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A Study on the Adequacy of Kota Kinabalu Sabah's Solid Waste Management Policy

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Abstract

A country with an adequate solid waste management policy should theoretically be able to better address its solid waste issues. Regrettably, not every country, particularly those in developing countries, has a solid waste management policy that is adequate. As a result, the majority of developing countries continue to struggle with solid waste issues. The effectiveness of solid waste management policies is investigated in this study. Due to ongoing solid waste management issues in Kota Kinabalu, Sabah, the city of Kota Kinabalu was chosen as a case study to further investigate the topic of policy inadequacy. The data for this study was collected and analysed using a qualitative method. According to the findings of the study, Kota Kinabalu's current solid waste management policy is still inadequate. This is because Kota Kinabalu's current solid waste management policy is still insufficient. As a result, the long-term viability of solid waste management in Kota Kinabalu, Sabah, is undermined. As a result, a more comprehensive solid waste management strategy is required.

***Keywords*:** Policy; Adequate policy; Comprehensive policy; Solid waste management

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INTRODUCTION

Solid waste management (SWM) is a complex issue with political, socioeconomic, structural, and environmental dimensions. It has become one of the most important problems confronting urban spaces in developing countries as a result of exponential urban development (Debrah, Vidal, and Dinis, 2021).This study aims to analyse the adequacy of solid waste management policy in Kota Kinabalu, Sabah. Environmental sustainability issues, particularly the issue of long-term solid waste management, have long been debated and discussed (Abdul khair, 2016; Agamuthu, Fauziah, and Noorazamiah Aiza, 2007; Moh and Manaf, 2017). Solid waste management is one of the most pressing issues facing most cities, particularly those in developing countries (Jin, Wang, and Ran, 2006, Moh and Manaf 2017). A major contributor is the continuous increase in waste generation as a result of the massive increase in the world's population (Agamuthu, Fauziah, and Kahlil, 2009; Moh and Manaf 2017). Solid waste management is defined as the process of controlling the waste generation, storage, collection, transfer and transportation, as well as waste recovery and disposal (Tchobanoglous, Theisen, &

Vigil, 1993). According to Pitt and Smith (2003), their primary goal is to reduce total waste generation as this will help reduce waste disposal costs and their harmful environmental effects. The municipal solid waste management tasks are the local government's responsibility (Abas & Wee, 2014; Schübeler, Wehrle, & Christen, 1996; United Nations Environment Programme, 2009).

BACKGROUND OF STUDY

Similarly, in developing countries like Malaysia, municipal solid waste management is also responsible for its local government (MHLG, 2006). The local government system is quite unique in Malaysia, because although Sabah, Sarawak and Peninsular Malaysia form Malaysia, their local governments are governed by a separate law. Local governments in Peninsular Malaysia are governed by the Local Government Act of 1976 (LGA), whereas in Sabah and Sarawak, they are governed by the Local Government Ordinance of 1961 (LGO) and the Local Authority Ordinance of 1996 (LAO), respectively (Fatma Sabariah, Manaf, & Mariani, 2013; MHLG, 2006). As a result, any local laws enacted in Peninsular Malaysia may not be applicable in Sabah and Sarawak, and vice versa. The recent mandatory source separation introduced in Peninsular Malaysia, for example, is only applicable in Peninsular Malaysia and not in Sabah and Sarawak (Moh & Manaf, 2017).

Like cities in most developing countries, Malaysia also faced major challenges in managing its solid waste due to deteriorating environmental quality (Dawda, 2010; Moh & Manaf, 2017; World bank, 1999). According to World Bank (1999), solid waste management issues in Malaysia were recognised as one of the top three environmental issues experienced by most of its local government. Eighteen years later, it remains one of the environmental issues, as solid waste is still managed mainly through landfilling (Moh & Manaf, 2017).

Malaysia's prospects for sustainable energy generation are in the spotlight due to the country's rapid development. The annual generation rate of Malaysian municipal solid waste (MSW) is expected to rise by 3.3 percent, while electricity demand is expected to rise by 3.3 percent. In Malaysia, the majority of landfills are open dumpsites, with landfills accounting for 89 percent of collected MSW (Yong et al., 2019). In addition, Malaysia currently generates 33,130 tonnes of solid waste per day, with that figure expected to rise to 49,670 tonnes per day by 2030 (MHLG, 2015; Yong et al., 2019).

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Despite having the only sanitary landfill in Sabah, Kota Kinabalu's solid waste, according to Abdul Hair (2016), remains poorly managed. This is consistent with Wan A Kadir (1997), as he found that although several landfills were upgraded to sanitary landfills in Malaysia, these upgraded landfills were not properly managed. In addition, the use of incinerator also poses other challenges due to their high operating costs and technical expert needs (Moh & Manaf, 2017, 2014). Therefore, relying solely on technological aspects may not be the most effective way to manage sustainable solid waste.

