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## **Exploring Factors Contributing towards Community's Awareness in 3R Behaviour**

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**Abstract:** The lack of knowledge and the ineffectiveness of many Reduce, Reuse, and Recycle (3R) awareness efforts are two problems caused by human behaviour and several solutions can be identified to rectify these issues. In line with this, one 3R programme was implemented in Samarahan, Sarawak, aiming to improve the knowledge, attitude, and practise of 3R awareness among the local community. 3R is one strategy for reducing and decreasing waste production whereby the rise of recycling rates could be the indicator of 3R awareness effectiveness for both the government and voluntarily engaged individuals as well as the communities. These days, both developed and developing nations are looking for the best methods in reducing the effects of climate change and looking for the best feasible solutions. As a result, this study has explored the conceptual ideas of general public's awareness and the factors that influence their behaviours to be involved and engaged in 3R activities. Positive information regarding these behaviours may encourage the public to accept and practise the concepts of good citizenship in Malaysia. As the government's aspiration to raise the citizen's awareness on the values and benefits of practising 3R in their daily life are still lacking, studying the factors that influence their behaviours to conduct 3R activities is a necessity to improve the environmental awareness.

**Keywords:** 3R awareness; behaviour; knowledge; attitude; practice

### **Introduction**

Global environmental crises such as global warming, air pollution and waste management problems have become a global issue in the world due to the increase of population and rapid development of technology, especially in the urban areas. In 2015, 195 nations including Malaysia agreed with the United Nation's motion in promoting Sustainable Development Goals (SDG) 2030; to provide a better world for future children ("The Global Challenge for Government Transparency: The Sustainable Development Goals (SDG) 2030 Agenda". n.d.). The SDG 2030 comprises several goals that aim to rectify the global environmental crisis particularly in relation to waste management practices; and the specific goals which are related to this research are Goal 3: Good Health and Well-being, Goal 4: Quality Education and Goal 11: Sustainable Cities and Communities. Goal 3 aims to sustain healthier lives of the community whereby the children are given the routine

immunizations which are important for them; and promote the well-being of the society, not specific to age, race and gender. As for Goal 4, the objective is to ensure the community at large could receive equitable quality education in which the opportunities to receive good education are provided to everyone; apart from promoting lifelong learning opportunities for all. Under Goal 11, the aim is to ensure that the cities and human habitations are safe, resilient and sustainable in which the public should have access to public transportation and that air pollution is no longer a problem for all.

In order to face the above global environmental crisis, it is undeniable that all countries should have suitable and appropriate policies in place to ensure that the crisis could be managed effectively and accordingly. In 2007, the Malaysian government has already taken an initiative to legislate the Solid Waste and Public Cleansing Management Act 2007. A solid waste segregation was also implemented by the Ministry of Urban Wellbeing, Housing and Local Government in which it involved several states, including the Federal Territories of Kuala Lumpur and Putrajaya, Johor, Malacca, Negeri Sembilan, Pahang, Kedah, and Perlis (Afizah Azlan et al., 2019). As Malaysia strives to position itself as a developed country, having a more sustainable waste management has emerged as the top priority for policymakers and other stakeholders.

Nevertheless, it seems that this initiative by the Malaysian government is still not sufficient. This is because Malaysia is still lagging when it comes to environmentally friendly waste management practices, particularly when it comes to recycling (Krishnan et al., 2022). Malaysia needs a good waste management system and practice; as it has a much lower recycling rate as compared to the neighbouring countries for example Singapore, Taiwan, Korea, and Thailand. It was also reported that Malaysia disposes of more than 30,000 tons of municipal solid waste daily, which amounted to 1.17kg of waste per day and the local environmental experts have also forecasted that by 2050, there will be no space for waste in Malaysia if no action is taken to resolve this problem (Malaysia Waste Management Solutions, 2022). To add, The Malaysian Reserve (2023) reports that as of March 2022, the data from the National Solid Waste Management Department revealed that Malaysia loses an estimated RM476 million in recyclable resources in an industry that is considered high value, simply because recycling practices have yet to become a norm in this country. It is further indicated that the trash generation has significantly increased in recent years where, in 2018, about 36,843 tonnes of waste were generated daily; 37,462 tonnes in 2019; 38,081 tonnes in 2020; 38,699 tonnes in 2021; and 39,936 tonnes last year. Consequently, these environmental issues could lead to a more major problem for society in the future.

