

# POLICIES, CHALLENGES AND STRATEGIES FOR MUNICIPAL WASTE MANAGEMENT IN MALAYSIA

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## Abstract

Municipal waste management (MWM) in Malaysia has become a challenging task in recent years due to population growth, industrialisation and an increase in quantity and variation in the types of waste generated. Suitable disposal sites are becoming scarce and most of the existing ones are nearly coming towards the end of its useful life. The government has promoted recycling programmes through various campaigns however little has been achieved due to the lack of participation and lukewarm attitudes of the public in Malaysia. Therefore, this paper is written to provide an overview and analysis of the policies, challenges and strategies to issues related to MWM in Malaysia.

**Keywords:** municipal waste management, environmental management, technology management, Malaysia

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## ■ 1.0 INTRODUCTION

The management of municipal waste continues to be a major challenge in urban areas throughout the world, particularly in the rapidly growing cities and towns of the developing world. The lack of an effective and efficient municipal waste management system has had negative impact on the environment. With a projected population of over 31 million in 2016, Malaysian generates more than 25,000 metric tonnes of domestic waste per day (Nadzri, 2013).

At present, the average per capita generation of municipal waste in Malaysia is about 0.85 kg/person/day depending on the economic and geographical status of an area. In major cities, such as Kuala Lumpur, it is estimated that the generation of waste is about 1.5 kg/person/day (Budhiarta et al., 2011). Authorities in most major cities in Malaysia are seeking for an alternative waste management approach as the landfill approach currently adopted becomes unsustainable due to rapid development and lack of new landfill spaces. In response to that, the Malaysian government, as part of the 10th Malaysia Plan(2011-2015), adopted waste recycling as a long-term strategy for municipal waste management (Economic Planning Unit, 2010).

## ■ 2.0 POLICIES OF MUNICIPAL WASTE MANAGEMENT (MWM) IN MALAYSIA

Starting from 8th Malaysian Plan, the government has included “waste minimisation”, “promotion of reuse”, “developing a recycling-oriented”, and “implementation of pilot projects for recycling” as some of its main policy goals. In the 9th Malaysian Plan (2006 - 2010) further emphasis were given to the continuation of reduce, reuse, recovery and recycling of waste as well as greater use of environmentally friendly products. As a result of this plan, a new department, known as National Solid Waste Management Department has been set up under the Ministry of Housing and Local Government (Economic Planning Unit, 2006). A new bill has been gazetted to implement the new Solid Waste and Public Cleansing Management Corporation Act 2007 (SWPCMC Act 2007). All matters relating to municipal waste management will be under the jurisdiction of this new department. The focus area of this department is Solid Waste Management (Manaf et al., 2009).

This act also provides executive power to the Federal Government to implement municipal solid waste management and public cleansing activities throughout Peninsula Malaysia, Federal Territories of Putrajaya and Labuan.

Through the SWPCMC Act 2007 the Federal Government of Malaysia has taken over the responsibility of MWM from state local authorities (LA) and privatised them to concession companies. The Federal Government undertook this measure due to several factors including lack of human and financial resources to manage waste and non-standardised approach to MWM. Therefore, the aim of the

privatisation exercise is to improve the quality of service, promote efficiency, provide better facilities and to have an integrated and holistic approach to Malaysian MWM (Yahaya and Larsen, 2008).

On top of that, the new laws also took into consideration waste minimisation, reuse, material recycling, energy recovery and landfill. While under the 9th Malaysia Plan, waste treatment facilities such as transfer stations, thermal treatment plants and waste to energy production facilities (WTE) were also earmarked as alternative treatment methods of municipal waste management potentially to be adopted in the near future.

In general, based on the new act, MWM in Malaysia involves the participation of various Government agencies from federal to state and down to LA. LA's role will be limited to receiving delegation of power from Federal Government. Nevertheless LA will be directly engaged with municipal solid waste. The decision to determine whether Municipal Solid Waste (MSW) collection is implemented either by local authority or private contractor is the LA's responsibility. Similarly, decision to determine the area for MSW collection will be based on the number of population by the LA.

## 2.1. Collection and transportation

Among the more than 25,000 metric tonnes of waste generated daily as mentioned above, 45% are organic waste (food waste), 24% are plastics, 7% paper, 6% metal and 18% are glass and others as shown in Table 1. Mechanism of separation at source between recyclables and non-recyclables are done voluntarily by Malaysians themselves with collection mechanism by the concessionaires that had started even five years ago on September 2012 (Budhiarta et al., 2011).

