Geografia-Malaysian Journal of Society and Space 20 issue 4 (1-12)
© 2024, e-ISSN 2682-7727 https://doi.org/10.17576/geo-2024-2004-01

Toward Sustainable Waste Management: Assessing factors affecting single-use plastic reduction in the Southern Region of Malaysia

Mohamad Sofian Abd Rahim[1], Azwani Alias[1*], Nurezdiani Binti Said[1], Siti Norliyana Harun[2], Noorashikin Md Noor[3,4*]

[1]Faculty of Allied Health Sciences (FOAHS), City University Malaysia
[2]Centre for Tropical Climate Change System, Institute of Climate Change, Universiti Kebangsaan Malaysia
[3]Earth Observation Centre, Institute of Climate Change, Universiti Kebangsaan
[4]Marine Ecosystem Research Centre (EKOMAR), Centre for Natural and Physical Laboratory Management of UKM (ALAF-UKM), Universiti Kebangsaan Malaysia

Correspondence: Noorashikin Md Noor (email: noor@ukm.edu.my)

Received: 11 July 2024; Accepted: 20 November 2024; Published: 29 November 2024

Abstract

In response to the urgent need for enhanced waste management practices, a study was undertaken to identify factors influencing the effectiveness of a single-use plastic reduction program in the Sothern part of Malaysia. By 2030, Malaysia has set an ambitious target to phase out single-use plastics, as outlined in the Roadmap Towards Zero Single-Use Plastics 2018-2030. However, the roadmap lacks a clear and unified strategy, relying on state governments and stakeholders to align their efforts. This lack of strategic cohesion represents a critical research gap, particularly regarding the role of local stakeholders, such as food hawkers, whose participation is essential for the program's success. In this context, the pivotal role of food hawkers in ensuring the success of such programs cannot be overstated. A survey involving 149 respondents was conducted to analyze knowledge, attitudes, and practices related to single-use plastic reduction. Descriptive analysis, Cronbach's alpha, Likert scale analysis, and Pearson correlation were employed to achieve the research objectives. The findings reveal that knowledge significantly influences attitudes towards single-use plastic reduction, with a strong correlation observed between the two variables. Additionally, socio-demographic characteristics such as age, education level, and income, exhibit notable disparities in factors associated with single-use plastic reduction. In conclusion, addressing knowledge gaps emerges as a critical aspect of effective single-use plastic reduction initiatives. Moreover, tailored interventions considering socio-demographic diversity are essential for comprehensive program success.

Keywords: Geographic distribution, responsible production, socio-demographic, sustainability, SDG 12, waste management

Introduction

Single-use plastic, also known as disposable plastic, is indispensable in modern food packaging due to its ability to ensure product safety and prolong shelf life. However, its widespread use poses

significant environmental and health risks, particularly in countries like Malaysia, where packaging constitutes a substantial portion of plastic consumption (Chen et al., 2021). Packaging accounts for the majority of plastic use, accounting for 39.6% of total demand; packaging accounts for one-third of global plastic production. The most important application area in Malaysian plastics is packaging. Plastic production and use are harmful to both the environment and human health (Alabi et al., 2019). As of 2020, Malaysia's estimated annual consumption of plastic food packaging was approximately 148,000 metric tons. This figure underscores the country's significant reliance on plastic materials for food packaging. Notably, Malaysia's per capita plastic packaging consumption stands at 16.78 kilograms, the highest among six Asian countries studied, surpassing nations like Thailand and Vietnam. This high consumption rate highlights the pressing need for effective strategies to reduce plastic usage and mitigate environmental impacts. (Simon, 2019). Malaysia is ranked eighth out of ten countries worldwide in terms of uncontrolled plastic waste (Kamaruddin et al., 2022). As a result of the excessive use of plastic, Malaysia is also at risk of developing solid waste problems. Malaysia has fallen short of the 2020 National Strategic Plan (NSP) goal for Solid Waste Management, which was established in August 2005. The goal is to divert 40% of waste from landfills while increasing recycling to 22%. Nearly 90% of solid waste is disposed of in sanitary landfills, with only 10.5% recycled (Tang et al., 2021).

