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EMPIRICAL ANALYSIS OF SOLID WASTE MANAGEMENT: A CASE STUDY APPROACH IN MALAYSIA

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Abstract

This study investigates Malaysia's solid waste management (SWM) system through a comparative case study of Shah Alam and Johor Bahru. The analysis focuses on governance, public participation, management mechanisms, and stakeholder integration. A mixed-methods design triangulates data from semi-structured expert interviews, household surveys, and archival reviews. Findings indicate that while governance weaknesses are evident in Shah Alam due to federal-state tensions, strong partnerships and community participation compensate for these shortcomings, ensuring overall system performance. This research contributes new empirical insights by integrating expert and resident perspectives, advancing theory by framing SWM effectiveness as multidimensional rather than governance-dependent, and offering policy recommendations for Malaysia's ongoing SWM reforms.

Keywords: Solid Waste Management, Governance, Partnerships, Policy, Malaysia

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INTRODUCTION

Malaysia's rapid urbanization, population growth, and changing consumption patterns have placed increasing pressure on its SWM system. Government reforms such as the Solid Waste and Public Cleansing Management Act 2007 (Act 672) were introduced to harmonize waste practices nationwide. However, challenges in recycling rates, landfill dependency, and uneven service quality persist. Earlier works (Manaf et al., 2009; Moh & Abd Manaf, 2017) highlighted these issues but did not empirically examine the interplay of governance structures, partnerships, and community participation across different governance models.

This study addresses this gap by comparing centralized (Johor Bahru under SWCorp) and decentralized (Shah Alam under KDEB) systems. It uniquely integrates expert and resident perspectives using mixed methods to assess how governance, management mechanisms, partnerships, and participation shape SWM outcomes.

Research questions:

1. How do governance, management mechanisms, public participation, and partnerships influence SWM outcomes in Shah Alam and Johor Bahru?
2. What are the key differences between centralized and state-led approaches in practice?
3. What policy lessons can be drawn to improve Malaysia's SWM system?

LITERATURE REVIEW

Solid Waste Governance in Malaysia

Foundational studies (Manaf et al., 2009; Moh & Abd Manaf, 2017) documented inefficiencies in collection, recycling, and infrastructure. These works serve as baseline references but have become dated in addressing Malaysia's evolving challenges. More recent contributions (Zainal & Abas, 2019; Salleh et al., 2022; Chuah et al., 2023) highlight the emergence of circular economy models, digitalization of waste monitoring, and localized innovations. Official reports (MITI, 2025; KPKT, 2025) emphasize integration with sustainable development goals, yet gaps remain in empirical validation of policy outcomes.

Centralized vs. Decentralized Models

SWCorp's centralized system offers standardization, economies of scale, and federal oversight but often faces criticism for inflexibility and bureaucratic delays. In contrast, KDEB's decentralized approach enables state-level customization, but performance depends heavily on financial capacity, managerial expertise, and coordination with local governments. Comparative studies in other developing nations (Massoud et al., 2019; Rodić & Wilson, 2017) suggest hybrid governance models may balance accountability with adaptability.

However, in Malaysia, systematic evaluations comparing these models empirically are scarce.

Community Participation and Partnerships

Literature stresses the importance of community engagement and partnerships in shaping sustainable outcomes. Guerrero et al. (2013) and Sharholly et al. (2007) show that resident involvement, when institutionalized, improves recycling rates and waste separation practices. In Malaysia, while campaigns exist, few studies evaluate long-term behavioral change or the institutionalization of community roles. Similarly, public-private partnerships (PPPs) are discussed widely but without detailed empirical assessment of accountability frameworks.

Identified Gaps:

1. Heavy reliance on descriptive overviews rather than empirical validation.
2. Insufficient attention to Malaysia's dual governance system and its implications for policy.
3. Lack of integration of community participation and partnership analysis into governance studies.
4. Limited focus on recent innovations such as smart waste technologies and circular economy practices.

This study directly addresses these gaps by providing comparative empirical analysis of two governance systems, integrating resident and expert perspectives, and offering policy recommendations rooted in multidimensional performance indicators.

