

ASSESSING PROBLEMS AND PROSPECTS OF SOLID WASTE MANAGEMENT IN MALAYSIA

Innocent A. Jereme, Chamhuri Siwar, Rawshan Ara Begum, Basri Abdul Talib & Md.
Mahmudul Alam

ABSTRACT

About 18,000 tons of wastes are generated per day and it is estimated to increase to more than 30,000 tonnes daily in Peninsular Malaysia by the year 2020. About 75% of this waste is being collected while the remainder is disposed off. Although there are potentials to recycle up to 80 % the total dry wastes collected, it could generate revenue of RM 476 million from recycling waste materials annually, but waste treatment facilities are insufficient in the country. Although the government has taken many recycling campaigns and initiatives and also introduced Solid Waste and Public Cleansing Management Act 2007 (Act 672) and Solid Waste and Public Cleansing Management Corporation Act 2007 (Act 673) to improve the waste management problems, but more needs to be done for sustainable solutions of waste management by recycling and treating a major portion of the wastes. Thus, this article attempts to review by assessing the current situation of waste management problems and prospects of recycling for better understanding and improvement of waste management services in Malaysia. It also provides a valuable insight for economic value of recycling as well as waste management comparison between Malaysia and other countries.

Keywords: solid waste, waste management, recycling, landfills, Malaysia

INTRODUCTION

With increasing economic growth, purchasing power and population size as well as improving standard of living have resulted in higher waste generation in Malaysia. Waste generation continues to grow, outstretching the available waste facilities out of limit. Thus, the issue of waste management has gained widespread attention in all states of Malaysia. It is estimated that about 18,000 tons of wastes are generated per day in Malaysia which is expected to increase at the rate of 2% every year (Yassin, 2006). Out of these, 75% of the wastes generated are collected and disposed at dumpsites or landfills that are not sanitary. In Kuala Lumpur, only 5% of the wastes generated in the city are recycled and the rest goes to landfills (Yassin, 2006). Table 1 shows percentage of municipal solid waste composition from 2002 to 2007 and 2010. Majority

of solid waste generated consists of food waste, mixed plastic and mixed paper over these year while glass, ferrous and others are lesser.

With the communities facing rapidly increasing disposal costs and the amount of materials being thrown away as environmentally and ethically unsound, thus the pressure is mounting on manufactures and packagers of consumer goods to minimise the amount of refuse. Amidst these changing circumstances, Malaysia has passed two important legislations such as Solid Waste and Public Cleansing Management Act 2007 (Act 672) and Solid Waste and Public Cleansing Management Corporation Act 2007 (Act 673) for sustainable solutions of waste management problems (Yahaya, 2007a).The Solid Waste and Public Cleansing Management Act 2007 provides for and regulate the management of controlled solid waste and public cleansing for the purpose of maintaining proper sanitation and for matters incidental thereto whereas the Solid Waste and Public Cleansing Management Corporation Act 2007 provides for the establishment of the Solid Waste and Public Cleansing Management Corporation with powers to administer and enforce the solid waste and public cleansing management laws and for related matters.

Table 1 Municipal solid waste composition in Malaysia

Compositions/ Percentage(%)	2002	2003	2004	2005	2006	2007	2010
Food waste	32	56.3	37.4	49.3	45	42	43.5
Mixed plastic	16	13.1	18.9	9.7	24	24.7	25.2
Mix paper	29.5	8.2	16.7	17.1	7	12.9	22.7
Textiles	3.4	1.3	3.4	--	--	2.5	0.9
Rubber and leather	2	0.4	1.3	--	--	2.5	--
Wood	7	1.8	3.7	--	--	5.7	--
Yard wastes	--	6.9	3.2	--	--	--	--
Ferrous	3.7	2.1	2.7	2	6	5.3	2.1
Glass	5.5	1.5	2.6	3.7	3	1.8	2.6
Others	1.9	8.4	10.4	18.2	15	25.74	1.8
Total	100	100	100	100	100	100	100

Source; (MHLG, 2011)

A study conducted by the Local Government Authority indicates that food waste and other organic waste constitute 47% of the total wastes generated, followed by paper 15%, plastics 14%, and others constitute the rest (Yassin, 2006). In 2020, there is target to recycle 20% of the total wastes generated, 15% for intermediate processing and the remaining 65% to be deposited at various landfill sites. There were 291 landfill sites in Malaysia to dump wastes, out of which

only ten were sanitary landfills; of these 291 sites, 112 were closed and the remaining 179 were still in operation in 2007. It is expected that solid waste generation in Malaysia will reach 30,000 tons per day in 2020 (Yahaya, 2007a). Therefore, the existing legislations on waste management were reviewed to improve waste management problems and to increase recycling awareness in the country (MHLG, 2003). This article attempts to review by assessing the current situation of waste management problems and prospects of recycling for better understanding and improvement of waste management practices in Malaysia. It also provides a valuable insight for economic value of recycling as well as waste management comparison between Malaysia and other countries.

