2.01 – 3.00	Moderate
1.01 – 2.00	Low
0.01 – 1.00	Vey Low

Sources: Cando et al., (2022)

Before presenting findings on KAP, the interpretation of mean score was based on a five-point Likert scale as shown in Table 2. This classification, adapted from Cando et al., (2022) was used to determine the overall level of KAP among respondents in this study. The questionnaire was prepared in dual languages, English and Malay to ensure clarity and inclusivity. However, Malay was predominantly used during data collection as it was more suitable and easily understood by the majority of respondents in the local community.

Table 3: Knowledge questions in questionnaire

Key	Knowledge Statement	Mean	St. Dev	Assessment
B1	I know that improper plastic waste management contributes to pollution in rivers, drainage systems, and coastal areas in Kuala Penyu	4.59	.6976	Very high
B2	I know the correct methods for separating and disposing of plastic waste according to local guidelines	4.17	.8652	Very high
B3	I am aware that certain types of plastic can be recycled, while others cannot.	3.96	1.179	High
B4	I know that improper disposal of plastic waste increases the burden on landfill sites.	4.41	.8299	Very high
B5	I am aware of existing local policies or regulations related to plastic waste management.	3.91	1.137	High
B6	I know the role of the Kuala Penyu District Council (MDKP) and other agencies in managing plastic waste.	3.67	1.214	High
B7	I understand that community participation is important for the success of plastic waste management policies.	4.27	.9412	Very high
B8	I am aware of local policies or guidelines related to the reduction of single-use plastics.	3.73	1.262	High
B9	I am aware that the use of plastic bags has been restricted/banned.	3.43	1.296	High
B10	I know that the bring your own bag campaign has been introduced to encourage consumers to carry their own bags when shopping.	4.02	1.014	Very high

Respondents exhibited a very high level of knowledge regarding the link between improper plastic management and the pollution of local ecosystems. As shown in Table 3, the statement identifying plastic waste as a contributor to the pollution of rivers, drainage systems and coastal areas (B1) recorded the highest mean score (m=4.59). Furthermore, there was strong recognition (m=4.41) that improper disposal significantly increases the burden on local landfills (B4), suggesting that the community is well-aware of the physical externalities of plastic waste.

Regarding procedural knowledge, respondents indicated a very high understanding of the correct methods for segregating and disposing of plastic according to local guidelines (m=4.17). This was complemented by a strong acknowledgement of the necessity of community participation for the success of waste management policies (m=4.27), which underscores a collective sense of responsibility toward local environmental governance.

While environmental awareness was exceptionally high, knowledge regarding specific local policies and institutional frameworks was relatively lower, though still categorized as “High”. Respondents

showed moderate awareness of the roles played by the Kuala Penyu District Council (MDKP) and other agencies (m=3.67). Similarly, while there was significant awareness of the bring you own bag campaign (m=4.02), knowledge regarding the actual ban on plastic bag (B9) received the lowest mean score in the study (m=3.43).

The result also highlighted a gap in the technical understanding a material circularity. Knowledge regarding which specific types of plastic are recyclable versus non-recyclable (B3) was high but lagged behind general environmental awareness (m=3.96). This suggest that while the community understand the "*why*" of plastic management, there is room for improvement in the technical "*how*", specifically regarding material identification and sorting.

Table 4: Attitude questions in questionnaire

Key	Attitude Statement	Mean	St. Dev	Assessment
C1	I believe that improper waste disposal or plastic waste mismanagement significantly contributes to plastic pollution.	4.47	.7581	Very high
C2	I believe that the use of plastic bags can and should be reduced.	4.32	.8150	Very high
C3	I support the implementation of plastic bag bans.	4.11	1.013	Very high
C4	I believe that the government is efficient in addressing waste management issues.	3.70	1.077	High
C5	I believe that recycling campaigns and policies in Malaysia do not require further improvement or innovation.	3.53	1.234	High
C6	I believe that more efforts are needed to reduce plastic waste generation in our country.	4.34	.7278	Very high
C7	I feel that waste segregation is difficult without proper guidance.	3.90	1.150	High
C8*	I find bringing reusable bags when shopping inconvenient.	2.74	1.446	Moderate
C9	I believe that waste disposal behavior is not related to a person's level of education.	3.34	1.327	High
C10	I am satisfied with the waste management services provided in my area.	3.48	1.243	High

**negative statements*

Respondents demonstrated a "very high" level of agreement regarding the link between mismanagement and plastic pollution (refer table 4), with mean score of 4.47. This awareness translate into strong support for reduction strategies. Specifically, there is a strong belief that plastic bag use should be reduced (m=4.32) and widespread support for the implementation of plastic bag bans (m=4.11). Furthermore, the highest consensus in this category was for the need for increased national effort to reduce plastic waste generation (m=4.34), indicating that the community perceives the current status quo as insufficient.

