

Landfills in Malaysia: Past, Present and Future

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Abstract

In Malaysia, the absence of an integrated waste management system resulted with more than 10.40 million tonnes of municipal solid waste (MSW) being disposed off into landfills annually. This highlights the importance of landfills in MSW management in Malaysia. However, sustainable landfilling technology is yet to be achieved. This paper deliberates the scenarios of landfilling in Malaysia. Past and present status is thoroughly discussed while future prospects will be scrutinized. During the 1970s, the disposal sites were small and mere open-dumping grounds to cater small communities. With the population expansion in the 80s a national program was developed to manage municipal and industrial wastes more systematically. Early 1990s saw the privatization of waste management in Malaysia, and the establishment of the first sanitary and secure landfills. A more systematic waste management was gradually in place by end of 1990s. However, the absence of an integrated waste management resulted with landfills being pre-maturely closed. The flow of events had eventually led to the passing of the Solid Waste and Public Cleansing Management Act 2007. Even though the bill is yet to be implemented, the government has taken big steps to improve waste management system further. Future waste management in Malaysia seems somewhat brighter with a clear waste management policy in place. Therefore it is hoped that waste management and landfilling can be more sustainable in the near future.

Keywords: Municipal solid waste, Open-dumps, Privatization, Solid Waste Public Cleansing Management Act 2007.

1 Introduction

Waste management has become an issue of concern ever since human began to build large communities within a designated area. The higher is the population the more important is a proper waste management system. Initially, waste management system was in place solely to cater the need of waste disposal where unwanted materials are to be rid off. The main objective of the disposal system was to take care of the sanitation and health of the community. However, with the development of modern civilization, getting rid of waste alone is insufficient as it translated to pollution and an unsustainable development. Therefore various strategies have been introduced to improve the waste management concept (Agamuthu 2001). Among the most well adopted concept is the inverted pyramid of waste management hierarchy as depicted in Figure 1-1.

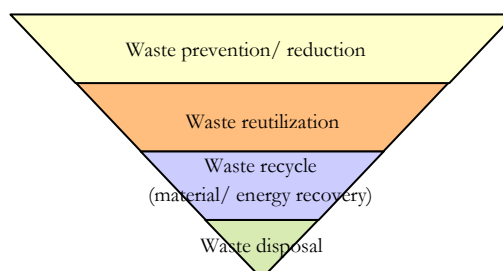


Figure 1-1: Waste management hierarchy

According to Figure 1-1, the smaller the size of the area of waste option the lesser is the preference. Waste reduction, reutilization and recycling, or the 3Rs concept is widely practiced throughout the globe in order to achieve sustainable waste management (Agamuthu et al 2009, Damgaard 2009, Agamuthu et al 2008). However, the final option i.e. disposal is still necessary since not all wastes can be diverted into the 3Rs streams. Therefore, sustainable management of landfills has to come into the picture. Landfill facilities are necessary to enable disposal of waste in a controlled manner. This is to ensure that the environmental impacts from the waste disposal activities can be minimized.

The earlier days saw landfills as mere disposal ground for waste, but this concept has changed over the year with various studies indicating the negative impacts to the environment. Among others are leachate contamination to surface and groundwater, infestation of pest, and emission of environmentally hazardous gases such as hydrogen sulphide and methane to the atmosphere (Ojeda-Benítez & Beraud-Lozano 2003, Scharff & Jacobs 2006, Buivid et al. 1981, Halvadakis et al. 1988). As a result, landfills are to be managed sustainably to hinder the potential risk to the environment. In addition, the concept of sustainable landfilling has been introduced where the results generate benefits both from the social and economical aspects. Nowadays, sustainable landfilling practice promise security in terms of pollution prevention as well as generating continuous revenue, even after the landfill is closed. Among the successful implementation of the sustainable landfilling concept are in Vienna and Osaka (Best Practice UN-Habitat 2002).

Annual generation of municipal solid waste (MSW) in Malaysia has exceeded 11 million tonnes that there is an urgent need of an efficient waste management system and a more sustainable landfilling practice (Agamuthu et al 2009a). The absence of an integrated waste management resulted with more than 10 million tonnes of MSW being disposed off into landfills annually (Fauziah and Agamuthu 2009). This highlights the importance of landfills in MSW management in Malaysia. The immense dependency necessitates that landfills are managed effectively and in a sustainable manner in order to reduce environmental impacts. However, sustainable landfilling technology is yet to be achieved. This paper deliberates the scenarios of landfilling in Malaysia. Past and present status is thoroughly scrutinized while future prospects will be discussed.

2 Management of the MSW in Malaysia

Solid waste management is defined as a discipline related to solid waste generation, storage, collection, transfer and transport, processing and disposal by taking into considerations, the environmental, economics, aesthetics and public concerns (Agamuthu 2001). However, the efficiency of waste management practice is highly dependant on the economical, social and technological aspect of the country.