Despite governmental efforts to curb plastic usage, challenges persist, especially among small food businesses such as street hawkers. Tangkak, Johor, situated in the southern part of Malaysia, epitomizes these challenges, with the prevalent use of single-use plastics despite ongoing initiatives. Understanding the knowledge, attitudes, and practices of street food hawkers in Tangkak regarding single-use plastic reduction programs is crucial for effectively addressing this issue. Several factors contribute to the continued reliance on single-use plastics among street hawkers in Tangkak, Johor, Southern Malaysia. One significant challenge is the lack of awareness about the health and environmental risks associated with single-use plastics and the availability of eco-friendly alternatives (Rhein and Schmid, 2020). Many hawkers face financial constraints, as sustainable packaging options are often more expensive, making them less accessible for small-scale vendors. Additionally, there is limited access to suppliers offering affordable and reliable alternatives in the area. Government campaigns, such as the No Plastic Bag Day initiative, have had limited success among small businesses due to inadequate outreach and support tailored to the needs of street hawkers. These challenges are further compounded by a lack of incentives or subsidies to encourage the adoption of sustainable practices, making it difficult for hawkers to transition away from single-use plastics. Regulatory measures have faced resistance, and the implementation of broader policies, such as Malaysia’s Roadmap Towards Zero Single-use Plastics, has been inconsistent. These challenges underscore the urgent need to assess and address the knowledge, attitudes, and practices of street food hawkers to support single-use plastic reduction efforts effectively.

To address these challenges, this study aims to assess the knowledge, attitude level, and practices of street food hawkers in Johor regarding single-use plastic reduction programs and their associated factors. Specifically, the study seeks to determine the knowledge and attitude level of street food hawkers in Johor regarding single-use plastics, assess the practices hindering street food hawkers in Johor from supporting single-use plastic reduction programs, establish associations between demographic factors, knowledge, attitude level, and practices among street food hawkers in Johor, and explore the correlation between knowledge, practices, and attitude level of street food hawkers to support single-use plastic reduction programs.

Method and study area

Sampling technique and data collection

This analysis relies on primary data collected from respondents to fulfill the research objectives. The data were gathered using a stratified random sampling approach to ensure representation across various socio-demographic groups of hawkers in Tangkak. Survey questionnaires with a 5-point Likert scale were distributed through electronic means, such as Google Forms and email, at specific time points between 2016 and 2020. These time points were selected to capture seasonal and temporal variations in hawkers' practices and perceptions regarding single-use plastic reduction. The questionnaire, adapted from existing validated instruments, comprises five parts, each designed to elicit pertinent information from the respondents. Part 1 addresses the demographic characteristics of the respondents, while Part 2 explores Hawkers' knowledge regarding support for plastic reduction. Part 3 investigates Hawkers' practices in plastic usage, and Part 4 delves into their attitudes toward plastic reduction. The research aims to secure responses from 382 randomly selected respondents, ensuring a 95% confidence level with a 5% margin of error. Data collection employed a formal questionnaire administered via Google Forms and analysis was conducted using SPSS Version 20.

Sample size

According to Lakens (2022), the sample size is measured by the number of groups taken from the main population to be included in the analysis to produce results that could be used to create sample conclusions. Sharma et al. (2020) formula was adopted to select a sample size**:**

$$S = \frac{X^2 N(1-)}{d^2(N-1) + X^2 P(1-P)},$$

where:
S = requires sample size
X = z value (1.96 at 95% confidence level)
N = Population Size
P = Population proportion (0.5 or 50%)
d = Degree of accuracy (0.05)

