European Proceedings of
Social and Behavioural Sciences
EpSBS

www.europeanproceedings.com
e-ISSN: 2357-1330

DOI: 10.15405/epsbs.2023.11.49

ICTHM 2023
International Conference in Technology, Humanities and Management

BARRIERS TO HOUSEHOLD WASTE RECYCLING: PAVING THE PATH TO A SUSTAINABLE FUTURE

Zahari Md Rodzi (a)*, Ashiera Nadiha Hazri (a), Nurul Ain Syahirah Mohd Azri (a), Nurul Dania Farisha Sharul Rhmdan (a), Zati Aqmar Zaharudin (a), Saladin Uttunggadewa (b)
*Corresponding author

(a) Mathematical Sciences Studies, College of Computing, Informatics and Media,Universiti Teknologi MARA (UiTM),Negeri Sembilan Branch, Seremban Campus, 70300 Seremban, Negeri Sembilan, Malaysia. zahari@uitm.edu.my
(b) Pusat Pemodelan Matematika dan Simulasi (P2MS) Institut Teknologi Bandung & Combinatorial Matematics Research Group, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Gedung Labtek III Lantai 1, Jalan Ganesha no. 10, Bandung 40132, Indonesia.

Abstract

This is a preliminary study conducted in Seremban, Malaysia, aimed at identifying barriers that hinder household waste recycling. A critical finding is that inconvenient or irregular recycling collection schedules significantly obstruct recycling behaviors among households, substantiated by a p-value of 0.031. To assess the reliability of these findings, the study employed the Hosmer-Lemeshow test, which validated the model's suitability with a p-value of 0.516. The Omnibus test further spotlighted other key predictors that significantly influence recycling behavior, marked by a p-value of 0.001. The Classification Table showcased a moderate accuracy level of 67.4% in identifying households that actively participate in recycling practices. Based on these initial findings, the study recommends enlarging the sample size and employing alternative analytical techniques, such as decision trees, for subsequent research. There is a pressing need for regularizing and optimizing recycling collection schedules to alleviate this significant barrier. Additionally, the study emphasizes the urgent need for public awareness campaigns to promote the importance of household waste recycling. These preliminary results will serve as a foundation for an advanced study aimed at deciphering the intricate interrelationships between different barriers to recycling using methods such as DEMATEL.

Keywords: Barriers, Household Waste Recycling, Recycling Behavior, Regression Analysis, Seremban

https://doi.org/10.15405/epsbs.2023.11.49
Corresponding Author: Zahari Md Rodzi
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

1. Introduction

The Department of National Solid Waste Management (JPSPN) estimated that in 2020, the recycling rate in Malaysia was 31.52 percent. The government's goal was 40% recycling by 2025, but this number fell short. In contrast, several advanced nations have achieved recycling rates of 60% or above long ago. Therefore, it is critical to encourage community participation in recycling programs and remove obstacles that have hampered recycling initiatives in Malaysia.

Malaysia has taken many steps to encourage recycling and trash reduction despite facing many obstacles. The national "Kampungku Bersih" (My Clean Village) program was established by the government to promote recycling and communal responsibility for trash pickup. IKEA Malaysia's take-back program for used furniture is one example of a private sector initiative, while the Tzu Chi Foundation has established recycling centers across the country that accept a wide variety of materials. Both recycling and waste reduction are the primary goals of these campaigns.

Malaysia has established the iCycle platform as a supplementary program for home garbage recycling to enhance recycling efforts. The government has also launched a "zero waste" program to address the problem of trash management and encourage environmentally friendly practices.

These actions demonstrate Malaysia's dedication to better recycling and trash management. To meet government recycling rate targets, however, it will be necessary to remove obstacles and increase community involvement. Malaysia can enhance its recycling and waste management practices and move towards a more sustainable future by implementing effective plans and encouraging collaboration between the government, the commercial sector, and communities.