2.1 Past Practices

In Malaysia, the focus on solid waste issues was not evident until late 1970s where solid waste management began with street cleaning and transporting domestic waste to disposal sites. The solid waste management program then was quite primitive and sufficient to cater the daily MSW generation of lesser than 0.5 kg per capita. The waste disposal activities only involved the local authorities (LA) namely the City Halls, Municipal Councils and District Councils.

The LAs are mainly empowered through Provisions under Streets, Drainage and Building Act 1974, Local Government Act 1976 and the Town and Country Planning Act 1976 (Agamuthu et al 2004). Solid waste management in the LAs was handled by the Department of Urban Services and in most cases waste collection service was only confined to urban areas while the rural community disposed the waste by burying or burning. Disposal sites then were mere open-dumping grounds owned by the LAs. Their sizes were small to cater small

communities and were scattered through out the country. In 1970s, dumping grounds generally were located near the urban areas since waste were collected mainly from this area.

In early 1980s, population expansion in the country resulted with the development of areas for commercials, industrial and housing activities. This led to the siting of landfills far from residential areas and away from urban centres. As a result, a more appropriate waste management system was necessary to avert risk to human that the management of municipal and industrial wastes was instigated at the national level. The event had led to the implementation of waste disposal regulations i.e. Refuse Collection & Disposal By –Laws (1983), and the launch of a hazardous waste management centre (Agamuthu et al. 2004, Noorhajan 1995).

The national program was developed to manage municipal and industrial wastes more systematically. However, not much improvement was recorded that waste disposal site was still identified as one of the contributors towards environmental degradation in the country, particularly river pollution due to leachate generation (Fauziah & Agamuthu 2003). With the increase in living standard, public became more vocal in making objections on the siting of landfill sites. Similarly with the waste management system, complains from public resulted with government decision to shift the responsibility to a third party. As a result, privatization of waste management in the country was proposed.

2.2 Privatization in Malaysia

Privatization in Malaysia was initiated as a national policy in 1983, to transfer responsibility and functions from the public sector to the private sector (Zainal 1997). Table 2-1 lists the objectives of the privatization initiated by Malaysian national policy which was later adopted in the waste management sector.

Table 2-1: Objectives of the Malaysian national policy on privatization.

No	Objectives of Privatization
1	Relieving the financial and administrative responsibility of the government.
2	Improving efficiency and productivity
3	Facilitating economic growth
4	Reducing the presence of the public sector in the economy, and
5	Assisting the country in meeting its' national development policy goals.

The privatization of urban solid waste management in Malaysia was initiated in 1993 with the objective to provide an integrated, effective, efficient, and technologically advanced solid waste management system. It is also expected to resolve the problems in solid waste management faced by the LAs such as finance, lack of expertise, illegal dumping, open burning and lack of proper solid waste disposal sites. Therefore, four private waste management consortiums were appointed for the whole country.

Privatization saw improvement in the waste collection system. However, no significant development was shown in the quality of the disposal sites. Privatization only resulted with transfer of responsibility from the LAs to the waste managing consortiums. As a result, the existing dumping grounds were used continuously to dispose waste. The lack of financial aid resulted with the waste managing consortiums being unable to construct more appropriate landfills. Less priority was given to the management of a landfill since 'out of sight and out of mind' concept is strongly embedded among the citizen. The ability of the concessionaires to improve the waste management facilities within their jurisdiction varied with the ability for them to generate revenues from their services. Table 2-2 details the four waste managing consortiums assigned to cater the need of waste management in the country.

Table 2-2: The waste managing consortiums during the privatization initiation in Malaysia.

Consortia	Areas of responsibilities
Alam Flora Sdn. Bhd.	Central and eastern regions (the Federal Territory of Kuala Lumpur, Selangor, Pahang, Terengganu and Kelantan).
Northern Waste Industries Sdn. Bhd.	Northern region (Perlis, Kedah, Penang and Perak).
Eastern Waste Management Sdn. Bhd.	East Malaysia (Sarawak, Sabah and Federal Territory of Labuan).
Southern Waste Management Sdn. Bhd.	Southern region (Negeri Sembilan, Melaka and Johor)

Public outcry then was never initiated by the issue of improper landfill management. On the other hand, most public uproar was due to their dissatisfaction over the waste collection service. As a result, appropriate management of municipal and industrial solid waste had taken a high precedence with bigger financial provision. The operation cost of MSW management had increasingly absorbed more and more of the total budget over the years (Agamuthu 2001). The cost of collection and transfer of waste for disposal alone had reached up to 60% of most LAs.

