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The Environmental Pollution and Solid Waste Management in Malaysia

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Abstract

Solid waste management (SWM) is defined as the control of waste generation, storage, collection, transfer, transport, processing and disposal of solid wastes (SW) consistent with the best practice of public health, economics and financial, engineering, administrative and legal, and environmental considerations. This study is to look at pollution caused by waste and the management of solid waste in a few states in Malaysia. Based on the previous study, two methods were used in the study is qualitative and quantitative methods. The qualitative method is with researchers using observation methods, referring to primary sources and conducting interviews. Meanwhile, quantitative methods are used to analyze data using descriptive statistics. Pollution that can occur from waste is water pollution, air pollution, and human health can also be affected. The management of solid waste by an authority in a state was scheduled and systematically. The authorities in a state has charged managing solid waste at RM3 for private house and RM6 for shop or organization. In fact, to improve the management of this waste the authorities also introduced Akta Jalan, Parit dan Bangunan, an effort to curb this waste. This is the way used by the authorities in managing solid waste in a state. The authorities in a state and the authorities in other state are the same parties managing their own solid waste, but there are differences in management systems conducted by both parties such as the way of waste collection scheduling, introduction to the Act and management status. All the steps that authorities take are a great way to deal with waste in a state. This study has also highlighted several ways in managing solid waste that can be done by the authorities such as 3R practice that can reduce waste, privatization that can help in financial, awareness of community and increasing waste management fees that can improve

the management. Improvements to management systems need to be done to ensure that people can live in comfortable and safe environment.

Keywords: Waste Management, Solid Waste Management, 3r Practice, Privatization, Awareness

Introduction

Waste management is important thing in the community living and can give impact to the community. The good waste management will make sure that community can live comfortably. The government policy that very significant to waste management is Dasar Alam Sekitar Negara. The aim of the policy is to keep our environment always clean, safe and productive to our generation in the future (Abdullah et al., 2010). The waste comes from human daily activities. Developing countries face major problem such as waste management in urban as well as in rural areas. According to Akta Kualiti Alam Sekeliling 1974, the waste is defined as a waste material covering the material prescribed as scheduled waste material or all substances either in the form of solid, liquid or in the form of gases or vapors released, release or placed in the environment that may be a factor to pollution (Hadi et.al, 2006). While, garbage is defined as unwanted items and other materials including materials from the garbage of the trade, agriculture and community activities but does not cover solids or solids in domestic sewage or signs of water pollutants such as silt and solids in industrial waste (Suhor, 2003). However, all the waste can cause pollution to the environment. Problematic waste management will cause pollution such as water pollution and air pollution (Wahab et al., 2019). This is due to some of the problem factors in waste management that can impact environment. The most obvious environmental damage caused by solid waste is aesthetic. A more serious risk is the transfer of pollution to ground water and land as well as the pollution of air from improper burning of waste. According to Shah et al., (2012), many waste activities generate greenhouse gases like landfills that generate methane and refuse fleets are significant sources of carbon dioxide and nitrous oxide.

In fact, this problem can interfere human health. Rapid urbanization, population growth, growth, commercial, institutional and home industries, and increased use have resulted in more item and waste disposed at the area (Afrizal & Embong, 2013). These factors should not be ignored because it is a process that occurs in the development of a country. In the management of solid waste, the main factor that becomes the barrier is the cost that too high, from taking, collection and transportation to landfill. According to Fauziah et al., (2004), condition worsening when there is a shortage in management systems and lack of workforce in executing every task that has been entrusted. Failure to comply with the collection schedule planned also causes the accumulated amount of garbage increasing. Therefore, the responsible party should consider effective initiatives to be taken in order to address this waste management problem. Solid waste management (SWM) is defined as the control of waste generation, storage, collection, transfer, transport, processing and disposal of solid wastes (SW) consistent with the best practice of public health, economics and financial, engineering, administrative and legal, and environment considerations (Omran et al., 2009). According to Muin (2018), in a state there will be a responsible party in managing this solid waste. The largest production of garbage is domestic waste which is the waste generated from homes or residential areas which is from our daily used. This is because increased population will contribute to increase the waste. The huge quantity of municipal solid waste generated, particularly in Peninsular Malaysia, has increased from 16,200 tonnes per day in

2001 to 19,100 tonnes per day in 2005 or an average of 0.8 kg/capita/day, that means the amount increases yearly and seems to grow in parallel with the urban areas in many Asian countries which are estimated to produce approximately 8 million tonnes per day (Tarmudi et al., 2009). Through this study it can be seen that waste dump rate increases every year in developing countries. People's concern especially in their home garbage management is needed for helping the government in handling environmental problems (Hasibuan, 2016). This is because they are the beginning of the existence of this waste.

