Youth Behaviour Towards Sustainable E-Waste Management in Malaysia

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ABSTRACT

The escalating consumption of electronic devices has led to a significant surge in electronic waste (e-waste) globally, presenting severe environmental and public health challenges. In Malaysia, youth aged 15 to 40 represent a critical demographic of digital consumers; however, their participation in formal e-waste disposal remains insufficient. This study aims to determine the factors influencing e-waste management behavior among Malaysian youth by examining three key predictors: knowledge of formal e-waste management programs, recycling habits, and the perceived convenience of recycling facilities and services. Underpinned by Social Cognitive Theory (SCT), the research conceptualizes behavior as a product of the dynamic interaction between cognitive understanding, learned habits, and environmental support. Adopting a quantitative approach, a crosssectional survey was conducted involving 384 respondents selected via convenience sampling. Data were gathered using a structured online questionnaire and analyzed using IBM SPSS Version 27. Pearson correlation analysis was utilized to assess the relationships between the independent variables and e-waste management practices. The findings are expected to provide critical insights for government agencies, NGOs, and industry stakeholders to design effective educational interventions and infrastructure improvements. By addressing the gaps in awareness and accessibility, this study contributes to enhancing sustainable waste practices, supporting Malaysia's circular economy goals, and advancing Sustainable Development Goal 12 Responsible Consumption and Production.

Keywords: Electronic waste (e-waste), E-waste management, Malaysian youth, Social Cognitive Theory (SCT), Recycling habits.

INTRODUCTION

The escalating global population and a shift toward consumer-oriented lifestyles have placed immense pressure on waste management systems, leading to rapid waste growth that challenges landfill capacities (Tun Ismail et al., 2025). Municipal solid waste generation is estimated to rise significantly by 2050, depending on economic and demographic conditions (Maalouf et al., 2022). Amidst this crisis, electronic waste (e-waste) has emerged as the fastest-growing waste stream globally, driven by technological innovation and shorter product lifespans.

E-waste, also known as Waste Electrical and Electronic Equipment (WEEE), encompasses discarded devices such as smartphones and household appliances that contain hazardous substances like lead and mercury, which pose severe risks to human health and the environment (Hernández-Uribe et al., 2025). However, e-waste also possesses a dual nature; while toxic if mishandled, it contains valuable recoverable materials, underscoring the urgent need for sustainable management through the 3R approach (reduce, reuse, and recycle) (Hernández-Uribe et al., 2025).

In the Malaysian context, e-waste generation has risen to over 364,000 tonnes annually, a trend largely driven by the high consumption of digital devices among youth (Rahman et al., 2024). Recent studies highlight that residential premises are primary sources of this waste, yet formal collection and treatment rates remain low, with

most e-waste ending up in landfills or being stockpiled in households (Iqbal et al., 2022). This issue is particularly acute in urban areas like Selangor and Negeri Sembilan, where rapid urbanization and growing consumption among youth have intensified e-waste volumes (Zulkifli et al., 2024). Despite high levels of general awareness regarding environmental issues, there remains a persistent gap between awareness and actual engagement with sustainable e-waste practices (Mohd Yahya et al., 2022).

Effective management is often hindered by infrastructural and behavioral barriers. Research indicates that the convenience of recycling facilities is a critical determinant of behavior; for instance, a study in the UK found that recycling rates improved significantly when recycling bins were made as accessible as general waste bins (Soon, 2024). Similarly, the lack of accessible bins in workplace settings has been shown to hinder recycling behavior even among motivated individuals (Singleton & Letts, 2024). In Malaysia, the role of access and awareness is equally pivotal, where clear knowledge of formal disposal methods, such as designated drop-off points, drastically reduces the likelihood of illegal dumping (Khan et al., 2023). Furthermore, behavioral interventions like peer nudging and observing recycling habits in others have been proven to reinforce positive environmental actions among students (Lakshmi et al., 2022).