3R (Reduce, Reuse and Recycle) is considered as an essential concept adopted by most developing countries in promoting sustainable waste management practices and material cycles society. This approach is implemented to extend the life of the landfills and at the same time, to reduce the natural resources exploration by the people (Mohammed et al., 2021). In this context, the public and society should be exposed to the importance of reducing waste and the methods in reusing and recycling. The meaning of reduce is to minimise the amount of waste that we have. As for reuse, it is to reuse or repurpose the items instead of purchasing new ones and the term recycle means we need to recycle our wastes as frequent as possible (Perstorp, 2022). As a result of these practices, it may reduce pollution, and this could be one of the ways to achieve sustainability.

A sound material-cycle and resource-efficient society starts with a public understanding of the 3R: Reduce, Reuse, Recycle, suggestively at an early age. Recycling awareness plays a major role in creating a sustainable environment and is essential to overcome environmental problems. One of the ways to address this issue is to use more recyclable products, like plastics, paper, boxes, glasses, and electronics. This awareness is the foundational component of such a society. Thus, to create more sustainable waste management systems and to lessen human impact on the environment, the 3R idea was developed. It is important to highlight that by putting the 3R into practice, it can increase economic activity, lessen the environmental effects of waste disposal, stop the loss of resources, and extend the useful life of land (Zamroni et al., 2020). Although the 3R practices have been successfully implemented in many developed countries, this has not yet been the case in developing countries like Malaysia. The adoption of 3R has failed for a variety of reasons namely the absence of effective institutional waste management procedures and a lack of legislation to support the 3R programmes (Jereme et al, 2015). The first 3R tactics were officially launched in Malaysia in the late 1980s, with most of the campaigns' attention going towards recycling. Numerous non-governmental

organisations have started taking part as a result. Nonetheless, the rate of recycling was rather low due to the existing systemic waste management practice that has remained unchanged.

Accordingly, this conceptual paper has focused on the significance of knowledge, attitude, and practice of 3R concepts among the public in Malaysia; including the developers, contractors and all parties that are related in producing waste. It is believed that an early education is important to ensure the effectiveness of this concept in one's life (Mahat et al., 2016). As reported by The Malaysian Reserve (2023), Alam Flora Environmental Solutions (AFES) COO Nazar Abdul Raof has revealed that Malaysia is lacking in terms of efficient waste management and recycling as compared to other countries and he urged Malaysians to act fast. He added that the younger generation should be exposed and taught about sustainability and recycling as they are fast learners and also the future stewards of the planet. Besides, the younger generation will also need to be exposed to a proper waste management system and practice the do's and the don'ts in their daily life in the long run.

## Methodology

This conceptual paper used a qualitative research approach to explore the determining factors that contribute to community awareness of the 3R (Reduce, Reuse, Recycle) behaviour. This research is based on an extensive review of existing literature and conceptual frameworks related to environmental awareness and behaviour change that can contribute a positive and good impact on the community. The basis of this research involved an in-depth review of scientific literature and conceptual models related to environmental awareness, sustainable behaviour and 3R practices. From the literature review, the basis for building a theoretical framework that guides the exploration of determining factors. The synthesis of information from this literature review will also lead to the development of a theoretical framework for future studies. This framework will integrate key concepts and factors identified in the literature, serving as a structured basis for understanding the determinants of community awareness in 3R behaviour. According to the conceptual analysis, the determining factors will be identified and categorised into relevant dimensions and then lead to the provision of a theoretical view through which these factors influence the awareness of the 3Rs in ensuring it becomes a good standard practice in the community.