**Table 1.** Waste composition generated per day in Peninsular Malaysia

Type of Waste	Percentage
Organic (Food)	45%
Plastics	24%
Paper	7%
Metal	6%
Glass & Others	18%
Total	100%

A two plus one (2 + 1) collection system, 2 days for residual and 1 day for recyclable waste including bulky and green waste, has been implemented. New standards on waste bin and garbage collection trucks have been used and enforcement on the efficiency of the collection schedule has also been implemented (Nadzri, 2013).

## 2.2. Recovery, treatment and disposal

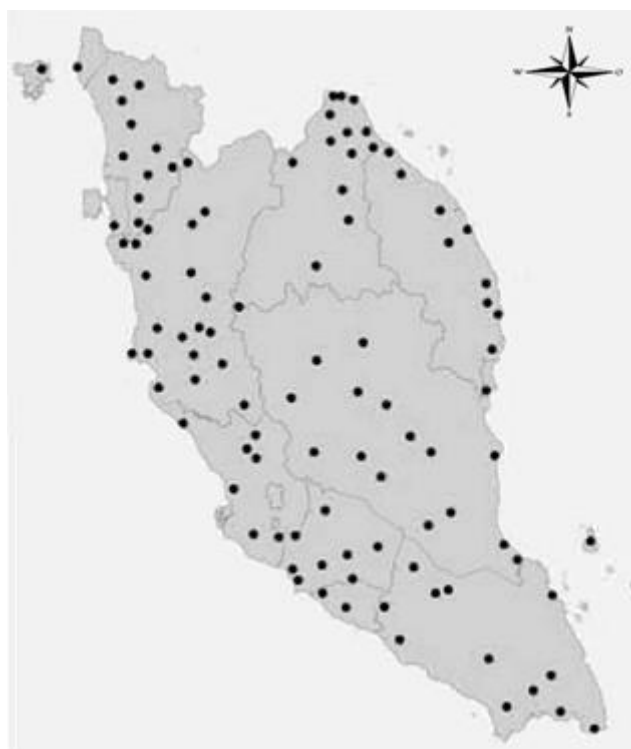
The wastes generated are then disposed off at 165 disposal sites in the country, which cater up to 95% of Malaysian waste, as shown in Figure 1. Of these, only 8 are sanitary landfills while the rest are open dumps. 11 more sanitary landfills are under various stages of implementation and construction. However, about 80% of these dumps have almost reached full capacity and are expected to be shut down over the next few years (Nadzri, 2013). Closing a landfill is environmentally challenging and involves acquiring other pieces of land, which will eventually become scarce in the future. At the moment, the country only has one WTE plant located at the central region and 4 mini incinerators under various stages of implementation in Langkawi, Tioman and Pangkor Island plus one in Cameron Highlands. In the 10th Malaysia Plan, another WTE plant is to be built and completed by 2018 in Negeri Sembilan.

## ■ 3.0 CHALLENGES IN MWM

The main challenge brought by the rapid increase of municipal wastes is its detrimental effect to both humans and the environment. Currently, major waste management approach in Malaysia is still by landfilling and incineration method.

### 3.1 Landfill

Due to increasing lack of space for new landfills, authorities in major cities in Malaysia are studying other waste management approaches. Among them is an approach to move away from unsanitary landfills due to greenhouse gas (GHG) emissions it causes such as methane and carbon dioxide. According to World Bank statistics, in 2010 Malaysia produced 42.2% more Methane, 250.5% more carbon dioxide, 10.4% more Nitrous Oxide and 99.9% other type of GHG than previous years from 1990 - 2010 as shown in Table 2 (The World Bank, n.d.). As these figures were dated seven years ago, the amount of GHG emissions presently is expected to be far greater. These statistics of Malaysia's environment are alarming. New sustainable MWM technologies are urgently required to address this issue because until today, the enforcement to control GHG emissions in Malaysia is still weak and inadequate.



**Figure 1.** Black dot shows the many location of existing and closed landfill sites in Peninsula Malaysia. 80% of the existing landfill sites have almost reached full capacity and are expected to be shut down in the next few years.

**Table 2.** Trends in greenhouse gas emissions (GHG)

Type of gas emissions	Thousand metric tons or equivalent	% Change 1990-2010
	2010	1990-2010
Carbon Dioxide	198,348.0	250.5
Methane	33,599	42.2
Nitrous Oxide	15,010	10.4
Other GHG	1,195	99.9

### 3.2 Incineration

Incineration is the second mostly used method to manage waste in Malaysia. It is one of the most effective means of dealing with various types of wastes. Despite being an attractive technological option for waste management, this type of combustion-based process for municipal solid waste treatment is a subject of intense debate around the world (Achillas et al., 2011). In the absence of effective controls, harmful pollutants such as dioxins may emit into the air, land and water which may affect human health and natural environment. Although incineration of municipal waste coupled with material and energy recovery can form an essential part of an integrated waste management system, yet strict controls are required to prevent its negative impacts on human health and natural environment (Misra and Pandey, 2005).