This paper aims to investigate the factors influencing e-waste management among Malaysian youth by focusing on three key variables: knowledge of formal management programs, recycling habits, and the convenience of facilities. By examining these determinants through the lens of Social Cognitive Theory, which emphasizes the interaction between environmental structures and individual behaviors (Schunk & DiBenedetto, 2020) , this study seeks to provide insights that can guide policymakers and industry stakeholders. Understanding the interaction between personal habits and environmental facilitators, such as facility accessibility, is essential for transitioning Malaysia toward a circular economy and achieving Sustainable Development Goal 12 (De Oliveira Neto et al., 2023).

LITERATURE REVIEW

Social Cognitive Theory (SCT)

Social Cognitive Theory (SCT), developed by Albert Bandura in 1986, is a prominent behavioral theory used to explain how individuals learn and act within a social context. Unlike theories that focus solely on internal dispositions or external stimuli, SCT emphasizes reciprocal determinism, a dynamic where personal cognitive factors, environmental influences, and behavior continually interact to shape one another (Nadzirah, 2024). This interaction makes SCT particularly relevant for understanding e-waste management behaviors among youth, where personal motivation, social context, and environmental conditions converge to influence actions (Vijayan et al., 2023).

In the context of this study, SCT is used to explain the factors influencing e-waste management among Malaysian youth. The theory's construct of self-efficacy the belief in one's ability to perform a behavior is linked to knowledge, as individuals develop confidence to recycle when they possess a deep understanding of the task (Bandhu et al., 2024). Furthermore, the concept of observational learning explains how recycling habits are formed by modeling the actions of peers and society. Finally, SCT posits that environmental facilitators, such as physical infrastructure, act as external supports that enable behavioral execution (Song et al., 2024). Therefore, SCT provides a robust theoretical foundation for this study, which examines how knowledge, recycling habits, and the convenience of facilities relate to e-waste management behavior.

E-Waste Management

E-waste management refers to the handling of discarded electrical and electronic equipment (WEEE), which includes everyday devices like mobile phones and laptops that contain both hazardous substances and valuable recoverable materials (Hsu et al., 2024). Proper management is critical as e-waste is the fastest-growing waste stream globally, with approximately 62 million metric tonnes generated in 2022, yet only a small fraction is formally recycled. In Malaysia, the rise in digital device consumption, especially among youth, has led to a steady increase in e-waste generation, exceeding 364,000 tonnes annually (Rahman et al., 2024).

Despite this growth, engagement with formal recycling programs in Malaysia remains low. Studies indicate a disconnect between awareness and action; for instance, while residents in Selangor show high awareness of recycling, actual behavior is significantly less common (Mohd Yahya et al., 2022). Improper disposal, such as

dumping e-waste in landfills, releases toxic metals like lead and mercury into the environment, contaminating soil and water (Islam et al., 2020). Thus, e-waste management is not only an environmental necessity but also a resource opportunity, driven by the "3R" approach: reduce, reuse, and recycle (HernándezUribe et al., 2025).

Determinants of E-Waste Management

The first determinant of e-waste management behavior is knowledge of formal programs. Knowledge refers to the understanding youth possess regarding collection facilities, government initiatives, and digital disposal platforms (Eidham et al., 2022). International studies, such as those by Trinh and Giao (2023) among Vietnamese students, found that higher knowledge of formal infrastructure was strongly associated with the intention to dispose of waste properly. In Malaysia, Munir and Daud (2024) revealed that individuals aware of designated drop-off locations were more likely to follow protocols rather than resort to illegal dumping. Educational interventions that enhance this knowledge can yield measurable improvements in management practices, consistent with SCT's emphasis on cognitive engagement (Moeini et al., 2023).

The second factor is recycling habits. Recycling habits refer to the consistent behavior of properly discarding e-waste, often developed through repeated exposure to social cues and routine (Kassim et al., 2023). According to SCT, habits are reinforced by observational learning, where individuals model the behavior of others (Liang et al., 2022). For example, Nordin et al. (2025) found that youth who attended recycling events demonstrated more consistent disposal behavior. Additionally, peer nudging has been shown to effectively establish these habits; students exposed to peers who recycle are more likely to contribute to communal efforts (Lakshmi et al., 2022). This suggests that witnessing recycling in practice helps transform sporadic actions into long-term behavioral patterns.