Generally, approximately 95% of the waste in Malaysia is disposed of through landfills and, to make matters worse, most landfill sites use an open dumping system (Mallak, Ishak, & Mohamed, 2014). Landfilling is still one of the common methods in Malaysia, as it is considered the cheapest waste disposal method (Dinie, Samsudin, & Don, 2013; Ngoc & Schnitzer, 2009). However, waste management through landfills has a negative impact on the environment, especially as waste is not properly treated (Ngoc & Schnitzer, 2009). Only several landfills were upgraded to sanitary landfills where waste can be treated properly. The rest is generally an open dump, so most landfills in Malaysia can potentially harm the environment (Moh & Manaf, 2014).

Consequently, solid waste management issues became one of Malaysia's top priorities (Agamuthu, Fauziah, & Kahlil, 2009; Agamuthu, Khidzir, & Hamid, 2009; Moh & Manaf, 2017). To address this problem, Malaysia has enacted policies aimed at achieving long-term solid waste management. Perhaps the most significant solid waste management policy ever introduced in Malaysia was the introduction of the Solid Waste Management Act (SWMA) in 2007. According to Agamuthu, Fauziah, et al. (2009), the passage of this new act is expected to have a significant impact on Malaysia's current solid waste management practises. Previously, Malaysia lacked a specialised institution to deal with solid waste management issues. However, this act allows for the creation of a specific solid waste management institution as well as a new solid waste management legislative framework in Malaysia.

The household was required to separate their waste at the source under the Solid Waste Management Act 2007 (Act 672). Starting on June 1, 2016, it will be mandatory for every household to separate their solid waste at the source. This act, however, is only applicable in Malaysia's Kuala Lumpur, Putrajaya, Johor, Melaka, Negeri

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Sembilan, Pahang, Kedah, and Perlis states and federal territories (Moh and Manaf, 2017).

Although Malaysia is progressing in the right direction, the existing policies relevant to addressing solid waste management issues in Malaysia continue to fall short of effectively addressing the problems (Abas & Wee, 2014). Furthermore, because Sabah, Sarawak, and Peninsular Malaysia each have their local government laws, most of the solid waste management policies or laws that have been introduced in Malaysia only affect Peninsular Malaysia's solid waste management system (MHLG, 2006). For example, the mandatory waste separation at source mandated by the Solid Waste Management Act 2007 (Act 672) is only in effect in a few states in Peninsular Malaysia and the Malaysian Federal Territories, with the exception of Sabah and Sarawak (Moh and Manaf, 2014). Because Sabah lacks mandatory waste separation and official waste separation guidelines at the source, the local government cannot compel the public to separate their waste (Fatma Sabariah et al., 2013). Furthermore, according to the Sabah MLGH (2007) report "Solid Waste Management Master Plan Study in Sabah," there are a number of existing policies that are indirectly relevant to addressing Sabah's solid waste issues. The Anti-Litter by-law of 2005 and the Conservancy and Hygiene by-law of 1984 are the most directly relevant by-laws in Sabah for dealing with solid waste issues. Despite the existence of several policies that are directly relevant to addressing issues of solid waste management in Sabah, the problems remain unsolved. As a result, the purpose of this study is to assess the adequacy of solid waste management policies in Kota Kinabalu, Sabah.

LITERATURE REVIEW

The World Bank estimated global average generation rate of municipal solid waste (MSW) in 2016 was 0.74 kilogrammes per capita per day, totalling around 2,01 billion tonnes of MSW. MSW's global production is projected to rise by 1.5% annually, reaching 3.0 billion tonnes by 2030.(Mi, Agamuthu and Joko, 2020). Adequate policies, particularly from policy lenses, play an important role in sustainable solid waste management, according to Guerrero et al. (2013). Policies are an important tool in supporting the sustainability of solid waste management, as a successful sustainable solid waste management system can only be achieved if policies are implemented effectively (Abass and Wee, 2015). This section will attempt to define the term "adequate policy" as well as identify the key elements that fall under the "proper policy"

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category. By identifying the key elements under the appropriate policy aspect, it would be possible to assist the study in analysing the adequacy of the existing solid waste management in the study area. According to previous literature, adequate policies are frequently associated with solid waste management policies, which typically consist of comprehensive policy elements and specific policies, and many developing countries lacking adequate policies have been found to lack both the comprehensive and specific policy elements, according to Agunwamba (1998) and Read (1999c).

Previous studies have shown that many developing countries' solid waste management systems have faced numerous challenges in managing their solid wastes due to a lack of adequate policies. For example, Jordan's major city's serious solid waste management problems are primarily due to a lack of adequate policies, as a result of which the city has suffered major environmental and health problems (Mrayyan and Hamdi, 2006). Its government's failure to develop a comprehensive policy that could cover all aspects of the solid waste management system was the main cause of its lack of adequate policies. Despite Jordan's potential to promote the composting industry, Marmolejo, Garca, and Diaz (2012) discovered that the country's high biodegradable waste composition was suitable for composting. However, the government failed to explore the waste recovery aspect through composting. As a result, waste that could be composted is simply dumped into landfills, contributing to an increase in waste generation. As a result, comprehensive solid waste management is required, particularly composting policy, as studies have shown that successful composting can help to reduce the amount of waste sent to landfills, thereby extending the landfill's life (Agbesola, 2013). In short, Jordan's lack of adequate policies stems primarily from the government's failure to develop a comprehensive policy capable of covering all aspects of solid waste management, particularly waste recovery through waste composting.