CURRENT SITUATION OF WASTE MANAGEMENT IN MALAYSIA

During the 6th Malaysia Plan (MP) for 1991-1995, Malaysian Government has given emphasis on diversifying the sources of growth of the wastes and prompted waste management in the country. The 7th Malaysia Plan (MP) for 1996-2000 also focused on the quality of life and the environment. As the population continued to grow and available lands were becoming scarce for acquiring landfill sites due to opposition by residents and community leaders, in the 8th Malaysia Plan (MP) for 2001-2005, a National Recycling Program was re-launched to inculcate the habit of recycling among the population; reduce operational cost of solid waste management; minimize the volumes of waste disposal by landfills; reduce utilization of raw materials; and improve awareness and cooperation among stakeholders (MHLG, 2003).

Under the 9th Malaysia Plans for 2006-2010 and with the implementation of the Solid Waste Management Bill, the recycling and disposal of solid waste was privatised in order to improve services, relinquish the financial burden and include the private sector. For example, the two concessionaires such as Southern Waste Sdn Bhd and Alam Flora Sdn Bhd are responsible for 44 Local Authorities from a total of 144 Local Authorities all over Malaysia. The privatisation exercise in the northern region is by Northern Waste Industries as the designated concessionaire; while the exercise in Kelantan, Terengganu, Sarawak and Sabah did not materialise, the Local Authorities there will continue to undertake the responsibility for collection and transportation of solid waste (Yahaya and Larsen 2008). These concessionaires are responsible for collection, storage, transportation, treatment and recycling of all of the countries non-hazardous wastes (Market Watch, 2011) In 10th Malaysia Plans (2011-2015). Federal government assumes full responsibility of solid waste management from local authorities, Collection of household solid waste to be privatised to three concessionaires with contract negotiations expected to be completed by end 2010, and other private operators to be licensed to operate solid waste management and public cleansing services (Bernama, 2010). Waste management in Malaysia has noticed a transition in the past 2 decades, although there is still need for more improvement.

In order to make the process easier, the consortia were instructed to take over the solid waste management for an interim period then. The reason for this is to give ample time as the full privatization of solid waste as it was been still being studied by the government. As the large-scale privatization then involves a more comprehensive transfer of activities and function than the previous semi-privatization measures; the public sector cannot pass all responsibilities onto the private sector. Hence, the waste management privatization was initiated on national level; it is the Federal Government responsibility to ensure that the consortia conform to the standards, and rules and legislation as required by the Government. The Department of Local Government at the Ministry of Housing and Local Government (MHLG) will be responsible for monitoring the consortia, while the Department of Environment (DOE) its responsibilities will be mainly in general pollution control and Environmental Impact Assessment (EIA) of waste treatment facilities (Hassan, 2002). The actual operationalization of the MHLG's responsibilities lie significantly with the local authorities, who will remain central in terms of enforcing laws and regulations and ensuring that private sector meets required standard and quality (MHLG, 2003). As part of the privatization process then, the fees for the waste management services was no longer the responsibility of the local authorities but must be managed by the waste management company. The particulars of this financial aspect of the waste services then was difficulty issue, but as the fee was not planned to be included in the semi-annual assessment rates imposed by the local authorities, a separate fee must be introduced. The introduction of such a fee meets some political and public opposition in Malaysia (Hassan, 2002), as it a very sensitive matter to the public. However, the fees were later settled between the private companies and the government as it has some political undertone because the public don't want to pay for perceive unseen service.

The interim period status of the solid waste service provision resulted in uncertainty by both the concessionaires and the Local Authority's especially the wait for the imminent National Waste Bill and the issues of service fees are creating some implications in regards to further development and final realization of the privatization process. It can be argued that these uncertainties pertain to a reluctance to invest in new resources and equipment by various stakeholders has resulted in relative short-term planning. With these uncertainties the federal government took a bold step in 2007 to established National Solid Waste Management Department (NSWMD).The Federal government has finally taken over management of solid waste with the creation of the National Solid Waste Department in 2007 which was signed into law in 2011(Yahaya, 2012). The following subsection discusses about the waste management practices in Malaysia.

Waste collection and transportation

Waste collection and transport in Malaysia is usually managed by the private concessionaires. With the creation of the National Solid Waste Department, the private collection companies still

deal with the actual waste collection services. This time around their contract is on long term basis unlike before the privatization when it was on ad-hoc basis. In the waste concession area of Alam Flora Sdn Bhd, private waste contractors are responsible for more than 50% of the total amount of waste collected. Community collection initiatives called community self-help or “gotong royong” in the local language also have a role in collection activities. Waste collections times are from 2-3 times a week, and collection methods also vary. Common collection point’s e. g. containers were required; household will bring their waste in front of the house for easy collection from waste operators. Door to door is another common collection method in Malaysia especially for individual houses and link houses (Karen et al. 2003).

Waste recycling in Malaysia

There are three different types of recyclables materials generated in Malaysia such as Paper, plastics and bottles, but out of these very little of the waste is recycled. In Kuala Lumpur for example, the current recycling rate is at 5% of the waste generated. However, this rate is underestimated according to the National Solid Waste Management Department due to in accurate data for waste recycled for some years; since recycling activities are still not regulated (thus no proper data is collected). Recycling rate by market players is estimated higher than 15% (Yahaya, 2012). Though, there is a plan to increase it to 20% by 2020 (MHLG, 2003).