## Discussion

The literature has provided an insight into three (3) different factors that contribute towards community's awareness in 3R behaviour involving waste production, knowledge, attitude and practice. It is believed that an early education is important to ensure the effectiveness of 3R's concept in one's life. Little attention has been given to public awareness of acceptable solid waste management techniques in which 3R is the starting point and a crucial component of a sustainable material-cycle and resource-efficient society. As a result, the public's attitude towards 3R behaviour is affected and causes them to ignore the significance of 3R in their daily life.

### 1. Theory of Planned Behaviour (TPB)

The theory that this study focused on is the Theory Planned Behavior (TPB) which is a development of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The shortcomings of the earlier models in addressing activities over which individuals have only partial volitional control which may lead to the need of this expansion. TPB offers a theoretical framework that systematically examines the variables that affect behavioural choices. The purpose of this study is to determine the factors that are the antecedents of communities' recycling conduct by using TPB as the theoretical framework. TPB argues that rational behaviour occurs when individuals weigh the effects of their decisions (Mahmud & Osman, 2010). TPB postulates that a person's intention to engage in a particular conduct or it determines the behaviour in the short run. According to Ajzen and Fishbein (1980), intention is the main determinant of behaviour and, when accurately quantified, could be utilized for predicting behaviour. In the study by Fielding et al. (2011), those who hold positive attitudes toward the environment believe that normative support is present and that they can engage in action if they have a strong desire for doing so. To comprehend a variety of ecologically responsible behaviours, such as recycling (Davis et al. 2005), composting (Taylor & Todd, 1995), and the adoption of

sustainable agricultural practises (Beedle & Rehman, 2000), the TPB has been successfully and widely employed by many parties. Thus, TPB is a suitable model in this discussion to examine the factors affecting the community's awareness in 3R behaviour.

## 2. Environmental Awareness

Notably, developing nations are eager to integrate the Sustainable Development Goals (SDGs) into their governance structures. The enhancement of environmental quality occurs when the SDGs are most extensively emphasized. As a result, improving environmental quality through various but direct or indirect activities is necessary. Common measures involve increasing knowledge of the 3R principles, which will boost the program's effectiveness. In accordance with recent research, people's understanding of climate change contributes to reduced environmental issues (Fu et al., 2020). This shows encouraging outcomes when such awareness exists. Environmental awareness will be a crucial component of education from the viewpoint of one's understanding of the natural world and actions that help or harm it, as it encourages people to become more dedicated to preserving the planet and making it a better place to live for future generations. The goal of environmental awareness is to constantly work towards preventing harm to the surrounding natural environment and to develop initiatives to remedy ecological harm. This goal will be the key in ensuring the success to contribute to the community's awareness toward this 3R behaviour (Ye & Shih, 2020). To prove this, one study was conducted by Oliver et al. (2020) among the small-frame practice laborers on the influence of environmental awareness and the results indicated that the laborers who were aware of different environmental issues are more likely to engage in eco-friendly behaviours that are very beneficial for environmental quality. This is in line with the findings by Novotný et al. (2021), who revealed that humans who were aware of the adverse effects of environmental issues are more likely to be engaged in eco-friendly initiatives that lead to improving environmental quality.

Conversely, Zsóka et al (2013) mentioned there is a correlation between environmental knowledge and awareness. The study has proven that the community that has knowledge about the environment will commonly have higher awareness level in 3R principles as they will apply this concept in their daily life routine. Additionally, a study by Hansmann et al. (2021) that examined the relationship between environmental consciousness and environmental protection behaviours found a 100 percent positive correlation. The study reached the conclusion that as people's level of environmental awareness rises, they will become more concerned about environmental issues and adopt eco-friendly behaviours. Additionally, a group of researchers who support the study said that a person's engagement in various climate-friendly and environmentally conscious actions is influenced by their level of environmental awareness (Carducci et al., 2021).

