

Current Status of Municipal Solid Waste Generation in Malaysia

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Abstract— Recent investigations in 2010 resulted information that population of Kuala Lumpur City Area has reached 1.66 million people (JPM, 2009). With the population growth rate of 6.1 percent, then the population in the year 2010 can be estimated at least to 1.69 million people. The number of municipal solid waste generated from Kuala Lumpur State Territory and delivered to TBTS was recorded of 2,000 tonnes per day. Accordingly, the solid waste generation average for any person is 1.2 kilograms a day.

From the survey found that almost total respondents, has already knew about the zero waste program and other government's waste management program. But this has to be mentioned if there was about 14% of the total respondents that have already recycled on their solid waste. Several of them have no convinced reason about why did they want to do a recycle thing. Though recycling activity in Malaysia is rising up, the recycling industry still needs to be enhanced.

The price of solid waste (plastic) collected from plastic used market at several places on Kuala Lumpur City area is about RM 0.45 per kilogram, due to data taken on May 2010. If the population in 2009 is about 1.66 millions, then the plastic value per day will be RM 179,280. The potential gross value calculation for one year period can be reached about RM 43,027,200. This potential value should be an additional income if the Government can build and develop an integrated plastic recycling market.

At present, Taman Beringin Transfer Station has been taking care of the average of solid waste at 2,100 tonnes per day. The capacity of this waste generation has been increasing in numbers, from 1,700 tonnes, since initial operation in 2002. In estimation, TBTS budget is around of RM 30,000,000 in the period of one year only for the purposes of simple operational cost. Government Board of Kuala Lumpur City should reconsider a better solution for funding that operating cost.

Keywords— Community Perception, Solid Waste Generation, Recycled Plastic Present Value, Municipal Solid Waste Management, Kuala Lumpur.

I. INTRODUCTION

A fast-growing economic in emerging-developing countries, typically at the capital city, has encouraged an increased solid waste generation in that specific area. With the development of Kuala Lumpur State Territory, along with the economic growth and business activity and consumption rate, will accelerate the daily generation and volume rate of municipal solid waste. Government Board of Kuala Lumpur City have managed as many as 2.500 tonnes of municipal solid waste a day for the year 1998 for at least 912.500 tonnes [11].

Waste minimization strategy and control for the coming few years in KL is the objective, to achieve the UN Agenda 21 which emphasizes on human and environment. Overall municipal solid waste management objectives in Malaysia, especially in Kuala Lumpur State Territory, is to collect, process and transmit garbage that really can not be recycled into the location or the last shelter system in accordance with

the terms of the social, economic and environmental values. Local government, in this case the Government Board of Kuala Lumpur City, should have an awareness of responsibility and active participation to support and implement good municipal solid waste management practices. Government Board of Kuala Lumpur City should have jurisdiction or the ownership of municipal solid waste that has been removed from every housing areas and consequently obliged to collect any waste generated by urban communities [12].

Solid waste management can be defined as the discipline associated with the control of generation [16]. At the same time, increasing traffic density problems also affect the removal and collection of municipal solid waste transportation, which will affect adversely the productivity rate from the source of waste, in this case Kuala Lumpur State Territory, to the place of final disposal, in this case Bukit Tagar Landfill, a remote location with a regional urban settlements. The long period required to move a municipal

solid waste from Kuala Lumpur State Territory towards Bukit Tagar Landfill.

By that, Government Board of Kuala Lumpur City should consider the best way of handling and management of municipal solid waste that meets the values of economic, hygienic, and ecologic. A more challenge now is to improve performance and productivity of municipal solid waste management that will bring economic benefits for local government which will then improve the quality of service to urban environmental management.

II. RESEARCH METHODOLOGY

Data collection included populations, generation rate and characteristics of municipal solid waste, management system in the Kuala Lumpur study area. Prior to the main survey a pilot study was carried out to test the practicalities of the proposed sampling strategy, waste collection and sorting systems and questionnaire. This survey was restricted only to local authorities managed by Private Company rounds in each authority area.

However, this represents an idealized situation and for practical reasons the following other criteria were set:

- the survey had to be based on all of Kuala Lumpur local authorities;
- there have to be two authorities from each community type (domestic and commercial);

The survey and sampling was taken place in 100 samples and has carried out from November-December 2009 and January-June 2010. Data are collected from Annual Reports and through in depth interviews to Private Company executive staff. These data are necessary for population growth rate and MSW generation rate determination.