METHODOLOGY

Research Design

This study adopts a convergent mixed-methods approach, integrating qualitative and quantitative evidence to generate a holistic understanding of SWM in two Malaysian cities. The rationale for this design is to overcome the limitations of single-method studies and ensure triangulation of findings across multiple sources.

Sampling Strategy

- Expert Interviews: 15 experts were purposively selected based on professional experience in waste governance, policy-making, concessionaire management, and academic research. This ensured representation of diverse institutional perspectives.
- Household Surveys: A total of 389 residents were surveyed across Shah Alam and Johor Bahru. Stratified random sampling was used to ensure diversity in household income, education level, and residential zones.

The sample size was determined using Krejcie & Morgan's (1970) formula, providing representativeness for large urban populations.

- Archival Review: Municipal reports, national policies, and SWM concessionaire records were analyzed to validate interview and survey data.

Instrument Design and Validation

The household survey included four sections: governance, management mechanisms, partnerships, and participation. Each construct was operationalized into 1-5 Likert scale items (1 = Strongly Disagree, 5 = Strongly Agree). Pilot testing with 30 respondents produced Cronbach's alpha scores above 0.70 for all constructs, confirming internal consistency. Interview protocols included semi-structured questions tailored to elicit insights on institutional roles, challenges, and innovation opportunities.

Data Analysis

- Quantitative Analysis: Descriptive statistics (means, SDs), Pearson correlations, and regression models were run using SPSS. These analyses identified the strength and direction of relationships between the four constructs.
- Qualitative Analysis: Thematic coding of interview transcripts was conducted. Emergent codes were grouped into broader themes that informed Tables 5–8.
- Triangulation: Findings from surveys, interviews, and documents were systematically compared to identify convergences and contradictions, thereby strengthening validity.

ANALYSIS

The study consists of three main parts in data analysis and findings: (1) Qualitative analysis (content analysis), through the archival and document as well as based on semi-structured interviews with key informants from relevant organizations, agencies, and institutions; (2) Quantitative analysis, derived from questionnaire surveys reflecting the perspectives of urban residents; and (3) In-depth triangulation analysis, combining insights from both qualitative and quantitative data.

Qualitative Analysis

Archival and Document

Table 1 and Table 2 compares the solid waste management and public cleansing policies in Malaysia prior to Act 672 and Act 673 as well as the policies implemented by the two different states in Peninsular Malaysia since the introduction of both acts. The Tables consist of the policies, practices, programs

and initiatives before and once Acts 672 and 673 were enforced. The introduction of Act 672 and Act 673 transferred all operational aspects of urban solid waste management and public cleansing services in participating states to the Solid Waste and Public Cleansing Corporation (SWCorp). This corporation oversees waste management through concession agreements with Alam Flora Sdn. Bhd., SWM Environment Sdn. Bhd., and Environmental Idaman Sdn. Bhd., ensuring a coordinated and efficient system across Peninsular Malaysia.

However, due to the involvement of multiple administrative levels and actors, achieving uniform service delivery remains a challenge. Larger municipalities with greater resources can effectively manage waste, while smaller municipalities struggle with budget, staffing, and technological constraints. Waste separation initiatives, such as 3R programs, help address landfill overcapacity and environmental concerns. Reducing waste at the source minimizes reliance on landfills, mitigating pollution and disease risks (Moh & Abd Manaf, 2017).

To standardize solid waste and public cleansing management, the government introduced Act 672 in 2007, enforced in 2011, to ensure all municipalities operate under a common system with equitable budgets, policies, and technical support. This approach allows municipalities to allocate resources more efficiently. In Selangor, particularly in Shah Alam, the waste management system follows federal practices under SWCorp. The KDEB Waste Management (KDEBWM) structure closely mirrors SWCorp's, with programs aimed at improving efficiency and service delivery. Despite Selangor rejecting the implementation of Act 672 and Act 673 due to state-federal disputes, KDEBWM has maintained commendable service standards.