There can be no sustainable future without effective recycling of municipal solid waste. Malaysia has taken numerous steps towards improving recycling rates and cutting down on waste. However, to meet government recycling rate targets, it is important to remove obstacles to recycling and increase community involvement.

In this analysis of the available research, we look at the main challenges and how they affect recycling at home. Significant barriers include people's preconceived notions about recycling, a lack of available storage space, inconvenient or inconsistent recycling collection schedules, a dearth of information about the advantages of recycling, a scarcity of recycling facilities, a dearth of incentives to recycle, and a lack of enforcement or penalties for those who don't follow the rules.

Several studies highlight negative attitudes towards recycling as a significant barrier (Almasi et al., 2019; Ayeleru et al., 2023; Babaei et al., 2015; Byrne & O'Regan, 2014; Corrado et al., 2022; Gilli et al., 2018; J. Padilla & Trujillo, 2018; Karatekin et al., 2023; King et al., 2023; Malibari et al., 2023; Vijayan et al., 2023; Yadav et al., 2022). Educative efforts, community involvement activities, and awareness programs are highlighted as means to combat unfavorable stereotypes and lack of enthusiasm about recycling.

The lack of available space for recyclables hampers efforts to sort the material and discourages people from getting involved (Li et al., 2020; Lu et al., 2022; Luthra et al., 2023; Matsumoto, 2011; Nguyen et al., 2022). This obstacle can be overcome with the use of creative solutions including small storage systems, shared collecting stations, and decreased packaging.

https://doi.org/10.15405/epsbs.2023.11.49
Corresponding Author: Zahari Md Rodzi
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Schedules for recycling collection that are either inconsistent or inconvenient: Reduced recycling of household waste is attributed, in part, to inconvenient or irregular recycling collection schedules (de Moraes et al., 2022; Dias et al., 2022; Shuvo, 2023; Tsimnadis et al., 2023). Unpredictable collection times or locations make it difficult for residents to recycle regularly. The key to overcoming this obstacle is the establishment of well-structured and consistent recycling collection systems that are in line with people's routines and preferences.

The lack of awareness and understanding regarding the benefits of recycling is a significant barrier (Almulhim, 2022; Azme et al., 2023; Chengqin et al., 2022; Fogt Jacobsen et al., 2022; Ghaedrahmati et al., 2023; Helmefalk et al., 2023; Mousa, 2022; Nguyen et al., 2022; Reijonen et al., 2021; Shah & Rezai, 2023; Shaikh et al., 2020; Tian et al., 2022; Zhong et al., 2022). These studies highlight the importance of educational initiatives and tailored communication tactics to increase public awareness and comprehension of recycling's positive effects on the environment, the economy, and society.

Household garbage recycling is hampered by a lack of convenient recycling centers and pick-up services (Chen et al., 2023; Dutta & Goel, 2021; Maiurova et al., 2022; Zaharudin et al., 2022). Inadequate collection stations and far-flung recycling facilities have been identified as problems for people living in places with insufficient recycling infrastructure. This challenge can be met through the implementation of mobile or community-based recycling services and the improvement of accessibility to recycling facilities.

The lack of desire or incentives to recycle is a barrier noted in the literature (Alves et al., 2020; Arain et al., 2020; Chengqin et al., 2022; Olasina & Kheswa, 2021; Tian et al., 2022; Yang et al., 2022). To get more people to join recycling programs, studies show that it's crucial to use efficient incentive mechanisms like monetary prizes, discounts, or recognition programs. The intrinsic motivation to recycle can be increased by motivational campaigns, social norms, and educational programs.

Lack of effective enforcement or penalties for non-compliance with recycling legislation is a barrier to recycling of household waste (Ayeleru et al., 2023; Favot et al., 2022; Liu et al., 2022; Ma et al., 2020; Woodard, 2021). Compliance with recycling legislation and increases in recycling rates have been shown to result from severe enforcement methods, such as fines or penalties for non-compliance. To overcome this obstacle, we need to have clear guidelines, monitoring methods, and public awareness of enforcement actions.