When it comes to the issue of waste, there is always the attitude of Not-In-My-Back-Yard (NIMBY) syndrome which a National Newspaper the New Sunday Times, used to describe the Malaysian’s attitude towards waste. Malaysians are also wary but still the people only recycle not more than 5% of all the waste generated (New Sunday Times, 2002). This concern is also shared by others who supported other sources that claim that the waste consciousness in Malaysia is poor. Most people here don’t wish to take a more personal endeavour in a matter mostly associated with dirt; filth and odours as nobody want to make his place of living a dumping ground for others.

With enlightenment campaign and some drastic measure taken by the government, it could be said that Malaysians are beginning to recycle more since the launching of first official recycling program in the peninsular Malaysia in 1993 initiated by the MHLG, and the subsequent other recycling programs by the Federal and states government. The stated objectives of the national recycling program was (i) to divert valuable resource in the waste stream from disposal and (ii) to help control cost of managing waste (Karen et al. 2003). The recycling program of most Local Government was envisioned as comprising of setting up of buy-back centres and the placement of drop off containers for recyclables at strategic locations such as schools, shopping malls, and so on. When the national recycling started according to the report only 23 Local Government of peninsular Malaysia had volunteered to participants in the program. But because of poor planning and lack of public participations the number of participants for the program reduced to

only 10 Local Government in 1998, many of the Local Government then chose not to continue with their recycling program.

However, in December 2000 the Ministry of Housing and Local Government (MHLG) re-launched the recycling programs, in other to make a difference from the first failed launching of the program. During the second launching of the recycling program, all participants were chosen by the MHLG unlike in the first launching where municipal councils volunteered to participate, 29 Local Government of Peninsular Malaysia were chosen to participate in the launching having met the criteria required by the local government. One of these requirements was the volume of waste generated by the municipalities. MHLG provided every participant with special drop-of containers for recyclables and these containers must be placed at strategic locations of the municipalities (Karen et al. 2003).

In other to encourage more public participation in this second recycling program, the MHLG engaged the services of one of the local public relation company in the city to carry out productions of pamphlets, posters and billboards, and commercial advertisement, and even recycling song to make the occasion more interesting and appealing to the public. Also in addition to this, many of the major cities in Malaysia, several buy-back centres established for easy deposition of recycling materials.

Another big difference in this second national program was the MHLG involved several companies that were known to be major producers of recyclable materials to participate in the recycling program. It initially involved only 23 municipalities when the program was first launched but later evolved up to 145 municipalities across the country. The main objectives are to reduce the costs of solid waste management/operation as well as to conserve resources.

Although recycling activities could be said to be on the rise, the materials recycling industry in Malaysia is demanding much larger quantities of recyclables. For example, Malaysia News Print Industries Sdn Bhd was forced to import 50% of its materials, and Kuala Lumpur Glass Manufacturing Sdn Bhd also imported 20% of their materials (New Sunday Times, 2002).

Waste treatment and disposal

Waste treatment and disposal facilities in general is still lacking behind in Malaysia. The incinerators that do exist in Cameron Highlands and Pulau Pangkor do not have the capacity for waste treatment KengZi Xiang, (2012), with the existing amount of waste; direct dumping on unsanitary landfills is the most applied method to dispose waste. No waste to energy facilities exists in Malaysia; although composting alternatives are being studied but no concrete activities have been undertaken since then (CAP, 2001). There are plans to construct new incineration plants in Malaysia; but public opposition because of its environmental effects plays a large role

in the disapproval of incineration site. There is one incineration plant plan to be located in Southern Kuala Lumpur with a capacity of 1.500 tons/day, taking about 50% of Kuala Lumpur's daily waste generations, but is not yet in operation due to peoples perceive effects to the environment and not economical viable. According to Connett (2010) incineration has no place in this 21st century where the sustainable waste management has become a buzz word. This public perceive awareness on the environmental effect of incineration has made it difficult in building bigger incinerations plant in Malaysia till today.

As at 1990 Malaysia was about 230 Landfills occupying an average of 15 hectares each. More than 80% of the remaining landfills have an estimated remaining lifetime of two years. All landfills in Malaysia are developed and operated on temporary basis and the management and operation are generally poor as a result of this. Almost 60% are open dumps and do not have adequate facilities such as weighing bright, fence and cover materials. Most of the sites did not conduct environment impact assessment (EIA) before it was built, and there is a lack of pollution control and measuring in particular for leachate and gas emissions (Karen et al. 2003). These section looks at legislative and institutional bodies that formulates polices on waste management in Malaysia and the new Acts that governs solid waste management.

Legislative and institutional initiatives

The management and legislation of waste management in Malaysia is not only exclusive to the Ministry of Housing and Local Government (MHLG). There are other Federal Government bodies that are also involved in the overall planning of waste management from the early stage together with the MHLG: Some of these bodies who are stake holders are the Department of Environment (DOE) and Economic Planning Unit (EPU). Though, the EPU does not actually involve in the day to day management of solid waste as it does not have competence which are important to take into considerations here but help finance new projects in relation to waste management (MHLG, 2003).