Methodology

Based on the previous study, two methods were used in the study is qualitative and quantitative methods. The qualitative method is with researchers using observation methods, referring to primary sources and conducting interviews. Meanwhile, quantitative methods are used to analyze data using descriptive statistics. That is by passing the questionnaire to the respondent. This paper is based on a few of articles on pollution issues caused by waste and waste management. In fact, the steps to overcome waste management problems are also highlighted in this paper.

Results and Discussion

Effects of Inefficient Waste Management

This solid waste management needs to be taken care by all parties. Solid waste that not well maintained will have a negative impact on humans and the environment (Kamarudin et al., 2018). For human it will disturb our health and for environment can caused pollution. Pollution is defined as the contamination of air, water and land or resources that cause harm to humans, animals and plants (Muin, 2018). Pollution from solid waste management also comes from human activities that do not concern to the environment. Solid waste from industrial activities are not well managed, could have a big impact on the environment. According to Boadi & Kuitunen (2002), the increased of industrial activity and consumption by the urban population lead to the generation of copious quantities of waste. It is because, industrial activity produced more waste then others activity. The state is also an area which many industrial activities such as fishing, cracker making and batik painting. All of these industries may have contributed to pollution through the waste management of the industry. Waste composition consists of several types of substances, particularly toxic waste coming from the last phase of the industrial activities such as copper, arsenic, mercury, polychlorinated biphenyls and hydrocarbons. All of these chemicals are likely to be streamed into rivers or seas that will cause water pollution. The river of the state was affected and deteriorated mainly in the downstream and center areas, this is because of several activities such as waste disposal, municipal, industrial and untreated agriculture into the river system (Amran et al., 2018). Therefore, proper solid waste management needs to be addressed as solid waste that is not properly managed will affect the natural ecosystem. Pollution that occurs due to solid waste also includes odor that indirectly causes illness when the human exposed to it.

Environmental pollution of waste dumping affects health through both short and long-term effects to human. In the short-term effects are congenital anomalies, asthma and respiratory infection and general symptoms such as stress, anxiety, headache, dizziness, nausea, eye and respiratory irritation have been also described. While, for the long-term health effects related

to waste exposure include chronic respiratory and cardiovascular diseases, cancer and even brain, nerves, liver, lymphohematopoietic or kidneys diseases. Table 1 below shows the outcomes that can be considered in the assessment for landfills in European countries (World Health Organization, 2015). Based on table 1 have found that people living near landfills riskier with the illness.

Figure 2 showed a study was conducted in Ghana on diseases caused by waste (Addo et al., 2015). It was revealed from the survey that malaria was the most predominant disease perceived by the household respondents (69.2%). Though this figure is based on perceptions, it is 16.2% higher than the national figure of 53%. Aside malaria, intestinal worms (10.2%), typhoid fever (5.8%), cancer (3.9%) and hepatitis (3.9%) were mentioned as the diseases the household respondents suffered from which they believed were the resultant of the dumpsites. A comparative analysis of the data revealed that the household respondents who lived near the dumpsites suffered more than those who lived far from the dumpsites. According to World Health Organization (2015), from these two data, it can be concluded that those living near the disposal site are at greater risk of disease.

Figure 3 shows the other effects of poor solid management that can occur. Inefficient solid waste management also has many other side effects on the environment as well as humans.

Table 1. Exposure and health outcome metrics used for health impact assessments for landfills

Expose Buffer	Exposure index	Health outcome	Health risk	Metrics	Ref
2KM	Distance	-congenital anomalies	Relative risk(RR)=1.02		I.C.
			(99%CI=1.01=1.03)		
		-annoyance from adours	54%**		P
Herr et. al 2003		-low birth weight	RR=1.06		
			(99%CI=1.052=1.062)		I.C.
Elliott et. al 2001					
5KM	H ₂ S(dispen.model)	-respiratoy diseases	RR=1.09(95% CI 1.00=1.19)		P
Golini et al. 2016					

* I.C. = cumulative incidence on the simulation period (2004-2020); P. = annual prevalence