Budget allocated for the preservation and maintaining a fit environment has always been specified, and without appropriate methods and technology to reduce waste for disposal. Thus, the cost of waste management in the country without doubt increased to an unacceptable level. Due to the inability to generate revenue from the waste management activities, two consortiums failed during their concession period. As a result, only two remain to date namely Alam Flora Sdn. Bhd. and Southern Waste Management Sdn. Bhd. to cater the need of the country's waste management demand.

The existing waste managing consortiums are facing various challenges to improve the quality of their services. Among others is the public demand for better collection services. As a result more focus is given to maintain good public relation by ensuring waste collection services are at the most efficient level. Due to the lack of focus on the landfill management aspect, Malaysia faced serious problems due to the pollution from landfills that solid waste management particularly improper waste disposal is considered as one of the three major environmental problems faced by most municipalities besides water and air pollutions (Agamuthu et al. 2004, Fauziah & Agamuthu 2003, Choy et al. 2002, World Bank 1999).

However, with the launching of sustainable development concept, more concern was given to the sustainability of waste disposal facilities. As a result, more development in the waste management system including the establishment of the first sanitary landfill and a secure landfill was initiated. The former was to cater the disposal of MSW from Kuala Lumpur and its outskirts, while the latter was for the treatment and disposal of the nation's hazardous waste. To accommodate the needs to dispose medical waste, medical waste incinerators were constructed in 1994.

2.3 Current Scenario

A more systematic waste management was gradually in place by end of 1990s. However, with the rapid development of the nation, urban population increase and improvement in the standard of living resulted with an average daily per capita generation of 1.2 kg in 2007 and more than 1.7 kg in 2010. In fact the 3% increase in MSW per annum alarms most waste managers. Urban population which contributes more than 65% of the total population is the main waste generator. Table 2-3 shows the trends of waste generation in major urban areas in Peninsular Malaysia from 1970 to 2009.

Table 2-3: Generation of MSW in major urban areas in Peninsular Malaysia (1970 – 2009)(Agamuthu et al 2009).

Urban centre	Solid waste generated (tonnes/ day)					
	1970	1980	1990	2002	2006*	2009*
Kuala Lumpur	98.9	310.5	586.8	2754	3100	3387
Johor Bharu (Johor)	41.1	99.6	174.8	215	242	264
Ipoh (Perak)	22.5	82.7	162.2	208	234	256
Georgetown (P. Pinang)	53.4	83.0	137.2	221	249	272
Klang (Selangor)	18.0	65.0	122.8	478	538	588
Kuala Terengganu (Terengganu)	8.7	61.8	121.0	137	154	168
Kota Bharu (Kelantan)	9.1	56.5	102.9	129.5	146	160
Kuantan (Pahang)	7.1	45.2	85.3	174	196	214
Seremban (N. Sembilan)	13.4	45.1	85.2	165	186	203
Melaka	14.4	29.1	46.8	562	632	691

* extrapolated figures

The absence of an integrated waste management resulted with landfills being pre-maturely closed. In 2007, leachate contamination into the Klang valley drinking water forced the government to take a major leap in the country's waste management system. As a result, more sanitary landfills are being built and new non-sanitary landfills are totally forbidden while existing non-sanitary landfills are to be upgraded to Level 4 landfills or to cease operation. This has enhanced a better management and monitoring of landfills in the country.

Resulting from the firm order from the federal government, the management of landfills in Malaysia began to see some improvement. Among others are the closing of open dumps which has high potential to contaminate the adjacent river systems. As a result, the toll of landfills in country sees drastic reduction. Currently, a total of 291 MSW non-sanitary landfills are recorded throughout the country. With only 12 sanitary landfills available, the 155 operating non-sanitary landfills play an important role in MSW management in the country (Table 2-4).

Table 2-4: Current status of MSW disposal sites in Malaysia

Status of disposal facilities	Current Number
Operating	155
Non-operating	136
Sanitary landfills	12
Total	303

The disposal facilities which are actively operating currently undergo upgrading in order to reduce the environmental impacts that originated from the dumping grounds. On the other hand a total of 111 disposal sites were closed when the facilities reached its full capacity or due to its unsuitable location. To date, more sanitary landfills are being proposed to cater the ever increasing need of waste disposal in the country. Table 2-5 lists the sanitary landfills in Malaysia.

Table 2-5: Sanitary Landfills in Malaysia in 2010.