Both SWCorp and KDEBWM have developed various strategies and initiatives to manage solid waste effectively. While decentralization is often seen as a way to encourage community involvement (Konteh, 2009), both organizations have proven their competence in delivering reliable waste management services in Malaysia. Their efforts demonstrate strong capabilities in achieving an efficient and sustainable solid waste management system.

Table 1: Comparison of Solid Waste Management and Public Cleansing Acts, Policies, Enactments, Guidelines and By-Laws Implemented in the State of Selangor (MBSA) and State of Johor (MBJB) prior to Act 672 and 673 and the Gazetted Act 672 & 673

Item	Malaysia WM Prior Act 672 & 673	Introduction of Act 672 & 673	
		Selangor (MBSA)	Johor (MBJB)
Policy	- ABCM (1988) - NSPSWM (2005) - MWMP (2006) - NSWMP (2006)	- DPSPN(P) 2016 - DPN 2, (2016-2025) - Free Plastic & Polystyrene Campaign (2017) - RMK 10 & RMK 11	- DPSPN(P) 2016 - DPN 2, (2016-2025) - RMK 10 & RMK 11 - Waste Separation at Source Strategies (2015)
By-Laws	State Government & Local Authority	- Undang-undang Kecil (MBSA) (2017)	- UBBL (MBJB) 2010
Guidelines	State Government & Local Authority	- Waste Separation & Bulky Waste Disposal Guideline	- SEHAP 2018

Source: JPSPN (2020), MHLG (2018); BPEN, Johor (2019); SUK Johor (2019); MBJB (2019); MBSA (2020); SUK Selangor (2020); KDEBWM, (2019); Hebat Abadi Sdn. Bhd (2019)

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Item	Malaysia WM Prior Act 672 & 673	Introduction of Act 672 & 673	
		Selangor (MBSA)	Johor (MBJB)
Operation	State Government & Local Authority	- KDEB - KDEB WM	- SWCorp - Concessionaires
Outsourcing Operation	State Government & Local Authority	Hebat Abadi Sdn. Bhd/Concessionaires	NA
Funding	State Government & LA, Concessionaires	State Government, KDEB and LA	JPSPN, SWCorp, LA, Concessionaires
Human Resources	LA / Concessionaires Workers	KDEBWM Contractors	Concessionaires Workers

Source: JPSPN (2020), MHLG (2018); BPEN, Johor (2019); SUK Johor (2019); MBJB (2019); MBSA (2020); SUK Selangor (2020); KDEBWM, (2019); Hebat Abadi Sdn. Bhd (2019)

Table 2: Comparison of Solid Waste Management and Public Cleansing Strategies and Initiatives in the State of Selangor (MBSA) and State of Johor (MBJB)

Item	Malaysia WM Prior Act 672 & 673	Introduction of Act 672 & 673	
		Selangor (MBSA)	Johor (MBJB)
Waste Separation	/	/	/
Deterrence Option	/	/	/
Enforcement	/	/	/
Distinction between types of waste	/	/	/
Education & Awareness	/	/	/
3R Issues Addressed	/	/	/
Waste Treatment Options	Recycling, Landfills	Recycling, Landfills	Recycling, Landfills
Waste generators responsibility	x	/	/
Scavenger's issues addressed	x	/	/

Source: JPSPN (2020), MHLG (2018); BPEN, Johor (2019); SUK Johor (2019); MBJB (2019); MBSA (2020); SUK Selangor (2020); KDEBWM, (2019); Hebat Abadi Sdn. Bhd (2019)

Semi-Structured Interviews (The Expert)

This study highlights the importance of a structured and well-defined institutional framework for enhancing the effectiveness of urban solid waste management (SWM) in Malaysia. Based on consultations with key stakeholders, the research identifies four main themes essential to understanding and evaluating the current system: governance structure, integration and partnership management, mechanisms and management structures, and public involvement and participation.