By incorporating the DEMATEL technique that is being used by some scholars (Ismail et al., 2023; Jin, 2023) for future research, Malaysia would be able to more precisely identify the main obstacles impeding recycling rate progress. This would improve collaboration between the government, private sector, and communities, bringing Malaysia closer to its aim of attaining a 40 percent recycling rate by 2025 and ensuring a more sustainable future.

2. Methodology

The rapid growth and industrialization of Seremban, a major city in Malaysia, has resulted in a massive increase in the amount of garbage people produce. A sustainable and environmentally conscientious community cannot be built without efficient recycling of household waste. The purpose of this research is to identify and analyze seven significant obstacles to recycling municipal solid trash in

https://doi.org/10.15405/epsbs.2023.11.49
Corresponding Author: Zahari Md Rodzi
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Seremban. The research uses a detailed questionnaire with eight components, each of which corresponds to one of the obstacles. The development of the questionnaire was informed by a comprehensive literature analysis of prior research on waste management and recycling methods. To further ensure the validity and reliability of the questionnaire, expert comments were solicited.

The questionnaire is divided into sections that each tackle a different challenge, such as apathy towards recycling, a lack of space to keep recyclables at home, inconvenient or inconsistent recycling collection schedules, a failure to appreciate recycling's value, a dearth of recycling resources, a failure to provide incentives for recycling, a failure to enforce or penalize those who do not follow the rules, and so on.

The questionnaire uses a five-point Likert scale to correctly capture respondents' perceptions and opinions. The scale runs from "strongly disagree" to "strongly agree," allowing respondents to indicate their level of agreement or disagreement. This methodology allows for the assessment of waste recycling-related beliefs, knowledge, and practices, yielding useful information on the unique challenges faced by Seremban-based households.

2.1. Analysis of Reliability and Validity 2.1

The questionnaire's items' consistency and internal accuracy were tested by reliability analysis. The questionnaire's validity in measuring the targeted constructs was the primary focus. In this investigation, we used Cronbach's Alpha, a popular statistic for gauging reliability. The reliability of the questionnaire items was calculated using Cronbach's Alpha. A Cronbach's Alpha of 0.60 or higher indicates sufficient reliability for scientific study. It shows the questionnaire's dependability is adequate, implying that it yields the same findings each time it's used. The resulting values of Cronbach's Alpha were examined, and compared to the minimum reliable value. This analysis verified the questionnaire's accuracy in assessing the specified constructs associated with the obstacles to recycling household waste in Seremban. This study improves the reliability and consistency of the data obtained, leading to more trust in the results. However, it should be noted that reliability analysis is only one part of a questionnaire's overall quality evaluation. For a more in-depth evaluation, it is also important to think about the questionnaire's validity, or how well it assesses the things it sets out to evaluate.

2.2. Regression Analysis Using Logistic Models 2.2

Logistic regression was used to examine the factors affecting household garbage recycling in Seremban. The purpose of the logistic regression model was to determine which factors were the most predictive of recycling practices. The dependent variable was a dichotomous one, with the possible values "recycling household waste" and "not recycling household waste." Insights into the importance and direction of the association between each barrier and recycling behavior were gained from the estimated coefficients from the model. The Hosmer-Lemeshow test was a part of the model evaluation; it determined whether or not the observed and predicted event rates were consistent. Independent variables' ability to predict the whole was assessed by the Omnibus test. The amount of variation in the response variable that might be attributed to the model was calculated not using R2, but rather modified R2 (Cox and Snell R2 and Nagelkerke R2).

https://doi.org/10.15405/epsbs.2023.11.49
Corresponding Author: Zahari Md Rodzi
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

3. Result and Discussion

The findings of the logistic regression technique used to forecast people's propensity to recycle domestic trash are summarised in Table 1. The table shows both the actual and expected results regarding household recycling rates. The program was able to accurately estimate the recycling habits of almost 73% of all households. The correct prediction rates for each category are also included in the table; 58.5% of households were correctly predicted as not recycling, while 83.3% of households were correctly predicted as recycling. Households were classified based on their scores relative to a cutoff value of 0.500. You can see how well the model predicts people's recycling habits for trash in the home by looking at the classification table.