Finally, the convenience of recycling facilities and services significantly influences management behavior. Convenience refers to the accessibility, visibility, and ease of use of infrastructure like drop-off points and collection centers (Azizi et al., 2023). Research by Singleton and Letts (2024) highlighted that a lack of bins in immediate work areas hindered recycling even among motivated individuals, aligning with SCT's concept of environmental facilitators. When facilities are convenient such as when recycling bins are as accessible as trash bins recycling rates improve significantly across various settings (Soon, 2024). In Selangor, residents in areas with well-maintained recycling stations reported a higher sense of responsibility and stronger habits compared to those in areas with poor infrastructure (Rahman & Aziz, 2023). Based on the above discussion, the following hypotheses are posited:

H1: There is a significant relationship between knowledge of electronic waste management programs and e-waste management among youth in Malaysia.

H2: There is a significant relationship between recycling habits and e-waste management among youth in Malaysia.

H3: There is a significant relationship between the convenience of electronic waste recycling facilities and services and e-waste management among youth in Malaysia.

Figure 1 portrays the conceptual framework.
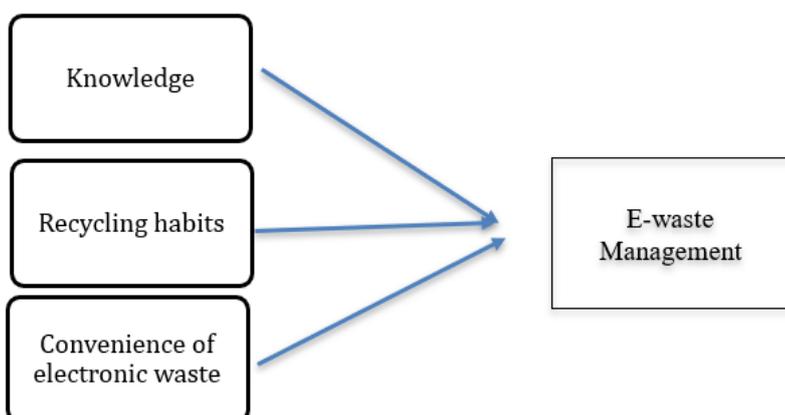
Figure 1: Conceptual Framework

METHODOLOGY

To examine the determinants of e-waste management behaviour among Malaysian youth, a quantitative crosssectional survey was conducted. This design was chosen for its ability to capture a snapshot of behavioural variables and environmental factors, allowing for the generation of statistically valid and generalisable findings. The study population was restricted to Malaysian youth aged 18 to 40, aligned with the *Youth Societies and Youth Development Act 2007 (Amendment 2019)*, owing to this group's significant role in electronic consumption and waste generation. A purposive sampling technique was utilised to screen for the age criterion. While the Krejcie and Morgan determination table suggested a minimum sample size of 384, the study successfully secured 407 valid responses after accounting for potential invalid submissions.

Data collection was facilitated through a structured online questionnaire circulated via major social media channels, including WhatsApp, Instagram, Facebook, TikTok, and Telegram. The instrument utilised a 5-point Likert scale to assess four key constructs: knowledge of formal management programmes (including 3R familiarity), e-waste recycling habits, the convenience of recycling infrastructure, and actual e-waste management behaviour. All items were adapted from validated instruments to ensure content reliability. For analysis, IBM SPSS Statistics Version 27 was employed. Preliminary screening included reliability testing via Cronbach's alpha (values > 0.70) and normality testing via skewness and kurtosis (range -2 to +2). Descriptive statistics provided an overview of respondent profiles, while Pearson correlation analysis was used to determine the relationships between knowledge, habits, convenience, and management behaviour, with statistical significance set at the 0.01 level.