While environment concern is high, attitudes toward governance and infrastructure are more cautious, falling within the "high" but not "very high" range. Satisfaction with local waste management services recorded a mean of 3.48, and the perception of government efficiency in handling waste in Kuala Penyu was slightly higher at 3.70. Interestingly, the belief that recycling campaigns and policies in Malaysia do not require further innovation or improvement received a mean score of 3.53, suggesting a segment of the population may be satisfied with current efforts, through this contrasts with the strong demand for more waste reduction efforts noted in statement C6.

The data highlights specific behavioural and structural barriers that may hinder the transition from positive attitude to actual practices. A significant number of respondents feel that waste segregation is difficult without proper guidance (m=3.90) pointing toward a need for clearer instructional support. Notably, the statement regarding the inconvenience of carrying reusable bags received a "moderate" mean score of 2.74. This relatively low score suggests that for a large portion of the community, bringing their own bags is not viewed as a major burden, which aligns with the high support for plastic

bag bans. Respondents also learned toward the belief that waste disposal behaviour is independent of education level (m=3.34), suggesting that the community views waste management as a universal responsibility rather than one dictated by formal academic background.

Table 5: Practices questions in questionnaire

Key	Attitude Statement	Mean	St. Dev	Assessment
D1	I separate plastic waste from other household waste.	4.02	.9425	Very High
D2	I use reusable bags when shopping.	4.31	.8955	Very High
D3	I frequently purchase products packaged in plastic.	3.76	1.016	High
D4	I reduce the use of single-use plastics such as straw, bottles and cutlery.	3.68	1.136	High
D5	I believe that my daily actions influence my environmental practices.	4.02	.9947	Very High
D6	I separate plastic waste from other types of waste (e.g paper, glass) before disposal.	3.45	1.266	High
D7	I dispose of plastic waste properly without burning it or throwing it into drains.	3.76	1.173	High
D8	I dispose of plastic waste in public trash bins.	3.85	1.122	High
D9	I use three-color recycling bins to dispose of recyclable waste.	3.20	1.428	High
D10	I sort my household waste by type before disposal.	3.40	1.271	High

Table 5 shows the highest performing practice among the community is the utilization of reusable bags during shopping (m=4.31), which aligns with the high level of policy support for plastic bag bans observed in the attitudinal analysis. Additionally, there is a strong sense of individual agency, with respondents highly believing that their daily actions directly influence environmental outcomes (m=4.02). This indicates a community that is psychologically invested in sustainable behavioral shifts. While general plastic segregation from household waste is reported as “very high” (m=4.02), more details sorting behaviors show a slight decline. Specifically, the practice of separating plastic from other specific recyclables like paper and glass (D6) recorded a lower mean of 3.45. Sorting household waste by type before disposal (D10) also fell into the “high” but not “very high” category (m=3.40). This suggests that while the community is willing to separate plastic as a broad category, the complexity of multi-stream sorting presents a behavioral bottleneck, potentially due to the “guidance gap” identified in the attitudinal findings.

The findings indicate a positive trend toward a responsible disposal, with a “high” assessment for avoiding harmful practices such as burning waste or discarding it into drainage systems (m=3.76). Public bins remain a primary disposal point for plastic waste (m=3.85). However, the utilization of specialized infrastructure remains the weakest link in the practice chain. The use of three-color recycling bins (D9) received the lowest mean score in the entire practice assessment (m=3.20). The high standard deviation in this category suggests significant inconsistency in access to or knowledge of these facilities across the rural coastal region of Kuala Penyu.

The community demonstrates a “high” level of effort in reducing single-use plastics such as straws and bottles (m=3.68). Despite this, the frequent purchase of plastic-packaged products remains a persistent practice (m=3.76), likely reflecting the systemic challenge of limited plastic free alternatives in rural retail environments.

4. Discussion

The result of this Knowledge, Attitude and Practice (KAP) analysis in Kuala Penyu, Sabah reveal a community that is environmentally conscious but technically and structurally constrained. While the “very high” score in environmental awareness and attitudes suggest a strong psychological readiness for sustainable waste management, the “moderate” to “high” score in technical practices regarding

multi-stream sorting and recycling bin utilization indicate a persistent knowledge and practice gap common in Malaysia coastal and rural context.
The residents of Kuala Penyu demonstrate a profound understanding of the ecological consequences of plastic mismanagement, particularly its impact on river and coastal ecosystems. This high level of awareness aligns with the findings of Badrum & Mapa, (2020) who noted excellent knowledge levels (96.2%) among residents in Penampang, Sabah. However, the lower practice scores for using three colour recycling bins and details waste sorting, suggest that awareness alone does not drive technical compliance. This disparity is often attributed to a lack of visible and accessible infrastructure as noted by Dusim, (2021) even when policy framework exist, they are frequently undermined by weal implementation and inadequate physical facilities in Sabah.