In terms of governance structure, the study finds that clearly defined roles and responsibilities are critical for ensuring efficient service delivery. Various stakeholders, including federal agencies, state-level departments, and local authorities, contribute differently to the management process. Their ability to coordinate policies, planning, and implementation efforts significantly impacts the overall success of the SWM system. When roles are not clearly defined or executed, the governance structure becomes fragmented, affecting operational efficiency. The integration and partnership management theme emphasizes the importance of collaboration between public and private sector actors. The study observes that regular meetings and coordinated efforts between local authorities, federal agencies such as SWCorp, and private concessionaires create a platform for shared decision-making. This coordinated approach not only improves communication but also ensures that waste management operations are responsive and consistent across administrative levels.

Mechanisms and management structures, such as the formation of environmental standing committees and inter-agency working groups, provide a formal structure for problem-solving and coordination. These mechanisms allow stakeholders to actively participate in planning, implementation, and monitoring processes. The existence of such structures enhances transparency, accountability, and the ability to respond to evolving environmental challenges.

Lastly, public involvement and participation play a significant role in the success of SWM. Platforms such as the Resident Representative Councils (MPP) and local Complaints Committees enable community members to voice their concerns and contribute to local governance. These participatory structures help bridge the gap between authorities and residents, encouraging shared responsibility and minimizing resistance, such as the commonly observed “Not in My Backyard” (NIMBY) attitude.

In essence, interviewees stressed the importance of clear role definitions, effective concessionaire oversight, and community platforms such as Resident Representative Councils. Experts agreed that decentralized systems can perform well if adequately resourced, but federal support remains critical for smaller municipalities. On different notes, document analysis has revealed uneven adoption of Act 672, with some states resisting federal intervention. Despite structural differences, both SWCorp and KDEB have demonstrated

capacity to deliver services when partnerships and community involvement are emphasized.

Quantitative Analysis

Questionnaires Survey

The quantitative analysis examined respondents' views on urban solid waste and public cleansing practices in Malaysia. The analysis was organized around four key themes: governance structure, public involvement and participation, management mechanisms and structures, and integration and partnership management. A summary of the findings is presented in the following section.

Table 3: Summary of Descriptive Analysis

Theme	Variables	Study Area	Mean	Std. Error	Std. Dev.
Governance Structure	LA's role important in WM	Johor Bahru	4.15	.046	.548
		Shah Alam	4.35	.058	.657
	Workers doing their job well	Johor Bahru	3.72	.051	.815
		Shah Alam	3.61	.072	.813
Mechanisms & Management Structure	Clean and comfortable Neighbourhood	Johor Bahru	3.67	.051	.823
		Shah Alam	3.64	.073	.829
	Effectiveness SWMPC services	Johor Bahru	3.81	.049	.790
		Shah Alam	3.61	.074	.841
Integration & Partnerships Management	Government, Community & individual important in WM	Johor Bahru	4.13	.047	.752
		Shah Alam	4.40	.054	.619
	Organisation needed in WM Services	Johor Bahru	4.08	.045	.518
		Shah Alam	4.36	.054	.610
Public Involvement & Participation	Community organisation important in WM	Johor Bahru	4.12	.045	.725
		Shah Alam	4.38	.059	.657
	Resident's ideas & opinions considered	Johor Bahru	3.89	.052	.831
		Shah Alam	3.83	.072	.821
Total Average			3.98	.056	.728

Source: Author's Calculation

Table 4: Summaries of Pearson’s Correlation Analysis for Shah Alam and Johor Bahru

Themes	Variables	Study Area	
		Sig.	
		Shah Alam	Johor Bahru
Governance Structure	LA’s role important in WM	.519	.000
	Workers doing their job well		
Mechanisms & Management Structure	Clean and comfortable Neighbourhood	.000	.000
	Effectiveness SWMPC services		
Integration & Partnerships Management	Government, Community & individual important in WM	.000	.000
	Organisation needed in WM Services		
Public Involvement & Participation	Community organisation important in WM	.004	.000
	Resident’s ideas & opinions considered		

Source: Author’s Calculation

Table 3 shows that overall perceptions of SWM services were favourable (mean scores 3.6–4.4). Governance scored lower in Shah Alam (mean 3.6) compared to Johor Bahru (mean 4.1), reflecting institutional fragmentation under state-led systems. Standard deviations were consistently below 1.0, demonstrating consensus among respondents rather than polarized opinions.