Table 1: Measurement of variables, normality test, and reliability test results

VARIABLES/ CONSTRUCT	Skewness	Kurtosis	Reliability Test	Normality Test
Knowledge about the formal ewaste management programme	-.601	-.166	0.732	0.941
E-waste recycling habits	-.191	-.663	0.707	0.960
Convenience of e-waste recycling facilities and service	-.800	.217	0.750	0.929
E-waste management	-.718	.076	0.746	0.932

FINDINGS

Demographic Profiles

The study analysed a sample of 407 respondents. The gender distribution showed a slight prevalence of males (n = 224, 55.0%) over females (n = 183, 45.0%). In terms of age, the largest cohort fell within the 21–30year range (n = 176, 43.2%), followed by those aged 31–40 (n = 146, 35.9%), 18–20 (n = 54, 13.3%), and 41–50 (n = 31, 7.6%). Educationally, the majority of participants possessed a bachelor's degree (n = 277, 68.1%). Other qualifications included Diplomas (n = 72, 17.7%), STPM (n = 29, 7.1%), Master's degrees (n = 25, 6.1%), and Other (n = 4, 1.0%). Geographically, the sample was fairly distributed across Semi-Urban (37.3%), Urban (35.1%), and Rural (27.5%) areas. Regarding employment, Private Sector Employees constituted the majority (52.6%), followed by Public Servants (40.3%) and the Self-Employed (7.1%).

Table 2: Demographic profiles

PROFILE	ITEMS	FREQUENCY (n)	PERCENTAGE (%)
Gender	Male	224	55.0
	Female	183	45.0
Age	18-20 Years old	54	13.3
	21-30 Years old	176	43.2
	31-40 Years old	146	35.9
	41-50 Years old	31	7.6

Education Level	STPM	29	7.1
	Diploma	72	17.7
	Bachelor's degree	277	68.1
	Master's degree	25	6.1
	Other	4	1.0
Current Living Area	Urban	143	35.1
	Semi-Urban	152	37.3
	Rural	112	27.5
Occupation	Public Servant	164	40.3
	Private Sector Employee	214	52.6
	Self Employed	29	7.1

Hypothesis Testing

The Pearson correlation analysis confirmed that all proposed hypotheses were statistically significant at the 0.01 level (2-tailed). The results indicate a positive and moderate relationship between all three independent variables and the dependent variable, e-waste management behaviour.

Specifically, **H1** is **supported**, as knowledge of e-waste management programmes exhibited a significant correlation ($r = 0.647$, $p = 0.000$). Similarly, **H2** is **supported**, with e-waste recycling habits showing a significant positive relationship ($r = 0.649$, $p = 0.000$). Finally, **H3** is **supported**, demonstrating that the convenience of recycling facilities and services is positively correlated with management behaviour ($r = 0.645$, $p = 0.000$).

While all factors were significant, e-waste recycling habits emerged as the strongest predictor ($r = 0.649$), followed closely by knowledge of programmes and the convenience of facilities. These findings statistically validate that improvements in knowledge, habits, and infrastructure convenience are directly associated with better e-waste management practices among Malaysian youth.

Table 3: Summary of Hypothesis Testing

Hypothesis	Pearson correlation (r)	Sig. (2-tailed)	Result
H1: There is a significant relationship between knowledge of electronic waste management programs and e-waste management among youth in Malaysia.	0.647	0.000	supported
H2: There is a significant relationship between electronic waste recycling habits and e-waste management among youth in Malaysia.	0.649	0.000	supported
H3: There is a significant relationship between the convenience of electronic waste recycling facilities and services and e-waste management among youth in Malaysia.	0.645	0.000	supported

DISCUSSION

The analysis indicates a significant and moderate positive correlation between knowledge of formal ewaste management programmes and e-waste management behaviour ($r = 0.647$, $p < 0.01$). This suggests that youth who possess a deeper understanding of the environmental consequences of e-waste, as well as formal disposal and recycling protocols, are more inclined to engage in responsible waste management. These findings align with prior studies in Malaysia and other developing nations, which established that awareness of formal recycling systems is a key driver of pro-environmental behaviour (Munir & Daud, 2024). Through the lens of Social Cognitive Theory (SCT), this relationship highlights the role of knowledge in enhancing self-efficacy; when youth are confident in their understanding of where and how to dispose of items, their likelihood of executing the correct actions increases.

Notably, e-waste recycling habits demonstrated the strongest correlation with e-waste managemént behaviour (r = 0.649, p < 0.01). This underscores the critical role of habit formation; youth who consistently practice waste separation, seek disposal information, or reuse devices exhibit superior overall management practices. This supports existing literature suggesting that repetitive recycling behaviours strengthen environmental responsibility and foster sustainable outcomes (Lakshmi et al., 2022). Within the SCT framework, this reflects the impact of observational learning and behavioural reinforcement, where repeated engagement in recycling creates a feedback loop that solidifies long-term habits. Consequently, interventions focused on behavioural reinforcement such as campus initiatives may be highly effective.