III. RESULT AND DISCUSSION

A. Financial Barriers

Many developing countries like Malaysia and Indonesia, have a habit in terms of allocating budget for urban solid waste management in the range of 20-50 percent. Urban solid waste which cannot be handled for about 30-60 percent of the total amount of waste throughout the urban areas. The total urban population that can covered by solid waste management services by local governments amounted to less than 50 percent. In some cases, transport equipment and solid waste collectors who are not suitable to be used anymore has reached 80 percent range, which requires remedial action and maintenance stages. So that it can be said that any circumstances and the poor quality of municipal solid waste management in developing countries is a normal thing and [20].

B. Role of The Government

Existing solid waste expenditure levels increased in Malaysia in line with the pattern of economic standard of living and consumption rate. These levels may differ, follow the type of expenditures and use of the land, such as dwellings, commercial, industrial, institutional, and so forth. Salleh (2001) mentions that since 1993, it has been launched Recycling Program which involves 23 local authorities or Pihak Berkuasa Tempatan (PBT) in the entire country.

Role of the Ministry of Housing and Local Government or Kementrian Perumahan dan Kerajaan Tempatan (KPKT) in municipal solid waste management is giving advice and notification automatically. The Role of Environmental Department is in terms of pollution control and handling in order to protect and maintain the quality of community environment. The Economics Planning Unit is also get involved in the development programs relating to the municipal solid waste management in national level [11]

The approach undertaken in this program specifically uses the original remains in the form of solid waste without going through the process of physical change. The rest is recycling a solid waste originally for producing a raw materials that may be used for further process. Last process is to deduct the expenses of existing solid waste generation from the sources.

PBT has allocated between 30 to 70 percent of manpower for their responsible in environmental management practices. In addition, for 40 to 50 percent of PBT officers get involved in cleaning, including the solid waste management. KPKT will always help and support PBT in order to provide the financial allotment to purchase the appropriate machines and vehicles maintenance. In addition, KPKT also been providing the financial allotment for upgrading and constructing several new solid waste container in some area of PBT.

C. Previous Condition of Municipal Solid Waste in Malaysia

In 2001, Kuala Lumpur State Territory estimated the total solid waste at 2.500 tonnes per day or equal to 912.500 tonnes a year. The quantity of dwelling premises reached as many as 65 percent or 1.625 tonnes per day. With total population estimated around of 1.5 million, then the average of solid waste generated from any person is as many as 1.7 kilograms a day. According to the solid waste accretion of 1.2 percent tons a year, the 2020 estimation will be around of 3.317 tonnes per day or 1,210,705 tonnes a year [3].

In the year 2003, amounted to 17.000 tonnes of solid waste generated on all regions of Malaysia peninsular. On average, solid waste per capita output is about 0.85 kg / capita / day. In the Kuala Lumpur State Territory estimated of 1.5 kg / capita / day. Solid waste collection activities reached about 76 percent, and at 1-2 percent of it has recycled directly and the rest sent to the landfill. Amounting to 5 percent of solid waste from Kuala Lumpur City Area has recycled directly [8].

In 2004, solid waste generation at Kuala Lumpur State Territory was calculated at 2.500 tonnes per day or a total of 912.500 tonnes a year. The quantity of dwelling premises reached as many as 65 percent or 1.625 tonnes per day. With a population of 1.57 million, then the average of solid waste generated from any person is as many as 1.6 kilograms a day.

In 2005, Kuala Lumpur solid waste generation was about 3478 tonnes/day, with the population was around of 2.150 million. The average of solid waste generated from any person is as many as 1.6 kilograms a day [14].

D. Lates Condition of Municipal Solid Waste in Malaysia

Privatization program of the municipal solid waste management at Kuala Lumpur State Territory began in 1996, in which Alam Flora Sdn Bhd (AFSB) has been sworn as

concession holder, and took over solid waste transfer station management namely Taman Beringin Transfer Station (TBTS) that started in 2001. Furthermore, as a technical problem occurred in AFSB, the management of the site TBTS then has transferred to the Solid Waste Disposal Sdn Bhd (SWDSB) in the year 2006.

To ensure the work of municipal solid waste collecting, transporting and disposing executed perfectly, the Unit Kawal Selia (UKS) has been realized [3]. For the contractor performance monitoring program, UKS always made the investigation sessions involving the Supreme Board of Management Kuala Lumpur. UKS also gave a warning to the relevant business partner, and provided achievement reports each month, and surveillance programs simultaneously. UKS also serves as a guardianship officer to ensure residual removal or garbages are placed in appropriate trash bins [8].