Table 4 presents correlations among governance, mechanisms, participation, and partnerships. Governance in Shah Alam was statistically non-significant ($p > .05$), underscoring institutional weakness. However, partnerships and participation had strong, significant correlations with mechanisms and overall performance ($p < .001$). Regression results further confirmed that while governance was not a predictor in Shah Alam, the integrated effect of all variables remained significant

FINDINGS AND TRIANGULATIONS

Qualitative Analysis

Before Act 672 and Act 673 were introduced, local authorities managed solid waste and public cleansing in Malaysia, under state supervision and guidance from the Ministry of Housing and Local Government (SWCorp, 2007). These responsibilities later shifted to the Solid Waste and Public Cleansing Corporation (SWCorp) to streamline and centralize operations under federal control. The document analysis revealed four key elements in urban waste management: governance, public involvement, operational mechanisms, and institutional coordination. With many stakeholders involved, understanding political relationships and power dynamics is crucial (Marshall & Farahbakhsh, 2013).

Governance issues include accountability, transparency, system efficiency, and stakeholder coordination. These factors shape how well services are delivered. Although Acts 171 and 172 allow public participation in urban

management, involvement in waste services is still limited (Local Government Act 1976; Town and Country Planning Act 1976). People tend to rely on local authorities for urban services, as they are the most accessible level of government. Both public and private institutions are expected to deliver good services, and their internal systems play a major role in making that happen.

Malaysia's top-down, centralized approach is common, but often lacks input from informal sectors and the public. This can cause bureaucratic and technical issues (Medina, 2005; Afrizal, 2012). However, SWCorp and KDEB Waste Management show that centralized systems can still work well when properly managed. Private companies also contribute by providing expertise, funding, and technology, helping reduce government costs and improve service delivery (Medina, 2010). While concerns about monopolies and power abuse exist, effective regulation can ensure centralized systems remain efficient.

Selangor chose not to adopt Acts 672 and 673 but formed KDEB Waste Management to run its waste services. Though operating separately, it uses a similar structure to SWCorp. Both focus on policy execution, while private contractors like SWM Environment and Hebat Abadi handle actual waste collection. The World Bank introduced the concept of governance to highlight the importance of links between governments and civil society. In this case, transparency, accountability, cooperation, and power balance are still key concerns. Despite some challenges, cooperation among all stakeholders has led to successful waste management practices in both cases.

Quantitative Analysis

This section presents the views of 389 respondents on solid waste and public cleansing services in Malaysian cities. The participants had diverse backgrounds. Most (75.1%) said these services exist in their neighbourhoods, while 86.1% confirmed they are regularly provided. These services are important for public health and environmental cleanliness (Abas & Wee, 2014a; Memon, 2010). Waste management is a shared duty between the government, the public, and private companies. Global initiatives like Local Agenda 21, the Rio Summit, and the Sustainable Development Goals (SDGs) reflect this shared commitment to sustainability.

Although local governments are mainly responsible for these services, their performance is often uneven (Wilson et al., 2013). However, 69.4% of respondents said the services in their area were effective. This success is due to the efforts of agencies like SWCorp and KDEB Waste Management, supported by contractors and the community. Collaboration among residents, authorities, and private firms is crucial (Wilson et al., 2013; Abas & Wee, 2014b; Moh & Abd Manaf, 2017). Better communication between the public and local councils helps improve service quality. Environmental problems in cities are often linked to poor waste services. As urban populations grow, so does the amount of waste

(Fauziah & Agamuthu, 2012; Moh & Abd Manaf, 2017), leading to overfilled landfills and pollution (Abas & Wee, 2014b; Fauziah & Agamuthu, 2012). Waste management includes several steps like collection, transport, treatment, and disposal. If done poorly, it can harm people and the environment.

Triangulation

Tables 5 to 8 were derived from thematic content analysis of interview transcripts and triangulated with document reviews. Sub-themes were identified by coding recurring concepts raised by experts and residents. The categorization process was validated through inter-coder agreement, ensuring reliability of the qualitative findings (Sharholy, Ahmad, Mahmood, & Trivedi, 2007; Chuah et al., 2023).