### 3.3 High cost in managing waste

According to previous Malaysia's Director General of National Solid Waste Management Department, 40% - 80% of LA expenditures are on managing municipal waste and public cleansing. The cost of MWM services per premise is around RM15.00 and the privatisation of the MWM had cost the Malaysian Government more than RM300 million. Capital expenditure (Capex) for a new landfill will be more than

RM30 million in average whereas the operating expenditure (Opex) of a landfill is around RM30.00 - RM40.00/tonne in average (Nadzri, 2013).

In this situation, LAs are, in most cases, incapable of absorbing the high cost expenditure since the necessary resources to implement adequate municipal waste management systems are generally underestimated. The absence of these consequently leads to inadequate waste management with far-reaching ramifications to both public health and the environment (Badgie et al., 2012).

### **3.4. Public awareness and enforcement**

The government has launched several recycling campaigns in the year 2000s to involve the participation of non-governmental organisations (NGO) and community groups as well as the launch of an extensive public education and publicity campaign. Unfortunately, the campaign received only a lukewarm response from the public.

The overall failure of the campaign has been succinctly noted by the Minister of Housing and Local Government, in which he mentioned that after more than two years of recycling campaigns, only 2% of waste is recycled while it will take only nine and a half days to fill the Petronas Twin Towers with garbage (Omran et al., 2009).

In fact, the figures quoted above are way below the government's target of increasing the nation's recycling rate to 22% by 2020, which would require a drastic transformation in habits and attitudes of the Malaysian public (Omran et al., 2009).

Education and awareness is the key to reduce waste. The amount of waste generated will continue to increase without a conscious decision by consumers to reduce, reuse and recycle. Early age education is also the key to ensure future generations contribute to sustainable MWM practices. Enforcement of regulation is another aspect to ensure rules are adhered to.

## **■ 4.0 FUTURE STRATEGIES**

The management of municipal waste in Malaysia is a challenge that must be planned and handled properly. Strategies to control the generation of municipal waste must be among the best and most appropriate methods to ensure sustainability. Control over the production of municipal waste can help reduce municipal waste being sent to landfills. The production of municipal waste can also be addressed by various means, such as enforcement of waste legislation, recycling; waste control at source, the design of an intelligent system for controlling the composition of municipal waste, and a continuous awareness campaign on waste-related issues (Badgie et al., 2012). Below are some other strategies that can be adopted based on documents analysis, surveys and interview done with the experts in MWM to fulfill the vision of developing a sustainable waste management system in Malaysia.

### **4.1. Upgrade infrastructure and human capital**

In general, meaningful progress has been made in Malaysia in terms of developing MWM infrastructures, but the desired goal of a clean and green nation has yet to be attained. Public awareness on waste management issues to be better informed about MWM remains inadequate.

Despite the fact that the local government has spent almost 40% - 80% of their operational budget on municipal waste management-related issues, the need for critical talents and expertise in waste management must not be undermined. The relevant stakeholders must acquire and develop expertise to manage the various municipalities of waste management effectively and efficiently as mentioned in the 11th Malaysia Plan to accelerate human capital development for an advanced nation (Economic Planning Unit, 2015).

### **4.2. Recycling programme**

One of the most serious problem that hinders the success of a recycling programme in Malaysia is the meek and shallow regulations and guidelines. National, state and local authorities should formulate regulations, policies and programmes that are sustainable. As an example, the programmes in Japan are carried out both through private and public systems, recycling is carried out through retailers' trade-in, barter system activities and community-based systems. While Germany has in place regulations on deposit system, waste disposal tax and amount of waste to be utilised in production [9]. Municipal waste recycling in Malaysia has a long way to go. Effort to reduce waste through waste minimisation or recycling should be planned properly. This does not mean that we have to switch to more capital-intensive and sophisticated systems because they are not necessarily more effective and efficient. The recycling programme should be properly planned involving all the relevant stakeholders including the government, municipalities, households, non-governmental organisations, manufacturers and last but not least the scavengers [9]. Current recycling rate of 5% is underestimated since recycling activities are still unregulated thus no proper data has been collected (Nadzri, 2013).

### 4.3. Development of Decision Support System (DSS)

In Malaysia, municipal waste analysis and data for major township and cities basically never have been well analysed and documented (Badgie et al., 2012). Several studies have been undertaken in the past on waste composition, but they were not undertaken using proper sampling techniques and lacks coordination. This is a factor that could defy a good strategy to manage municipal waste in this country. In other words, at the moment there is no DSS that has been developed for waste management system. This could hinder critical information from being utilised for future planning (Nadzri, 2013).