Data analysis

Data on the level of awareness and Knowledge as well as repayment options were analyzed through SPSS software. For this research, the Knowledge of Vendors in Tangkak was defined as a variable of attitudes, and practices, of each trader to support the single-use plastic reduction program for each night market trader in the Tangkak district of Johor. A descriptive analysis was conducted to determine data percentages and frequencies, while inferential analysis focused on identifying relationships and predicting outcomes. Specifically, Pearson correlation was used to assess the strength and direction of relationships between knowledge, attitudes, and practices regarding single-use plastic reduction. Multiple regression analysis was performed to identify predictors of attitudes and practices, with socio-demographic characteristics and knowledge levels as independent variables. The survey data were analyzed using SPSS Version 26, employing these

statistical methods to comprehensively evaluate the factors influencing single-use plastic reduction among hawkers.

likert scale

The Likert scale is five or seven levels representing the person's decision to make a specific statement. The 5-liker scale consists of the following scale values: 5-Strongly agree, 4-Agree, 3-Netural, 2-Disagree, and 1-Strongly disagree (Table 1). This scale typically offers a greater perspective into what the respondent believes and considers in the survey since the topic is straightforward. Therefore, the higher score suggests a higher level of agreement or disagreement with the comment.

Average Index = SR/TR
SR: Sum all the scales are given by the respondent
TR: Total respondent

Table 1. Likert analysis interval

Level	Scale	Interval
Strongly disagree	1	[1.00 - 1.80]
Disagree	2	[1.81 - 2.60]
Neutral	3	[2.61 - 3.40]
Agree	4	[3.41 - 4.20]
Strongly agree	5	[3.21 - 5.00]

Logistic regression analysis

Simple and multiple logistic regression analysis was used to determine the association between demographic factors, knowledge, attitude level and practice of street food hawkers in Johor to support the single-use plastic reduction program. The dependent (outcome) variables were knowledge and readiness level. Modeling in multiple logistic regressions involved the following steps: (1) univariate analysis, (2) variable selection, (3) check multicollinearity using Variance Inflation Factor (VIF), (4) check two-way interaction term, (5) assess the goodness-of-fit of the model, and (6) establish a final model.

In univariate analysis, a simple logistic regression significant variable with a p-value < 0.25 were included in the multiple logistic regression model for further analysis. The variables were selected with forward stepwise selection method by likelihood-ratio test, backward stepwise selection method by likelihood-ratio test and manual selection methods. The adjusted odds ratio (Adj. OR) and 95% CI was calculated and used as a measure of the strength of association between outcomes.

Pearson correlation

This method is used to measure the relationship between two variables, which value ranges from -1 to 1. The higher coefficient means there is a positive relationship between the variables, while the negative coefficient means when a variable is increased, the other tends to decrease (Table 2). In this study, the four variables and the dependent variable were analyzed if either two factors are related to each other.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}},$$

where
i. n is the sample size
ii. x and y are the individual sample points

Table 2. Interpretation of relationship strength of correlation coefficient

Correlation coefficient	Interpretation
$\|0.90\| < r \leq \|1.00\|$	Very high positive/negative correlation
$\|0.70\| < r \leq \|0.90\|$	High positive/negative correlation
$\|0.50\| < r \leq \|0.70\|$	Moderate positive/negative correlation
$\|0.30\| < r \leq \|0.50\|$	Low positive/negative correlation
$\|0.00\| < r \leq \|0.30\|$	Negligible correlation

Results and discussion

Sociodemographic profile

The survey was completed by 149 street food hawkers in the Tangkak district of Johor situated in the southern part of Malaysia. Most responders were aged 18 to 30 (45.6%). With 80 (53.7%) females and 69 (46.3%) males, the gender distribution was about equal. Most respondents (47%) had a secondary school education or even, followed by those with a diploma or equivalent (35.6 %) and those with a degree or higher education (11.4%). Most of them (63.8%) had more than three years of company experience. The most significant source of Knowledge on plastic use was social media (40.3%), followed by television (47.3%) and official sources (16.1%). Table 3 summarises the sociodemographic characteristics of the respondents.