Similarly, waste recycling in India is deemed ineffective as a result of the government's failure to develop adequate policies to manage the country's solid waste, particularly in the area of waste recovery. This is reflected in the lack of a comprehensive policy covering all aspects of solid waste management, particularly waste recycling, despite the country's potential to expand its recycling industry (Apo, 2007). In some ways, India's waste recycling industry's potential was revealed when the informal sector recycled 10% of the country's total waste (Apo, 2007). With India's rising waste generation, waste recycling has become a critical component in reducing the amount of waste sent to landfills. If waste generation is not controlled, existing

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landfills can easily be replenished. For example, in Kolkata, India, the rising trend in waste generation has had a significant impact on final disposal, as most of the city's landfills are already operating at capacity (Chakrabarti, Majumder, and Chakrabarti, 2009). This is exacerbated by the city's unsustainable landfill practises, with the majority of its landfill being an open dump, which contributes to environmental pollution (Chakrabarti et al., 2009). As a result, India's government's failure to develop a comprehensive policy capable of covering all aspects of solid waste management, particularly waste recovery through waste recycling, is a major contributor to the country's lack of adequate policy.

Faced with a similar fate, Nigeria's solid waste management system's lack of adequate policies has played a significant role in the country's serious solid waste management problems (Agunwamba, 1998). Because of a lack of adequate policies, the government has been unable to develop comprehensive policies that cover all aspects of the country's solid waste management system. Although there was a lack of planning to properly manage their waste dumping issues, the government established a national environmental cleanup programme that was organised as a monthly event, as the country was facing a serious waste disposal problem (Agunwamba, 1998). Furthermore, the government has yet to implement a waste separation policy, resulting in recyclable waste being thrown away (Kofoworola, 2007). They may have been deprived of the benefits of recycling and composting as a result of their government's failure to initiate intensive recycling and composting activities, which could bring financial and environmental benefits. According to studies and observations in Nigeria, recycling is still considered underdeveloped, which is exacerbated by the lack of a waste minimisation policy (Afon, 2007; Agunwamba, 1998; Kofoworola, 2007). As a result, in order to address solid waste issues holistically, the development of a comprehensive policy capable of covering all aspects of solid waste management, including waste generation management, storage, collection, transfer and transportation, recovery and disposal, is critical. In short, Nigeria's government's failure to develop comprehensive policies capable of covering all aspects of solid waste management is a major contributor to the country's lack of adequate policy.

According to Abduli's (2007) study, adequate policies are required to ensure the Islamic Republic of Iran's long-term solid waste management. In his study, he stated that the country needs to develop a comprehensive policy capable of covering all aspects of solid waste management, particularly at the national, regional, and municipal

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levels, in order to ensure adequate policies. The policy should emphasise waste minimization, source reduction, waste generation, on-site treatment, storage and processing, waste transfer and transportation, recycling, dumping, and post-disposal control (Apo, 2007). Fortunately, the country moved in the right direction when it took the initiative to propose a comprehensive solid waste management bill to its Parliament (Apo, 2007). This bill, which includes a comprehensive national solid waste management programme, was the first national attempt to establish a national solid waste management strategy in the Islamic Republic of Iran. This could indicate that the comprehensive policy component is critical to achieving appropriate policies and, in turn, to long-term solid waste management.

The comprehensive policy element is one of the most important aspects of achieving adequate policies. The majority of developed countries have policies in place that cover all aspects of solid waste management, including waste management, proper storage, collection, transfer, and transportation, treatment or recovery, and disposal (Mrayyan and Hamdi, 2006). Singapore, for example, has a more sustainable solid waste management system because its government has developed a comprehensive policy that covers the entire waste system. Its effective waste collection system is largely due to the government's ongoing efforts to develop a more comprehensive waste collection policy (Apo, 2007).

Similarly, developed countries such as Japan, the United Kingdom, and Germany, according to the MHLG (2006), have adequate solid waste management policies because their governments have consistently developed comprehensive policies in their solid waste management systems that can cover all aspects of solid waste management in a comprehensive manner, particularly as regards the management of hazardous waste. This is evident in the fact that the majority of their policies are aimed at reducing or preventing waste from entering the waste stream at the point of generation. For example, the Japanese government is convinced that in order to address the issues surrounding solid waste in a comprehensive manner, it must develop a comprehensive policy that focuses not only on proper waste disposal, but also on a comprehensive policy that can cover the entire aspect of solid waste, particularly from the point of generation as waste reduction from the point of generation (ABRELPE & ISWA, 2013).

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METHODOLOGY

This study collected and analysed data using a qualitative approach. The qualitative method is a paradigm not only for data collection, but also for the entire research process in terms of idea generation and data collection (Creswell, 2014). It is a broad scientific research paradigm in which a particular philosophy is applied to the generation of ideas and data from various sources for interpretation and analysis (Lune & Berg, 2017). Thematic analysis was used to examine the data gathered from secondary sources. Thematic analysis, according to Braun and Clarke (2006), is the process of identifying, analysing, and reporting patterns (themes) within data. Data for this study was gathered from secondary sources such as books, journal articles, and the internet. The data analysis based on the themes aided the study in coming up with several key conclusions about the overall findings gained from secondary data.