Table 1. Group statistics

Observed		Predicted		
		Do you recycle?		Percentage Correct
		No	Yes	
Do you recycle?	No	24	17	58.5
	Yes	10	50	83.3
Overall Percentage				73.3

Table 2 shows the results of omnibus tests of model coefficients that determine the importance of the independent variables in the logistic regression model as a whole. The results show that the model as a whole is significant statistically. The p-value of 0001 from a chi-square test with 7 degrees of freedom indicates that there is a statistically significant association between the independent variables and the dependent variable (household waste recycling behavior). As a result, the recycling behavior of individual households may be predicted using the model coefficients.

Table 2. Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step	25.616	7	.001
Block	25.616	7	.001
Model	25.616	7	.001

The model fits the data well, as shown by the -2 Log likelihood value of 110.804 in Table 3's model summary from the logistic regression study. The model's Cox and Snell R Square value of 0.224 suggests that the independent variables account for approximately 22.4% of the variance in recycling behavior. An updated version of the Cox and Snell R Square, the Nagelkerke R Square value of 0.302 indicates that the model adequately explains about 30.2% of the observed variation in recycling behavior. The model has considerable predictive performance, as evidenced by these findings, and may explain a sizable portion of the observed variation in recycling practices across Seremban households. However, additional research and the use of other statistical metrics are required to provide a comprehensive assessment of the model's effectiveness.

https://doi.org/10.15405/epsbs.2023.11.49
Corresponding Author: Zahari Md Rodzi
Selection and peer-review under responsibility of the Organizing Committee of the conference
eISSN: 2357-1330

Table 3. Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
110.804[a]	.224	.302

Table 4's Hosmer and Lemeshow test for logistic regression analysis provides insight into the model's accuracy. The results of the tests show that the model is a good fit for the data. The p-value of 0.516 for a chi-square test with 8 degrees of freedom is larger than the conventional 0.05 threshold. This shows that the model is a good fit for the data and that there is insufficient evidence to reject the null hypothesis. Therefore, the logistic regression model utilized in this work provides a satisfactory fit to the data as shown by the Hosmer and Lemeshow test.

Table 4. Hosmer and Lemeshow Test

Chi-square	df	Sig.
7.192	8	.516

Table 5 displays the results of a logistic regression analysis that looked at the challenges of recycling domestic trash in Seremban. Only inconvenient or inconsistent recycling collection schedules (Barrier 4) were found to have a statistically significant relationship with recycling behavior, out of the various obstacles examined. Compared to households with more easy and consistent collection schedules, those confronting these obstacles were less likely to recycle. However, no significant relationships were found between recycling behavior and other barriers, such as a lack of recycling facilities and services, a lack of knowledge about the advantages of recycling, a lack of space to keep recyclables at home, a lack of motivation or incentive to recycle, a negative outlook on recycling, or the absence of enforcement or penalties for noncompliance with recycling regulations. This research suggests that if Seremban wants to be serious about getting its residents to recycle more of their household waste, it may need to focus on making recycling pickup times more predictable and accessible.

Table 5. Variables in the Equation

Barriers	B	Sig.	Exp(B)
B1. Limited access to recycling facilities and services:	-.283	.445	.753
B2. Lack of awareness and understanding of the benefits of recycling	.173	.745	1.189
B3. Limited storage space for recyclable materials at home:	.264	.554	1.302
B4. Inconvenient or inconsistent recycling collection schedules	-1.089	.031	.337
B5. Lack of motivation or incentive to recycle:	-.119	.810	.888
B6. Negative attitudes towards recycling	-.641	.242	.527
B7. Lack of enforcement or penalties for non-compliance with recycling regulations	-.309	.348	.734
Constant	6.302	.000	545.474