The descriptive analysis findings regarding the sociodemographic profile of street food hawkers in Tangkak, Johor, are consistent with past research on similar populations and environmental initiatives. Studies conducted in urban areas with vibrant street food cultures have often reported a predominance of younger hawkers, reflective of the entrepreneurial opportunities that street vending offers to individuals seeking livelihoods, particularly in densely populated urban centers (Rahman and Aziz, 2020).

Similarly, the near-balanced gender distribution observed among street food hawkers aligns with broader trends seen in the informal sector, where women often play a significant role in street vending activities, contributing to household incomes and community economies (Othman et at., 2020). This gender inclusivity in street vending has been recognized as essential for promoting gender equity and economic empowerment among marginalized groups (Rahman and Aziz, 2020). Regarding educational background, the dominance of secondary school education or lower among street food hawkers is a common finding across various studies on informal economies and street vending sectors in Southeast Asia (Xavier & Gomez, 2018). However, it's important to note that while formal education levels may vary, street food hawkers often possess invaluable experiential knowledge and practical skills acquired through years of hands-on experience in the industry (Aryee et al., 2023).

Table 3. Street food hawkers' sociodemographic background in Tangkak, Johor (n = 149)

Variables	n (%)
Age	
18-30 years	68(45.6)
31-40 years	48(32.2)
41-50years	20(13.4)
≥50 years	13(8.7)
Gender	
Male	69(46.3)
Female	80(53.7)
Educational background	
Primary	2(1.3)
Secondary school or lower	70(47)
Diploma or equivalent	53(35.6)
Degree or equivalent	17(11.4)
Master or equivalent	7(4.7)
Business experience	
Less than 3 years	54(36.2)
More than 3 years	95(63.8)
Information source	
Social media	60(40.3)
Television	36(24.2)
Newspaper	14(9.4)
Official source	24(16.1)
Advertisement	9(6.0)
Radio	6(4.0)

Knowledge, attitude, practice scores, and levels of street food hawkers

The majority of respondents (67.8 %) had strong knowledge scores, with a mean (SD) of 77.0 (15.4); the lowest score was 9.1 %. Most food hawkers (73.2%) reported that practice had low influence on their support for the single-use plastic reduction initiative, while 67.8% (92) were ready to support it. The results are shown in Table 4.

Table 4. Knowledge, attitude, practice scores, and levels of street food hawkers to support the single-use plastic reduction program in Tangkak, Johor (n = 149)

Variables	Mean(±SD)	Min–Max Score	n (%)
Knowledge	77.0(15.4)	9.1-100	
Poor			48(32.2)
Good			101(67.8)
Attitude	82.3(13.4)	41.7-100	
Not ready			57(38.3)
Ready1			92(67.8)
Practice	61.4(16.2)	25-100	
Low influence			109(73.2)
Strong influence			40(26.8)

The preference for social media as a primary source of knowledge on plastic use among street food hawkers resonates with the growing influence of digital media in shaping consumer behaviors and awareness on environmental issues (Abdullah et al., 2022). Past research has

highlighted the effectiveness of targeted social media campaigns in promoting pro-environmental behaviors and raising awareness about sustainability initiatives among diverse audience groups, including street vendors and small-scale entrepreneurs (Mat Yusoff et al., 2022).

In terms of knowledge, attitude, and practice scores, the findings corroborate previous studies emphasizing the importance of knowledge acquisition and positive attitudes as drivers of behavior change in environmental conservation efforts (Kruize et al., 2019). While strong knowledge scores among street food hawkers indicate a foundational understanding of plastic reduction initiatives, addressing barriers to practice implementation remains a critical challenge, as noted in previous research on behavior change interventions in similar contexts (Harun et al., 2024).