Solid waste generated from every landed-houses, apartments, flats, commercial shops, private and royal offices levied and collected by the workers and put into baskets or trolleys and then transported into the suitable solid waste lorry. Solid waste that has been collected then transported using three types of lorries, namely compactor lorries, open lorries and roll-on-roll-out lorries. Solid waste generated from the entire area of Kuala Lumpur State Territory picked and sent by lorries owned by the private contractor, such as the Alam Flora Sdn Bhd, to Beringin Park transfer station. In transfer stesen, the whole municipal solid waste compressed and compacted to facilitate the transfer into the larger lorries, namely the semi-trailer container, which then sent to Bukit Tagar landfill.

Recent investigations in 2010 resulted information that population of Kuala Lumpur City Area has reached 1.66 million people [6]. With the population growth rate of 6.1 percent, then the population in the year 2010 can be estimated at least to 1.69 million people. The number of municipal solid waste generated from Kuala Lumpur State Territory and delivered to TBTS was recorded of 2,000 tonnes per day. Accordingly, the solid waste generation average for any person is 1.2 kilograms a day. The amount and generation rate of solid waste from Kuala Lumpur State Territory remaining unchanged and cannot be better from year to year, and strategic planning needed to avoid excess spending capacity that bring bad impact on TBTS management and in Kuala Lumpur State Territory environment primarily.

In current investigations carried out from solid waste samples collection at TBTS location around 100 kg weights per sample, and the composition which could be found from the sample is as Table 1 below.

TABLE 1.
MUNICIPAL SOLID WASTE COMPOSITION FROM KUALA LUMPUR

Type of Solid Waste	Percentage of Total Solid Waste Sample
Food Waste (and its mixtures)	74 percent
Plastics (and its mixtures)	21 percent
Paper (and its mixtures)	1 percent
Mixed Organic	1 percent
Wood	1 percent
Others	2 percent

The composition of municipal solid waste from Kuala Lumpur City area, as can be seen at Figure 1, will not only need a further attention but treatment also. The Board of Government of Kuala Lumpur should be aware of this recent condition. Regarding a plastic component in its total solid waste at Kuala Lumpur in a high level of composition and need a lots of time to be degradable naturally, a further action need to be taken in order to reduce the possibility of plastic mountain in Kuala Lumpur City area at next few years.

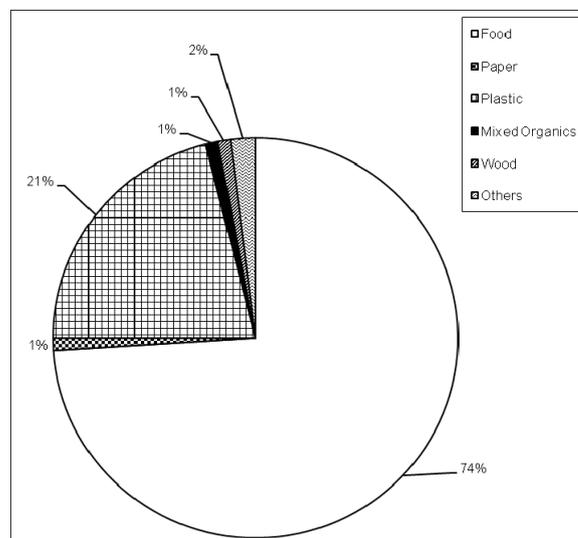


Fig 1. Municipal Solid Waste Composition from Kuala Lumpur

Total solid waste generation rate for each person is about 1.2 kg / capita / day, and following the above statement, for each generation rate of solid waste type can be seen in Table 2 below.

TABLE 2.
WASTE GENERATION RATE FROM KUALA LUMPUR CITY

Type of Solid Waste	Generation Rate/person/day
Food Waste (and its mixtures)	0.6 kg / capita / day
Plastics (and its mixtures)	0.24 kg / capita / day
Paper (and its mixtures)	0.18 kg / capita / day
Others	0.18 kg / capita / day

The price of solid waste (plastic) collected from plastic used market at several places on Kuala Lumpur City area is about RM 0.45 per kilogram, due to data taken on May 2010 (Table 3). If the population in 2009 is about 1.66 millions, then the plastic value per day will be RM 179,280. The potential gross value calculation for one year period can be reached about RM 43,027,200. This potential value should be an additional income for the Government if they can build and develop an integrated plastic recycling market.