Since these departments are not working in isolations but together in making the overall legislation on waste management for the state or regional and local authorities to implement at grass root levels. Its shows that the Federal, State and Local Authorities are playing significant roles in waste management stream in Malaysia. These federal agencies are all involved in waste management as decisions-makers within their areas of jurisdiction. They are not directly involved in daily functioning and performance of waste management services as earlier stated, but in their role as planners and developers of sound legislative framework and control the coherence existence between local, regional/state and federal waste management plans (Karen et al. 2003).

During the privatizations of solid waste management, these agencies became an important strategic partner in coordinating and planning since they must be the central and coordinating body in ushering in different private waste concessionaries in Malaysia e. g, Alam Floral Sdn Bhd. The two existing Acts (Solid Waste and Public Cleansing Management Act 2007 and Solid Waste and Public Cleansing Management Corporation Act 2007) which provide legal frameworks for current solid waste management in Malaysia by the amendment of previous reference on solid waste management in the Local Government Act 1976, and the Street, Drainage and Building Act 1974. These amendments were necessary to enable a smooth implementation of the new Act, and also to guard against any confusion during the implementation period (Yahaya and Larsen 2008).

Establishment of National Solid Waste Management Department

In April 2007 the much anticipated National Solid Waste Management Department was created making waste a national issue, and taking the responsibility of waste from Local Authorities' (Yahaya 2007b). As has earlier stated the bill has now been signed into law in 2011 and the public is eagerly expecting a better performance from the concessionaires this time around. The following are parts of the policies that will guide the new solid waste management for effective implementation.

- A standard and integrated system of waste management through promoting a more efficient operating procedure;
- Cost-efficient waste management by commissioning regional landfills within the state boundaries; and
- Private sector waste management enterprises applying for licenses will be vetted based on cost effectiveness of the projects, their environmental friendliness and technological capabilities.

Moreover, a service committee at the state level will allow the local councils to offer suggestions to the concessionaries. It will also be made compulsory for homeowners to separate wastes into dry wastes and wet wastes within two to three years on the enactment of the law, when kitchen wastes will be collected twice a week and recyclable or dry wastes will be collected once a week. This will reduce the quantity of landfill wastes into half and extend the lifespan of the sites.

In order to encourage a higher recycling rate, take-back and deposit rebate schemes will be implemented, where people will be encouraged to return recyclable wastes such as plastic containers for a token sum of money, leading to a hygienic environment for the scavengers. Additionally, Lorries will unload in sheds so that the scavengers can carry out their jobs before the wastes go to their destined landfills. There are also plans to utilise kitchen wastes as composts (New Sunday Times, 2009).

With the creation of the National Solid Waste Management Department under the federal government, it means a total overhaul of the old system when solid waste management was under the control of Local Council which has been the system since 1976. This means more funds for the concessionaires who will now not act in temporary basis as it has been all these while when it was under the local authorities. There should be no more excuse from the concessionaries to perform below expectations as their contract will become permanent, enabling them acquire more modern equipment and can engage seasonal experts in their management. Local Authorities will now play an advisory role, enabling them to concentrate in other areas, like, planning, health and revenue collection.

Prospects of waste recycling in Malaysia

A significant challenge facing developing countries is the search for appropriate solution for collecting, treating and disposal of waste or reuse of waste materials generated in municipal and community areas. Recycling of waste is a challenge confronting many developing countries, as urban cities are in the increase in population and so is the waste generated. There is low level of recycling in many developing countries; either because of ignorance or apathy towards recycling (Ko Chi Wai, 2007). But in Malaysia there abound potentials for recyclable materials, as much as 80% of the wastes generated could be recycled and this could be utilized to reduce overall waste generation (Habitat, 1994a). However, in Malaysia, the Selangor state government is considering a proposal to recycle more waste and turn it into an income generating venture as most local council spend up to 30% of their local budget on rubbish collection and some up to 60% (Daily Metro, 2008). The recent creation of a National Solid Waste Department is a step in the right direction as this will relieve the Local of the financial burden of managing waste (Yahaya, 2007a).

Unlike most developed countries, the traditional method that the country has been using is to use the landfills for waste disposal of waste, and overtime buries them with soil. But Landfills require huge plots of land and usually fill up very quickly. Some big landfills have already been closed down due to reaching their capacity, as well as the suitability of the locations which use to be far away from residential areas, but are no more due to population and township growth. Some examples are the Kelana Jaya dumpsite (now filled with condos, a stadium and commercial development). Subang Airport road used to stink badly whenever you use the road to airport, but is now a residential area with condos and houses. Sri Kembangan/ Air Hitan were also closed down and also Selaying Landfills (Ko Chi Wai, 2007).

