



UNIVERSITI
TEKNOLOGI
MARA

Cawangan Perak

ISCU 2025

17TH RISM INTERNATIONAL SURVEYING CONFERENCE FOR UNDERGRADUATES

Embracing Construction Revolution 4.0 (CR4.0): Transforming Malaysia's Built Environment

16th - 17th May 2025 | Friday - Saturday

E-ISBN PROCEEDING VOLUME I



YOUR FUTURE BUILT TODAY

©Royal Institution of Surveyors Malaysia

Published by
Royal Institution of Surveyors Malaysia
3rd Floor, Bangunan Juurukur
64 & 66, Jalan 52/4
46200 Petaling Jaya
Selangor

E- PROCEEDING 17th RISM ISCU 2025 Volume 1

Editors: Lizawati Abdullah, Nor Suzila Lop, Nor Nazihah Chuweni, Suriani Ngah Abdul Wahab,
Hasnan Hashim

All Rights Reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law.

eISBN 978-629-94789-0-4



(online)

WELCOME SPEECH FROM THE CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ السَّلَام

عَلَيْكُمْ وَرَحْمَةُ اللَّهِ وَبَرَكَاتُهُ

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed “*Embracing Construction Revolution 4.0: Transforming Malaysia’s Built Environment.*” On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'

Chairman, Universities' Partnering Committee

RISM Session 2024/2025

May 2025

WELCOME SPEECH FROM CO-CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

Associates Professor Dr. Nur Hisham Ibrahim, *PMP*

Co-Chairman, Universities' Partnering Committee

RISM Session 2024/2025

May 2025

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

Sr Dr. Nurul Fadzila Zahari

Project Director

RISM 17th ISCU 2025

ZERO-WASTE AWARENESS AMONG MALAYSIAN PUBLIC UNIVERSITY STUDENTS

Ai Shan Tan¹, Shirley Jin Lin Chua^{2*}

¹Department of Building Surveying, Faculty of Built Environment, Universiti Malaya,
50603, Kuala Lumpur, Malaysia.

^{2*} Centre for Building, Construction and Tropical Architecture, Faculty of Built Environment, Universiti
Malaya, 50603 Kuala Lumpur, Malaysia.

E-mail: shirleychua88@um.edu.my
Corresponding author

ABSTRACT

This study aims to investigate zero-waste awareness among Malaysian public university students, focusing on the implementation of zero-waste management practices, student awareness levels, and strategies to enhance engagement with sustainable waste practices. With Malaysia facing a critical waste management crisis and rising landfill saturation, public universities are identified as key contributors to municipal solid waste generation. Despite existing zero-waste initiatives and awareness campaigns, a significant gap persists between students' knowledge and their actual behavior towards waste reduction and recycling. The research employs a mixed-method approach, incorporating semi-structured interviews with university management and online questionnaire surveys targeting students from three selected public universities. Data collection will assess current implementation levels, measure students' awareness and attitudes toward zero-waste practices, and identify actionable measures to bridge the gap between awareness and behavior. Anticipated results are expected to reveal varying degrees of zero-waste implementation across institutions and highlight key factors influencing student participation in sustainable waste management. The study aims to propose evidence-based recommendations for enhancing zero-waste awareness and adoption, contributing to broader sustainability goals within higher education institutions in Malaysia.

Keywords: Awareness, Public University, Sustainable, Waste Management, Zero-Waste

I. INTRODUCTION

Zero waste is a comprehensive approach aimed at minimizing waste generation and maximizing resource efficiency to create sustainable environmental, social, and economic systems (Almansour & Akrami, 2024). Although the term 'zero-waste' was coined in the 1970s, the concept is still in development and the zero-waste principles are evolving over time (Zaman & Newman, 2021). Zero-waste acknowledges that waste is a 'misallocated resource' or a 'resource in transition' which is produced during the intermediate phases of production and consumption activities. Thus, it should be recirculated to the system to reuse, reassemble, resell, redesign, recycle or reprocess (Zaman, 2017).