4. Conclusion and Recommendations

The purpose of the research was to determine the obstacles to recycling domestic trash in Seremban. Only one of the seven obstacles we looked at had any meaningful correlation with recycling behavior, and that was cumbersome or inconsistent recycling pickup schedules. Inconsistent pickup times

may make it difficult for locals to recycle consistently. The remaining obstacles, however, were not significantly linked to changes in recycling habits. It is suggested that the number of participants be increased so that more information about the independent variables may be gleaned from the data. Decision trees and other non-traditional methods have the potential to provide similar insights. These results support the implementation of focused awareness efforts that aim to remove the impediments that did not exhibit statistically significant relationships. These initiatives need to address issues including limited storage space, motivation, unfavorable attitudes, and enforcement while spreading the word about recycling's many benefits. Positive recycling attitudes and behaviors can be encouraged by removing these obstacles. To further increase recycling activities, efforts should be made to make recycling facilities and services more easily accessible. More recycling centers might be built, or pick-up locations could be placed strategically across neighborhoods. It is possible to increase the frequency with which people recycle by making recycling easier for them to do. Seremban's household garbage recycling rates can be improved overall by the removal of these obstacles and the introduction of strategic initiatives. This has the potential to encourage environmentally responsible trash management and cut down on pollution.

Acknowledgments

This work is supported by the International Research Matching Grant (IRMG 2021) UiTM Negeri Sembilan - 600-TNCPI 5/3/DDN (05) (003/2021).

References

Almasi, A., Mohammadi, M., Azizi, A., Berizi, Z., Shamsi, K., Shahbazi, A., & Mosavi, S. A. (2019). Assessing the knowledge, attitude and practice of the kermanshahi women towards reducing, recycling and reusing of municipal solid waste. *Resources, Conservation and Recycling, 141*, 329-338. https://doi.org/10.1016/j.resconrec.2018.10.017

Almulhim, A. I. (2022). Household's awareness and participation in sustainable electronic waste management practices in Saudi Arabia. *Ain Shams Engineering Journal*, *13*(4), 101729. https://doi.org/10.1016/j.asej.2022.101729

Alves, L., Silva, S., & Soares, I. (2020). Waste management in insular areas: A Pay-As-You-Throw system in Funchal. *Energy Reports*, *6*, 31–36. https://doi.org/10.1016/j.egyr.2020.10.024

Arain, A. L., Pummill, R., Adu-Brimpong, J., Becker, S., Green, M., Ilardi, M., Van Dam, E., & Neitzel, R. L. (2020). Analysis of e-waste recycling behavior based on survey at a Midwestern US University. *Waste Management*, *105*, 119–127. https://doi.org/10.1016/j.wasman.2020.02.002

Ayeleru, O. O., Fewster-Young, N., Gbashi, S., Akintola, A. T., Ramatsa, I. M., & Olubambi, P. A. (2023). A statistical analysis of recycling attitudes and behaviours towards municipal solid waste management: A case study of the University of Johannesburg, South Africa. *Cleaner Waste Systems, 4*, 100077. https://doi.org/10.1016/j.clwas.2023.100077

Azme, S. N. K., Yusoff, N. S. I. M., Chin, L. Y., Mohd, Y., Hamid, R. D., Jalil, M. N., Zaki, H. M., Saleh, S. H., Ahmat, N., Manan, M. A. F. A., Yury, N., Hum, N. N. F., Latif, F. A., & Zain, Z. M. (2023). Recycling waste cooking oil into soap: Knowledge transfer through community service learning. *Cleaner Waste Systems, 4*, 100084. https://doi.org/10.1016/j.clwas.2023.100084

Babaei, A. A., Alavi, N., Goudarzi, G., Teymouri, P., Ahmadi, K., & Rafiee, M. (2015). Household recycling knowledge, attitudes and practices towards solid waste management. *Resources, Conservation and Recycling*, *102*, 94–100. https://doi.org/10.1016/j.resconrec.2015.06.014