TABLE 3.
SOLID WASTE RECYCLE PRICE FROM TAMAN BERINGIN TRANSFER STATION

Type of Solid Waste	Average Price (RM/Kg)
Plastics (and its mixtures)	0.45
Paper (and its mixtures)	0.1
Alluminium	2.5
Cardboard	0.2

Data taken from on-site interview by May 2010.

E. Materials of Solid Waste in Kuala Lumpur

A study by Wilson et al. (in press) highlighted the role of informal sector in waste minimization through recycling. It showed that recycling rates already achieved by the informal sector could be quite high, typically in the range from 20% to 50%; often up to half of this is in the form of clean, source-separated materials collected directly from households and businesses by itinerant waste buyers. The application of modern recycling technologies in accordance with the European and Cyprus legislation, aiming at the recovery of paper, glass, plastics, aluminum and non-ferrous metals from MSW were presented by Athanassiou and Zabaniotou (2008). The international situation was reviewed, the general trends were marked and the main recycling practices treatments were reported. Pappu et al. (2007) outlined the present status on generation and utilization of both non-hazardous and hazardous solid wastes in India.

Unfortunately that the role of the Government may not fixed recent solid waste issues with respect to municipal solid waste management at the rest of Kuala Lumpur State Territory. With regard to the UNCED Agenda 21 (1992), solid waste recycling operation initially was the effort that most acceptable. In an effort that increasingly done, the Government needs to encourage more efforts around to develop the solid waste recycle industry in the Kuala Lumpur State Territory [1].

F. Zero Waste Campaign

The Selangor government had declared its plans to make every Saturday a plastic bag-free day effective on January 1, 2010. A 'No Plastic Bag' campaign observed involving 20 big retailers that includes supermarkets, supermarkets, pharmacies and convenience stores throughout the state, and were urged to reduce the use of plastic bags.

Selangor's first 'No Plastic Bag Day' passed by so quietly, which many consumers were frustrated at being caught unawares. In one case, a Government representative that found had shopping said he had gone to a hypermarket in Subang Jaya on Saturday, without knowing it was the first day of the campaign. The shopper said that he will support the campaign but it should be made and well known by every consumers. Without an appropriate information, so many consumers will miss this campaign.

The campaign had already followed by many private and commercial institutions or retailers. One of the Carrefour's public relations manager said there had been a few complaints from consumers at its stores, and it was actually a matter of educating the public. The manager said also that most Carrefour stores in the Klang Valley have been plastic bag-free since last year and their target was to have no plastic bags in Carrefour Malaysia by 2012.

However, Giant will start implementing its 'no plastic bag' days from Jan 9, 2010. The manager said their stores in Penang had already promoted the campaign well, with managers explaining the concept to customers. Giant will prepare carton boxes for customers to pack their things. Plastic bags will still be available at 20 cent but Giant will be selling reusable bags at RM1.99. That means if consumers are going shopping on a Saturday in Selangor, they have to bring their own bags, or must pay 20 cent for a plastic bag

at some of the retail malls that observe a 'No Plastic Bag Day' on every campaign day.

G. Community Perception on Municipal Solid Waste Management in Kuala Lumpur

Municipal solid waste management in Malaysia has proven to be efficiently, effectively, and adequate. This study has used the existing literature, a primary data from recent empirical evidences for sampling and analyzing the various issues related to municipal solid waste management in Malaysia. One of the main issues is there are many potential economic values from solid waste generation that can be taken as a community side income-generation. Furthermore, composting has been widely acknowledged as an management alternative rather than disposed to landfills directly.

The regional waste recycling program supported by the Ministry of Housing and Local Government was introduced since 1993. The national program of waste recycling that was redesigned by the Ministry of Housing and Local Government was launched and started at December 2000, ten years ago. This program supported by the Local Authorities (by instructions from the Federal Government and voluntarily basis). The objective was to reduce waste generation by applying 3R concepts (reduce, reuse & recycle). The target is to reduce the total generated waste at a minimum rate of 22% in the year of 2020, from this recent rate at 5% [8].

Data was gathered to get a description of current community perception of municipal solid waste generation and management in Kuala Lumpur City areas based from the current survey. Survey was located around Kuala Lumpur City areas for three months periods. Questionnaires were spread randomly and limited to 100 respondents according to statistical method and limited resources. Sampling was taken during the first week of January 2010 until the first week of June 2010. Sampling area was chosen at Kuala Lumpur City areas only, excluded areas of industrial which was contained mixed and hazardous waste. Samples were taken from the respondents lived and stayed at Kuala Lumpur City areas permanently.