Since zero waste policy requires effective planning of waste management processes, strengthening waste sorting and recycling infrastructure and raising awareness of the society, it can be assumed that it will increase environmental awareness, change waste management habits and contribute to the adoption of a sustainable lifestyle (Karacaoğlu, 2024). Therefore, it is clear that there is a strong relationship between zero waste policy and environmental awareness (Karacaoğlu, 2024). In Malaysia, the lack of knowledge and awareness of sustainable zero waste practices have become a major obstacle to sustainable development in the construction industry (Sheikh Ilmi et al., 2024). To address this, the implementation of Zero Waste concept should be widely promoted to reduce the solid waste production and mitigate the depletion of natural resources (Sheikh Ilmi et al., 2024).

Education and promotion targeting young generation in shaping values and norms towards the environments can support the adoption of zero waste lifestyle (Maulana & Dwipayanti, 2022). University students have a good access to updated information on Zero Waste, thus are more ready in accepting the concept (Maulana & Dwipayanti, 2022). Malaysian universities as higher education institutions are believed to be the right setting for promoting pro-environmental behaviour, especially to overcome the municipal solid waste (MSW) problems (Baba-Nalikant, Abdullah, et al., 2023). In 2024, there are approximately 681,000 students are enrolled in public universities and only around 420,000 students enrolled in private universities (Shahd, 2024).

Therefore, this paper intends to examine the implementation levels of zero-waste management in public universities, evaluate the awareness level among public universities students, and suggest measures to increase zero-waste awareness among Malaysian public universities students.

II. LITERATURE REVIEW

2.1 Definition of Zero-waste

The term “zero waste” was used publicly in the first half of the 1970s by Paul Palmer, who used it in the name of the company he founded (Zero Waste Systems). The definition of zero waste according to the Zero Waste International Alliance (ZWIA) is as follows:

“Zero waste: The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.”

The concept of Zero Waste is to minimize waste generation so that less waste is wasted to the landfill (M Nizar et al, 2018). The zero-waste term does not mean that we produce no waste, rather we dump no waste at the landfill site (Permana, A.S et al, 2023). Zero waste management is the holistic approach which utilizes waste as a resource produced in the intermediate steps in the process of consumption of resource (Palaq et al., 2024). Zero waste strategies may be applied to companies, to communities, industrial sectors, to schools, and homes since they include many stakeholders, not only those of the environment, but also technological aspects (Hamid et al., 2019).

2.2 The Current Implementation Level of Zero-waste Management in Universities

Higher Educational Institutions (HEIs) in Malaysia are no exception in the global movement towards sustainable development. Many research studies had been conducted on the effectiveness of SWM strategies, as well as innovative solutions in SWM on campus. Table 2.1 summarizes the initiatives that have been adopted or implemented on campus across HEIs in Malaysia.

2.3 The Parameters to Measure Awareness Level

Measures of awareness usually come with three different nomenclatures, scales, tests or questionnaires (Gafoor, 2012). Awareness as self-reports can be explored in the form of opinion or direct questions (Gafoor, 2012).

Knowledge, Practices, and Attitudes

In cyber security awareness, awareness is gauged by evaluating individuals' knowledge of cyber security, their practices (e.g., password management), and attitudes towards security measures (Nimkar & Kumar, 2024). The level of awareness is linked to educational background and professional experience, with higher awareness associated with fewer cybercrime incidents (Nimkar & Kumar, 2024). The practicality of zero waste practices and the habit of waste sorting significantly influence awareness levels, particularly among females, as shown in the Hungarian model (Vinkóczy et al., 2024). Understanding of electronic waste management is a specific area of awareness that contributes to overall zero waste consciousness (Ikizoglu, 2024).

Capability-Based Approaches

Capability-Based Dynamic Models assess awareness through a structured, standardized approach that evaluates capability across different levels and groups (Erol & Sagioglu, 2018). Awareness of environmental issues such as air, water, and soil pollution, and ecological balance is crucial. This was evident in the increased awareness among primary school students involved in zero waste projects (Karacaoğlu, 2024). The development of scales like the Zero Waste Awareness Scale (ZWAS) and others involves ensuring psychometric validity and reliability, which are crucial for accurately measuring awareness levels (Coskun, 2022).