** Confidence intervals are not available, because this value refers to data from questionnaires

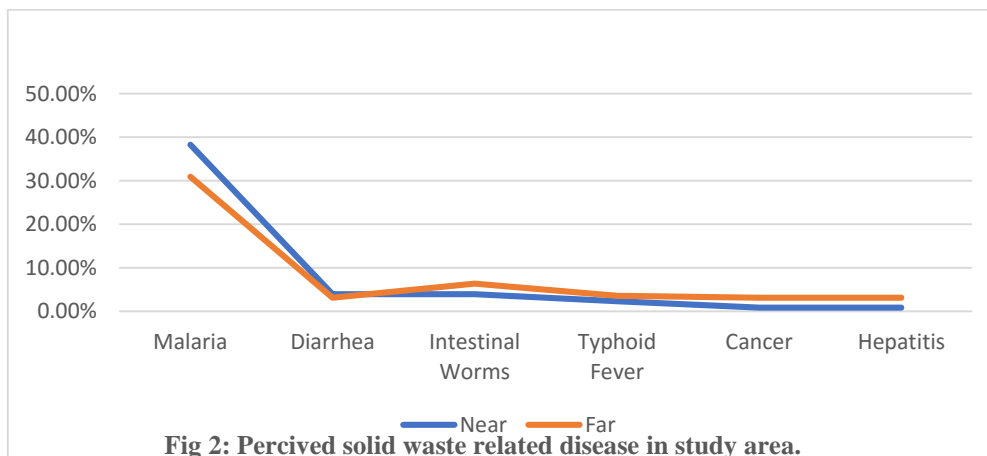


Fig 2: Perceived solid waste related disease in study area.

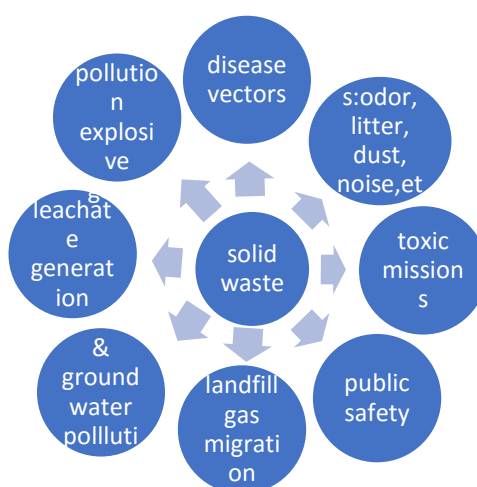


Figure 3: Environmental Impacts Associated with Poor Solid Waste Management Systems.

Some of the Ways Managing Solid Waste by a State in Malaysia

In a state in Malaysia, the function of the authorities in solid waste management for this area is similar to the function of another state waste management company such as Alam Flora Sdn. Bhd (private company). The activities associated with the management of solid waste from the generation point to final disposal have been grouped into six functional elements including waste generation, storage, collection, transfer and transport, processing and recovery and disposal (Omran et al., 2009 & Abdulli et al., 2008). All of these activities are to ensure that the garbage produced will not harm humans and the environment. The average waste generation rate was 0.71 kg / capita / day in the eastern states of Kelantan, Terengganu and Pahang (Fauziah et al., 2004).

The collection of waste should be scheduled and static to ensure it can be managed properly. Table 3 shows a schedule implemented by the authorities in carrying out waste management in a state in Malaysia (Kuala Terengganu City Council Portal, 2015a). The authorities have collected garbage from house to house 3 times a week and charges only RM3, while business premises are daily collected and the charge only RM6. For the main streets and alley, the

authorities conduct quotes on a daily basis and a day interval. This action is a way for the authorities to manage solid waste in the state area and to keep the area in good condition. If this waste is not properly managed, it will cause problems. According to Mahyudin (2017), one of the problems that arises from waste is the decreasing aesthetic in the surrounding collection area that can causing social conflicts with the surrounding communities that can give a negative impact in communities living.

Table 4: Waste Collection Service Schedule

No	Type Collection	Time Operation	Monthly Payment Rates (Rm)
1.	Garbage Collection House to House	3 Times Per Week (Sunday, Tuesday & Thursday)	3.00
2.	Garbage Collection Business Premises in Town	Everyday	6.00
3.	Ordinary Collection		No Fees Charged
	Main Roads	Everyday	
	Alley	Day Interval	

To ensure that the waste management situation is under control, the authorities also introduced several acts to the public to be followed. The act of throwing away the rubbish on average is in contravention of the provisions (i) Paragraph 47(1)(a) Akta Jalan, Parit dan Bangunan, 1974 (Akta 133); or (ii) Undang-Undang Kecil 13 2) The compound offer of RM50.00 (Ringgit Malaysia: Fifty) shall forthwith be issued by the enforcement member of the authorities to any person who commits an offense in paragraph (1) above. 3) If the offender fails to settle the compound offer in paragraph (2) above, they may be fined up to - (i) RM500.00 (Ringgit Malaysia: Five Hundred) for offenses under the Akta Jalan, Parit dan Bangunan, 1974 (Akta 133); or (ii) RM250.00 (Ringgit Malaysia: Two hundred and fifty) for offenses under the authorities law (Kuala Terengganu City Council Portal, 2015b).

