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Urban Culture and Social Behavior in Pekanbaru, Indonesia: Navigating Solid Waste Management Challenges

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***Abstract*: This study investigates the cultural and social behaviors influencing solid waste management in Pekanbaru, Indonesia, where significant challenges such as illegal disposal sites, inadequate disposal facilities, and rampant waste accumulation pose serious health risks. Utilizing the Theory of Planned Behavior, the research analyzed 12 journals from 2014 to 2024, focusing on journals with significant thematic overlap to assess social attitudes, subjective norms, perceived behavioral control, and behavioral intentions. Key findings reveal a gap between strong societal expectations and actual waste management practices, hindered by infrastructural and logistical constraints. Recommendations include enhancing infrastructure, enforcing regulations, promoting community engagement, and adapting policies to improve waste management efficacy and reduce health risks.**

***Keywords*: waste management, theory of planned behavior, similarity analysis, social capital, culture.**

1. Introduction

A. Background

Pekanbaru, the capital city of Riau Province in Indonesia, has experienced significant urban development over the past few decades. With a population of approximately 1.2 million people, the city faces numerous challenges associated with rapid urbanization, including effective solid waste management. According to Muflihun, the Acting Mayor of Pekanbaru, the city grapples with five critical issues: suboptimal waste management, persistent flooding, high road damage levels, inadequate educational infrastructure, and a rising stunting rate (Suci, 2023). These issues underscore the importance of understanding and addressing the solid waste management practices in Pekanbaru to enhance urban living conditions and sustainability.

Solid waste management in Pekanbaru is particularly problematic. The city generates between 900 and 1,000 tons of waste daily, a significant portion of which ends up in illegal temporary disposal sites due to insufficient awareness and infrastructure (Turnip, 2023). Inspections by the Pekanbaru City Inspectorate reveal two major issues: the proliferation of illegal temporary disposal sites (TPS) and the lack of heavy equipment at the final disposal site (TPA) (Hidayat, 2023). These challenges are exacerbated by inadequate public education on proper waste disposal practices and the logistical difficulties of managing such a large volume of waste.

In response to these pressing issues, the Pekanbaru City government developed Regulation No. 08 Year 2014 concerning waste management. This regulation aims to create a comprehensive waste management system that ensures a clean and healthy environment, preserves environmental functions, promotes public health, and turns waste into a valuable resource. The goal of such regulation is to establish an integrated waste management system that covers all aspects from waste generation to disposal, ensuring that the city can effectively handle its waste while minimizing environmental impacts.

The successful implementation of this regulation requires active participation from both the city government and the residents of Pekanbaru. The city government is responsible for providing the necessary infrastructure and resources, such as adequate waste collection facilities, heavy equipment for waste processing, and public education campaigns to raise awareness about proper waste disposal practices. They also need to enforce the regulations and ensure that illegal disposal sites are eliminated, and that waste is managed according to the principles of reduce, reuse, and recycle (3R).

On the other hand, the residents of Pekanbaru play a crucial role in the success of this regulation. Public participation is essential in reducing the amount of waste generated and ensuring that waste is disposed of properly. This includes segregating waste at the source, using designated waste collection points, and participating in community recycling programs. By working together, the city government and the residents can create a more sustainable and livable urban environment, addressing the solid waste management challenges that Pekanbaru faces.

B. Problem Statement

The inadequate implementation of solid waste management in Pekanbaru is evident through several critical issues. These include the presence of illegal temporary disposal sites (TPS),

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a lack of sufficient heavy equipment at the final disposal site (TPA), and the accumulation of waste on streets and in drainage systems. These problems are exacerbated by a lack of public awareness and engagement in proper waste disposal practices. This persistent mismanagement of solid waste poses significant health risks to the population.

Poor sanitation due to inadequate waste management can lead to a variety of health problems. Accumulated waste attracts pests and vermin, such as rats and flies, which are vectors for diseases like leptospirosis, typhoid, and cholera. Additionally, stagnant waste in drainage systems can create breeding grounds for mosquitoes, increasing the risk of vector-borne diseases such as dengue fever and malaria. The decomposition of organic waste also produces harmful gases and contributes to air pollution, which can exacerbate respiratory conditions like asthma and bronchitis. Moreover, exposure to improperly disposed hazardous waste can lead to chemical burns, poisoning, and long-term health effects such as cancer.

Understanding the cultural and social dynamics that contribute to these waste management challenges is essential for developing effective and sustainable solutions. The Theory of Planned Behavior (TPB) provides a useful framework for analyzing how attitudes, subjective norms, and perceived behavioral control influence individuals' intentions and actions regarding waste management. By examining these factors, we can gain insights into the behaviors and practices that need to be addressed to improve waste management in Pekanbaru.