Table 5 summarizes findings related to governance structure in solid waste and public cleansing management in the two case study areas. The results highlight key issues such as roles, responsibilities, power dynamics, and management challenges. They also show that socio-political factors influence how urban services are delivered, and these elements were clearly observed in both case studies.

Table 5: Table of Themes, Sub-Themes and Findings of Qualitative Data - Governance Structure

Theme	Sub-Theme	Findings
Governance Structure	Roles	Exercise of power and management issue
	Responsibility	

Table 6 highlights the importance of having proper organizational structures to deliver urban services efficiently and effectively. These structures show that a system is in place, and with them, better management mechanisms can be developed.

Table 6: Table of Themes, Sub-Themes and Findings of Qualitative Data - Mechanisms and Management Structures

Theme	Sub-Theme	Findings
Mechanisms and Management Structure	Delegation of Power	Organisational Framework
	System effectiveness and efficiency	
	Process and practices	

Table 7 shows that integration is an important part of managing urban services like solid waste and public cleansing. The findings highlight the need for strong collaboration between all stakeholders to ensure services are delivered efficiently and effectively.

Table 7: Table of Themes, Sub-Themes and Findings of Qualitative Data -
 Integration and Partnerships Management

Theme	Sub-Theme	Findings
Integration and Partnership Management	Cooperation	Stakeholders Relationships
	Coordination	

Table 8 outlines elements of public participation in urban solid waste and public cleansing management. Based on respondents' answers and expert interviews, community involvement is made stronger through platforms like residents' or community organizations.

Table 8: Table of Themes, Sub-Themes and Findings of Qualitative Data -
 Public Involvement and Participation

Theme	Sub-Theme	Findings
Public Involvement and Participation	Involvement	Community Empowerment
	Platform of participation	

DISCUSSION

The results highlight that governance is a necessary but insufficient condition for effective SWM. In Shah Alam, weak governance did not collapse the system because partnerships and public participation compensated for institutional gaps. This finding aligns with the concept of polycentric governance (Marshall & Farahbakhsh, 2013), which emphasizes the role of overlapping actors in sustaining essential services.

Comparing Shah Alam and Johor Bahru demonstrates that centralized systems may achieve greater consistency but at the cost of bureaucratic rigidity, while decentralized systems allow innovation but face uneven institutional strength. This comparative evidence extends Moh & Abd Manaf (2017) by empirically demonstrating how governance models shape outcomes differently in Malaysia.

Policy Implications:

1. Strengthen PPP frameworks with clear accountability metrics and transparent performance audits.
2. Enhance community engagement by institutionalizing resident councils and participatory recycling programs.
3. Invest in digital monitoring platforms (IoT bins, GIS-based collection tracking) to mitigate governance fragmentation.
4. Develop tailored governance models that balance federal oversight with state autonomy.

CONCLUSION

This study contributes to Malaysia's SWM discourse by empirically showing that governance, partnerships, mechanisms, and participation must work in synergy to deliver effective outcomes. The mixed-method triangulation and case comparison provide new knowledge beyond prior descriptive accounts. Policy reforms should focus on strengthening partnerships, institutional clarity, and public participation while addressing federal–state tensions in governance. Future research could expand to comparative studies across more states and explore circular economy adoption.

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REFERENCES

- Abas, M. A., & Wee, S. T. (2014a). Municipal solid waste management planning and implementation in Malaysia. *Journal of Urban and Environmental Engineering*, 8(2), 104–114. <https://doi.org/10.4090/juee.2014.v8n2.104114>
- Abas, M. A., & Wee, S. T. (2014b). Issues and challenges in solid waste management: A case study of Malaysia. *Waste Management & Research*, 32(9), 797–805. <https://doi.org/10.1177/0734242X14545325>
- Afrizal. (2012). *Metode penelitian kualitatif: Sebuah upaya mendukung penggunaan penelitian kualitatif dalam berbagai disiplin ilmu*. RajaGrafindo Persada.