FINDINGS

A comprehensive policy is defined in this study as a solid waste management policy that can cover all aspects of the solid waste management system, including waste generation, storage, collection, transfer, and transport, treatment or recovery, and waste disposal. The findings from secondary data will be presented in the following section.

Table 1: *Summary of Thematic Findings*

Data Extract	**Sub Themes**	**Main Themes**
Local Government Ordinance of 1961 revealed that it is unable to cover every aspect of the solid waste management system.	Cannot cover all aspects	Lack of comprehensive solid waste management policy
The Local Government Ordinance of 1961 section 49 (1) Part V primarily concern aspects of cleanliness, sanitation, and public health. The Section, on the other hand, does not cover all aspects of the solid waste management system, such as waste generation management, particularly through waste minimisation.	Mainly focused on cleanliness, sanitation and public health	
local government in Sabah still lacks official guidelines to refer to, particularly in the process of establishing, managing, and operating solid waste disposal sites in their jurisdiction.	Lack of clear guidelines on disposal	
The existing solid waste management policy in Kota Kinabalu does not cover the concepts of "reduce, reuse, and recycle" (3Rs), which are part of the waste minimisation concepts.	Does not cover "reduce, reuse and recycle" (3Rs),	
The local government in Kota Kinabalu is still working on developing proper waste separation guidelines for the city of Kota Kinabalu, according to the local newspaper.	Lack of waste separation laws	

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According to the Sabah MLGH (2007) in their report "Solid Waste Management Master Plan Study in Sabah," was considered less comprehensive, particularly in the area of waste treatment or waste recovery (waste recycling, waste separation, and composting).	Lack of waste treatment and waste recovery	

The Local Government Ordinance 1961, relevant solid waste management by-laws such as Anti-litter by-laws and Conservancy and Hygiene by-laws, reports, journals, and newspapers were the main secondary data used in this study, as mentioned in the previous section. Overall, the secondary data revealed that Kota Kinabalu's current solid waste management policy is still considered inadequate.

Analyses of the Local Government Ordinance of 1961 revealed that it is unable to cover every aspect of the solid waste management system. As previously stated, the Local Government Ordinance of 1961 governs Sabah's local government. The ordinance establishes a local government in Sabah and empowers it to perform a wide range of functions. Because this ordinance primarily defines the functions of the local government in Sabah, it follows that the solid waste management policy in Kota Kinabalu is based on it. Section 49 (1) Part V, for example, outlines the functions of the local government in Sabah in relation to solid waste management:

i. Keep clean streets, bridges, squares, playing fields and other open or closed public places in the (LA) area (section 49(1)(39));

ii. Require any owner or occupier of land to keep such land in a clean condition (section 49(1)(41))

However, a close examination of the section described above reveals that they primarily concern aspects of cleanliness, sanitation, and public health. The Section, on the other hand, does not cover all aspects of the solid waste management system, such as waste generation management, particularly through waste minimisation. In fact, the study found no provision in the ordinance that comprehensively covers the aspect of waste minimisation after examining it. Aside from that, there are no provisions in the ordinance that require households or the general public to reduce their waste. This scenario was confirmed in a report published by MHLG (2006) titled "The Study on National Waste Minimization in Malaysia," which stated that the Local Government Ordinance, 1961 is unable to cover all aspects of the solid waste management system.

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It was reported that there was still no provision in the ordinance that comprehensively mentioned the aspect of waste minimisation, despite the fact that it is an important aspect of managing waste generation because these concepts focus on waste prevention and waste reduction activities. The lack of a comprehensive provision in the ordinance to cover the aspect of waste minimisation could indicate that Kota Kinabalu's current solid waste management policy is unable to comprehensively cover the aspects of managing waste generation, waste treatment or recovery, and proper waste disposal, as waste minimisation is closely related to this aspect. Apart from the fact that the LGO is unable to comprehensively cover the aspect of waste minimisation, it is possible that the existing solid waste management policy in Kota Kinabalu does not cover the concepts of "reduce, reuse, and recycle" (3Rs), which are part of the waste minimisation concepts.

Although it is undeniable that the Local Government Ordinance covers some aspects of the solid waste management system, such as cleanliness and public health, it does not cover all aspects of the solid waste management system. Despite the fact that the Local Government Ordinance of 1961 empowers local governments in Sabah to create by-laws, the study discovered that the existing by-laws in Sabah still lack by-laws that can comprehensively cover all aspects of the solid waste management system in Kota Kinabalu. The Anti-litter by-laws of 2005 and the Conservancy and Hygiene by-law of 1984 are the most relevant by-laws adopted to address the issues of solid waste management in Sabah, according to the study, and they are used by the local government as their main references in developing their solid waste management policy. However, the study discovered that both bylaws are unable to cover every aspect of solid waste. In fact, both bylaws are primarily concerned with cleanliness, sanitation, and public health, but they are unable to adequately address waste minimisation and the concepts of "reduce, reuse, and recycle" (3Rs). As a result, the existing solid waste management policy in Kota Kinabalu can still be considered inadequate.