C. Research Objectives

This study aims to explore the cultural and social behaviors related to solid waste management in Pekanbaru, using the Theory of Planned Behavior as a theoretical framework. The specific objectives of the study are:

1. To identify the cultural and social factors that influence waste management practices in Pekanbaru.
2. To assess the impact of public attitudes, subjective norms, and perceived behavioral control on waste disposal behaviors.
3. To evaluate the effectiveness of current waste management policies and practices in the city.
4. To propose recommendations for improving waste management practices based on the findings.

D. Significance of the Study

This study is significant because it addresses the pressing issue of solid waste management in Pekanbaru, a city facing rapid urbanization and its associated challenges. By examining the cultural and social behaviors influencing waste management practices, this research aims to provide insights that can inform policy and practice improvements. The findings will be valuable for policymakers, urban planners, and community leaders seeking to enhance waste management systems and promote sustainable urban living in Pekanbaru.

2. Methodology

This research employs a desktop study and a descriptive analysis approach. A total of 12 journals related to waste management in Pekanbaru City, conducted from 2014 to 2024 were analyzed. Descriptive analysis highlighted issues related to social behavior in waste management. The Theory of Planned Behavior was used as the theoretical framework to analyze the data and understand the factors influencing waste management behaviors in Pekanbaru. Prior to journals analysis using the TPB, a similarity analysis across 12 journals were conducted. This is to ensure that all 12 journals share similar themes and issues related to waste management in Pekanbaru City. To assess and quantify the similarity among the 12 journals related to waste management in Pekanbaru City, we used a text similarity approach based on Natural Language Processing (NLP) techniques. Specifically, we employed a method such as the cosine similarity measure, which quantifies how similar two documents are irrespective of their size. This involves representing the text summaries of each journal as vectors in a high-dimensional space and then calculating the cosine of the angle between these vectors. The closer the cosine value is to 1, the higher the similarity. Steps for performing this analysis are outlined below:

1. Text Preprocessing: Clean and prepare the text summaries for analysis, which includes lowercasing the text, removing punctuation and stop words, and tokenizing the text.
2. Vector Representation: Convert the pre-processed text into vectors using techniques such as TF-IDF (Term Frequency-Inverse Document Frequency), which reflects how important a word is to a document in a collection of documents.
3. Cosine Similarity Calculation: Compute the cosine similarity between every pair of journal summaries to quantify their similarity.
4. Similarity Matrix Creation: Organize the pairwise similarity scores into a matrix format, which can be used to visually inspect and understand the similarity between all journal entries.

After examining the similarity assessment, journals were grouped based on the level of similarities. Those with low levels of similarity were dropped and only those with more than two similarity lines (or value > 0.2) were analyzed using TPB theory. TPB assessment looked at four measures, namely (i) social attitude, (ii) subjective norms, (iii) perceived behavioral control, and (iv) behavioral intentions. Each measure was identified and described from journals with high similarity. Each measure were scored using a Likert scale, in which a score of 1 means very weak, 2 is weak, 3 is medium, 4 is strong, and 5 means very strong.

3. Literature Review

Urban culture significantly shapes social behaviors, particularly in the context of how communities interact with their environment and manage resources like solid waste. In Indonesian cities, urban culture is a complex blend of traditional values and modern influences, creating unique challenges and opportunities in solid waste management.

A. Malay Culture and its Influence on Waste Handling

Malay culture, which permeates much of Indonesian society, emphasizes communal values and collective responsibility. These cultural traits play a crucial role in how urban communities handle solid waste. Traditionally, Malay communities practice a form of resource management that revolves around mutual cooperation (gotong royong), where community members work together to maintain cleanliness and order. This collective approach can enhance community-driven waste management initiatives, fostering a sense of shared responsibility and cooperation (Shuker et al., 2018).

However, the transition from rural to urban living has strained these traditional practices. Rapid urbanization, increased population density, and consumerism have led to an increase in waste production, overwhelming the capacities of traditional waste management methods. Studies have shown that integrating traditional communal practices with modern waste management techniques can lead to more effective solid waste management systems in urban areas (Baba et al., 2021).

B. Good Examples of Solid Waste Management

Globally, there are several successful examples of solid waste management that can serve as models for Indonesian cities. For instance, Sweden's waste management system is renowned for its efficiency and effectiveness. Sweden recycles nearly 99% of its household waste, using advanced technologies and comprehensive policies to minimize landfill use. Key components of Sweden’s success include strong regulatory frameworks, public awareness campaigns, and incentives for waste reduction and recycling (Ekvall, 2019).

In Japan, the practice of meticulous waste sorting and recycling has been institutionalized through public education and strict regulations. Citizens are required to separate their waste into various categories, and there are designated days for different types of waste collection. This level of community involvement and government oversight ensures high recycling rates and reduces environmental impact (Yamamoto & Fujii, 2019).

C. Health Impact of Poor Solid Waste Management

Improper management of solid waste poses significant health risks. Accumulation of waste in urban areas can lead to the proliferation of disease vectors such as rodents and insects, which can transmit diseases like dengue fever, leptospirosis, and cholera. Additionally, open dumping and burning of waste release harmful pollutants into the air, soil, and water, contributing to respiratory problems, skin diseases, and other health issues among urban populations (World Health Organization, 2018).