The alternatives of landfills like incinerators, particularly of gigantic types but still unknown status Broga incinerator in Semenyih which courted controversy due to questions about its location in a catchment area as well as the Japanese contractor which has a questionable project

back in his home country. Nobody likes to have a waste processing plant behind his or her backyard. The incinerator was first proposed to be in Puchong but was relocated due to residence and political pressures. Something has to be done to cope with its ultimate disposal. The government is to tackle the problem even though the idea of smaller, more efficient and manageable incinerator would be idea than the biggest incinerator.

People living in the peninsular Malaysia especially Selangor should be encouraged to cultivate the habit of reducing waste by recycling as in developed countries where it has become of thing habitually even from younger age (Ko Chi Wai, 2007). The high economic growth in recent years in many states in Malaysia requires a sustainable means of managing waste. The recently created National Waste Department has been a way forward to that effect. Malaysia government could borrow a leaf from Europe where recycling has become a habit of life as in the case of the Cliff Borough Council in East London. The Cliff Borough Council in East London, in 2001-2002, recycling rate was just 9.7% but it jumped to 48% in 2003-2004, and reached to 50% by December 2004, suggesting that CBC may become UK's biggest performing local authority. The study of RCR suggested that a well-designed communication campaign and an effective marketing strategy was the key to achieving success in recycling programs (Child, 2004).

There is a proposal by the government for some years to enforce compulsory garbage separation in Malaysia. It is not an easy thing to do even though it could have succeeded in some countries like Taiwan, as their cultural values and attitude towards environment issues are different from that of Malaysia. The fact that the policy was successful in Taiwan does not mean it will be also effective here as well; therefore Malaysia should find friendly policy that should be wholly accepted by her citizenry (Ko Chi Wai, 2007).

Malaysia is now intensified its effort through integrated waste management system of reducing waste through sustainable waste management of 3R and final disposal. Awareness of this program is being carried out through campaigns, mass media and lectures. At the same time the State Government is facilitating through the Ministry of Housing and Local Government to provide facilities such as waste bins and collection centres households (MHLG, 2006).

Recently residents in some states like Selangor are required to separate their waste into organic and inorganic waste for easy collections and recycling by Alam Flora Sdn Bhd. Although the new rule attracts no penalty for failing to do so, household waste could be refused to be collected by Alam Flora for failing to separate their waste accordingly (Bavani, 2009). On the other hand Shopping Malls in the state are now required not to give plastic bags on every last Saturday of the month to shoppers. Shoppers who insist on collecting bags are required to pay RM0.20 cents for each plastic bag collected and the money will be channelled to the charity homes in Selangor chosen by the state. Below are Figures 2 and 3 showing the current recycling rate in Malaysia and recycling target for the year 2020.

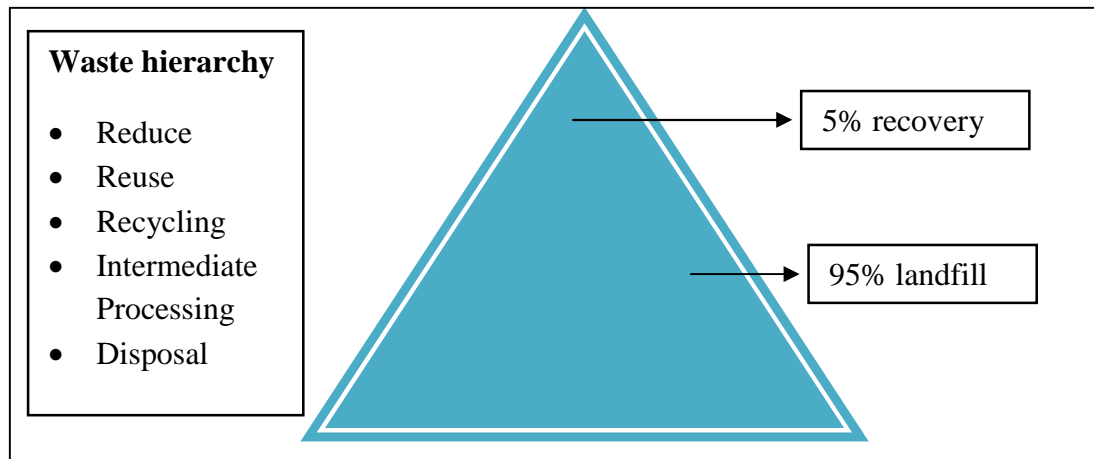


Figure 2: The current waste management system in Malaysia
Source: Ministry of Housing and Local Government (2003)

Figure 2, shows that the current waste recycling and recovery is only 5% of the total waste generated in the state while the rest 95% is sent to landfill. Land has been the traditional method system of waste disposal in Malaysia as earlier said. This trend has been going on for ages in Malaysia, as there are abundant lands to deposit waste. But with the increase in population and high growth of economy in Malaysia in the last decade, there are calls for a more sustainable system to dispose waste without much environmental effect as land is running out and becoming expensive to build landfills.

The use of “sustainable landfills” by some authorities could have been the reason behind the recent construction of the biggest landfill in Malaysia, the Bukit Tagar sanitary landfill in Ulu Selangor 50 km north from Kuala Lumpur in Selangor which started operation in 2005 occupying a capacity of 1,700 acres of land with 120 metric tons of air space.