Knowledge-Attitude-Behavior Framework

Knowledge-Attitude-Behavior Framework assesses awareness based on users' knowledge, attitudes, and behaviors regarding information security, often using methods like the Analytic Hierarchy Process (AHP) (Fadhilah et al., 2021). In zero waste awareness, behavioral motivation is one of the key parameters where this includes the intrinsic and extrinsic motivations that drive individuals to engage in zero waste practices. It is a critical component of the Zero Waste and Sustainable Waste Management Behavior Scale developed in Türkiye (Ikizoglu, 2024).

2.4 Zero-waste Awareness Level in Malaysia

Lack of awareness, weak enforcement, and “attitudes” are also cited as contributing factors to the campus waste problem (Baba-Nalikant et al., 2023). From the interviews, it was found that the main challenges faced in implementing SWM on campus are: low awareness among the community; lack of policy and guidelines on SWM; and insufficient facilities (Ali et al., 2021). The awareness level of zero waste in Malaysia is generally low, with various sectors showing different degrees of understanding and engagement. The construction industry, for instance, faces significant challenges due to a lack of knowledge and awareness about sustainable zero waste practices, which hinders the implementation of effective waste management strategies (Ilmi et al., 2024). Public awareness of waste management, such as brine waste from desalination, is average, with a need for increased education on environmental impacts (Mahadi et al., 2024).

2.5 Measures to Increase Zero-waste Management

Innovative Technologies

The use of innovative technologies, such as microwave pyrolysis, can overcome some challenging waste management issues and create co-benefits (Awasthi et al., 2021). Developing innovative systems, such as the combination of anaerobic digesters and biofilm reactors, can improve the management of food waste and wastewater. These systems can enhance biogas production and meet water quality standards, offering economic and environmental benefits (Sakcharoen, 2024).

Educational Campaigns

Education plays a crucial role in raising awareness about zero-waste practices. It helps individuals understand the impact of waste and the importance of sustainable practices (Baba-Nalikant et al., 2023). Institutions like Istanbul Technical University have highlighted the need for structured frameworks to guide zero-waste initiatives, emphasizing that merely diverting waste does not ensure circularity (Maçin et al., 2024). Social media platforms, however, are emerging as vital tools for informal learning and awareness-raising about zero waste lifestyles, indicating a growing public interest and engagement in this area (Zulkifli & Manaf, 2024). Recognition of the adverse link between microplastics and health was a major factor promoting zero-waste awareness and behavior (Choi et al., 2022).

Waste Reduction Strategies

The presence of strong environmental policies and exemplary leadership can drive the adoption of zero-waste practices. These elements provide the necessary support and guidance for individuals and communities to engage in sustainable behaviors (Baba-Nalikant et al., 2023). Personal experiences with waste management can significantly influence an individual's commitment to zero-waste practices. These experiences often lead to a greater understanding and appreciation of the need for waste reduction (Baba-Nalikant et al., 2023). Minimizing single-use products by Encouraging the use of reusable items instead of single-use products can significantly reduce waste production (Sa'diyah et al., 2024). Waste sorting and composting where households should sort waste into organic and inorganic categories, with composting organic waste to reduce landfill contributions (Sa'diyah et al., 2024).

2.6 Summary

As a summary, literature review pointed out the understanding on zero waste (ZW). The current implementation level of zero waste management in universities are discussed in this chapter to provide a clearer picture on zero waste management. Throughout the literature review, the parameters to measure awareness level and zero-waste awareness level in universities are being examined. The literature reviews also discovered on the measures to increase zero waste management. The conceptual framework is shown in the Figure 1.0.