## 3. Influential Factors on the Community's Behaviours

Pursuant to this analysis of the literature, there is a big impact on environmental consciousness towards the community, especially when it comes to the 3R principles. These principles are perceived to assist the nation to maintain and improve its environmental quality for a better future. This conceptual paper focused on three factors that influence the community's behaviour, specifically on knowledge, attitude and practice.

### *Knowledge*

In order to implement the 3R awareness program which promotes sustainable waste management practices, knowledge is part of a critical component. Plenty of initiatives are dedicated to informing the public on the positive effects of effective waste management and its consequences on the environment. The community is given more influence by being educated and equipped with environmental knowledge. The phrase "environmental knowledge" is used to describe ideas and behaviour relating to the environment. According to a previous study by Olsen et al. (2020), by highlighting sustainable environmental behaviour and sustainable development, educators significantly contribute to students' acquisition of the information and skills required to promote human life. Therefore, teachers may provide students with clearer understanding on the environmental waste education, either during formal or informal education.

Hence, by providing students all the necessary tools for widespread positive societal consequences, environmental education essentially encourages sustainable lifestyles and discourages students from leading unsustainable lifestyles (Sibbel, 2009). In accordance with a different study by Tikka et al. (2010), public awareness and attitudes toward the environment will increase as a result of education. A separate investigation by Panko and Sharma (2016) demonstrates that immersing students in environmental education's practical applications will provide a deeper comprehension of the larger principle of knowledge and learned attitudes. Thoo et al. (2021) analyse the relationship between recycling intentions and behaviour in higher education, primarily focusing on plastics and energy as components of environmental initiatives. Their research establishes a link between the students' intentions to recycle and the impact of friends, family, the media, and environmental organisations. According to Flannagan (2017), teaching middle school students about waste separation and recycling can have a positive impact on their recycling and waste reduction practices because at that age, they can begin to actively consider their habits and take action to protect the environment or avoid producing needless waste.

It is true that understanding environmental recyclables education is important for imparting knowledge and raising awareness of the 3R principles. In the words of Chun T'ing et al. (2020), 3R behaviour is favourably influenced by habits and knowledge, which typically develop in children under the influence of schools, parents, and teachers. Particularly, by implementing the 3R principles, the community's contribution to environmental waste management will have a favourable effect on the cost of waste operation. As a result, this will guarantee long-term environmental and sustainable development benefits.

### *Attitude*

Attitude has always been a subject of interest to many researchers as well as psychologists. Attitudes can be positive, negative, or neutral and can influence a person's behaviour, decisions, and interactions with others. Attitude refers to an ongoing assessment of a person, thing, or idea that can be neutral, hostile, or conflicted. (Wood, 2018). According to Abdulghani et al. (2019), Malaysia, a developing nation, struggles with ineffective solid waste management because of a lack of attitude, perception, and willingness among its citizens. Recent studies have highlighted the importance of attitudes on individuals' engagement in environmentally friendly behaviours, providing evidence on the relationship between attitudes and the 3R principles of reuse, reduce, and recycle. According to research by Syaekhoni et al. (2017), the customers' aspirations to make green purchases could influence their decision-making in a way that is more socially conscious. This implies that the customers will become more conscious in how their choices could affect the society as a whole.

Chen and Chang (2013) explored the association between recycling attitudes and recycling behaviour. Positive attitudes towards recycling were found to significantly predict the individuals' recycling behaviour, demonstrating a strong relationship between attitudes and the recycling dimension of the 3R principle. Faridy and Rohendi (2021) found out that parents' education and behaviour towards 3R practices play an important role in developing children's action in relation to the practice of 3R. They also highlighted that if the children are introduced to 3R practices at younger age, it creates a good 3R habit; and the children also learn by example when the parents themselves are practising the 3R behaviour.