Name of landfill	Status of disposal facilities	Location (state)
Bukit Tagar Sanitary Landfill	Operating	Selangor
Air Hitam Sanitary Landfill	Closed	Selangor
Jeram Sanitary Landfill	Operating	Selangor
Seelong Sanitary Landfill	Operating	Johor
Pulau Burong Sanitary Landfill	Operating	Penang
Mambong Sanitary Landfill	Operating	Sarawak
Bintulu Sanitary Landfill	Operating	Sarawak
Sibu Sanitary Landfill	Operating	Sarawak
Kota Kinabalu Sanitary Landfill	Operating	Sabah
Tanjung Langsat Sanitary Landfill	Operating	Johor
Tanjung 12 Sanitary Landfill	Operating	Selangor
Miri Sanitary Landfill	Operating	Sarawak

3 Future Prospect of Landfills in Malaysia

Current trend indicates positive response towards the improvement of waste management system among the waste managers in the country. Thus, future prospect of landfills in Malaysia is expected to be brighter with higher opportunities of an efficient waste disposal system. The possibility of enhancing the current waste management system in the country is more realistic with the passing of the Solid Waste and Public Cleansing Management (SWPCM) Act 2007.

3.1 The Solid Waste and Public Cleansing Management Act 2007

The flow of events had eventually led to the passing of the SWPCM Act 2007. Even though the bill is yet to be implemented, the government has taken the big steps to improve waste management system further.

The 88-page SWPCM Act 2007 was discussed in the Parliament for 10 years before it was approved in August 2007. Administered by the Ministry of Housing and Local Government, the objective of the bill is to improve and ensure high quality services in solid waste management. Adapted from Best Management Practices in solid waste management from Japan, Denmark, Switzerland, Germany and the United States, the bill also focused on public cleanliness management (Agamuthu et al 2009a). Among the main strategies to achieve the target, efficient solid waste treatment, interim treatment, and appropriate final disposal of solid waste are to be implemented. Also integrated in the strategies are the 3Rs which covers the management and regulations. It includes the management of amenities from roads and toilets to drains, food courts and grasses by the roadsides. The bill covers the management of solid waste from commercial centres, public sites, construction sites, households, industrial zones and institutions, as well as imported solid wastes.

With more focus given to 3Rs activities, the waste generated in the country is hoped to be managed more efficiently. Mandatory source separation will enable the higher recovery of recyclables and reduce the final disposal significantly. Source separation is included under the Clause 74. Consequently, it will effect to lengthen the life-span of landfill in the country. In addition to that, waste managers will be given full authorities to conduct waste collection, transfer and disposal activities. This will ensure the generation of revenue via recycling to the waste managers. Recovery activities including recycling by unauthorized parties will be liable to fines of RM10,000 within Clause 71 of the bill. Also contained is the prohibition against unauthorized escape of waste, which implies the clause on illegal dumping. This will assist the waste managers

to handle waste collection, treatment and disposal more efficiently by avoiding additional cost incurred from illegal dumping activities.

Apart from that, Part III of the SWPCM Act 2007 also includes clauses related to the construction, alteration or closure of disposal facilities. The clauses imply the necessity of acquiring approval prior to the any activities which involve the construction, alteration or closure of landfills. This will enable the authorities to monitor the management of landfills and prevented non-compliances due to improper landfill management. As a result, it is necessary that landfill managers abide the rules and regulation stipulated by the appropriate authorities. Consequently, issues of pollution from landfills can be minimized significantly.

Also addressed in the bill is the licensing provision whereby stricter regulations are imposed to licensers. Non-compliance will resulted with the refusal of license or revocation of license. This is a very important scope which needs to be covered since current waste management license holders lack the willingness to improve or upgrade their waste management facilities. With reference to the Clause 20 of the bill, it is mandatory that all licensers comply with the license conditions that establishment of efficient and sustainable landfills are more promising in near future.

Charges on waste collection, treatment and disposal services are also ruled in the bill where waste generators are required to pay fess or levy to the service providers. Currently, charges for waste management services are incorporated into the assessment fees paid by each premises to the municipalities. With the charges imposed, the revenue to be collected by the waste managers can be allocated more significantly for the appropriate services either for collection, treatment or disposal of waste. Waste generator's failure to comply will resulted with them being liable to fines. As a result, the financial management of landfills can be handled more efficiently that possibility of improving the quality of landfills are more feasible. Besides, a Solid Waste and Public Cleansing Management Fund will also be established to finance activities in regards to solid waste management services. It is also hoped that the funding will enable more research and development in improving the technology in waste management. Thus, landfills in Malaysia can see improvement towards more sustainable practices.

4 Conclusions

Past waste management in Malaysia saw primitive technology where main disposal facilities were mere open dumping sites. Current practice sees the improvement with controlled dumps being upgraded and the establishment of more sanitary landfills. The trend in establishing more sanitary landfill is obvious with the passing of the SWPCM Act 2007. The bill enlightens the improvement of the current waste management facilities to a more sustainable practice. Future waste management in Malaysia seems somewhat brighter with a clear waste management policy in place. Therefore it is hoped that waste management and landfilling can be more sustainable in the near future.

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