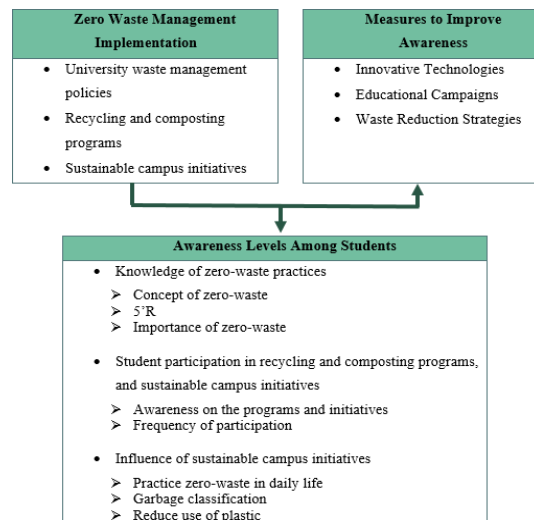


Figure 1.0 Conceptual framework

III. METHODOLOGY

A mixed method which combines qualitative and quantitative data collection and analysis to address research questions more effectively is used to obtain in this research. The desktop study is conducted to have a depth review on the zero waste management. The awareness level on zero waste of the students from the 3 selected public universities are planned to determine by online questionnaire survey throughout the research. The existing initiatives on zero waste management in the case study building is determined via the semi-structured interview. The interview session with the expertise also gives ideas on measures to increase the zero-waste awareness among public university students. The interview helps to provide the interviewer with precise direction from the professional's perspective. The study of the findings may then be used to make recommended measures for increasing the zero-waste awareness among public university students. The research flow framework is shown in the Figure 2.0 below.

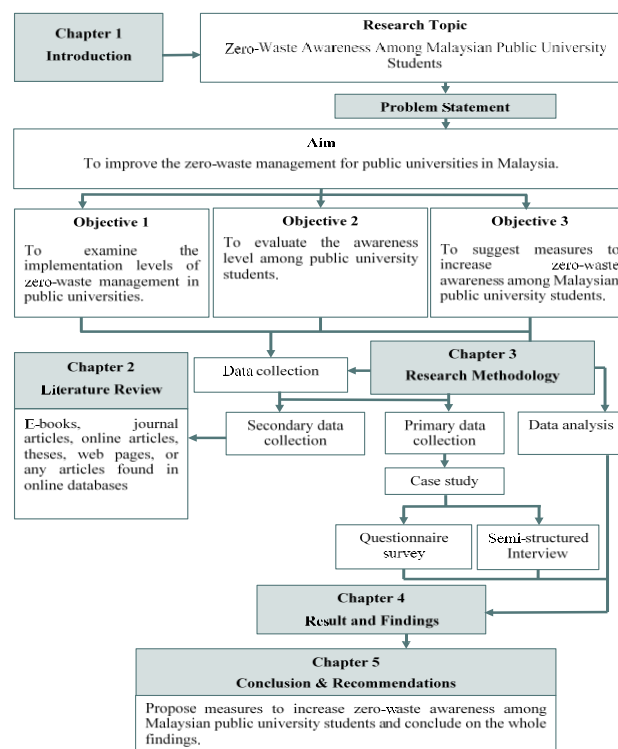


Figure 2.0 Research flow framework

IV. EXPECTED FINDINGS AND CONCLUSION

This research has pointed out the understanding on Zero Waste (ZW). The implementation level of zero-waste management and the awareness level among students in the three selected public universities are discussed in this research. This research will show that the zero-waste awareness among Malaysian public university students is significantly influenced by both the implementation of zero-waste management practices and targeted awareness-improvement measures. It is anticipated that students who are exposed to structured university waste management policies, active recycling and composting programs, and sustainable campus initiatives will demonstrate higher levels of knowledge and engagement with zero-waste concepts, including the 5Rs (Refuse, Reduce, Reuse, Recycle, Rot). Moreover, educational campaigns and innovative technologies are expected to enhance student awareness and encourage proactive participation. The conclusion will likely highlight that the combination of institutional support and awareness strategies not only boosts students' understanding but also positively shapes their daily behaviors, such as practicing zero-waste, sorting garbage, and reducing plastic usage, contributing to a more sustainable campus environment. This research provides ideas on improving the awareness level of zero-waste among students and promotes the important of implementation of zero-waste management in public universities.