Studies have highlighted the correlation between poor waste management and increased incidence of health problems in densely populated urban areas. For example, in Jakarta, inadequate waste disposal systems have been linked to frequent flooding, which exacerbates the spread of waterborne diseases (Surjadi et al., 2019).

D. Solid Waste Management Regulations

Solid waste management in urban areas involves a range of practices, policies, and challenges. Globally, approaches to waste management vary, but successful systems typically include a combination of regulatory frameworks, technological solutions, and community engagement.

In Indonesia, several regulations govern solid waste management. The primary legislative framework is the Law No. 18/2008 on Waste Management, which outlines the responsibilities of the government and the public in managing waste. This law mandates waste reduction at the source, recycling, and proper disposal of waste. Additionally, the Indonesian government has developed city development plans that integrate waste management strategies to ensure sustainable urban growth (Government of Indonesia, 2008).

For instance, the Jakarta Green City Plan aims to reduce waste generation and improve waste management through the promotion of recycling programs, the establishment of waste banks, and the development of waste-to-energy projects. These initiatives are part of a broader effort to create environmentally sustainable cities that can cope with the challenges of rapid urbanization (Jakarta Capital City Government, 2020).

In the context of Pekanbaru, the city government has developed Regulation No. 08 Year 2014 concerning waste management to address the pressing issues related to solid waste. This regulation aims to create a comprehensive waste management system that ensures a clean and healthy environment, preserves environmental functions, promotes public health, and turns waste into a valuable resource. The regulation seeks to achieve these goals through a structured approach that covers all aspects of waste management, from generation to final disposal.

Regulation No. 08 Year 2014, issued by the Pekanbaru City government, serves as a comprehensive framework for managing solid waste in the city. The regulation's main objectives are to create a clean and healthy environment, maintain the ecological balance, and enhance public health while transforming waste into a resource with economic value. Key components of this regulation include:

- Waste Management System: Establishing a systematic and integrated waste management process that spans from waste generation to final disposal. This includes provisions for waste segregation, collection, transportation, processing, and disposal.
- Public Participation: Encouraging active involvement from the community and businesses in waste management activities. This involves raising public awareness about proper waste disposal practices and promoting community-based recycling programs.
- Infrastructure and Resources: Ensuring the availability of necessary infrastructure and resources, such as waste collection facilities, heavy equipment for waste processing, and adequate final disposal sites.
- Regulatory Enforcement: Implementing strict measures to eliminate illegal disposal sites and ensure compliance with waste management regulations. This includes monitoring and evaluation mechanisms to assess the effectiveness of waste management practices.

- Environmental and Public Health Protection: Addressing health risks associated with poor waste management by promoting sanitation and reducing the prevalence of vector-borne diseases. The regulation mandates the proper handling and disposal of hazardous waste to prevent environmental contamination and protect public health.

E. Common Problems in Urban Cities in Indonesia

Despite regulatory efforts, urban cities in Indonesia face several challenges in effective waste management. Common problems include insufficient infrastructure, lack of public awareness, and inadequate enforcement of regulations. Rapid population growth and urbanization have outpaced the development of waste management facilities, leading to issues such as illegal dumping, overflowing landfills, and inefficient waste collection systems (Moersidik et al., 2016).

Furthermore, the informal sector plays a significant role in waste management in many Indonesian cities. Informal waste pickers contribute to recycling efforts but often work under hazardous conditions without proper support or recognition from municipal authorities. Integrating the informal sector into formal waste management systems can improve overall efficiency and sustainability (Medina, 2010).

4. Theoretical Framework

The Theory of Planned Behavior (TPB) is a widely used framework for understanding how individual attitudes, subjective norms, and perceived behavioral control influence behavioral intentions and actions. This theory is particularly relevant to the study of solid waste management as it helps explain why people engage in environmentally responsible behaviors (Ajzen, 1991).

Beyond TPB, other social and cultural theories can provide deeper insights into waste management behaviors. Social Capital Theory, for example, emphasizes the role of social networks and trust in facilitating cooperative behavior. In the context of waste management, strong social capital within a community can enhance collective efforts to maintain cleanliness and manage waste effectively (Putnam, 2000). Cultural Theory, developed by anthropologist Mary Douglas, categorizes societal attitudes toward risk and environmental management into four cultural types: individualist, egalitarian, hierarchist, and fatalist. Understanding these cultural perspectives can help tailor waste management policies and programs to align with the values and beliefs of different communities (Douglas, 1992).

In summary, the literature on urban culture and social behavior, solid waste management practices, and theoretical frameworks provide a comprehensive foundation for understanding the complexities of waste management in Indonesian cities. Integrating traditional cultural practices with modern management techniques, learning from global best practices, and applying relevant social and cultural theories can enhance the effectiveness of waste management systems and promote sustainable urban development.