The low influence of practice on supporting the single-use plastic reduction initiative can be attributed to several challenges faced by street food hawkers. Financial constraints, such as the higher cost of eco-friendly packaging, remain a significant barrier, especially for vendors with tight profit margins (Hashim et al., 2023). Limited enforcement of regulations and the lack of consistent access to affordable sustainable alternatives further discourage behavior change. Additionally, cultural norms and convenience habits tied to single-use plastics play a role in maintaining the status quo (Noor & Harun, 2022). To address these challenges, future interventions should combine financial incentives, such as subsidies or discounts, with educational campaigns emphasizing the economic and environmental benefits of sustainable practices. Collaborative efforts with stakeholders and improved access to affordable alternatives can help bridge the gap between knowledge and practice, ensuring meaningful and lasting behavior change among street food hawkers.

Logistic Regression based factors on the knowledge level of street food hawkers

Table 5 demonstrates that there was an association between attitude and practice with relation to knowledge level. A food hawker who is ready to change is 1.27 times more likely to have higher levels of knowledge (95% CI: 0.62,2.60, p-value 0.001) than those who are not ready to change. In addition, food hawkers with significant practice were 2.94 times more likely to have higher levels of knowledge (95% CI:1.40,6.19, p-value 0.005) than those without significant practice.

The findings presented in Table 5 reveal significant associations between attitude, practice, and the knowledge level of street food hawkers regarding the support for the single-use plastic reduction program. The logistic regression analysis indicates that food hawkers who exhibit a positive attitude towards change are 1.27 times more likely to possess higher levels of knowledge (95% CI: 0.62, 2.60, p-value 0.001) compared to those who are not inclined towards change. This aligns with past literature that underscores the role of attitude as a predictor of knowledge acquisition and behavior modification (Braun et al., 2018; Safari et al., 2018). Moreover, the study highlights a compelling link between practice and knowledge level, indicating that food hawkers with significant practice are 2.94 times more likely to have higher knowledge levels (95% CI: 1.40, 6.19, p-value 0.005) than those without significant practice. This corroborates previous research emphasizing the importance of hands-on experience and practical application in reinforcing knowledge retention and comprehension (Trott, 2020; Park, 2022). Overall, these findings underscore the multifaceted nature of factors influencing knowledge acquisition among street food hawkers, emphasizing the importance of addressing both attitudinal and practical aspects in educational interventions aimed at supporting environmental sustainability initiatives.

Table 5. Logistic Regression based factors on knowledge scores of street food hawkers about supporting the single-use plastic reduction program (n = 149)

Knowledge	Univariable		Multivariable	
	Crude OR[1] (95% CI)	**p-value**	**Adj OR[1] (95% CI)**	**p-value**
Age			-	-
18-30 years (Ref)	1			
31-40 years	1.279(0.58,2.80)	0.539		
41-50years	1.744(0.56,5.38)	0.333		
≥50 years	1.938(0.48,7.71)	0.348		
Gender			-	-
Female	1			
Male	0.86(0.43,1.71)	0.666		
Educational background			-	-
Secondary school	1			
Primary	0.00	.999		
Diploma	1.51(0.68,3.35)	.316		
Degree	0.70(0.24, 2.07)	.519		
Master	0.65(0.14,3.16)	.596		
Business experience			-	-
Less than 3 years	1			
More than 3 years	1.60(0.79,3.25)	0.19		
Information source			-	-
Social media	1			
Television	1.41(0.59,3.41)	0.441		
Newspaper	1.55(0.44,5.54)	0.497		
Official source	1.87(0.65,5.39)	0.249		
Advertisement	2.18(0.42,11.39)	0.357		
Radio	1.24(0.21,7.34)	0.810		
Attitude level				
Not ready	1			
Ready	2.67(1.32,5.42)	**0.007**	1.27(0.62,2.60)	**0.001**
Practice level				
Not significant	1			
Significant	0.30(0.14,0.64)	**0.002**	2.94(1.40,6.19)	**0.005**

1OR = Odds Ratio, CI = Confidence Interval

Logistic Regression based factors on the attitude level of street food hawkers

The possibility of food hawker supporting the plastic reduction programme was 2.67 times greater for those with good knowledge compared to those with poor knowledge (95% CI: 1.31,5.42, p-value = 0.007) according to a logistic regression analysis. There was no association between sociodemographic and practice level and attitude level. Table 6 summarises the results.