TABLE 4.

COMMUNITY PERCEPTION ON MUNICIPAL SOLID WASTE MANAGEMENT IN KUALA LUMPUR

No.	Statements (Question)	No. of respondents	% of total respondents
1	The government is running a zero waste campaign	100	
	Know	94	94%
	Don't know	6	6%
2	Waste from household is frequently picked-up by workers	100	
	Agree	91	91%
	Don't agree	9	9%
3	Waste collection & separation methods has informed very clear and intensively	100	
	Agree	83	83%

	Don't agree	17	17%
4	Recycling is...	100	
	Know	77	77%
	Don't know	23	23%
5	Anything we do at our home	100	
	Trash Pick-up	91	91%
	Collecting centers	27	27%
6	You are a recycler	100	
	Yes	14	14%
	No	82	82%
7	The reason you do recycle	14	
	It's the right thing to do	8	57.1%
	My employees/parents/household made me do it	6	42.9%
8	You will get participate if a recycling campaign for charity takes place near where you live	100	
	Yes	49	49%
	No	51	51%

From the questionnaires collected directly from the field (Table 4), the results find that almost all of the people (total respondents), 94% noted, has already knew about the zero waste program and other government's waste management program. Some respondents, for about 9% from the total respondents, told that solid waste from several locations was not frequently and totally picked-up by workers. While about 83% of the total respondents said that waste collection and separation methods has informed very clear and intensively.

Furthermore, there were about 77% of the total respondents have a better understanding about the solid waste recycling issues. But this has to be mentioned if there was about 14% of the total respondents that have already recycled on their solid waste. Several of them have no convinced reason about why did they want to do a recycle thing. And they're just following on their closest friends or nearby community to do a solid waste recycling (42.9% of 14 respondents).

Though recycling activity in Malaysia is rising up, the recycling industry still needs to be enhanced. The Malaysian's attitude towards recycling is higher, but only few practice it [7]. It is alarming that, due to lack of proper recycling activity, Malaysian Newsprint Industries Sdn. Bhd. is forced to import 50% of its materials and Kuala Lumpur Glass Manufacturers Sdn. Bhd. also import up to 20% (New Sunday Times, 20th October, 2002b). Since 1993 a major effort of recycling was launched by the Ministry of Housing and Local Government but unfortunately limited recycling activities taken place [1].

A. Latest Situation of Beringin Park Transfer Station

At present, Taman Beringin Transfer Station (TBTS) has been taking care of the average of solid waste at 2,100 tonnes per day. The capacity of this waste generation has been increasing in numbers, from 1,700 tonnes, since initial operation in 2002 [15].

TBTS has received facility improvements for the second time after increasing its waste volume capacity in 2007 and 2008. TBTS may receive municipal solid waste from the area of Kuala Lumpur State Territory more than 2.700 tons in one day. In addition, the management of solid waste transfer station has a broad issue and requires a very large financial budget for daily operations. Especially when there was an increased solid waste generation capacity every months.

TBTS have a very critical situation right now. Total solid waste generation sent from Kuala Lumpur City Area was increased in large amount correlated with the growing population of Kuala Lumpur positively year after year. If TBTS have experienced a limited waste volume capacity and will be required additional financial budget, this has become a serious problem for the Government Board of Kuala Lumpur City. In estimation, TBTS budget is around of RM 30,000,000 in the period of one year only for the purposes of simple operational cost. Government Board of Kuala Lumpur City should reconsider a better solution for funding that operating cost.

IV. CONCLUSION

A Government participation in waste campaign program in the early 2010 has still not bring a significant and positive impact to the communities yet, specially who lived in Kuala Lumpur areas. The waste volume generated in each day still showed a similar result, even it doesn't bring a slightly differences, if compared before and after the program was launched. The more time will needed in order to realize the Government's zero waste program. An intergrated stakeholders collaboration and participation will also needed between Government Bodies, Local Authorities, Public and Provate Institutions, and Academic Communities.

A large and diverse solid waste composition generated from Kuala Lumpur areas containing a big economic potential value will contribute to a significant side income generation and jobless rate can be reduced, and must be followed up by the Government in order to reduce daily waste generation rate and extend the lifetime of Bukit Tagar landfill.

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