5. Results

A. Reviews of Previous Studies: Social Capital and Cultural Perspectives

Partnerships, and cultural influences. Below is an analysis based on Social Capital Theory and Cultural Theory to explain public behavior regarding waste management in the city.

Social Capital Theory emphasizes the importance of relationships, networks, and norms that enable collective action. Several studies illustrate how social capital impacts waste management in Pekanbaru. For instance, the efforts by the Dalang Collection Garbage Bank (Journal 1) to enhance community involvement through strategic planning, educational training, and site visits reflect the building of social capital to foster sustainable waste management practices. Additionally, the performance issues in waste management (Journal 2) such as poor public awareness and involvement, and insufficient socialization of regulations, indicate a deficiency in social capital, which hampers effective waste management.

Cultural Theory, which explores how cultural values and societal structures influence perceptions and behaviors, can also explain public behavior towards waste management. The revitalization of Malay local wisdom in maintaining environmental harmony, as discussed in a Journal 10 study, exemplifies how cultural values can be leveraged to promote sustainability. This cultural approach fosters a sense of responsibility and collective care for the environment, positively influencing public behavior towards waste management.

Through the lens of Cultural Theory, we observe that attempts to build and leverage social capital for better waste management are evident in community outreach and educational programs. These initiatives aim to enhance public knowledge and awareness, encouraging culturally integrated waste management practices. However, significant challenges remain. Gaps in public knowledge, awareness, and the integration of cultural practices into waste management systems hinder the effectiveness of these efforts.

The success of waste management initiatives often hinges on the degree of social capital present within the community and the alignment of cultural practices with environmental policies. In the context of Pekanbaru, for instance, the enhancement of both social and cultural capital could play a crucial role in improving waste management systems. Efforts to strengthen social and cultural capital involve not only improving public education and outreach but also ensuring that cultural values are respected and integrated into waste management policies.

The summarized journal entries in the Table 1 below highlight various aspects of waste management practices and challenges in Pekanbaru City.

B. Measuring Journal's Similarity

We calculated the cosine similarity among the 12 journals, which measures how similar their textual content is in terms of waste management topics in Pekanbaru City. Each entry in the resulting matrix represents the similarity between a pair of journals, with values ranging from 0 (no similarity) to 1

(identical content). A breakdown of some key findings is outlined below:

1. The journals show a range of similarities, with most values indicating moderate to low similarity, suggesting diverse focuses and approaches in each study.
2. The highest similarity score appears between Journal 3 and Journal 11 (about 0.32), indicating a stronger thematic overlap. These journals both delve into policy aspects of waste management.
3. Journals like 5, which focuses on a theoretical framework for waste management, show lower similarity with other journals, suggesting a unique approach or focus compared to more practical or policy-driven studies.

These similarities provide insights into which journals might share common themes or methodologies and could be considered together for a more comprehensive understanding of