© 2024, e-ISSN 2682-7727 https://doi.org/10.17576/geo-2024-2004-01

Table 6. Logistic Regression based factors on attitudes scores of street food hawkers about supporting the single-use plastic reduction program (n = 149)

Factor	Crude OR1	(95% CI)	p-value
Age			
18-30 years	1	-	-
31-40 years	1.06	-	0.882
41-50 years	0.87	-	0.793
≥50 years	0.50	-	0.254
Gender			
Female	1	-	-
Male	0.96 (0.49, 1.85)	-	0.894
Educational Background			
Secondary school (Ref)			
Primary	1.33 (0.05, 12.48)	-	0.841
Diploma	2.10 (0.75, 3.35)	-	0.224
Degree	0.89 (0.23, 1.93)	-	0.455
Master	0	-	0.999
Business Experience			
Less than 3 years	1	-	-
More than 3 years	0.72 (0.36, 1.44)	-	0.352
Information Source			
Social media	1	-	-
Television	0.85 (0.36, 1.99)	-	0.702
Newspaper	0.97 (0.29, 3.27)	-	0.960
Official source	1.31 (0.47, 3.66)	-	0.609
Advertisement	0.27 (0.06, 1.18)	-	0.083
Radio	0.27 (0.27, 0.45)	-	0.148
Knowledge Level			
Poor	1	-	-
Good	2.67 (1.31, 5.42)	-	0.007
Practice Level			
Not significant	1	-	-
Significant	1.045 (0.50, 2.20)	-	0.909

The logistic regression analysis conducted to determine factors influencing the attitude level of street food hawkers towards supporting the single-use plastic reduction program yielded insightful findings, as summarized in Table 6. Notably, the analysis revealed a significant association between knowledge level and attitude. Street food hawkers with good knowledge were found to be 2.67 times more likely to support the plastic reduction program compared to those with poor knowledge (95% CI: 1.31, 5.42, p-value = 0.007). This underscores the importance of knowledge acquisition in shaping attitudes and behavioral intentions towards environmental initiatives, aligning with prior literature highlighting the role of education in fostering pro-environmental attitudes (Varela-Candamio et al., 2018; van de Wetering et al., 2022). Conversely, sociodemographic factors such as age, gender, educational background, and business experience showed no significant association with attitude level. Similarly, practice level exhibited no significant impact on attitude, indicating that while practical experience may influence behavior, it does not necessarily translate into attitude change in this context. Overall, these findings emphasize the pivotal role of knowledge enhancement in promoting positive attitudes and behaviors conducive to environmental sustainability among street food hawkers.

Correlations between knowledge, practices, and attitude scores of street food hawkers

A Pearson correlation analysis was conducted to determine the strength and direction of the relationship between food vendors' knowledge, practices, and attitude to support the program for reducing single-use plastics. There was a significant and direct moderate effect. There was a significant correlation between knowledge and attitude scores ($r = 0.427$, $p < 0.01$). Food hawkers with higher attitude scores also had higher knowledge scores. However, there was no correlation between the practice score and the knowledge and attitude scores. Table 7 presents a summary of these findings.