Similarly, according to the report "Solid Waste Disposal in Sabah: Survey Report" by Lim et al., (2002), the existing solid waste management policy in Kota Kinabalu is considered to be less comprehensive, especially in terms of proper waste disposal. It was reported that the local government in Sabah still lacks official guidelines to refer to, particularly in the process of establishing, managing, and operating solid waste disposal sites in their jurisdiction. The lack of proper waste disposal in landfills is exacerbated by the lack of regulations in the areas of waste

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segregation and waste recycling (Fatma Sabariah et al., 2013). The local government in Kota Kinabalu is still working on developing proper waste separation guidelines for the city of Kota Kinabalu, according to the local newspaper (Daily Express, 24 March 2017). As a result of these findings, it was discovered that the current solid waste management policy in Kota Kinabalu is still insufficiently comprehensive to cover all aspects of the solid waste management system, particularly proper waste disposal.

Furthermore, the existing solid waste management policy in Sabah, according to the Sabah MLGH (2007) in their report "Solid Waste Management Master Plan Study in Sabah," was considered less comprehensive, particularly in the area of waste treatment or waste recovery (waste recycling, waste separation, and composting). According to the report, the waste treatment or waste recovery process in Kota Kinabalu primarily focuses on treating waste after it has been sent to a landfill site via Material Recovery Facilities (MRF). In short, there is still a lack of a comprehensive policy to treat or recover waste before it is sent to the landfill, particularly through waste separation at source and waste recycling. The findings were in line with a report published by the National Solid Waste Management Department in 2014 titled "Survey on Solid Waste Composition, Characteristics, and Existing Practice of Solid Waste Recycling in Malaysia," which stated that Sabah has the lowest recycling rate among Malaysia's states. The overall waste recycling rate in Sabah was only 2.9 percent, with 4.5 percent in Kota Kinabalu, according to the report's findings, whereas the overall waste recycling rate in other Malaysian states was 9 percent or higher. The low rate of waste recycling in Sabah may indicate that the current solid waste management policy in Kota Kinabalu relating to waste recovery or treatment, specifically waste recycling, is considered insufficient.

In summary of the results collected from the secondary data, the current policy on the management of solid waste, as it cannot cover each aspect of the system of solid waste management in Kota Kinabalu, is less comprehensive. The current solid waste management policy in Kota Kinabalu is primarily concerned with cleanliness, sanitation, and public health. However, there is still a lack of policy focusing on critical aspects such as waste management, waste treatment or recovery and proper disposal.

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DISCUSSION

According to previous research, the element of comprehensive policy in the context of solid waste management is defined as a policy that can cover all aspects of the solid waste management system, which essentially includes managing waste generation, storage, collection, transfer, and transport, treatment or recovery, and waste disposal (Agunwamba, 1998; Guerrero et al., 2013; Haidy et al., 2016). The study found that the existing solid waste management policy in Kota Kinabalu is still considered less comprehensive, based on the overall findings gathered from secondary data.

In Kota Kinabalu, the current solid waste management policy is less comprehensive, especially in terms of managing waste generation and waste recovery. As previously stated, the findings revealed that the local government in Kota Kinabalu primarily focuses on the fundamental aspects of the solid waste management system, such as cleanliness, sanitation, and public health, as the local government prefers to organise programmes related to cleanliness, such as the Kota Kinabalu Anti-litterbug campaign. These findings corroborate Wan A Kadir's assertions (1997). He pointed out that Malaysia's overall solid waste management system still focuses on the fundamentals of solid waste management, with most solid waste management by-laws focusing on the aspects of cleanliness, sanitation, and public health, but none of the by-laws covering the entire spectrum of solid waste management.

Although it cannot be denied that maintaining the aspects of cleanliness, sanitation, and public health are equally important for a sustainable solid waste management system, focusing solely on this aspect will not be able to comprehensively address the overall issues of solid waste management because it does not cover all aspects of the solid waste management system. Focusing solely on the aspect of cleanliness, for example, may be unable to effectively address solid waste issues such as increasing waste generation because it only addresses one aspect of the waste system. However, by incorporating other aspects such as waste minimisation and 3Rs (reduce, reuse, and recycle) approaches, other aspects such as waste generation management may indirectly help to reduce waste generation and maintain the solid waste management system.

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Introducing comprehensive solid waste management policies, such as comprehensive waste minimisation policies, is the key to controlling waste generation because it primarily focuses on reducing waste generation at the point of waste generation (Mallak et al., 2014). In fact, developing a comprehensive waste minimisation policy is one of the most important aspects of achieving long-term solid waste management in developed countries (Defra, 2007). Developed countries such as the United Kingdom, Japan, Denmark, Switzerland, Germany, and the United States have implemented comprehensive solid waste management minimisation policies in their waste systems to achieve sustainable solid waste management (Hotta & Aoki-Suzuki, 2014; Moh & Manaf, 2014; Phillips, Tudor, Bird, & Bates, 2011).

Furthermore, the findings of this study are in line with those of previous studies. According to MHLG (2006), Malaysia as a whole still lacks a comprehensive solid waste management policy, particularly in the area of waste minimisation, even at the federal and state levels. Despite the fact that 3Rs activities (reduce, reuse, and recycle) are an important component of waste minimisation concepts, it was reported that there was no comprehensive policy developed in Malaysia (MHLG, 2006). As a result, it can be concluded that Malaysia's solid waste management policy is still incomplete.