Figure 3 shows the strategic recycling target of Malaysia with integrated waste management of reduce, reuse, recycling, intermediate processing and final disposal to increase waste recycling rate and recovery in the 8MP till 2020. This target is feasible if appropriate policies and technology are in place.

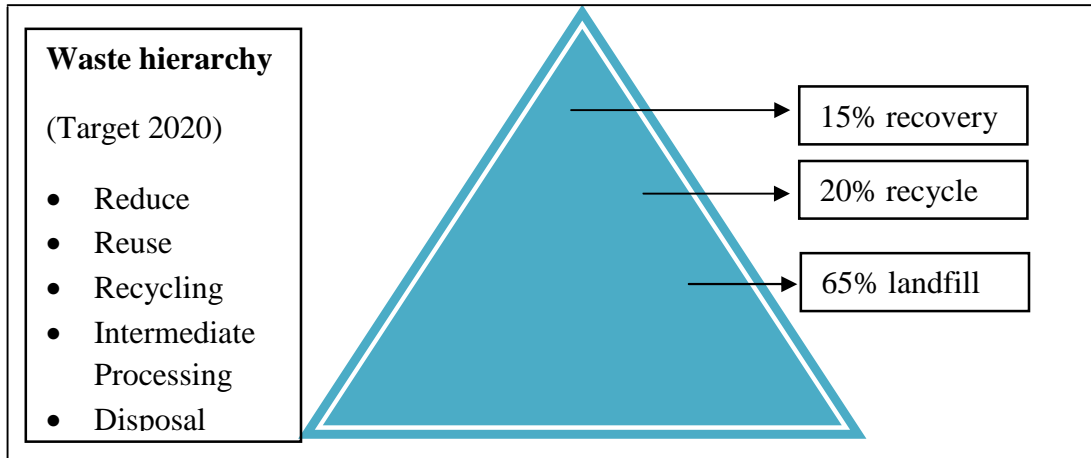


Figure 3: Waste recycling targets for Malaysia in the 8MP for 2020
Source: Ministry of Housing and Local Government (2003)

There is still insufficient emphasis being played by local authorities and others on the whole of question of re-use. We are all familiar with these sticky labels that enable us to reuse old envelopes, but have many of operators of business or local authorities that can reuse our items (Waite, 1995). That notwithstanding, the government is encouraging, households; offices to either give out their old materials to those in need when refurbishing their offices or homes than throwing it into the waste stream. Reusable bags are sold at some shopping malls that are also biodegradable. People are encouraged to buy household items that are refillable, like hair cream, beverages and some soft drinks with plastic bottles etc. so as to reduce waste at households' level. Recycling has become a known issue since the launching of the first national recycling program in 1993 and the re launching of it in December 2000 in Malaysia. The Government has in many ways disseminating this message to her citizens, that recycling is a sustainable means of managing waste so as to attain the state target of 20% diversion of waste sent to landfills in 2020.

This is being made possible by provisions of waste bins at strategic places in the state and privatizing waste management. Households are encouraged to separate their waste into wet and dry waste for easy collections and recycling, though not compulsory. But for Malaysia to achieve her target of 20% recycling rate in 2020 more proactive measures has to be taken by making waste separation compulsory at household levels and with the imposition of fines for failing to separate their waste. Other waste hierarchy plans of Malaysia to be achieved in 2020 is the establishing of an intermediate processing facility in state where recyclable materials will be sorted by types, compacted, baled and sold to many manufacturing companies in the countries that use secondary raw materials for productions and also for export. Intermediate processing facilities will process and market newspapers, mixed paper, cardboard, plastic, tin can, glass and aluminium received from various parts of the state of the country and for export as well.

Table 3 shows the amount and percentage of waste generated and economic value of recycling waste materials. However, the potentials to generate revenue from the recycling sector are high as papers yield RM205.2 million and plastics RM163.8 million in 2005 financial year. The total economic value is estimated at RM476 million in 2005 and more than RM600 million **in 2011**. Waste materials in Malaysia will continue to be revenue generation source for the government if properly managed with policies that are encouraging. It should be noted that the average market prices of this materials were based on prices at recycling centre (Yahaya 2012). It could be higher at recycle agents, middlemen and end buyers (industries) are much higher on recyclables waste materials. It accounted for 6million tonnes of waste per annum which was disposed at landfill. These could have been composed or treated for energy recovery which could as well yield revenue for local authorities and reduce cost for disposing at landfills.

Table 3 Waste generation and revenue of recycling waste materials

Composition	Percentage (%)	Amount of waste generated (tonnes/per year)	Market price (RM/Kg)	Values (Million RM)
papers	17.1	1,026,000	0.20	205.2
Plastics	9.1	546,000	0.30	163.8
Glass	3.7	222,000	0.05	11.1
Aluminium	0.4	24,000	2.00	48.0
Scrap metals	1.6	96,000	0.50	48.0
Other non-recyclables	68.1	4,086,000	-	-
Total	100	6,000,000	-	476.1

Note: 1) Waste composition data obtained from Ministry of Housing and Local Government 2005

2) Total waste generation waste estimated at 6Milliom tonnes per year

3) Average market price were based on prices at recycling centre as of September 2005: actual prices at recycling agents, middlemen and end buyers (Industries) are usually higher

Source: Yahaya, 2012

Recycling activities can gradually be accepted if the policy and technology are friendly Polprasert (1998), as it can help reduce disposal cost for local authorities with its economic benefits. Communities will engage in recycling activities when the environment is accommodating to do so and also the possibility of increasing their income will make it more appealing.