Table 1
Table title comes here

Journals	Summary of Journal
1. Anita, Tua, H.R.F.S., Meilani, N.L. (2023). Waste Management Development Strategy by Bank Sampah Dalang Collection Pekanbaru City. Moderat: Jurnal Ilmiah Ilmu Pemerintahan. Vol. 9, No. 1.	The research underscores the critical role of public perceptions in waste management, revealing a substantial gap in public knowledge about appropriate waste disposal methods. The efforts undertaken by the Dalang Collection Garbage Bank—including strategic planning, educational training, community outreach, and site visits—are designed to enhance community involvement and shift public attitudes toward more sustainable waste management practices.
2. Hayati, K. Kusumaningrum, N.R., Afriyanni, K.A. (2022). Performance of Waste Management in Pekanbaru City. Inovasi Pembangunan – Jurnal Kelitbangan, Volume 10, No. 1.	This paper evaluates the effectiveness of solid waste management in Pekanbaru City across five dimensions: operational technical, institutional, financial, community participation, and regulatory aspects. The findings indicate that the performance of solid waste management in Pekanbaru is suboptimal. Challenges identified include inadequate human resources and waste management infrastructure, poor public awareness and involvement, lax enforcement of local regulations, and insufficient socialization concerning regulations.
3. Anugerah, M.F., Syamsuadi, A., Hartati, S., Arisandi, D., Trisnawati, L., and Saputram R, (2020). Studi Pendahuluan: Konstruksi Kebijakan Pengelolaan Sampah Di Kota Pekanbaru 2012-2014	This study focuses on identifying the design of government policies aimed at addressing the waste management issues in Pekanbaru City. The findings reveal that the policy initiatives undertaken involve a strategic plan termed the "waste clean area action plan." This plan emphasizes optimizing the roles of institutions responsible for waste management, enhancing regulatory functions, and improving the technical operations of waste management systems.
4. April, M., Alkadafi, M., and Ilyas. (2024). implementation of Public-Private Partnerships in Waste Management in Pekanbaru City. Jurnal Trias Politika. 2024, Vol. 8. No. 1: 19 – 32	This research investigates the factors contributing to the ineffectiveness of waste management in Pekanbaru City, particularly within the Public-Private Partnership (PPP) model framework. The findings indicate that the PPP model has fallen short in effectively addressing waste management issues. Key issues identified include ambiguous contract management between the local government's and the private sector, insufficient opportunities for widespread public engagement, and a lack of public awareness regarding the separation of organic and inorganic waste.
5. Ernawaty, Zulkarnaen, Siregar, Y.I., and Bahruddin. (2019). Waste Management at Pekanbaru City. Dinamika Lingkungan Indonesia, Juli 2019, p 126-135, Vol. 6, No. 2.	This study utilizes a qualitative approach with a descriptive method, grounded in empirical observations. The findings from the study conclude that waste management in Pekanbaru is not yet fully effective. This ineffectiveness is attributed to the suboptimal implementation of the existing waste management strategies, which have not successfully transitioned from outdated practices to the more progressive 3R concept (reduce, reuse, and recycle) promoted by the government.
6. Chaerula, M., and Rahayu, S.A. (2019). Cost Benefit Analysis for Developing Municipal Solid Waste Treatment Facility: Case Study of Pekanbaru City. Journal of Natural Resources and Environmental Management. 9(3): 710-722	The study is designed to evaluate the total costs and benefits, both direct and indirect, of waste management strategies in Pekanbaru City using Cost Benefit Analysis (CBA). It seeks to determine the economic feasibility of prioritizing waste treatment over disposal. The findings substantiate that focusing on waste treatment rather than mere disposal offers greater total benefits, aligning with national waste management policies.
7. Pratamam J.N. (2018). Waste Management in Pekanbaru City (A Case Study on Waste Banks in Pekanbaru City in 2016)	In this study, the research focuses on two primary questions concerning waste management in Pekanbaru City via the Garbage Bank program in 2016: firstly, assessing the state of waste management through the program, and secondly, identifying the factors that obstruct its effectiveness. The research identifies several key impediments to the successful implementation of the Garbage Bank program in Pekanbaru City in 2016. These include inadequate socialization about the program, insufficient budget allocation to support the program, a lack of technical training, and inadequate facilities and infrastructure for the Garbage Bank operations.
8. Astuti, N., Irawaty, I., and Sari, F.M. (2022). The Strategy of the Environment and Hygiene Office in Overcoming the Existence of Illegal Temporary Shelter (TPS) in Pekanbaru	This paper analyzes the strategies implemented by the Environment and Hygiene Office (DLHK) to address the issue of illegal temporary shelters (TPS) in Pekanbaru. The findings indicate that while the DLHK has developed adequate strategies to combat the proliferation of illegal shelters, their effectiveness is undermined by a significant challenge: the lack of public awareness and compliance with the regulations.
9. Karimah, P., and Habibie, D.K. (2024). Implementation of Pekanbaru Mayor's Regulation No. 134 of 2018 on Waste Management Policy in Pekanbaru City (A Case Study on the Application of Administrative Sanctions). MOTEKAR: Jurnal Multidisiplin Teknologi dan Arsitektur, Vol. 2 No. 1 Mei 2024. P 227-247	This study is driven by the persistent issue of littering, highlighting ongoing challenges in enforcing administrative sanctions under the waste management policy in Pekanbaru City. It seeks to evaluate the effectiveness of the implementation of Pekanbaru Mayor Regulation Number 134 of 2018, which focuses on waste management policies, specifically through the lens of administrative sanctions. The findings from this research suggest that the enforcement of this regulation has not been carried out as prescribed. As a result, it has been ineffective in deterring public non-compliance with waste management guidelines.
10. Thamrin, H. (2014). Revitalization of Malay Local Wisdom in Maintaining Environmental Harmony. TOLERANSI: Media Komunikasi Umat Bergama, Vol. 6, No. 1, pp .90-106.	The Malay cultural system is deeply intertwined with environmental wisdom, expressed through a rich tapestry of cultural practices and beliefs that stress the importance of living in harmony with nature. This profound understanding is reflected in their agricultural methods, home and community sanitation practices, and the conservation of forests and traditional lands, all of which are influenced by cultural myths and taboos. Emphasizing these traditional values is crucial for promoting sustainable environmental practices within the community.
11. Adlin. (2021). Waste Management System in Pekanbaru City. City Government Capability, Issues, and Policy Alternatives. Jurnal Bina Praja, 13(3), 395–406.	This study focuses on evaluating the government's proficiency in waste management, the associated challenges, and potential policy alternatives that could address these issues in Pekanbaru City. Quantitative data analysis reveals that a significant number of respondents identify the weakest aspects of the city government's waste management capabilities as technical and leadership skills. Additionally, qualitative analysis suggests that addressing the capacity limitations and waste management challenges in Pekanbaru could be achieved through the implementation of various alternative policies.
12. Harirah, MS. Z., Isril, Febrina, R. (2020). Politics of Waste Management (A Study on the Implementation of Waste Management Partnerships in Pekanbaru City). Journal of Government and Civil Society. Vol. 4, No. 1, April 2020, pp. 19-35	The findings of the study highlight three critical aspects of program implementation. Firstly, there is a notable alignment between the program and its beneficiaries. Observations from the field indicate that many programs, as structured and mandated by legislation, are already quite comprehensive and well-tailored to the needs of the beneficiaries. Secondly, there is a compatibility between the program and the organization responsible for its implementation. This suggests that the implementing bodies are well-suited to manage and execute these programs effectively.

waste management issues in Pekanbaru City. A complete matrix showing the similarities values of the 12 journals is presented in Table 2.