This act was introduced as a form of action that the community needs to adhere and they may be subject to the law if violates it. All this action is to make sure that the state always clean from solid waste. However, every effort that the authorities do to ensure the clean environment will not succeed if the attitude and mentality of the community is not in line with this effort. This matter has been proven when rubbish is still being thrown away everywhere in a beach in that state which is transmitted by a user through social sites (Yatim, 2019). In ensuring a cleaner and safer environment, more aggressive efforts should be taken by all parties. Industry practitioners also need to manage solid waste properly and not take a nonchalant attitude towards the environment.

Comparison with others Management Authorities in Malaysia

In a big city in Malaysia also has an authority that handled waste management of the city. Its function is the same as other authorities, which is to ensure the clean and safe environment to the community. In every management there is a difference in managing the solid waste. This is influenced by several factors such as population density, demographics and economic

conditions of the area. The difference seen in waste management in a big city is through time collection. The authorities have set the time of waste collection to be carried out by them. For example, in the Table 5, there is a time set for waste collection in the area of the Bangsar (Omran et al., 2009). This collection time is very useful for residents to do their waste disposal at the designated time. In fact, the residents of the area will not miss to throw away their waste that will cause bad smell on time. They will concern about time to throw their waste at the right time.

Table 5: Sample Garbage Collection conducted at Bangsar Area

Area	Day	Time
Taman Bandaraya Bukit Bandaraya	Sunday	1.00 a.m-12.00 p.m
Bangsar Baru Bangsar Park	Tuesday	8.00 a.m-12.00 p.m
Bukit Persekutuan Bukit Bangsar	Thursay	8.00 a.m-12.00 p.m
Taman Lucky Taman Bkt. Pantai	Saturday	8.00 a.m-12.00 p.m

Source: DBKL Annual Report, 1992.

In addition, to ensure that people follow the waste management planned, there is an introduction to some of the act. The both authorities have introduced some of the act to the community in enhancing the management system. The authorities in big city has introduced the Act 171 Local Government Act 1976 under the Laws of collection, disposal and disposal of rubbish 1998, Section 6 (1) and Section 7 (1) on the ways of disposal of waste by the community (Omran et al., 2009). While, the authorities in other state has introduced Jalan, Bangunan, 1974 (Akta 133) to convict someone who violates the rules of waste disposal. Each management uses an approach to their own law, but its function is the same as raising the waste management system at the area (Kuala Terengganu City Council Portal, 2015b). Besides that, the differences in management status in that two state.

According to the Local Government Act 1976, Local Authorities (PBT) are responsible for the provision of facilities and services related to the management of solid waste, especially within the local authority area (Anuar & Wahab, 2015). In a state, waste management remains the responsibility of the local authority, but in the other state waste management has been assisted by a private company. Starting 1997, Alam Flora Sdn Bhd (AFSB) is subject to an interim agreement with the Local Authority (PBT) to manage waste collection and cleaning services until full privatization is implemented (Omran et al., 2009). This has shown that the authorities in a big city intends to privatize waste management in the state. Although waste management of each state seem quite the same, but there are differences in managing the waste depending on the state. All the action that they did are to make sure their state in clean and comfortable condition.

Improvement of Waste Management

The main step in ensuring the effectiveness of waste management is by reducing waste. One way to reduce waste is by implementing the 3R concept aggressively. The 3R concept is based on the practice of reducing, reuse and recycling. Reduce is by reducing the use of things that have the potential to produce a lot of waste, avoiding disposable items, using products that can be refilled, and by reducing the use of plastic bags when shopping. Reuse is to use items that are considered rubbish for different functions, for example using paper to be a wrapper. Reuse is to extend the life and time of use of things before being dumped in the trash. Recycle is done by converting used goods into other objects that are more useful and suitable for use. For example, changing used bottles into flower vases (Setianingrum, 2018).

According to Sakawi (2011), all these activities help in the separation of recyclable materials and separate collection for recycling purposes. The waste reduction practices are synonymous with the community, they are responsible in this practice. The practice of this concept needs to be done aggressively as it reduces the amount of solid waste. In India, recycling is done by rag picker, they work day and night to collect the recyclable materials from the streets, bins and disposal sites for their livelihood, and only a small quantity of recyclable materials is left behind them. It has been estimated that the recyclable content varies from 13% to 20% (for example, in Mumbai 17% and in Delhi 15% of Municipal Solid Waste is recyclables) (Sharholly et al., 2008). This activity is very helpful to reduce amount of solid waste in India. In Delhi, there are more than 100,000 rag pickers and the average quantity of solid waste materials collected by one rag picker is 10–15 kg/day and about 17% of Delhi waste handling is done by rag pickers, who collect, sort and transport waste free of cost, as part of the informal trade in scrap, saving the government Rs 600,000 (US\$13,700) daily (Sharholly et al., 2008). This has been demonstrated that recycling practices can reduce waste in the areas.