Byrne, S., & O'Regan, B. (2014). Attitudes and actions towards recycling behaviours in the Limerick, Ireland region. *Resources, Conservation and Recycling*, *87*, 89–96. https://doi.org/10.1016/j.resconrec.2014.03.001

Chen, Q., Hou, Y., Lai, X., Shen, K., Gu, H., Wang, Y., Guo, Y., Lu, L., Han, X., & Zheng, Y. (2023). Evaluating environmental impacts of different hydrometallurgical recycling technologies of the retired nickel-manganese-cobalt batteries from electric vehicles in China. *Separation and Purification Technology, 311*, 123277. https://doi.org/10.1016/j.seppur.2023.123277

Chengqin, E. K., Zailani, S., Rahman, M. K., Aziz, A. A., Bhuiyan, M. A., & Gazi, M. A. I. (2022). Determinants of household behavioural intention towards reducing, reusing and recycling food waste management. *Nankai Business Review International*. https://doi.org/10.1108/nbri-01-2022-0011

Corrado, L., Fazio, A., & Pelloni, A. (2022). Pro-environmental attitudes, local environmental conditions and recycling behavior. *Journal of Cleaner Production, 362*, 132399. https://doi.org/10.1016/j.jclepro.2022.132399

de Moraes, C. S. B., Carnicel, L. S., Nolasco, A. M., Braghini, G. M., Martires, M., Bonaretto, C. M. V., Pinto, W. L. H., Felipe, B. F., Sasso, F. J., & de Paula, L. A. (2022). Contributions on Selective Waste Collection and Recycling Cooperatives in Municipalities in the State of São Paulo, Brazil.Contributions on Selective Waste Collection and Recycling Cooperatives in Municipalities in the State of São Paulo, Brazil. *Journal of Environmental Science and Engineering B*, *11*(5). https://doi.org/10.17265/2162-5263/2022.05.003

Dias, P., Palomero, J., Cenci, M. P., Scarazzato, T., & Bernardes, A. M. (2022). Electronic waste in Brazil: Generation, collection, recycling and the covid pandemic. *Cleaner Waste Systems, 3*, 100022. https://doi.org/10.1016/j.clwas.2022.100022

Dutta, D., & Goel, S. (2021). Understanding the gap between formal and informal e-waste recycling facilities in India. *Waste Management*, *125*, 163–171. https://doi.org/10.1016/j.wasman.2021.02.045

Favot, M., Grassetti, L., Massarutto, A., & Veit, R. (2022). Regulation and competition in the extended producer responsibility models: Results in the WEEE sector in Europe. *Waste Management, 145*, 60-71. https://doi.org/10.1016/j.wasman.2022.04.027

Fogt Jacobsen, L., Pedersen, S., & Thøgersen, J. (2022). Drivers of and barriers to consumers' plastic packaging waste avoidance and recycling - A systematic literature review. *Waste Management, 141*, 63-78. https://doi.org/10.1016/j.wasman.2022.01.021

Ghaedrahmati, Z., Ghaffari, M., Mehrabi, Y., Alavi, N., Amereh, F., Roostaei, K., & Rafiee, M. (2023). Urban informal waste recycling in Tehran: Knowledge, attitudes and practices towards health risks during recycling process. *Cleaner Waste Systems, 4*, 100064. https://doi.org/10.1016/j.clwas.2022.100064

Gilli, M., Nicolli, F., & Farinelli, P. (2018). Behavioural attitudes towards waste prevention and recycling. *Ecological Economics, 154*, 294-305. https://doi.org/10.1016/j.ecolecon.2018.08.009

Helmefalk, M., Palmquist, A., & Rosenlund, J. (2023). Understanding the mechanisms of household and stakeholder engagement in a recycling ecosystem: The SDL perspective. *Waste Management, 160*, 1-11. https://doi.org/10.1016/j.wasman.2023.01.030