The cosine similarity matrix presented in Table 2, quantifies the similarities between each pair of the 12 journal summaries regarding waste management in Pekanbaru City. Considering the range of similarity values, we screened the value below 0.2 and selected journals with similarity values equal and above 0.2.

A brief explanation highlighting the likely thematic or content-related connections among the journals based on their similarity score equal and above 0.2:

1. Journals 1, 2, 4, and 7: These journals are likely connected through their focus on foundational aspects of waste management strategies and policies in Pekanbaru. They may discuss similar themes such as the roles of governmental policies, public-private partnerships, and community involvement in waste management.
2. Journals 2, 4, 7, 8, 9, and 11: This group seems to cover a broad range of waste management aspects, from policy and technical operations to community engagement and regulatory challenges. The connection suggests a comprehensive approach to waste management, encompassing evaluation, implementation, and challenges faced in the city.
3. Journals 3, 4, 6, 7, 8, 9, and 11: These journals appear to intersect on the practical and policy implementation aspects of waste management, including the effectiveness of specific programs like public-private partnerships and the garbage bank program. They also seem to delve into how these programs are influenced by and impact policy-making and community practices.
4. Journals 4, 7, 8, 9, 11, and 12: Grouping these journals suggests a strong focus on the dynamics of policy enforcement, community engagement, and the broader implications of waste management practices. It indicates a discussion on the interaction between policy frameworks and their practical applications in urban settings.
5. Journals 6 and 9: This pair likely discusses specific aspects of waste management effectiveness, potentially focusing on particular interventions or programs within Pekanbaru, such as administrative sanctions and their impact on public behavior and compliance.
6. Journals 7, 9, 11, and 12: These journals are possibly linked through their focus on the outcomes and challenges of existing waste management policies and strategies. They might explore both the successes and shortcomings of these strategies in achieving sustainable waste management.
7. Journals 8 and 9: This similarity suggests a focus on specific regulatory and operational challenges in waste management. The journals might examine issues such as the legality and enforcement of waste management practices, including the handling of illegal waste sites and the effectiveness of administrative measures.
8. Journals 9 and 11: The high similarity between these journals indicates a deep exploration into policy implementation and its effects, particularly looking at how policies are enacted on the ground and their effectiveness in addressing waste management issues.

The illustration of those 12 connected journals based on their similarity is shown in Figure 1.

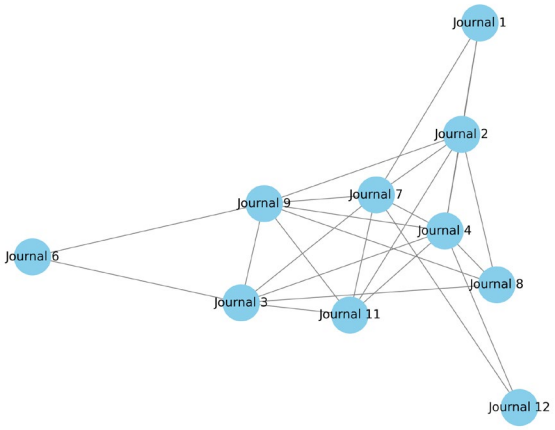

Fig. 1. Journals similarity diagram

C. *Applying the Theory of Planned Behavior (TPB)*

Journals in the red-dotted circle are considered to share similar themes and issues related to waste management in Pekanbaru City. These seven journals were analyzed using the TPB theory. The Theory of Planned Behavior (TPB) is a psychological theory that predicts deliberate behavior because behavior can be planned. TPB is the successor to the similar Theory of Reasoned Action of Ajzen and Fishbein (1977). The TPB model comprises four key components: attitude, subjective norms, perceived behavioral control, and behavioral intention. The meaning of those four components are:

- Attitude: This refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question. It is determined by the beliefs about the likely outcomes of the behavior and the evaluations of these outcomes. For example, if a person believes that recycling helps the environment and considers this outcome as important, they will likely have a positive attitude towards recycling.
- Subjective Norms: This component involves the perceived social pressure to perform or not to perform the behavior. It is influenced by the beliefs about whether important others (family, friends, peers, etc.) think one should engage in the behavior and one's motivation to comply with these others. For instance, if a person's friends and family highly value environmental conservation, the person might feel a strong subjective norm to participate in behaviors like recycling.
- Perceived Behavioral Control: This reflects the extent to which a person feels able to perform the behavior.