The next step is to use organic waste in agriculture as a compost or soil improver and feeding food waste to animals. This practice is the most significant valorization operation in two of the cities, Moshi in Tanzania and Sousse in Tunisia. This traditional use is also present in Nairobi, Kenya; Quezon City, Philippines; Managua, Nicaragua; and Kunming, China (Wilson et al., 2012). Waste in Malaysia is dominated by organic waste, which comprises more than 40% of the total waste stream. In the 1980s and 1990s, the average organic waste was approximately 50% consisted of processed kitchen waste and food waste (Visvanathan et al., 2004).

The percentages of organic matter in municipal solid waste in selected African cities were recorded as 56% in Ibadan, 75% in Kampala, 85% in Accra, 94% in Kigali and 51% in Nairobi (Cofie et al., 2006). This thing shows that over half of the waste is organic waste. In most countries, organic waste has been used as Vermicomposting in agriculture. Vermicomposting was started in Ontario (Canada) in 1970 and is now processing about 75 tones of refuse per week, American Earthworm Company (AEC) began a farm in 1978-1979 with about 500 tones capacity per month, Aoka Sangyo Co. Ltd. Japan has there 1000 tones per month plants processing wastes from pulp and food industries. Besides these, there are about 3000 other vermicomposting plants in Japan with 5-50 tones capacity per month and it has also started in Italy and in the Philippines (Aalok et al., 2008). This organic waste reuse can be implemented especially in the villages where there are usually has farm animal and agricultural activities. Therefore, the reuse of organic waste helps in reducing pollution and the amount of solid waste.

Privatization of the company that manages the solid waste is also a step in helping the waste management. Privatization, more economic approach is considered as one option to improve the collection operation in a state or area (Jalil, 2010). The government found that most local authorities lack the financial, expertise and human resources to provide solid waste management services and public cleansing quality, local authorities should provide 40% to 45% of the workforce to perform services related to solid waste management (Anuar & Wahab, 2015). In managing this solid waste requires a high cost. Collection of fees imposed on society maybe not enough to run a perfect waste management. In this regard, efforts through privatization and acquisition are seen as the best way for solid waste management to be managed better, systematic and focused (Haslinda et al., 2015). According to Abduli (2008), the absence of financial support always leads to the development of the countries have a waste management system that is inefficient and no management systems.

Consequently, communities need to spend some money on managing their solid waste. In a state in Malaysia, the residents only need to pay RM3 per month for solid waste management but the fee maybe not sufficient for good waste management. Because of that, the authorities need to increase fees in order to provide better waste management. Punitive measures are provided in the Bill to tackle the problem of consumers who refuse to pay waste disposal fees. The failure to settle the collection fees will allow the licensed concessionaire to take the case to the Tribunal for solid waste management (Periathamby et al., 2009). The authorities also need to implement a solid waste payment act to ensure that the public pays it. So that, they can provide a better solid waste management.

Community awareness on the management of solid waste is the first thing to emphasize (Jusoh et al., 2018). A study conducted on the first-year students of Universiti Kebangsaan Malaysia found that there were a number of students (63.8%), having knowledge about Solid Waste Management (SWM), but not consistent with their attitude. The results of this study showed that more than half of the students (65.9%) had negative attitudes towards solid waste management (Desa et al., 2011). The efficiency on the separation of waste depends on the awareness of citizens and municipal leaders on the impacts of waste management systems in the city (Guerrero et al., 2013). The moves towards better resource management, including more repair and reuse, higher recycling, more home composting require behavior change from the community (Desa et al., 2013). The key to managing this waste is the behavior of the community itself to adopt measures for good waste management.

Conclusion

In conclusion, solid waste management can contribute to environmental pollution if not properly managed. Water and air pollution will occur as solid waste is discarded and not discharged to the proper place. The management of the authorities is a good move in solid waste management, for example, introducing the drainage and building works 1974. However, this management needs to be improved with some steps to manage solid waste. Research on the community should be given due diligence as a trigger for this solid waste source. Educating the community on 3R practices, privatization of management, increasing public awareness and increasing the solid waste management fee rates are among the steps that can be taken to improve waste management. The authorities need to find ways or improve waste management that has been done by looking at the management of other management as well as waste management from abroad.

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