REFERENCES

- Ali, R., Lim, C. L., Zainun, N. Y., Sunar, N. M., Hamidon, N., Harun, H., Hamid, N. H., & Muhamad, M. S. (2021). Towards Zero-Waste Campus: Perception of the community in UTHM Pagoh Campus on solid waste management system. *IOP Conference Series Materials Science and Engineering*, 1051(1), 012060. <https://doi.org/10.1088/1757-899x/1/012060>
- Almansour, M.; Akrami, M. Towards Zero Waste: An In-1051 Depth Analysis of National Policies, Strategies, and Case Studies in Waste Minimisation. *Sustainability* 2024, 16, 10105. <https://doi.org/10.3390/su162210105>
- Coskun, S. (2022). Zero Waste Management Behavior: Conceptualization, Scale Development and Validation—A Case Study in Turkey. *Sustainability*, 14(19), 12654. <https://www.mdpi.com/2071-1050/14/19/12654>
- Eco-Cycle. (2024, December 18). What is zero waste? - Eco-Cycle. <https://ecocycle.org/learn-about-zero-waste/what-is-zero-waste/>
- Fadhilah, A. L., Ruldeviyani, Y., Prakoso, R., & Arisya, K. F. (2021). Measurement of information security awareness level: A case study of digital wallet users. *IOP Conference Series Materials Science and Engineering*, 1077(1), 012003. <https://doi.org/10.1088/1757-899x/1077/1/012003>
- Fazri, N. (2024, January 4). UMP embarks on 6R Campaign for sustainable green campus. UI GREENMETRICS. <https://mygreen.umpsa.edu.my/index.php/ump-embarks-on-6r-campaign-forsustainable-green-campus>
- Hamid, S., Skinder, B. M., & Bhat, M. A. (2019). Zero waste. In *Practice, progress, and proficiency in sustainability* (pp.134–155). <https://doi.org/10.4018/978-1-7998-0031-6.ch008>
- Ikizoglu, B. (2024). The Development of a Zero Waste and Sustainable Waste Management Behavior Scale in Türkiye. *Sustainability*, 16(23), 10181. <https://doi.org/10.3390/su162310181>
- Jillani, H., Chaudhry, M. N., & Zahid, H. (2022). Assessing sustainability cognizance in higher education institutions. *Current Research in Environmental Sustainability*, 4. <https://doi.org/https://doi.org/10.1016/j.crsust.2022.100190>
- K, N. D. S. (2022). A study of research methodology. *International Journal of Scientific Research in Science Engineering and Technology*, 537–543. <https://doi.org/10.32628/ijrsrset2293175>
- Karacaoğlu, Ö. C. (2024). Environmental Awareness of Students in a Primary School with Zero Waste Policy. *European Journal of Contemporary Education and E-Learning*, 2(6), 3-28. [https://doi.org/10.59324/ejceel.2024.2\(6\).01](https://doi.org/10.59324/ejceel.2024.2(6).01)
- Kathrin, Kuhn. (2023). *Research Methodology*. Gabler Theses, 67-106. doi: 10.1007/978-3-658-43898-2_3
- Kelvinwatertech. (2024, September 18). Zero waste management. Kelvin Water Technologies Pvt. Ltd. <https://www.kelvinindia.in/blog/what-is-zero-waste-management-and-its-principle/>
- Maçın, K. E., Arıkan, O. A., & Damgaard, A. An MFA–LCA framework for goal-oriented waste management studies: ‘Zero Waste to Landfill’ strategies for institutions. *Waste Management & Research*, 0(0) <https://doi.org/10.1177/0734242x241287734>
- Mahadhir, M. (2024, October 22). UUM becomes first university to launch Drive-Through Recycling Centre. UUM TODAY. <https://uumtoday.com/campus-news/uum-becomes-first-university-to-launch-drive-through-recycling-centre/>
- Mahadi, C., Kasmuri, N., & Miskon, M. F. (2024). Brine waste from seawater desalination in Malaysia: Assessment on public awareness and understanding. *IOP Conference Series Earth and Environmental Science*, 1369(1), 012012. <https://doi.org/10.1088/1755-1315/1369/1/012012>