Ismail, J. N., Rodzi, Z., Al-sharqi, F., Hashim, H., Sulaiman, N. H., Cawangan, U., Sembilan, N., Seremban, K., Sembilan, N., Kelantan, U. C., Machang, K., Selangor, U. C., & Dengkil, K. (2023). The Integrated Novel Framework : Linguistic Variables in Pythagorean Neutrosophic Set with DEMATEL for Enhanced. *International Journal of Neutrosophic Science*, *21*(02), 129–141. https://doi.org/https://doi.org/10.54216/IJNS.210212

J. Padilla, A., & Trujillo, J. C. (2018). Waste disposal and households' heterogeneity. Identifying factors shaping attitudes towards source-separated recycling in Bogotá, Colombia. *Waste Management*, *74*, 16–33. https://doi.org/10.1016/j.wasman.2017.11.052

Jin, G. (2023). Selection of virtual team members for smart port development projects through the application of the direct and indirect uncertain TOPSIS method. *Expert Systems with Applications, 217*, 119555. https://doi.org/10.1016/j.eswa.2023.119555

Karatekin, K., Haçat, S. O., & Demir, F. B. (2023). Investigation of attitudes towards solid waste and recycling from a social perspective. *Türk Akademik Yayınlar Dergisi (TAY Journal)*, *7*(1), 152-178.

King, C. D., Stephens, C. G., Lynch, J. P., & Jordan, S. N. (2023). Farmers' attitudes towards agricultural plastics - Management and disposal, awareness and perceptions of the environmental impacts. *Science of The Total Environment, 864*, 160955. https://doi.org/10.1016/j.scitotenv.2022.1609555

Li, C., Zhang, Y., Nouvellet, P., Okoro, J. O., Xiao, W., & Harder, M. K. (2020). Distance is a barrier to recycling – or is it? Surprises from a clean test. *Waste Management*, *108*, 183–188. https://doi.org/10.1016/j.wasman.2020.04.022

Liu, J., Luo, X., Liu, X., Li, N., Xing, M., Gao, Y., & Liu, Y. (2022). Rural residents' acceptance of clean heating: An extended technology acceptance model considering rural residents' livelihood capital and perception of clean heating. *Energy and Buildings, 267*, 112154. https://doi.org/10.1016/j.enbuild.2022.112154

Lu, Z., Hasselstrom, L., Finnveden, G., & Johansson, N. (2022). recycling of plastic packaging in Sweden. *Cleaner Waste Systems*, *3*(October).

Luthra, A., Lowe, J., & Ochoa Berkley, K. (2023). Dispossession by platformization: The rise of on-demand recycling in urban India. *Geoforum, 141*, 103731. https://doi.org/10.1016/j.geoforum.2023.103731

Ma, M., Tam, V. W. Y., Le, K. N., & Li, W. (2020). Challenges in current construction and demolition waste recycling: A China study. *Waste Management*, *118*, 610–625. https://doi.org/10.1016/j.wasman.2020.09.030

Maiurova, A., Kurniawan, T. A., Kustikova, M., Bykovskaia, E., Othman, M. H. D., Singh, D., & Goh, H. H. (2022). Promoting digital transformation in waste collection service and waste recycling in Moscow (Russia): Applying a circular economy paradigm to mitigate climate change impacts on the environment. *Journal of Cleaner Production, 354*, 131604. https://doi.org/10.1016/j.jclepro.2022.131604

Malibari, A., Alsawah, G., Saleh, W., & Lashin, M. M. A. (2023). Analysis of Attitudes towards Food Waste in the Kingdom of Saudi Arabia Using Fuzzy Logic. *Sustainability, 15*(4), 3668. https://doi.org/10.3390/su15043668

Matsumoto, S. (2011). Waste separation at home: Are Japanese municipal curbside recycling policies efficient? *Resources, Conservation and Recycling*, *55*(3), 325–334. https://doi.org/10.1016/j.resconrec.2010.10.005

Mousa, A. M. (2022). *Original article Knowledge , Attitude , and Practices of Recycling and its Associated Factors among Undergraduate Students in University of Tripoli*. *February*. https://doi.org/10.5281/zenodo.4012572