Furthermore, the study confirms a significant positive relationship between the convenience of recycling infrastructure and e-waste management behaviour (r = 0.645, p < 0.01). This implies that responsible e-waste management is heavily dependent on the accessibility and ease of use of recycling facilities and collection services. This aligns with research identifying physical infrastructure as a fundamental enabler of sustainable behaviour (Azizi et al., 2023). According to SCT, environmental facilitators are essential for translating intention into action; even individuals with high knowledge and positive attitudes may fail to act if facilities are lacking. Thus, accessible and well-maintained infrastructure serves as a necessary external cue to reinforce responsible disposal.

Theoretical Implications

The findings of this study offer significant contributions to the theoretical understanding of environmental behavior, particularly by validating the application of Social Cognitive Theory (SCT) within the context of digital waste management. First, the study reinforces the SCT construct of self-efficacy by demonstrating that specific knowledge acts as a precursor to action. This aligns with recent scholarship by Yaacob et al. (2025), which argues that when youth possess a deep cognitive mastery of how and *where* to recycle, their confidence to execute the behavior increases. This suggests that "knowledge" in the modern context is not merely awareness, but a functional tool that builds the self-efficacy required to navigate complex recycling systems.

Second, the results extend the understanding of observational learning and habit formation. The strong correlation between recycling habits and management behavior supports the notion that sustainable actions are socially reinforced routines rather than isolated decisions. Nordin et al. (2025) recently highlighted that youth exposed to communal recycling events demonstrate more consistent disposal behaviors, confirming that environmental cues and peer modeling are critical for transforming sporadic actions into ingrained habits. Furthermore, Sulaiman et al. (2025) emphasize that habits are formed through repeated exposure to these environmental cues, suggesting that theoretical models must account for the "automaticity" of recycling behavior driven by supportive surroundings.

Practical Implications

Implications for Policymakers and Infrastructure From a policy perspective, the study highlights that the current inadequacy of waste management practices requires systemic infrastructural changes rather than a reliance on awareness alone. Goh and Sukri (2025) argue that fragmented regulatory frameworks and a lack of certified recycling centers are the primary barriers hindering effective e-waste control in Malaysia. Furthermore, Rahman et al. (2024) emphasize that e-waste generation has risen to over 364,000 tonnes annually, largely driven by digital consumption, necessitating urgent government intervention to manage this growing volume. Therefore, policymakers such as the Department of Environment (DOE) must prioritize the expansion of accessible drop-off points in high-density youth areas. As noted by Zulkifli et al. (2024), rapid urbanization has intensified waste volumes in states like Selangor, making physical infrastructure a critical behavioral enabler; without convenient access, even high environmental awareness fails to translate into sustainable practice.

Implications for Education and Community Programs For educational institutions and NGOs, the findings suggest a pivot from passive information campaigns to active habit-building initiatives. Hernández-Uribe et al. (2025) identify a persistent lack of engagement despite rising e-waste volumes, suggesting that current educational models are insufficient in mitigating the health risks associated with toxic e-waste components. To address this, Sulaiman et al. (2025) advocate for service-learning approaches where students facilitate recycling awareness, as experiential learning effectively reinforces environmental responsibility. Additionally, Norziana et

al. (2025) found that students in higher learning institutions show better recycling practices when knowledge is paired with positive attitudes, reinforcing the need for universities to implement "active" recycling programs such as gamified collection drives that allow youth to practice the behavior repeatedly.

LIMITATIONS FOR FUTURE RESEARCH

Demographic and Geographical Constraints. This study is subject to specific demographic limitations, primarily its focus on youth aged 18 to 40 within largely urbanized settings. This exclusion of younger adolescents (under 18) and rural populations presents a gap in understanding the full spectrum of "digital native" behaviors, as Zulkifli et al. (2024) emphasize that digital waste trends are pervasive across all young age groups, not just young adults. Furthermore, the findings may not be fully generalizable to rural areas where infrastructure is significantly scarcer compared to the urban centers studied. Nordin et al. (2025) highlight that e-waste recycling behaviors can vary significantly by region, as seen in their study of Negeri Sembilan, suggesting that future research must expand to include rural and semi-rural populations to capture the nuances of geographical disparities in waste management access.