Apart from that, the study's main findings revealed that Kota Kinabalu's current solid waste management policy is considered to be less comprehensive, particularly in terms of proper waste disposal. Because Kota Kinabalu still lacks a comprehensive waste minimisation policy, waste generated in the city may not be properly recovered (waste recycling, waste separation, and waste composting) or treated before being disposed of in a landfill. If waste is not properly recovered before it reaches the landfill, the amount of waste produced will increase, while the lifespan of the existing landfill will be shortened, as waste that has the potential to be recycled is simply dumped into the landfill. Abdul Hair (2016) found that the composition of solid waste in the Kayu Madang landfill still included high recyclable waste such as paper (21 percent), boxes (4.7 percent), plastic (18.4 percent), iron (4.1 percent), aluminium (4.1 percent), and glass (4.1 percent) (3.4 percent).

The lower rate of recycling in Sabah, according to this study, could indicate a lack of a comprehensive policy to support proper waste disposal in Kota Kinabalu. According to the National Solid Waste Management Department (2014) report "Survey on Solid Waste Composition, Characteristics, and Existing Practice of Solid Waste

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Recycling in Malaysia," household recycling in Sabah is the lowest in Malaysia, compared to other states. The report also points out that Sabah's lower recycling rate contributed to Malaysia's overall recycling rate being lower. Furthermore, no specific by-laws have been enacted in Kota Kinabalu, Sabah, to force the public to separate their waste to this day (Miwil, 2019).

Furthermore, Abdul Hair (2016) discovered that the composition of solid waste in the Kayu Madang landfill still contained a high percentage of organic waste (45%) derived primarily from food waste, indicating a lack of proper waste disposal policy. The presence of a large amount of food waste in the landfill could indicate that no comprehensive policy has been developed to address the issues of organic waste being dumped in landfills, according to the study.

According to the study, if organic waste can be controlled or reduced, it can help to reduce the amount of waste sent to landfills while also improving the landfill's lifespan indirectly. As a result, the cost of operating the landfill is reduced, and the problem of leachate produced by organic waste is reduced. Furthermore, if the number of organic wastes can be reduced, the local government may be able to shift from landfill to incinerator waste management, because the lower the composition of organic waste, the more suitable the incinerator technology is for the local government.

Furthermore, in Kota Kinabalu, a comprehensive policy in the area of proper waste disposal is urgently needed. This is due to the fact that the existing landfill in Kayu Madang accepts waste not only from the district of Kota Kinabalu, but also from other nearby district councils such as Penampang, Tuaran, and Kota Belud (Abdul Hair, 2016). As a result, not only does the local government have to deal with the waste, but it also indirectly contributes to the growing amount of waste sent to landfills, which shortens their lifespan if not properly managed. According to a study conducted by Sabah MLGH (2007), the landfill in Kayu Madang will likely reach its maximum capacity in 2015. This is in line with the findings of the study's interview, which revealed that the Sabah state government intends to close the existing landfill in Kayu Madang and relocate it to the Nabawan area of Keningau. This implied that the existing landfills in Kayu Madang are approaching their capacity limit.

According to the information gathered during the interview, the Kayu Madang landfill is nearing capacity. Furthermore, Abdul Hair (2016) stated that, despite being

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Sabah's only sanitary landfill, Kayu Madang is still unable to manage solid waste issues in Kota Kinabalu in a sustainable manner. He claimed that the waste sent to the Kayu Madang landfill is simply too much, and that the landfill is unable to handle the increased waste generation. As a result, this indirectly demonstrates that relying solely on technology (sanitary landfills) will not ensure long-term solid waste management. Furthermore, this supports the study's argument that solid waste issues should not be analysed solely from a technological standpoint. In fact, even in developed countries such as Japan, the government does not rely solely on technology to address rising waste generation; instead, it has focused on developing a comprehensive solid waste management policy, particularly in the area of waste minimisation, in order to reduce waste generation and, as a result, lower construction costs (Hotta & Aoki-Suzuki, 2014).

Furthermore, the study found that several strategies used by the local government in Kota Kinabalu to extend the life of the Kayu Madang Landfill have failed, indicating a lack of proper waste disposal policy. One of the strategies used by KKCH is the introduction of a technology known as the Material Waste Facility (MRF), which was thought to be capable of recycling up to 40% of waste disposed in landfills while also composing 30% of the disposal waste. However, due to the MRF operator's financial difficulties, this technology had to be turned off. The closure of this facility had an indirect impact on the landfill's waste recovery process. The MRF's closure indirectly demonstrated that relying solely on technology does not guarantee long-term solid waste management.

As a result, the lack of comprehensive strategies to address landfill issues in Kota Kinabalu implies that the solid waste management policy in Kota Kinabalu is still considered inadequate, particularly in terms of waste recovery. As a result, more attention must be paid to enacting more comprehensive policies, particularly in the area of waste recovery, in order to reduce the burden of the existing landfill, which is still the primary method of waste disposal in Kota Kinabalu.