As a result, attitudes play a critical role in shaping public support for 3R-related policies and projects. Positive attitudes towards these concepts can lead to increased acceptance and support for recycling programmes, waste management rules, and government policies in supporting sustainable practices. Such programmes can benefit from attitude alignment in terms of their execution and effectiveness.

### *Practice*

The word "practise" in the context of environmental awareness describes the intentional actions and behaviours that people or groups take to advance sustainability, conservation, and responsible environmental stewardship. It entails adopting eco-friendly behaviours and choices into daily routines and decision-making processes. KAP surveys (knowledge, attitude, and practises) have been widely used to investigate human behaviour in a variety of disciplines, including health, community development, child protection, and

education. KAP surveys have been widely utilised in environmental research to assess the public's knowledge, attitude, and practise on environmental concerns (Besar, Hassan, Bolong, & Abdullah, 2013).

Anua et al. (2022) who conducted a study to raise the understanding, attitude, and practise of 3R among primary school pupils discovered a significant difference in knowledge ( $p=0.030$ ) but no significant variations in attitude ( $p=0.484$ ) or practise ( $p=0.248$ ) ratings before and after the 3R programme. KAP surveys have also been utilised to investigate youth's knowledge, attitude, and practice of the environment. In a different KAP survey, which examined the level of environmental knowledge, attitude, and practice among 244 young Malaysian civil servants, it was discovered that while the respondents generally had good environmental knowledge and attitudes, their recycling behavior was only moderate (Besar et al., 2013). Both studies showed that adopting sustainable environmental practices is not always the result of environmental practice. The study concluded that continuous awareness on 3R campaign and activities should be conducted at an early age among the students to increase their practices on 3R. Tan (2013) emphasized that the success or failure of a recycling programme depends on the level of practice; in which the higher the level of practice is, greater success could be achieved. Altikolatsi et al. (2021) found that family attitudes and practices on recycling behavior have a significant impact on the recycling awareness of primary school students. Practices and education about the environmental and recycling topics are crucial to foster awareness and commitment to such a behavior, in addition to using interesting and attractive posters, leaflets, comics, and animations. It was discovered that the mothers and dads of the recycling had reported that the students had gained, on average, greater educational degrees which contributed to another interesting finding.

Understanding the levels of knowledge, attitude and practice will enable a more efficient process of awareness creation as it will allow the program to be tailored more appropriately to the needs of the community. Referring to these findings, the researchers will conduct a quantitative study afterwards based on the 3R Programme, which was organized this year in Samarahan, Sarawak; in the quest to examine the level of community and public awareness towards the 3R concept. The main focus of the research shall be on the knowledge, attitude and practice because 3R has become the government's priority agenda for a greener environment; in line with one of the SDG 2030 introduced by the United Nations which has been mentioned earlier.

## Conclusion

In conclusion, this study has shed a light on the crucial determinant factors that influence the general public's awareness of the 3R concept. The government could encourage recycling among its communities by providing early education. It is crucial to encourage high levels of involvement in recycling activities rather than merely carrying out our initiatives to raise awareness. Despite the government's sustained efforts through various environmental sustainability initiatives, the outcomes remain somewhat uncertain to this day. While a high level of awareness regarding policies and initiatives is necessary, understanding their determinants and benefits is undoubtedly valuable, as it alone may not be sufficient to induce significant changes in society's recycling habits. The effectiveness of these policies is contingent on their formulation, implementation, and evaluation.

As such, in order to garner stronger public support and drive meaningful changes in recycling behaviours, the policymakers should embark on a collaborative journey. This journey involves the development of equitable and responsive recycling policies, with a strong emphasis on public involvement, particularly during the policy design phase. Engaging the community in the decision-making process not only ensures that policies align with their needs and concerns but also fosters a sense of ownership and responsibility among the public. This is because the effectiveness of the 3R concept could increase as the community gains more understanding and practises it diligently in their daily routine. Many people learn about environmental protection in school, but they do not implement it in real life. This attitude of lacking concern towards the environment among the community is a critical component that must be properly addressed. If more communities have gained certain levels of understanding on the importance of environmental education, more people will be more inclined to participate in environmental protection activities and be committed to raise awareness towards environmental issues. As a result, they will become more proactive and able to come up with more effective and efficient new ideas in solving environmental problems. In this manner, we can

move closer to achieving a more sustainable and environmentally conscious society, where the principles of reduce, reuse, and recycle become an integral part of our collective consciousness in order to allow successful implementation of the 3R concept to the community.