One of the most successful findings in this study is the high rate of reusable bag adoption (m=4.31). This practice is supported by a very high awareness of "*bring your own bag*" campaigns and a positive attitude toward reducing single-use plastics. The success of this specific behavior in Kuala Penyu mirror recent trends in Kota Kinabalu, where citizens have been shown to adjust positively to plastic bag bans when supported by consistent media campaigns and voluntary business compliance (BERNAMA, 2024). Furthermore, the finding that residents do not find carrying bags highly inconvenient suggests that nudging strategies in retails environments as explore by Lim (2020)), are effective at fostering long-term behavioral changes in the Malaysian retail store.

Despite strong pro-environmental attitudes, respondents expressed that waste segregation is difficult without proper guidance (m=3.90). This "guidance gap" is a critical barrier to achieving a circular economy. According to Sihaloho & Rusliadi, (2025), household participation in sorting often remains low (approximately 20%) due to a lack of public education on the technicalities of separation. This is reflected in the findings where respondents were less certain about identifying specific recyclable plastic types compared to their general knowledge of pollution. The reliance on public bins rather than specialized recycling streams suggests that without clear, procedural education such as the programs proposed by Pudin, (2015) for Sabah communities will continue to default to "all-in-one" disposal method.

A notable findings is the relatively moderate awareness regarding the specific role of the district council and the legal status of plastic bans. This lack of institutional clarity can lead to lower satisfaction with waste services and a perception that the government is only moderately efficient. Research by Kamaruddin et al., (2022) emphasizes that Malaysia's roadmaps are often aspirational and without stronger localized legislation and clear communication of institutional roles, community participation will remain fragmented. The results suggest that for rural coastal areas like Kula Penyu, policy success depends on transitioning from top-down mandates to collaborative governance that includes active community engagement and transparent service delivery.

In conclusion, this study confirms that the rural coastal community of Kuala Penyu possesses the foundational environmental literacy and positive attitudes necessary to support Sabah transition toward sustainable waste management. However, the transition is currently stalled by a lack of specialized infrastructure and technical sorting guidance. To bridge this gap, local authorities should focus on enhancing the visibility of recycling facilities and providing clear, community level education to translate high environmental intent effective technical practices.

5. Conclusion

This paper suggests a strong underlying recognition of environmental concerns among the rural coastal community of Kuala Penyu especially regarding the consequences of poor disposal of the plastic waste to the pollution of rivers, drainage systems as well as the coastal areas. Although the individual and collective willingness to participate in the waste management policies is high, there is still a strong institutional and technical gap. There is significantly less awareness about the MDKP and the legal position of the plastic bag ban than about the general ecological knowledge. Such results suggest that

the community is ready to make a shift towards a circular economy, but is currently hampered by the lack of institutional clarity and technical advice when it comes to waste segregation.

Despite the insights gained, several limitations should be acknowledged. Firstly, this study relies on self-reported data, which may be subject to social desirability bias, where respondents might over-report positive practice such as waste segregation to align with perceived social norms. Secondly, the geographical scope is limited to the rural coastal district of Kuala Penyu. Therefore, the findings may not be fully generalizable to urban centers or high-altitude rural areas in Sabah, where waste infrastructure and socio-economic dynamics differ significantly. Lastly, the cross-sectional nature of the KAP analysis provides a snapshot in time, which may not capture the long-term durability of behavioral changes as new policies are introduced.

To bridge the "knowledge and practice gap," the following actions are recommended for local stakeholders. The MDKP should enhance its presence through localized outreach programs to clarify its role in the waste management ecosystem and provide definitive information on existing regulations, such as the plastic bag ban. Rather than focusing solely on environmental awareness, educational interventions should prioritize procedural knowledge. This includes providing clear, visual guides on how to correctly segregate different types of plastic and other recyclables at the household level. Efforts must be made to align physical infrastructure with community willingness. Increasing the density and visibility of three-color recycling bins in coastal villages will lower the barrier to technical compliance.

Future research should expand on these findings by conducting longitudinal studies to track how community practices evolve following specific infrastructure upgrades or educational interventions. Additionally, a comparative analysis between rural coastal communities and inland rural communities in Sabah could provide deeper insights into how geographical and cultural differences influence plastic waste management practices. Finally, incorporating qualitative methods, such as focus group discussions or ethnographic observations, would help to further uncover the underlying socio-economic and cultural barriers that prevent high environmental knowledge from translating into consistent technical practice.

References

Abdullah, E. N., Rahman, H. A., & Zain, I. N. M. (2023). Knowledge and Practice on the No Plastic Bag Campaign Among Undergraduate Students in Universiti Putra Malaysia (UPM). *Malaysian Journal of Medicine and Health Sciences*, *19*, 98–108.