Methodological Limitations. Methodologically, this study employed a cross-sectional survey design, which captures data at a single point in time rather than tracking changes over a period. While this approach effectively identifies correlations between variables, Khan et al. (2023) note that it limits the ability to draw causal inferences about how behavioral intentions evolve into permanent habits. Additionally, while the sample size was sufficient for statistical validity, Ahmad et al. (2023) caution that self-reported data in quantitative surveys can be subject to response bias, where participants may overstate their pro-environmental behaviors. Therefore, future scholarship should adopt longitudinal research designs to evaluate the persistence of recycling habits over time, particularly following specific policy interventions or educational campaigns.

CONCLUSION

This research investigated the determinants of e-waste management behavior among Malaysian youth, specifically analysing the roles of knowledge regarding formal management programs, recycling habits, and the convenience of recycling infrastructure. The empirical analysis reveals that all three constructs share a significant positive correlation with e-waste management behavior, with recycling habits emerging as the most critical predictor. These results affirm that youth who possess adequate knowledge, ingrained recycling routines, and access to convenient facilities are substantially more inclined to adopt responsible disposal practices.

Collectively, this study underscores the necessity of a holistic strategy that integrates educational outreach with behavioral reinforcement and infrastructural expansion. Theoretically, the findings validate the utility of Social Cognitive Theory in explaining pro-environmental behavior within the Malaysian context. From a practical standpoint, it is imperative for policymakers, educational institutions, and industry stakeholders to synergize their efforts: prioritizing targeted awareness campaigns, fostering consistent recycling habits, and optimizing the accessibility of formal e-waste facilities to ensure sustainable management among the younger generation.

Ethics Statements

Ethical approval for this study was obtained from Research Ethics Committee, Faculty of Administrtaive Science and Policy Studies, UiTM on 14 February 2025 (Approval Number: FSPPP/REC/124a).

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Author contributions

All authors contributed to this manuscript, and all have approved this final version of publication.

Conflict of interest

The authors agree that this research was conducted without any self-benefits or commercial or financial conflicts and declare the absence of conflicting interests with the funders.