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## References

- Abdulghani, E. M. S., Shadi, K. M., & Akalpita, T. (2019). Community attitude, perception and willingness towards solid waste management in Malaysia, case study. *Journal of Wastes and Biomass Management*, 1(1), 09-14. <https://doi.10.26480/jwbm.01.2019.09.14>
- Afizah Azlan, N. N., Ab Latif, N. A., Lukman, N., & Abdul Aziz, N. U. (2019). Implementation of 3R among staff at the petroleum management company. *Proceedings of the 2nd Economics and Business International Conference*. <https://doi.org/10.5220/0009201101780183>
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice-Hall.
- Altikolatsi, E., Karasmanaki, E., Parissi, A., & Tsantopoulos, G. (2021). Exploring the factors affecting the recycling behavior of primary school students. *World*, 2(3), 334–350. <https://ideas.repec.org/a/gam/jworld/v2y2021i3p21-350d580324.html>
- Anua, S. M., Anwar, N. N. K., Zain, N. M., Abd Rahman, W. N. W., Hamzah, N. A., & Abdul Rahman, H. (2022). Reduce, reuse and recycle (3R) awareness programme to increase the knowledge, attitude and practice on 3R among primary school students. *International Journal of Academic Research in Business and Social Sciences*, 12(13), 62 - 74. <http://dx.doi.org/10.6007/IJARBSS/v12-i13/14144>
- Awang Besar, T., Hassan, M.S., Bolong, J., & Abdullah, R. (2013). Exploring the levels of knowledge, attitudes, and environment-friendly practices among young civil servants in Malaysia. *Pertanika Journal of Social Science and Humanities*, 21, 21-38. <http://psasir.upm.edu.my/id/eprint/40687>
- Beedle, J., & Rehman, T. (2000). Using social-psychology models to understand farmers' conservation behavior. *Journal of Rural Studies*, 16, 117-127. [http://dx.doi.org/10.1016/S0743-0167\(99\)00043-1](http://dx.doi.org/10.1016/S0743-0167(99)00043-1)
- Carducci, A., Fiore, M., Azara, A., Bonaccorsi, G., Bortoletto, M., Caggiano, G., Calamusa, A., Antonella De Donno, Osvalda De Giglio, Dettori, M., Pamela Di Giovanni, Angela Di Pietro, Alessio Facciola, Federigi, I., Iolanda Grappasonni, Izzotti, A., Libralato, G., Chiara Lorini, Maria Teresa Montagna, & Liberata Ketì Nicolosi. (2021) Pro-environmental behaviors: Determinants and obstacles among Italian university students. *International Journal of Environmental Research and Public Health*, 18(6), 3306. <https://doi.org/10.3390/ijerph18063306>
- Chen, Y.-S., & Chang, C.-H. (2013). The determinants of green product development performance: Green dynamic capabilities, green transformational leadership, and green creativity. *Journal of Business Ethics*, 116, 107-119. <https://doi.org/10.1007/s10551-012-1452-x>
- Chun T'ing, L., Moorthy, K., Yoon Mei, C., Pik Yin, F., Zhi Ying, W., Wei Khong, C., Zhao Chern, G., & Zin Lin, T. (2020). Determinants of 3Rs behaviour in plastic usage: A study among Malaysians. *Heliyon*, 6(12). E05805. <https://doi.org/10.1016/j.heliyon.2020>
- Davis, G. Phillips, P.S., & Read, A.D. (2005). Demonstrating the need for the development of internal research capacity: Understanding recycling participation using the Theory of Planned Behavior in West Oxfordshire, UK. *Resources, Conservation & Recycling*, 46(2), 115-127. <https://doi.org/10.1016/j.resconrec.2005.07.001>