Alias, F. S., Manaf, L. A., Ariffin, M., & Abdullah, S. H. (2019). Community's Existing Practices and Knowledge on Recycling at Kundasang, Sabah. *Journal of Science and Mathematics Letter*, *7*, 11–25.

Alteneiji, S. M., Mathew, B. T., Mohammed, H. A., Abu-elsaoud, A. M., El-tarabily, K. A., & Raish, S. M. Al. (2024). Knowledge, Attitudes, and Practices towards Single-Use Plastic Bags in the United Arab Emirates. In *Sustainability* (Vol. 16).

Badrum, S. Y. B. (2023). *The Study of Sociodemographic in the aspect of Knowledge, Attitude, Practices and Readiness of community in Penampang, Sabah related to Governance and Waste Management Practices*.

Badrum, S. Y., & Mapa, M. T. (2020). Village-Level Knowledge, Attitude, and Practice (KAP) on Solid Waste Management in Penampang, Sabah. *LPPM UPN "Veteran" Yogyakarta Conference Series Proceeding on Political and Social Science (PSS) Volume*, 148–160. https://doi.org/10.31098/pss.v1i1.191

BERNAMA. (2024). Natural Resources Ministry: Malaysia moves closer to single-use plastic bag ban by 2026, engages states on roadmap. *Malaymail*.

Cando, E. N. T., Burdeos, K. B., & Desiree F, G. (2022). Knowledge, Attitude and Practices on Solid Waste Management Among Households in the Urban Communities of Butuan City, Philippines. *Journal of Environmental Science and Management*, *25*(1), 1–8.

Chin, K. K. C., Mahanta, J., & Nath, T. K. (2023). Knowledge, Attitude, and Practices toward Plastic Pollution among Malaysians: Implications for Minimizing Plastic Use and Pollution.

Sustainability (Switzerland), *15*(2). https://doi.org/10.3390/su15021164

Dalyanto, A., Sajidan, Siswandari, & Sukarmin. (2021). Developing instrument to measure entrepreneur skills of vocational school students based on sustainable development. *Journal of Physics: Conference Series*, *1842*(1). https://doi.org/10.1088/1742-6596/1842/1/012025

Dusim, H. H. (2021). A Study on the Adequacy of Kota Kinabalu Sabah's Solid Waste Management Policy. *Journal of Administrative Science*, *18*(1), 199–218. http:jas.uitm.edu.my

Dusim, H. H. (2025). Toward Sustainable Waste Management: Assessing the Potential Implications of Sabah's Solid Waste and Public Cleansing Management Enactment 2022. *Journal of Administrative Science*, *22*(2), 253–266.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis Eighth Edition*. www.cengage.com/highered

Kamaruddin, H., Radzi, M. S. N. B. M., Marwan, M. A., Maskun, & Patittingi, F. (2022). Critical Analysis on the Malaysian Legal Approach and Policy in Plastic Waste Reduction. *Res Militaris*, *12*(2), 1738–1745.

Khanam, N., Wagh, V., Gaidhane, A. M., & Quazi, S. Z. (2019). Knowledge , Attitude and Practice on Uses of Plastic Products , Their Disposal and Environmental Pollution: A Study among School - going Adolescents. *Journal of Datta Meghe Institute of Medical Sciences University*, 57–60. https://doi.org/10.4103/jdmimsu.jdmimsu

Lim, I. (2020). Nudging in Supermarkets to Reduce Plastic Bag Consumption among Customers: A Framework for Change. *Journal of Sustainable Development*, *13*(4), 142–163. https://doi.org/10.5539/jsd.v13n4p142

Mapa, M. T., Rahim, M. S. ., Talip, M. ., Dollah, R., & Irawan, L. . (2024). Kemudahan sanitasi (pengurusan sisa pepejal) di Pulau Bum-bum, Semporna, Sabah, Malaysia. *Journal of Social Science and Humanities*, *5*(4), 16–28.

Pudin, S. (2015). *Research Commons at the University of Waikato Copyright Statement: Development of an environmental education programme for waste management with local communities in Sabah, Malaysia*.

Sihaloho, U. O., & Rusliadi, R. (2025). Collaborative Governance in Plastic Waste Recycling in Medan City: Integrating Informal Sector, Community Participation, and Policy. *Jurnal Administrasi Publik*, *1*(11), 26–37.

Swesi, A. E. M., Mallak, S. K., & Tendulkar, A. (2019). Community attitude, perception and willingness towards solid waste. *Journal of Wastes and Biomass Management (JWBM)*, *1*(1).

Taylor, M. (2020). Malaysia top plastic consumer in Asia, says WWF. *The Star*. https://www.thestar.com.my/news/nation/2020/02/17/malaysia-top-plastic-ocean-polluter-in-asia-says-wwf