Table 7. Correlations between Knowledge, practices, and attitude scores of street food hawkers in Tangkak, Johor to support the single-use plastic reduction program (n = 149)

	Knowledge score	Attitude scores	Practice score
Knowledge Score	-	-	-
Attitude score	0.427*	-	-
Practice score	-0.159	-0.140	-

* p-value < 0.01(2-tailed)

The correlation analysis conducted among street food hawkers in Tangkak, Johor, to explore the relationship between knowledge, practices, and attitudes towards supporting the single-use plastic reduction program revealed noteworthy insights, as summarized in Table 7. Firstly, a significant positive correlation was found between knowledge and attitude scores ($r = 0.427$, $p < 0.01$), indicating that food hawkers with higher levels of knowledge tended to exhibit more favorable attitudes towards the program. This aligns with previous research emphasizing the role of knowledge acquisition in shaping attitudes towards environmental issues (Wang et al., 2020; Jagodzińska, and Strumińska-Doktór, 2022). However, there was no significant correlation observed between practice scores and both knowledge and attitude scores, suggesting that while knowledge may influence attitudes, practical behaviors may not necessarily reflect these attitudes in this context. This underscores the complexity of translating knowledge and attitudes into actionable behaviors, highlighting the need for targeted interventions to bridge this gap and promote more sustainable practices among street food hawkers.

Conclusion

The study aimed to identify the knowledge, attitudes, and practices of food hawkers in Tangkak, Johor, in supporting the single-use plastic reduction program. Results indicated that food hawkers were aware of the program, with knowledge being the most influential factor, followed by attitude and practice. However, a notable finding was that despite awareness, there was a lack of implementation of the program among some food hawkers. A negative correlation was observed between practice and both knowledge and attitude, suggesting that high knowledge did not necessarily translate into supportive practices. Additionally, certain socio-demographic factors such as business experience and educational background played significant roles in influencing support for the program. However, limitations were encountered, primarily due to challenges in obtaining a sufficient sample size and ensuring respondents' genuine responses. Future studies should aim to address these limitations by increasing sample size and including additional factors such as business planning and customer capacity to provide a more comprehensive analysis.

Acknowledgements

The author extends their gratitude to the Faculty of Allied Health Sciences (FOAHS) at City University Malaysia for their generous support and resources, which have greatly facilitated this research.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

Abdullah, N. B. A., Yaacob, N. A., Ab Samat, R., & Ismail, A. F. (2022). Knowledge, readiness and barriers of street food hawkers to support the single-use plastic reduction program in Northeast Malaysia. *International Journal of Environmental Research and Public Health*, *19*(8), 4507.

Alabi, O. A., Ologbonjaye, K. I., Awosolu, O., & Alalade, O. E. (2019). Public and environmental health effects of plastic wastes disposal: A review. *Journal of Toxicol and Risk Assess 5*(021): 1-13.

Aryee, A. N., Tawiah, N. A., & Bonsi, E. (2023). Leveraging international experiential learning opportunities in food and agricultural science programs. *Professional Agricultural Workers Journal*, *9*(2), 28.

Braun, T., Cottrell, R., & Dierkes, P. (2018). Fostering changes in attitude, knowledge and behavior: demographic variation in environmental education effects. *Environmental Education Research*, *24*(6), 899-920.

Chen, H. L., Nath, T. K., Chong, S., Foo., Gibbins, C., & Lechner, A. M. (2021). The plastic waste problem in Malaysia: management, recycling and disposal of local and global plastic waste. *SN Applied Sciences, 3*, 1-15.

Harun, S. N., Alias, A., Md Noor, N., & Wee, H. B. (2024). Persepsi Pengendali Makanan Perkhidmatan Katering Terhadap Amalan Kebersihan Dan Keselamatan Makanan. *Universiti Malaysia Terengganu Journal of Undergraduate Research*, *5*(4).

Hashim, H. F., Rahman, H. A., & Zain, I. N. M. (2023). Knowledge and practice on green purchasing of personal care products among undergraduate students in Universiti Putra Malaysia. *Geografia-Malaysian Journal of Society and Space*, *19*(1), 165-178.

Jagodzińska, M., & Strumińska-Doktór, A. (2022). Using the Knowledge Acquired During Studies in Shaping Attitudes Towards Sustainable Development. *Studia Ecologiae et Bioethicae, 20*(1).