- Faridy, F., & Rohendi, A. (2021). The role of parents in engaging early childhood to implement 3R (reduce, reuse, recycle). *International Conference on Engineering, Technology and Social Science (ICONETOS 2020)*, 483–486. <https://doi.org/10.2991/assehr.k.210421.070>
- Fielding, K.S., Terry, D.J., Masser, B., & Hogg, M.A. (2011). Integrating social identity theory and the theory of planned behaviour to explain decisions to engage in sustainable agricultural practices. *British Journal of Social Psychology*, 47(1), 23-48. <https://doi.org/10.1348/014466607X206792>
- Fu, L., Sun, Z., Zha, L., Liu, F., He, L., Sun, X., & Jing, X. (2020). Environmental awareness and pro-environmental behavior within China's road freight transportation industry: Moderating role of perceived policy effectiveness. *Journal of Cleaner Production*, 252, 119796. <https://doi.org/10.1016/j.jclepro.2019.119796>
- Flanagan, S. (2017). *How can education improve the recycling behaviors and Attitudes of middle school students?* [Masters of Arts in Education, Natural Science and Environmental Education. Hamline University, Saint Paul, Minnesota]. [https://digitalcommons.hamline.edu/hse\\_all/4322](https://digitalcommons.hamline.edu/hse_all/4322)
- Hansmann, R., Laurenti, R., Mehdi, T., & Binder, C.R. (2020) Determinants of pro-environmental behavior: A comparison of university students and staff from diverse faculties at a Swiss University. *Journal of Cleaner Production*, 268, 121864. <https://doi.org/10.1016/j.jclepro.2020.121864>
- International Trade Administration. (2022, August 23). *Malaysia Waste Management Solutions*. <https://www.trade.gov/market-intelligence/malaysia-waste-management-solutions>
- Krishnan, D., Ghazali, M., Md Shahid, K., Sahid Hamid @ Hussain & Hassan, S. (2022). Recycling knowledge among Malaysians towards maintaining clean environment. *Journal of Tourism, Hospitality and Management (JTHERM)*, 7(29), 336-343. <http://dx.doi.org/10.35631/JTHERM.729024>
- Jereme, I.A., Alam, M.M. & Siwar, C. (2015). Waste recycling in Malaysia: Transition from developing to developed country. *Indian Journal of Education and Information Management*. 4(1), 1-14. <https://ssrn.com/abstract=2942721>
- Mahat, H., Suhaily Yusri, M., & Ngah, C. (2016). 3R practices among MOE preschool pupils through the environmental education curriculum. *SHS Web of Conferences*, 23, 04002. <https://doi.org/10.1051/shsconf/20162304002>
- Mahmud, S. N. D., & Osman, K. (2010). The determinants of recycling intention behavior among the Malaysian school students: an application of theory of planned behaviour. *Procedia - Social and Behavioral Sciences*, 9, 119-124. <https://doi.org/10.1016/j.sbspro.2010.12.123>
- Mohammed, M., Shafiq, N., Elmansoury, A., Al-Mekhlafi, A.-B. A., Rached, E. F., Zawawi, N. A., Haruna, A., Rafindadi, A. D., & Ibrahim, M. B. (2021). Modeling of 3R (reduce, reuse and recycle) for sustainable construction waste reduction: A partial least squares structural equation modeling (PLS-SEM). *Sustainability*, 13(19), 10660. <https://doi.org/10.3390/su131910660>
- Novotný, R., Huttmanová, E., Valentiny, T., & Kalistová, A. (2021). Evaluation of Environmental Awareness of University Students: The Case of the University of Presov, Slovakia. *European Journal of Sustainable Development*, 10(2), 59-72. <https://doi.org/10.14207/ejsd.2021.v10n2p59>
- Oliver, D. M., Zheng, Y., Naylor, L. A., Murtagh, M., Waldron, S., & Peng, T. (2020). How does smallholder farming practice and environmental awareness vary across village communities in the karst terrain of southwest China? *Agriculture, Ecosystems & Environment*, 288, 106715. <https://doi.org/10.1016/j.agee.2019.106715>
- Olsen, S.K., Miller, B.G., Eitel, K.B., & Cohn, T.C. (2020). Assessing teachers' environmental citizenship based on an adventure learning workshop: A case study from a social-ecological systems perspective. *Journal of Science Teacher Education*, 31(8), 869–893. <https://doi.org/10.1080/1046560X.2020.1771039>
- Panko, M., & Sharma, R. (2016). Integrating waste management and pollution control in tertiary vocational education programmes: Case studies. *International Journal of Information and Education Technology*, 6(3), 228–231. <https://doi.org/10.7763/IJNET.2016.V6.690>