- Mamat, N. (2021, March 8). The 4Rs' introduced in IIUM Zero Single-Use Plastic Campaign. <https://newsroom.iium.edu.my/index.php/2021/03/08/the-4rs-introduced-in-iium-zero-single-useplastic-campaign/>
- Palaq, Jasrotia, R., Langer, S., Rozumbetov, K. (2024). Zero Waste Management System. In: Bhat, R.A., Dar, G.H., Hajam, Y.A. (eds) Zero Waste Management Technologies. Springer, Cham. https://doi.org/10.1007/978-3-031-57275-3_3
- Pamela, Lyon. (2023). Research Methodology. SIDREA Series in Accounting and Business Administration, 47-69. doi: 10.1007/978-3-031-30988-5_3
- Salih, Erdem, Erol., Seref, Sagioglu. (2018). Awareness Qualification Level Measurement Model. doi:10.1109/IBIGDELFT.2018.8625305
- Sameer, Nimkar., Sanjiv, Kumar. (2024). An Analytical Study on Cyber Security Awareness Level. 1-6. doi:10.1109/icicet59348.2024.10616311
- Schlunegger, M. C., Zumstein-Shaha, M., & Palm, R. (2024). Methodologic and Data-Analysis Triangulation in Case Studies: A Scoping Review. Western Journal of Nursing Research, 46(8),611-622. <https://doi.org/10.1177/01939459241263011>
- Shahd, A. (2024, October). Number of university students in Malaysia: a 2024 overview. YOURUNI. <https://en.your-uni.com/blog/number-of-university-students-in-malaysia>
- Sheikh Ilmi, H., Yee, J. W., Kam, K. J., Lim, T. S., & Soon, L. T. (2024). Implementation Of Zero Waste Concept In Malaysia: From Contractors' Perspective. Planning Malaysia, 22(32). <https://doi.org/10.21837/pm.v22i32.1521>
- Singh, S. (2024, December 17). What is Research Design? Types, Elements and Examples Researcher.Life. <https://researcher.life/blog/article/what-is-research-design-types-examples/>
- Sparnicht, C. (2022, September 7). Zero Waste Definition - Zero Waste International Alliance. Zero Waste International Alliance. <https://zwia.org/zero-waste-definition/>
- Thammananya Sakcharoen. (2020). Innovative zero- waste system for building wastewater recycling and food waste management [Thesis Doctor of Philosophy, Chulalongkorn University]. Chulalongkorn University Intellectual Repository (CUIR). <https://doi.org/10.58837/CHULA.THE.2020.13>
- Vinkóczy, T., Rácz, É. H., & Koltai, J. P. (2024). Sorting for Sustainability: Harnessing Female Awareness of Zero Waste. Journal of Sustainability Research, 6(4), e240065, Article e240065. <https://doi.org/10.20900/jsr20240065>
- Waste (WS)–Sustainability@UKM.(n.d.). <https://www.ukm.my/kelestarian/rankings/uigreenmetric/waste/>
- Zaman, A. (2017). A Strategic Framework for Working toward Zero Waste Societies Based on Perceptions Surveys. Recycling, 2(1), 1. <https://doi.org/10.3390/recycling2010001>
- Zaman, A., & Newman, P. (2021). Plastics: are they part of the zero-waste agenda or the toxic-waste agenda? Sustainable Earth, 4(1), 4. <https://doi.org/10.1186/s42055-021-00043-8>
- Zulkifli, N. S., & Manaf, L. A. (2024). Exploring the informal learning of zero waste lifestyle in Malaysia with big data analytics. Cleaner and Responsible Consumption, 12. <https://doi.org/https://doi.org/10.1016/j.clrc.2024.100182>



UNIVERSITI
TEKNOLOGI
MARA

Cawangan Perak

eISBN 978-629-94789-0-4



9 786299 478904

(online)