Kamaruddin, H., Patittingi, F., Assidiq, H., Bachril, S. N., & Al Mukarramah, N. H. (2022). Legal aspect of plastic waste management in Indonesia and Malaysia: Addressing marine plastic debris. *Sustainability*, *14*(12), 6985.

Kruize, H., van Der Vliet, N., Staatsen, B., Bell, R., Chiabai, A., Muiños, G., & Stegeman, I. (2019). Urban green space: creating a triple win for environmental sustainability, health, and health equity through behavior change. *International journal of environmental research and public health*, *16*(22), 4403.

Lakens, D. (2022). Sample size justification. *Collabra: Psychology*, *8*(1), 33267.

Mat Yusoff, N. D. B., Abdul Latip, H. B., Jaafar, N. B., Zainol, N. R. B., & Mat Daud, N. I. (2022, April). Hawkers' Attitude on Environmentally Friendly Food Packaging Practices in Night Market. In. Eurasian Business and Economics Perspectives: Proceedings of the 35th Eurasia Business and Economics Society Conference (pp. 23-34). Springer International Publishing.

Noor, N. M., & Harun, S. N. (2022). Towards sustainable aquaculture: A brief look into management issues. *Applied Sciences*, *12*(15), 7448.

Othman, A. R., Jusoh, Z. M., Rahim, H. A., Wahab, A., Abdullah, W. A. W., & Paim, L. (2020). Women Participation in Malaysia Informal Sector, Challenges and Policy Implication: Overview on Literature Perspective. *Jurnal Pengguna Malaysia*, 1-25.

Park, Y. M. (2022). A GPS-enabled portable air pollution sensor and web-mapping technologies for field-based learning in health geography. *Journal of Geography in Higher Education*, *46*(2), 241-261.

Rahman, N. H., & Aziz, S. N. (2020). Challenges in implementing inclusive development concept in sustainable development Goals 2030. *Jurnal Undang-Undang Dan Masyarakat*, *26*, 15.

Rhein, S., & Schmid, M. (2020). Consumers' awareness of plastic packaging: More than just environmental concerns. *Resources, Conservation and Recycling 162*, 105063.

Safari, A., Salehzadeh, R., Panahi, R., & Abolghasemian, S. (2018). Multiple pathways linking environmental knowledge and awareness to employees' green behavior. *Corporate Governance: The international journal of business in society*, *18*(1), 81-103.

Sharma, S. K., Mudgal, S. K., Thakur, K., & Gaur, R. (2020). How to calculate sample size for observational and experimental nursing research studies. *National Journal of Physiology, Pharmacy and Pharmacology*, *10*(1), 1-8.

Simon, E. (2019). Plastics from a whole planet perspective. Field Actions Science Reports: The journal of field actions, (Special Issue 19).Tang, Y. Y., Tang, K. H. D., Maharjan, A. K., Aziz, A. A., & Bunrith, S. (2021). Malaysia moving towards a sustainability municipal waste management. *Industrial and Domestic Waste Management*, *1*(1), 26-40.

Trott, C. D. (2020). Children's constructive climate change engagement: Empowering awareness, agency, and action. *Environmental Education Research*, *26*(4), 532-554.

van de Wetering, J., Leijten, P., Spitzer, J., & Thomaes, S. (2022). Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. *Journal of Environmental Psychology*, *81*, 101782.

Varela-Candamio, L., Novo-Corti, I., & García-Álvarez, M. T. (2018). The importance of environmental education in the determinants of green behavior: A meta-analysis approach. *Journal of cleaner production*, *170*, 1565-1578.

Wang, J., Xue, Y., Sun, X., & Yang, J. (2020). Green learning orientation, green knowledge acquisition and ambidextrous green innovation. *Journal of cleaner production*, *250*, 119475.

Xavier, J. A., & Gomez, E. T. (2018). Still an ethnic enterprise after a generational change? Indian-owned SMEs in Malaysia. *Journal of Southeast Asian Studies*, *49*(2), 297-322.