- Perstorp. (2022, May 23). *3R Malaysia - Reduce, Reuse & Recycle*. Perstorp Sdn. Bhd. A Leader in Waste Handling Solutions. <https://perstorp.my/3r-malaysia-reduce-reuse-recycle/#:~:text=The%20first%20is%20to%20minimise>
- Sibbel, A. (2009). Pathways towards sustainability through higher education. *International Journal of Sustainability in Higher Education*, 10(1), 68–82. <https://doi.org/10.1108/14676370910925262>
- Syaekhoni, M. A., Alfian, G., & Kwon, Y. S. (2017). Customer purchasing behavior analysis as alternatives for supporting in-store green marketing decision-making. *Sustainability*, 9(11), 2008. <https://doi.org/10.3390/su9112008>
- Taylor, S., & Todd, P. (1995). An integrated model of waste management behavior: A test of household recycling and composting intentions. *Environment and Behavior. Sage Journals*, 27(5), 603-630. <https://psycnet.apa.org/doi/10.1177/0013916595275001>
- The Malaysian Reserve. (2023, September 11). *Empowering Communities through Education: Fostering Recycling Habits among Youth with AFES*. <http://surl.li/mcmnl>
- Tikka, P.M., Kuitumen, M.T., & Tynys, S.M. (2010). Effect of educational background on students' attitudes, activity levels and knowledge concerning the environment. *Journal of Environmental Education*, 31(3), 12–19. <https://doi.org/10.1080/00958960009598640>
- New Jersey Minority Educational Development. (n.d.). *The global challenge for government transparency: The sustainable development goals (SDG) 2030 agenda*. <http://surl.li/mcmntv>
- Thoo, A. C., Tee, S. J., Huam, H. T., & Mas'od, A. (2021). Determinants of recycling behavior in higher education institutions. *Social Responsibility Journal*, 18(8), 1660-1676. <https://doi.org/10.1108/SRJ-05-2021-0209>
- Wood, W. (2018). Attitude change: Persuasion and social influence. *Annual Review of Psychology*, 51, 539–570. <https://doi.org/10.1146/annurev.psych.51.1.539>
- Ye, Y. H., & Shih, Y. H (2020). Environmental education for children in Taiwan: Importance, purpose, and teaching methods. *Universal Journal of Educational Research*, 8(4), 1572-1578. <https://doi.org/10.13189/ujer.2020.080451>
- Zamroni, M., Rahma Sandhi Prahara, Ari Kartiko, Dia Purnawati, & Dedi Wijaya Kusuma. (2020). The waste management program of 3R (reduce, reuse, recycle) by economic incentive and facility support. *Journal of Physics: Conference Series*. 1471, 012048. <https://doi.org/10.1088/1742-6596/1471/1/012048>
- Zsóka, Á., Szerényi, Z.M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production*, 48, 126–138. <https://doi.org/10.1016/j.jclepro.2012.11.030>