Waste management comparison between Malaysia and other countries

In most developing countries or region like Malaysia, recycling rate is still at the infant stage when compared to some European countries. Due to recycling activities is mostly practice by the informal sector, therefore accurate recycling rate is difficult to determine as it stands at 5% according to (MHLG, 2003). A look at the table could show Ireland, German and Netherland has high recycling rate at 33%, 45% and 27% respectively even though composting is not included, which is a far cry from what is obtain in Malaysia today. However, higher income countries tend to have higher recycling rate as there is more awareness due to aggressive campaign on recycling and it is made compulsory at households' level. Countries in developing like Malaysia only engage in waste activities for economic purpose, and not for concern for environment; hence recycling at household level is arbitrary or volitional.

Therefore, the driven factor is poverty to supplement meagre incomes. This lack of pro environmental attitude is militating against the campaign to embrace recycling activities as a way of life like in some developed countries. Though, one could argue the rationale behind comparing a developing country like Malaysia and developed countries on this issue. All developing countries are looking up to developed countries as role model in measuring any developing indexes of which solid waste management is one of it. Learning from the secret behind their high recycling and composting rate could help in policy reformation, change in attitude and behaviour by the local community. Aggressive campaign on the need for recycling and the awareness of environmental impact of waste generation holds the key for the high recycling rate in some developed countries. Below is the current recycling and composting rate of European countries.

Table 2 European Union Municipal waste statistics 2011

EU countries	Waste generated (kg person)	Landfill %	Recycling %	Incineration %	Composting %
EU Average	503	36%	24%	22%	15%
Denmark	718	3%	31%	54%	12%
Luxembourg	687	15%	27%	38%	20%
Cyprus	658	80%	11%	0%	9%
Ireland	623	49%	33%	4%	3%
Germany	597	1%	45%	37%	17%
Netherlands	596	1%	27%	32%	24%
Malta	583	84%	6%	1%	0%
Austria	552	3%	27%	33%	32%
Italy	535	46%	20%	16%	12%
Spain	531	58%	15%	9%	18%

France	527	28%	19%	35%	18%
United Kingdom	518	49%	25%	12%	14%
Finland	505	40%	22%	25%	13%
Greece	496	82%	15%	0%	3%
Portugal	487	59%	11%	21%	8%
Belgium	464	1%	36%	42%	20%
Sweden	460	1%	33%	52%	15%
Lithuania	442	77%	18%	0%	2%
Slovenia	411	50%	29%	1%	5%
Hungary	382	67%	17%	11%	5%
Bulgaria	375	93%	3%	0%	3%
Romania	365	79%	1%	0%	0%
Latvia	350	74%	9%	0%	1%
Slovakia	327	75%	4%	10%	6%
Czech Republic	320	64%	15%	18%	2%
Poland	315	57%	9%	1%	14%
Estonia	298	60%	17%	0%	9%

Source: Eurostat, 2012

CONCLUSION

The generated solid waste is increasing over the years and it is estimated to increase to more than 30,000 tonnes in Peninsular Malaysia daily by the year 2020. It is also estimated that 75% of this waste is being collected while the remainder is disposed off including illegal dumping. In Malaysia, recycling rate is still at the infant stage when compared to some European countries. The SWM services are targeted to focus the improvement plans and to measure their efficiency as extend collection service by 90%, reduction & recovery by 17%, closure of dump sites by 100% and source separation by 100% by the year 2015 – 2020. However, these targets should be reviewed periodically to ensure achievable within the timeframe up to 2020. In other hand, Malaysia has a huge potential for recyclable materials, as much as 80% of the wastes generated could be recycled and this could be utilized to reduce overall waste generation. A study by the MHLG shows that Malaysia could generate revenue RM 476 million from recycling waste materials. In fact these targets are achievable if the Solid Waste and Public Cleansing

Management Act 2007 and Solid Waste and Public Cleansing Management Corporation Act 2007 is implemented properly.

In terms of economic condition, Malaysia is about to achieve its 2020 vision as a developed nation but there is need a prompt action for improving the environmental aspects especially for solid waste management services. In this case the policy for polluter pays principle should implement strictly that if you generate much waste you have to pay more for it. The thought of paying high cost for disposal by waste generators such as industry or households will surely compel them to reduce the volume of waste they generate and to recycle more. This policy could motivate waste generators to cultivate recycling habit more, though difficult to implement in developing countries like Malaysia, but could gradually be implemented with time and as the people get used to the system. Involvement of other stakeholders such as community and private sectors is very important in policy formation and implementation for effective solid waste management and recycling program as it helps to create sense of belonging and ensure the policies effectiveness in their locality. Hence, effective waste management service is crucial for maintaining the health of urban and rural communities and protection of the environment as well as generating employment and revenue.