Nguyen, T. T. T., Malek, L., Umberger, W. J., & O'Connor, P. J. (2022). Household food waste disposal behaviour is driven by perceived personal benefits, recycling habits and ability to compost. *Journal of Cleaner Production*, *379*(October). https://doi.org/10.1016/j.jclepro.2022.134636

Olasina, G., & Kheswa, S. (2021). Exploring the factors of excessive smartphone use by undergraduate students. *Knowledge Management and E-Learning*, *13*(1), 118–141. https://doi.org/10.34105/j.kmel.2021.13.007

Reijonen, H., Bellman, S., Murphy, J., & Kokkonen, H. (2021). Factors related to recycling plastic packaging in Finland's new waste management scheme. *Waste Management*, *131*, 88–97. https://doi.org/10.1016/j.wasman.2021.05.034

Shah, M. U., & Rezai, R. (2023). Public-sector participation in the circular economy: A stakeholder relationship analysis of economic and social factors of the recycling system. *Journal of Cleaner Production, 400*, 136700. https://doi.org/10.1016/j.jclepro.2023.136700

Shaikh, S., Thomas, K., Zuhair, S., & Magalini, F. (2020). A cost-benefit analysis of the downstream impacts of e-waste recycling in Pakistan. *Waste Management*, *118*, 302–312. https://doi.org/10.1016/j.wasman.2020.08.039

Shuvo, T. F. (2023). *" Plastic Recycling & Plastic Recycling Business in Bangladesh " By*. *January*, 0–33.

Tian, X., Xie, J., Hu, L., Xiao, H., & Liu, Y. (2022). Waste LEDs in China: Generation estimation and potential recycling benefits. *Resources, Conservation and Recycling, 187*, 106640. https://doi.org/10.1016/j.resconrec.2022.106640

Tsimnadis, K., Kyriakopoulos, G. L., Arabatzis, G., Leontopoulos, S., & Zervas, E. (2023). An Innovative and Alternative Waste Collection Recycling Program Based on Source Separation of Municipal Solid Wastes (MSW) and Operating with Mobile Green Points (MGPs). *Sustainability, 15*(4), 3106. https://doi.org/10.3390/su15043106

Vijayan, R. V., Krishnan, M. M., Parayitam, S., Anantharaman Duraisami, S. P., & Saravanaselvan, N. R. (2023). Exploring e-waste recycling behaviour intention among the households: Evidence from India. *Cleaner Materials, 7*, 100174. https://doi.org/10.1016/j.clema.2023.100174

Woodard, R. (2021). Waste Management in Small and Medium Enterprises (SMEs): Compliance with Duty of Care and implications for the Circular Economy. *Journal of Cleaner Production, 278*, 123770. https://doi.org/10.1016/j.jclepro.2020.123770

Yadav, R., Kumar Panda, D., & Kumar, S. (2022). Understanding the individuals' motivators and barriers of e-waste recycling: A mixed-method approach. *Journal of Environmental Management, 324*, 116303. https://doi.org/10.1016/j.jenvman.2022.116303

Yang, J., Jiang, P., Zheng, M., Zhou, J., & Liu, X. (2022). Investigating the influencing factors of incentive-based household waste recycling using structural equation modelling. *Waste Management, 142*, 120-131. https://doi.org/10.1016/j.wasman.2022.02.014

Zaharudin, Z. A., Brint, A., & Genovese, A. (2022). A multi-period model for reorganising urban household waste recycling networks. *Socio-Economic Planning Sciences, 84*, 101396. https://doi.org/10.1016/j.seps.2022.101396

Zhong, H., Zhou, S., Zhao, Z., Zhang, H., Nie, J., & Simayi, P. (2022). An empirical study on the types of consumers and their preferences for E-waste recycling with a points system. *Cleaner and Responsible Consumption, 7*, 100087. https://doi.org/10.1016/j.clrc.2022.100087