Table 2
Matrix of similarity for the 12 journals

	J 1	J 2	J 3	J 4	J 5	J 6	J 7	J 8	J 9	J 10	J 11	J 12
J 1	1.000	0.222	0.182	0.234	0.126	0.186	0.211	0.167	0.147	0.161	0.136	0.125
J 2	0.222	1.000	0.194	0.268	0.151	0.192	0.212	0.235	0.222	0.179	0.260	0.153
J 3	0.182	0.194	1.000	0.314	0.180	0.226	0.284	0.244	0.321	0.110	0.322	0.197
J 4	0.234	0.268	0.314	1.000	0.162	0.182	0.258	0.266	0.219	0.145	0.264	0.233
J 5	0.126	0.151	0.180	0.162	1.000	0.114	0.123	0.095	0.125	0.118	0.135	0.100
J 6	0.186	0.192	0.226	0.182	0.114	1.000	0.180	0.183	0.243	0.112	0.197	0.120
J 7	0.211	0.212	0.284	0.258	0.123	0.180	1.000	0.183	0.256	0.126	0.240	0.322
J 8	0.167	0.235	0.244	0.266	0.095	0.183	0.183	1.000	0.234	0.172	0.190	0.188
J 9	0.147	0.222	0.321	0.219	0.125	0.243	0.256	0.234	1.000	0.137	0.270	0.169
J 10	0.161	0.179	0.110	0.145	0.118	0.112	0.126	0.172	0.137	1.000	0.126	0.134
J 11	0.136	0.260	0.322	0.264	0.135	0.197	0.240	0.190	0.270	0.126	1.000	0.156
J 12	0.125	0.153	0.197	0.233	0.100	0.120	0.322	0.188	0.169	0.134	0.156	

It is linked to past experiences, anticipated impediments, and the availability of necessary resources and opportunities. A high perceived behavioral control suggests that an individual perceives the behavior as easy to perform. For example, access to convenient recycling facilities can increase an individual's perceived control over recycling activities.

- Behavioral Intention: Behavioral intention represents a person's readiness to perform a given behavior. It is considered an immediate antecedent of behavior. Intentions capture the motivational factors that influence a behavior; they indicate how hard people are willing to try, and how much effort they are planning to exert, in order to perform the behavior. Behavioral intention is generally influenced by attitude toward the behavior, subjective norms, and perceived behavioral control.

A summary of examining the above measures in seven journals is presented in the Table 2. From the table, Journal 3 emerges as the highest scoring among the surveyed journals, particularly excelling in the areas of behavioral intention and subjective norms with scores of 5 and 4, respectively. This suggests that the community covered in Journal 3 experiences robust communal and institutional support, alongside a strong drive to adopt positive waste management behaviors. These high scores likely reflect effective governmental planning and proactive community engagement strategies. Conversely, Journals 9 and 8 are tied as the lowest scoring, each displaying notably low scores in behavioral intention and perceived behavioral control. The poor scores in these journals indicate prevalent issues such as weak public compliance, ongoing reliance on illegal dumping practices, and structural barriers. These factors contribute to making it difficult for individuals to engage in legally compliant waste management behaviors.

Subjective norms and behavioral intention both achieved the highest total scores of 21, indicating that these areas are perceived positively across the journals. High scores in subjective norms suggest strong societal pressures and expectations about waste management, although their effectiveness in changing behavior varies. Similarly, the high scores in behavioral intention reflect a strong collective will to engage in positive waste management practices, likely driven by targeted socialization, educational initiatives, and supportive policies. In contrast, perceived behavioral control received the lowest score of 15, highlighting significant challenges such as inadequate infrastructure, limited resources, and logistical constraints that collectively impede effective waste management. This underscores a critical gap in the capabilities and support available to individuals for managing waste effectively.

Given the low scores in perceived behavioral control, it is essential to focus on enhancing the infrastructure and resources necessary to empower individuals and communities to manage waste more effectively. This could include investments in waste processing facilities, the establishment of more accessible recycling points, and the allocation of resources to underserved areas. Additionally, while subjective norms are strong, there is a need to translate these social pressures into concrete actions. Campaigns and programs should be designed to align societal expectations with tangible outcomes by introducing rewards, recognitions, or penalties to ensure compliance. Furthermore, as behavioral intentions are generally high, it is crucial to support these intentions with continuous community engagement, ongoing educational programs, and robust policy frameworks that facilitate and reward compliant behaviors.

Overall, the analysis reveals that despite strong intentions and societal support for proper waste management, the actual participation of individuals is hindered by practical barriers. Addressing these barriers is key to enhancing the effectiveness of waste management practices.