Apart from that, the study discovered that Kota Kinabalu's current solid waste management policy is still regarded as inadequate, particularly in terms of proper waste disposal. According to the findings, there is still no comprehensive policy in place for scavengers working in the Kayu Madang landfill. Despite the fact that scavengers play an important role in waste separation and recycling, there is still no comprehensive

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policy in place to formalise their participation in the system. Aside from that, there is still a lack of a comprehensive policy to protect scavengers from a hazardous working environment that could jeopardise their health and well-being. Failure to develop a comprehensive policy for scavengers may have an impact on their contribution to waste recovery, which is primarily accomplished through waste recycling activities. According to Abdul Hair (2016), scavengers made a significant contribution to waste recovery in the landfill, particularly through waste separation and recycling activities. He also claimed that scavengers defeated the MRF because they were able to separate waste more thoroughly and were able to recycle up to 20% of the total waste disposed of in the landfill.

Aside from that, the lack of a specific solid waste management institution in Sabah to deal with specific solid waste management issues may imply that the current solid waste management policy in Kota Kinabalu is less comprehensive. This is because developing a comprehensive solid waste management policy becomes difficult without a specific solid waste management institution to handle specific matters regarding solid waste management in Sabah. Although the local government in Kota Kinabalu is responsible for solid waste management, they may not be able to devote their full attention to it because they have other responsibilities (Moh & Manaf, 2014).

Wan A Kadir (1997) conducted a study that supports this, stating that the lack of a specific body to manage Malaysia's solid waste management is the main contributing factor to the lack of comprehensive policies in the country's solid waste management. Similarly, Ezeah (2010), claims that one of the main barriers to achieving a sustainable municipal solid waste management in Abuja, Nigeria is the lack of a specific solid waste management institutional structure. Wan A Kadir (1997), on the other hand, argued that the main reason why a developed country like the United Kingdom has a more comprehensive solid waste management policy is that their government established a specific solid waste management institution to deal with issues relating to their aspect of solid waste management. As a result, the absence of a specific institution to handle the aspect of solid waste management may indirectly contribute to the lack of a comprehensive solid waste management policy.

Furthermore, the importance of establishing a specific institution to handle issues related to solid waste management has been recognised in Malaysia, particularly since the Malaysian government established the Department of National Solid Waste

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Management (NSWM), which is responsible for developing a comprehensive solid waste management policy in West Malay (Moh & Manaf, 2014). However, as previously stated, this institution is only applicable in West Malaysia due to Malaysia's unique local government system, as Sabah is governed by a different set of local government laws. This means that any changes made by the institution may have no impact on Kota Kinabalu's existing solid waste management policy. The recent introduction of a mandatory waste separation policy in Malaysia, for example, does not apply in Sabah. As a result, the lack of a specific institution not only contributes to the government's inability to develop a comprehensive solid waste management policy, but also implies that the current solid waste management system in Kota Kinabalu lacks a comprehensive policy.

CONCLUSION

The study's overall findings lead to the conclusion that Kota Kinabalu's current solid waste management policy is still inadequate. As a result, this may have an impact on the long-term viability of solid waste management in Kota Kinabalu, Sabah. It is critical to ensure that the existing policy in Kota Kinabalu, Sabah, is more comprehensive in order to ensure the sustainability of solid waste management.

REFERENCES

Abas, M. A., & Wee, S. T. (2014). The Issues of Policy Implementation on Solid Waste Management in Malaysia. *International Journal of Conceptions on Management and Social Sciences*, 2(3), 12–17.

Abas, M. A., & Wee, S. T. (2015). A Review of the Factors that Influence the Good Governance Practices : An Insight towards Sustainable Solid Waste Management. 3, 1–7.

Agamuthu, Fauziah, S. H., & Kahlil, K. (2009). Evolution of Solid Waste Management in Malaysia: impacts and implications of the solid waste bill, 2007. *Journal of Material Cycles and Waste Management*, 11(2), 96–103. https://doi.org/10.1007/s10163-008-0231-3.

Agamuthu, P., Khidzir, K. M., & Hamid, F. S. (2009). Drivers of sustainable waste management in Asia. Waste Management & Research : *The Journal of the International Solid Wastes and Public Cleansing Association*, ISWA, 27(7), 625–633. https://doi.org/10.1177/0734242X09103191.

eISSN 2600-9374

Agunwamba, J. (1998). Solid Waste Management in Nigeria: Problems and Issues. Environmental Management, 22(6), 849–856. https://doi.org/10.1007/s002679900152.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/The publisher's URL is: http://dx.doi.org/10.1191/1478088706qp063oa.

Creswell, J. W. (2014). Research Design: Qualitative, Quantitative, & Mixed Methods Approaches. California: Sage Publication.

Dawda, B. (2010). Solid Waste Management System in the Kanifing Municipal Council Area, The Gambia.

Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising awareness on solid waste management through formal education for sustainability: A developing countries evidence review. *Recycling*, *6*(1), 1–21. https://doi.org/10.3390/recycling6010006.

Defra. (2007). Waste Strategy for England 2007. Department for Environment Food and Rural Affairs, 127. Retrieved from http://archive.defra.gov.uk/environment/waste/strategy/strategy07/documents/waste07-strategy.pdf.