REFERENCES

1. Ahmed, N., Latif, R. A., & Baharum, A. (2021). Awareness and disposal behavior of e-waste among Malaysian youth. International Journal of Environmental Research and Public Health, 18(6), 3124. https://doi.org/10.3390/ijerph18063124
2. Azizi, D. D. S., Hanafiah, M. M., Woon, K. S., & Ismail, H. (2023). Exploring the factors influencing consumer behaviours and practices towards sustainable WEEE management in Putrajaya, Malaysia. Heliyon, 9(6), e17244. https://doi.org/10.1016/j.heliyon.2023.e17244
3. Bandhu, D., Mohan, M. M., Nittala, N. A. P., Jadhav, P., Bhadauria, A., & Saxena, K. K. (2024). Theories of motivation: A comprehensive analysis of human behavior drivers. Acta Psychologica, 244, 104177. https://doi.org/10.1016/j.actpsy.2024.104177
4. De Oliveira Neto, G. C., De Jesus Cardoso Correia, A., Tucci, H. N. P., Melatto, R. A. P. B., & Amorim, M. (2023). Reverse chain for electronic waste to promote circular economy in Brazil: A survey on electronics manufacturers and importers. Sustainability, 15(5), 4135. https://doi.org/10.3390/su15054135
5. Eidham, M.S.N., Aswad, A. M. A., & Adilla, A. R. F. (2022). The study of e-waste management awareness among students of UiTM Seremban 3. Borneo Akademika, 6(1), 67–75. https://doi.org/10.24191/ba/v6i1/80378
6. Guarnieri, P., de Oliveira Vieira, B., Cappellesso, G., Alfinito, S., & Camara e Silva, L. (2022). Analysis of habits of consumers related to e-waste considering the knowledge of Brazilian national policy of solid waste: A comparison among white, green, brown and blue lines. Sustainability, 14(18), 11557. https://doi.org/10.3390/su141811557
7. Hernández-Uribe, Ó., Cárdenas-Robledo, L. A., Hernández-González, J. C., Valle, M., & Leo-Avelino, G. (2025). E-waste landscape on the environment and human health: A bibliometric analysis. International
8. Journal of Science and Research Archive, 14(1), 1289–1296. https://doi.org/10.30574/ijsra.2025.14.1.0215
9. Hsu, J., Wang, J., & Stern, M. (2024). E-waste: Global problem, its impacts, and solutions. Journal of Global Information Management. https://doi.org/10.4018/JGIM.337134
10. Iqbal, M., Rahim, A. R. A., & Noor, N. M. (2022). Exploring behavioral intention towards e-waste recycling: A study of Malaysian households. Sustainability, 14(4), 2235. https://doi.org/10.3390/su14042235
11. Kassim, E. S., Hassan, M. F., Nor, F. M., & Lee, T. (2023). To Recycle e-Waste or Not: Understanding Consumers' Intention from the Lens of Behavioral Theories. Information Management and Business Review, 15(1), 72–85. https://doi.org/10.22610/imbr.v15i1(i)si.3409
12. Khan, M. A., Aziz, M. A., & Jusoh, M. (2023). The role of access and awareness in e-waste recycling behavior: Evidence from Malaysia. Environmental Challenges, 13, 100710. https://doi.org/10.1016/j.envc.2023.100710
13. Lakshmi, G., Nguyen, K., Mazhikeyev, A., Hack-Polay, D., & Anafiyayeva, Z. (2022). Nudging student recycling behaviour: An experimental study in Kazakhstan and UK higher education. Journal of Cleaner Production, 377, 134164. https://doi.org/10.1016/j.jclepro.2022.134164
14. Maalouf, A., Mavropoulos, A., Maalouf, A., & Mavropoulos, A. (2022). Re-assessing global municipal solid waste generation. Waste Management & Research the Journal for a Sustainable Circular Economy, 41(4), 936–947. https://doi.org/10.1177/0734242x221074116
15. Moeini, B., Ayubi, E., Barati, M., Bashirian, S., Tapak, L., Ezzati-Rastgar, K., & Hashemian, M. (2023). Effect of household interventions on promoting waste segregation behavior at source: A systematic review. Sustainability, 15(24), 16546. https://doi.org/10.3390/su152416546

16. Munir, N. M. N. M., & Daud, N. I. M. (2024). Navigating E-Waste Disposal: Formal practices among residents of Bukit Sentosa, Rawang, Selangor. Sustainability, 2(1), 35–43. https://doi.org/10.37934/sijap.2.1.3543

17. Nordin, N. B., Mohd Noor, N. H., & Yaacob, M. 'A. (2025). Examining e-waste recycling behaviour among Malaysian public in Negeri Sembilan. Journal of Administrative Science, 22(1), 83–100. https://doi.org/10.24191/jas.v22i1.4447

18. Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. Contemporary Educational Psychology, 60, 101832. https://doi.org/10.1016/j.cedpsych.2019.101832

19. Singleton, J., & Letts, A. (2024). Exploring a lower carbon future: Recycling opportunities in a rural public hospital in Queensland, Australia. Journal of Environmental Planning and Management, 1–16. https://doi.org/10.1080/09640568.2024.2345741

20. Soon, D. W. X. (2024). Promoting recycling behaviours through convenience: Focus on the relatives, not the absolute. Cleaner Waste Systems, 7, 100135. https://doi.org/10.1016/j.clwas.2024.100135

21. Trinh, L. T. K., & Giao, N. T. (2023). Evaluating willingness to pay for E-Waste recycling in Vietnam. Civil Engineering Journal, 9(10), 2399–2410. https://doi.org/10.28991/cej-2023-09-10-03

22. Zulkifli, N. S., Jamil, M. F., & Omar, M. F. (2024). Youth and digital waste: Trends and recycling behavior in Malaysian urban areas. Southeast Asian Journal of Environmental Sustainability, 8(1), 21–34.