Successful waste management in any given country depends on reliable information about quantities, types, and the amount of material that can be captured and support decision-makers to make an informed decision in the future (Badgie et al., 2012).

### 4.4. Alternative technology

In considering alternative technology to be used for managing waste, Malaysia has to take into consideration the risk, sustainability, impact on environment and commercially proven technology and reliability for long term solution. Emerging technology, such as thermal plasma waste treatment method that employ pyrolysis and gasification, are available and looks promising. A thorough viability study of the method needs to be conducted rather than focusing on building new incinerators.

The development of pyrolysis and gasification technologies has been successfully deployed in large-scale plants in Europe, North America and Japan (Gomez et al., 2009). Similar setup can be developed in this country especially in the area where hazardous gases are emitted such as in the petrochemical industrial area. A political and social issue can also be avoided if such setup can be realised because there are many evidences to indicate that the hazardous waste can be treated by this type of facility in the developed countries.

## ■ 5.0 CONCLUSION

In conclusion, Malaysia's municipal waste management strategies had to a certain degree been able to improve the environmental quality, public health, and socio-economic development as detailed in the country's future vision. This is mainly attributed to growing interest of the government on environmental issues, as demonstrated by the establishment of SWPCMC Act 2007, the implementation of 10th and 11th Malaysia Plan and privatisation initiatives.

However, more ground works are required to increase the effectiveness and efficiency in achieving the targeted objectives on municipal waste management with an integrated and sustainable perspective particularly for the local, state, and federal governments to undertake in attaining a clean, green, and beautiful Malaysia for all to cherish in the future.

## ■ REFERENCES

- Nadzri, Y., 2013. "The Way Forward: Solid Waste Managment in Malaysia." 10th Annual Waste Management Conference & Exhibition, Malaysia, pp.10-19 July, 2013.
- Budhiarta, I., Siwar, C., and Basri, H., 2011. *Current status of municipal solid waste generation in Malaysia*. International Journal on Advanced Science, Engineering and Information Technology, 2(2), pp.16–21.
- Economic Planning Unit, (2010). "Eighth Malaysia Plan 2011-2015." *Economic Planning Unit Malaysia, Prime Minister's Department*.
- "The World Bank| World Development Indicators." [Online]. Available: <http://wdi.worldbank.org/table/3.9>. [Accessed: 04-Aug-2013].
- Achillas C., C. Vlachokostas, N. Moussiopoulos, G. Baniyas, G. Kafetzopoulos, and A. Karagiannidis, 2011. "Social acceptance for the development of a waste-to-energy plant in an urban area," *Resources, Conservation and Recycling*, vol. 55, no. 9–10, pp. 857–863.
- Misra V. and S. D. Pandey, 2005. "Hazardous waste, impact on health and environment for development of better waste management strategies in future in India," *Environment international*, vol. 31, no. 3, pp. 417–431.
- Badgie D., M. A. Samah, L. A. Manaf, and A. B. Muda, 2012. "Assessment of municipal solid waste composition in Malaysia: Management, practice and challenges," *Polish Journal of Environmental Studies*, vol. 21, no. 3, pp. 539–547.
- Omran A., A. Mahmood, H. Abdul Aziz, and G. M. Robinson, 2009. "Investigating households attitude toward recycling of solid waste in Malaysia: a case study," *International journal of environmental research*, vol. 3, no. 2, pp. 275–288.
- Hassan N., T. L. Chong, M. Rahman, and M. Awang, 2011. "Recycling model in developing countries: an illustration for Malaysia," in *Environmentally Conscious Design and Inverse Manufacturing*, 2001. Proceedings EcoDesign 2001: Second International Symposium on, 2001, pp. 494–498.
- Gomez E., D. A. Rani, C. R. Cheeseman, D. Deegan, M. Wise, and A. R. Boccaccini, 2009. "Thermal plasma technology for the treatment of wastes: A critical review," *Journal of Hazardous Materials*, vol. 161, no. 2, pp. 614–626.
- Yahaya N. and I. Larsen, 2008. "Federalising Solid Waste Management in Peninsular Malaysia," in *Proceeding of International Solid Waste Association (ISWA) World Congress*, Singapore.
- Economic Planning Unit, 2006. "The 9th Malaysia plan: 2006-2010." *Putra Jaya, Malaysia: Prime Minister's Department*.
- Manaf L. A., M. A. A. Samah, and N. I. M. Zukki, 2009. "Municipal solid waste management in Malaysia: Practices and challenges," *Waste Management*, vol. 29, no. 11, pp. 2902–2906.
- Economic Planning Unit, 2015. "Eleventh Malaysia Plan 2016-2020." *Economic Planning Unit Malaysia, Prime Minister's Department*.