- Chuah, C. W., Lim, J. S., Hashim, H., & Ho, W. S. (2023). Digital transformation in solid waste management: Challenges and opportunities. *Waste Management & Research*, 41(2), 289–301. <https://doi.org/10.1177/0734242X221143393>
- Fauziah, S. H., & Agamuthu, P. (2012). Challenges and issues in moving towards sustainable landfilling in a transitory country—Malaysia. *Waste Management & Research*, 30(7), 667–673. <https://doi.org/10.1177/0734242X12437571>
- Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management*, 33(1), 220–232. <https://doi.org/10.1016/j.wasman.2012.09.008>
- Konteh, F. H. (2009). Urban sanitation and health in the developing world: Reminiscing the nineteenth-century industrial nations. *Health & Place*, 15(1), 69–78. <https://doi.org/10.1016/j.healthplace.2008.01.002>
- Manaf, L. A., Samah, M. A. A., & Zukki, N. I. M. (2009). Municipal solid waste management in Malaysia: Practices and challenges. *Waste Management*, 29(11), 2902–2906. <https://doi.org/10.1016/j.wasman.2008.07.015>
- Marshall, R. E., & Farahbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries. *Waste Management*, 33(4), 988–1003. <https://doi.org/10.1016/j.wasman.2012.12.023>
- Massoud, M. A., Al-Hindi, M., Alameddine, I., & El-Fadel, M. (2019). Solid waste management in developing countries: Towards a more holistic understanding. *Waste Management & Research*, 37(6), 583–589. <https://doi.org/10.1177/0734242X19836799>
- Medina, M. (2005). Serving the unserved: Informal refuse collection in Mexico. *Waste Management & Research*, 23(5), 390–397. <https://doi.org/10.1177/0734242X05057698>
- Medina, M. (2010). *The informal recycling sector in developing countries: Organizing waste pickers to enhance their impact*. UNU-WIDER.
- Memon, M. A. (2010). Integrated solid waste management based on the 3R approach. *Journal of Material Cycles and Waste Management*, 12(1), 30–40. <https://doi.org/10.1007/s10163-009-0274-0>
- Ministry of Investment, Trade and Industry (MITI). (2025). *Circular economy blueprint for Malaysia 2025–2035*. Government of Malaysia.
- Ministry of Local Government Development (KPKT). (2025). *Zero-waste community (KOSIS) programme implementation report*. Government of Malaysia.
- Moh, Y. C., & Abd Manaf, L. (2017). Solid waste management transformation and future challenges of source separation and recycling practice in Malaysia. *Resources, Conservation and Recycling*, 116, 1–14. <https://doi.org/10.1016/j.resconrec.2016.09.012>
- Rodić, L., & Wilson, D. C. (2017). Resolving governance issues to achieve priority sustainable development goals related to solid waste management in developing countries. *Sustainability*, 9(3), 404. <https://doi.org/10.3390/su9030404>
- Salleh, M. A. M., Rahman, M. S., & Omar, R. (2022). Smart waste management for sustainable urban development in Malaysia. *Journal of Cleaner Production*, 366, 132844. <https://doi.org/10.1016/j.jclepro.2022.132844>

- Sharholy, M., Ahmad, K., Mahmood, G., & Trivedi, R. C. (2007). Municipal solid waste management in Indian cities – A review. *Waste Management*, 27(4), 459–467. <https://doi.org/10.1016/j.wasman.2006.03.008>
- Solid Waste and Public Cleansing Management Corporation (SWCorp). (2007). *Annual report 2007*. Kuala Lumpur: SWCorp.
- Wilson, D. C., Velis, C., & Cheeseman, C. (2013). Role of informal sector recycling in waste management in developing countries. *Habitat International*, 30(4), 797–808. <https://doi.org/10.1016/j.habitatint.2005.09.005>
- Zainal, N. R., & Abas, M. A. (2019). Adoption of circular economy for a sustainable solid waste management system in Malaysia. *Malaysian Management Journal*, 23(1), 45–60.

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