Dinie, M., Samsudin, M., & Don, M. M. (2013). Jurnal Teknologi Full paper Municipal Solid Waste Management in Malaysia : Current Practices , Challenges and Prospect. *Jurnal Teknologi*, 1, 95–101. Retrieved from www.jurnalteknologi.utm.my.

Ezeah, C. (2010). Analysis of Barriers and Success Factors Affecting the Adoption of Sustainable Management of Municipal Solid Waste in Analysis of Barriers and Success Factors Affecting the Adoption of Sustainable Management of Municipal Solid Waste in Abuja, Nigeria. University of Wolverhampton.

Fatma Sabariah, A., Manaf, L. A., & Mariani, H. N. (2013). Overview of municipal solid waste management in malaysia. Borneo Science, 33(9), 23–30.

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.

Haidy, H. D., Mohammad Tahir, M., & Delia, L. O. (2016). Sustainable Solid Waste Management from the Perspective of Policy. 13(2), 1–9.

Hotta, Y., & Aoki-Suzuki, C. (2014). Waste reduction and recycling initiatives in Japanese cities: lessons from Yokohama and Kamakura. Waste Management & Research, 32(9), 857–866. https://doi.org/10.1177/0734242X14539721.

eISSN 2600-9374

Lune, H. & Berg, L. (2017). Qualitative Research Methods for the Social Sciences. Edinburgh: Pearson Education Limited.

Mallak, S. K., Ishak, M. B., & Mohamed, A. F. (2014). Waste Minimization Benefits and Obstacles for Solid Industrial Wastes in Malaysia. *IOSR Journal of Environmental Science, Toxicology and Food Technology*, 8(2), 43–52. https://doi.org/10.9790/2402-08214352.

MHLG. (2006). The Study on National Waste Minimisation In Malaysia. Japan International Cooperation Agency Yachiyo Engineering Co., Ltd. Ex Corporationl, (July).

Mi, Y., Agamuthu, P., & Joko, W. (2020). Challenges for Sustainable Development of Waste to Energy in Developing Countries. *Waste Management & Research*, *38*(3), 229–231. https://doi.org/10.1177/0734242X20903564.

Miwil, O. (2019, March 29). Sabah to look at waste separation by- law to cut KK landfill volume. New Straits Times, Kuala Lumpur Straits Times.

Moh, Y. C., & Manaf, A. L. (2017). Solid Waste Management Transformation and Future Challenges of Source Separation and Recycling Practice in Malaysia. Resources, Conservation and Recycling, 116 (January 2017), 1–14. https://doi.org/10.1016/j.resconrec.2016.09.012.

Moh, Y. C., & Manaf, L. A. (2014). Overview of Household Solid Waste Recycling Policy Status and Challenges in Malaysia. Resources, Conservation and Recycling, 82, 50–61. https://doi.org/10.1016/j.resconrec.2013.11.004.

National Solid Waste Management Department. (2014). Survey on Solid Waste Composition , Characteristics & Existing Practice of Solid Waste Recycling in Malaysia. In Survey on SOlid Waste Composition, Characteristics and main report.

Ngoc, U. N., & Schnitzer, H. (2009). Sustainable solutions for solid waste management in Southeast Asian Countries. Waste Management, 29(6), 1982–1995. https://doi.org/10.1016/j.wasman.2008.08.031.

Phillips, P. S., Tudor, T., Bird, H., & Bates, M. (2011). A Critical Review of a key Waste Strategy Initiative in England: Zero Waste Places Projects 2008-2009. Resources, Conservation and Recycling. https://doi.org/10.1016/j.resconrec.2010.10.006.

Pitt, M., & Smith, A. (2003). Waste management efficiency at UK airports. Journal of Air Transport Management, 9(2), 103–111. https://doi.org/10.1016/S0969-6997(02)00063-7.

eISSN 2600-9374

Schübeler, P., Wehrle, K., & Christen, J. (1996). Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries. Retrieved from http://www.worldbank.org/urban/solid_wm/erm/CWGfolder/conceptualframework.pdf.

Tchobanoglous, G., Theisen, H., & Vigil, S. (1993). Integrated solid waste management: engineering principles and management issues. New York: McGraw-Hill, Inc.

United Nations Environment Programme. (2009). Developing Integrated Solid Waste Management Plan - Training Manual. United Nations Environment Programme (UNEP), Volume 4, 1–176.

Wan A Kadir, W. R. (1997). The Development of a Framework for Sustainable Waste Management Policy and Strategy for Malaysia (University of Salford). Retrieved from http://core.ac.uk/download/pdf/1664526.pdf.

World bank. (1999). What a Waste : Solid Waste Management in Asia. Retrieved from http://web.mit.edu/urbanupgrading/urbanenvironment/resources/references/pdfs/WhatAWasteAsia.pdf.

Yong, Z. J., Bashir, M. J. K., Ng, C. A., Sethupathi, S., Lim, J. W., & Show, P. L. (2019). Sustainable Waste-to-Energy Development in Malaysia: Appraisal of Environmental, Financial, and Public Issues Related with Energy Recovery from Municipal Solid Waste. Processes, 7(10), 1–29. https://doi.org/10.3390/pr7100676.

eISSN 2600-9374