Table 3
Summary of TPB analysis in the seven selected journals

Journals	Attitude	Subjective Norms	Perceived Behavioral Control	Behavioral Intention
2	Only 3-5% of the population practices waste management using the 3R principles (Reduce, Reuse, Recycle).	Highlights the involvement of various actors, including government offices, and local community organizations. However, the effectiveness of these norms is limited by insufficient public cooperation and the presence of illegal waste dumping.	Significant barriers such as inadequate infrastructure (TPS and TPA), limited human resources, and insufficient facilities. These obstacles reduce the perceived behavioral control among the public	There are efforts to promote behavior change through education, socialization, and community involvement. However, the actual uptake of these practices is still low, indicating moderate behavioral intentions.
Score	**2**	**3**	**2**	**3**
3	The text suggests a high level of awareness and commitment but lacks specific data on individual or collective attitudes.	The narrative indicates strong communal and institutional support for waste management practices, suggesting robust subjective norms.	While the initiatives suggest an improvement in capabilities and resources, there is no direct measurement of the community's perception of their control over waste management outcomes in the Pekanbaru City.	The clear governmental planning and community engagement strategies strongly suggest that there is a high intention to engage in positive waste management behaviors.
Score	**4**	**4**	**3**	**5**
4	Reflects the existing low level of favorable attitudes towards waste management.	There are evident norms suggesting community involvement, but the actual engagement levels may be lacking, as indicated by the overall management inefficiencies.	Limited by structural barriers and lack of facilities, indicating poor perceived behavioral control among the populace.	There are intentions driven by policy, but practical application and public uptake are limited.
Score	**3**	**4**	**2**	**3**
7	Reflects the low level of positive public attitudes towards waste management, as indicated by the lack of community knowledge and participation.	While there is an expectation for involvement, the actual engagement does not fully align with these norms, suggesting moderate subjective norms.	This low score reflects the significant barriers faced by the community, which hinder their ability to manage waste effectively.	There are clear intentions to manage waste better, but the implementation and real impact are hindered by various challenges.
Score	**2**	**3**	**2**	**3**
8	This score reflects poor public attitudes as people continue to use illegal dumping sites despite awareness campaigns.	Moderate score due to existing, but insufficient, social pressures and expectations for proper waste management.	Low perceived control, indicated by structural limitations and insufficient facilities provided by the Government, which make it challenging for individuals to dispose of waste legally.	Indicates low behavioral intentions to engage in prescribed waste management behaviors due to ongoing non-compliance and reliance on illegal dumping.
Score	**2**	**3**	**2**	**2**
9	Reflects the general public's lack of compliance and the persistent issue of improper waste disposal, suggesting a negative or apathetic attitude towards the administrative sanctions and regulations.	Indicates that while there are norms and regulations in place, their influence over community behavior is limited, as evidenced by the continued improper disposal practices.	Reflects significant barriers that hinder the community's ability to manage waste effectively, highlighting deficiencies in infrastructure and enforcement.	Indicative of the minimal impact that current policies and sanctions have on changing individual and collective behaviors regarding waste management.
Score	**2**	**2**	**2**	**2**
11	This score reflects a general apathy or lack of proactive engagement among the public toward the existing waste management systems.	This score suggests that while there are recognized norms, their impact on behavior is moderate at best.	Reflects significant obstacles that prevent the public from feeling they can effectively manage waste due to systemic and logistical issues.	Indicates a moderate level of intent influenced by government policy (at the city and provincial level of Riau), yet possibly undercut by public dissatisfaction or distrust in the system's efficacy.
Score	**2**	**3**	**2**	**3**
Total	**17**	**21**	**15**	**21**

6. Conclusions and Recommendations

A. Conclusions

The analysis of waste management practices in Pekanbaru City reveals several key insights. Despite strong behavioral intentions and substantial subjective norms indicating widespread societal expectations for effective waste management, actual practices lag behind potential due to several critical barriers. Notably, perceived behavioral control remains low across various studies, hindered by inadequate infrastructure, insufficient resources, and logistical constraints. These deficiencies make it challenging for residents to engage in effective waste management practices, despite the presence of robust governmental and community-driven initiatives.

B. Recommendations

To improve waste management in Pekanbaru City, it is crucial to address the gap between intentions and actual practices by enhancing the structural and logistical support systems. The following steps are recommended:

- Enhance Infrastructure: Invest in upgrading and expanding waste management facilities such as recycling centers and legal disposal sites. This will

increase the accessibility and convenience for the public to dispose of waste responsibly.

- Strengthen Enforcement and Compliance: Implement stricter enforcement of existing waste management regulations and introduce penalties for non-compliance. Simultaneously, recognition programs should be developed to reward compliant behaviors and successful waste reduction efforts by individuals and organizations.
- Community Engagement and Education: Continue to foster community involvement through targeted educational campaigns that not only raise awareness but also equip citizens with the necessary skills and knowledge to manage waste effectively. These programs should focus on demonstrating the tangible benefits of proper waste management and the adverse impacts of non-compliance.
- Policy and Planning Support: Local government should ensure that waste management policies are adaptable and responsive to the evolving needs of the community. This includes regular assessments of waste management strategies and the integration of technological advancements that can enhance waste processing and recycling.

By implementing these recommendations, Pekanbaru City can transform its waste management system into a more effective, efficient, and community-supported endeavor.

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