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REFERENCES

- Bavani, M. 2009. Separate your waste from June 1, The Star online, April 29. <<http://thestar.com.my/metro/story>>. Accessed Sept 2013
- Budzik, M. Jonathan, M. , Luciano, A. and Juliana, P. 2002. Waste Management Overseas - The Malaysian experience, Dec. (online) <<http://www.ecowaste.com/swanabc/papers/budz01.htm>> (Accessed July, 2013)
- Bernama, 2010 Key points of 10th Malaysia Plan
<http://www.themalaysianinsider.com/business/article/key-points-of-10th-malaysia-plan>
Accessed 18:4; 14
- Child, R. 2004. Resource Conservation and Recycling, Cliff Borough Council Recycling Progress Report in Eastern London. pp.1-25.

Connett, P. 2010. Incineration: A poor solution for the 21st century <[http://www. slideshare. net/FrankieDolan/incineration-a-poor-solution-for-the-21st-century-by-dr-paul-connett](http://www.slideshare.net/FrankieDolan/incineration-a-poor-solution-for-the-21st-century-by-dr-paul-connett) (Accessed 6 July 2012)

Consumers Association of Penang (CAP).2001.The proposed thermal waste treatment Plant for waste management in Kg Bohol, Mukin Sungai Besi, Kuala Lumpur.(online)<[http://www.surfforever.com/sam/pressurelease/kgbohol. html](http://www.surfforever.com/sam/pressurelease/kgbohol.html)>(Accessed on August 2013)

Daily Metro.2008.Money in recycling, 7 May.

Eurostat, 2012., Managing municipal solid waste— A review of achievements in 32 European Countries Municipal waste', [http://epp. eurostat.ec.europa.eu/portal/page/portal/statistics/ search database](http://epp. eurostat.ec.europa.eu/portal/page/portal/statistics/search database).Accessed 11 January 2013.

Hassan, M. 2002. Environmental Management in Malaysia: E. I. A process in Malaysia.*Ministry of Resources and Environment*.

Habitat International, 1994a. Appraisal of solid waste collection and private sector involvement in Dar re Salaam City, Tanzania. *Habitat International*.**29** (2) 353 -366.

Karen, A. K, Nash, A., May, L. C. and Knudsen, 2003. Household Hazardous Waste Management and Stakeholder's involvement in Kuala Lumpur.Department of Environment, Technology and Social Studies, University of Roskilde, Denmark.

Ko-chi Wai .2007.Reduce, Reuse and Recycle. <http://waikc.blogspot.com/2007/06/reduce-reuserecycle.html>>

KengZi Xiang (2012),Incinerator for Municipal Solid Waste in Kuala Lumpur <http://greenbluegroup.com /2012/04/incinerator>. Accessed 11 April 2013

Ministry of Housing and Local Government (MHLG) 2003.Overview of solid waste management in Malaysia, Kuala Lumpur, Local Government Department.

Ministry of Housing and Local Government (MHLG) 2006.Waste management and the Challenges, Kuala Lumpur, Local Government Department.

Municipal solid waste composition in Malaysia (MHLG 2011,

Market Watch 2011. The 9th-10th Malaysian plan, The Environmental Sector in Malaysia

New Sunday Times.2001.Waste management's and recycling problems: data issues. 16 April.

New Sunday Times.2002.National New Solid Waste Department, October.

New Sunday Times.2009.Not-In-My-Back-Yard Syndrome (NIBM).18 January.

Polprasert, C. 1998. Organic waste recycling.Asian Institute of Technology, Thailand.(online)<http://lrc.mcast.edu. mt/digitalversion/Table_of_Contents_132294.pdf>(accessed on August 2013)

Waite, R. 1995. Household Waste Recycling,*London: Earthscan Publications Ltd.*

Yahaya, N. 2007a.Solid waste management, Conference on climate change preparedness.National Solid Waste Department.Kuala Lumpur.11 September.

Yahaya, N. 2007b.The New National Solid Waste Department.The New Sunday Time, 1 January.

Yassin, M. 2006. Speech given in the Waste Management Conference, Ministry of Local Government and Housing, Kuala Lumpur, 16 May.

YahayaNadzri Bin and Ib Larsen 2008; Federalizing Solid Waste Management In Peninsular Malaysia; Department of National Solid Waste Management, Ministry of Housing and Local Government,

Yahaya N. 2012. Solid Waste Management in Malaysia: The way forward.National Solid Waste Management Department, Ministry of Housing and Local Government, 19th July: Waste management 2012

Innocent A. Jereme¹, Chamhuri Siwar¹, Rawshan Ara Begum², Basri Abdul Talib³ & Md. Mahmudul Alam¹

¹Institute for Environment and Development (LESTARI),

²Institute of Climate Change (IPI),

³Faculty of Economics and Management,

Universiti Kebangsaan Malaysia (UKM), 43600Bangi,

Selangor D.E, Malaysia

Corresponding author: innocent_jereme@yahoo.com