

OVERVIEW OF MUNICIPAL SOLID WASTE MANAGEMENT PRACTICES AND CHALLENGES IN SABAH: A REVIEW PAPER

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ABSTRACT. *As urbanisation continues takes place, the management of solid waste is becoming a major environmental and public health problem in urban areas. In 2013, solid waste generation in Sabah was 2,062 390 kg/day where the values increase year by year where the waste generation rate in Sabah is 0.7 kg/capita. The amount will keep increasing without the improvement of linkage between government, local councils, collection service providers, traders, recycling centre operators, non-governmental organizations and related stakeholder in planning a proper solid waste management. This paper presents an overview of the solid waste management practices and challenges in Sabah respectively. There are about 23 local authority which responsible in collecting of municipal solid waste from commercial, institutional and residential areas, sweeping of roads and footways, beach and river cleaning and minimization of waste. The solid waste management is involved generation, storage, collection, processing, transfer and transport, disposal and treatment. However, uncollected area, immigrants, squatter villages and lack of human resource and finance has become the challenges to local authority in handling the solid waste management. Thus, solid waste should be manage efficiently due to sustainable environment and create a better quality life.*

KEYWORDS. Solid waste, waste generation rate, local authority, solid waste management practices, challenges

INTRODUCTION

Statistics shows that the Malaysian population reached over 28 million in 2010 at a rate of 2.4% per annum since 1994 (HMGN and MoPE, 2003). It shows that the population growth rapidly which makes the municipal solid waste (MSW) generation also increase. The Solid Waste and Public Cleansing Management Act 2007 defines solid waste as controlled solid waste which includes commercial solid waste, household solid waste, institutional solid waste and public solid waste (Act 672). The 9th Malaysia plan has reported that the average per capita generation has increase from 0.67 kg/person/day in 2001 to 0.8 kg/person/day in 2005 (EPU, 2006). Assuming a 3.6% of population growth in 2020, the amount expected to be 31,000 tonnes/day of waste (LGD, 2005) which mostly Malaysian solid waste contains a very high of concentration of organic waste and consequently has high moisture content (Latifah *et al.*, 2009).

The phenomenon of increasing MSW has create the management of solid waste continues to be a major challenge in urban areas including in Sabah. This paper will present the overview of solid waste management practices and challenges by local authority in managing solid waste in Sabah.

MUNICIPAL SOLID WASTE MANAGEMENT

Background Information

Sabah has a total area of 73,620 square km (7.362 mil hectares) and is located between 4-8° north latitude and 115-120° east longitude. Sabah is one of the 13 states of Malaysia and it is located on the northern portion of the island of Borneo. It is the second largest state in the country. The capital of Sabah is Kota Kinabalu, is often referred to as “Land below the wind” because its location just south of the typhoon-prone region around Philippines. The state is divided into 24 administrative unit comprising one city hall Kota Kinabalu, two municipal council Sandakan and Tawau, 20 district council and one town board Kudat (Fig.1) (Source: www.sabah.gov.my).



Figure 1. District of Sabah.

The population of Sabah is 3,117,405 as in 2010. Sabah is the third most populous state in Malaysia. Urban population today is a mixture of different ethnic groups of Kadazan Dusun which 18% followed with Bajau 14%, 6% of Malay and others Sabah Bumiputera is 20% include, Bisaya, Suluk, Bugis, Banjar, Idahan, Jawa, Iranun, Tidung and others. Only 9% is Chinese population and other non-Bumiputera is 1.5% (DOS, 2010). Over the last 3 decades, Sabah economy has expanded considerably from the growth rapid pace through oil palm, timber, cocoa and extract of crude petroleum. These activities were also encouraged by the primary commodity price in the world market (NSD, 2012). Presently, Sabah is the major producer of oil palm oil and cocoa in whole Malaysia. The palm oil plantations covering more than 700,000 hectares mainly found in the east coast of state. The oil palm sector in Sabah is very important to the state economy which this sector contributes more than 30% of total income. Eco-tourism also is the major contributor to earnings in Sabah where it becomes the platform of foreign currency exchange. In 2006, there are about 2,000,000 tourists has visit Sabah and it is estimated that the number will continue to rise following promotional activities by the state and national tourism board (STB, 2007). There are national parks and a lot of beautiful islands along Sabah coastal area to attract the tourist such as Pulau Sipadan, Pulau Manukan, Pulau Mamutik, Pulau Sapi, Pulau Gaya and many more.

Institutional and Legislation Frameworks

In Sabah, municipal solid waste is under the jurisdiction of the respective city/municipal/district council based on the Local Government Ordinance 1961 which responsible for the collection, treatment and disposal of solid waste (Anti-Litter By Laws, 1984; Conservancy and Hygiene By-laws, 1984).

The municipal council has enforce Municipal Council (Anti-Litter) By-Laws enacted in 1976, which allows for a maximum compound of RM100.00 as low as RM5.00 to RM 10.00 is accepted. The enforcement is intention to raise the people awareness about to throw their waste in the proper place and in proper manner. It can be simplify that people who pollute will be punished. In 2005, total of 6,070 litterbugs were arrest and total of RM 58,154.00 was collected (Chua, 2006; Kota Kinabalu Municipal Council (Anti-Litter By-Laws, 1984; Tawau Municipal Council (Anti-Litter) By- Laws, 1984 [repealed by Uniform (Anti-Litter) By-laws, 2010; Sandakan Municipal Council (Anti-Litter) By- Laws, 1984 [repealed by Uniform (Anti-Litter) By-laws, 2010).

In Sabah, there are no official guidelines available for segregation of the MSW at source and no regulations imposed on how waste are segregated. None of the councils compels residents to separate their waste. At present, local authority functions and duties are to keep the areas under jurisdiction clean and hygienic. So, in performing these functions, the LA has statutory authority include:

a) Uniform (Anti-Litter) By-Laws 2010

These By-laws is applied in the whole area under the jurisdiction of all Local Authority in Sabah.

- i. "Litter" means any dust, sand, earth, gravel, clay, stone, cement, paper, ashes, carcase, refuse, leaves and branches, grass, straw, boxes, barrels, bales, shavings, sawdust, garden refuse, stable refuse, trade refuse, manure, garbage, bottles, glass, can, food container, food wrapper, particles of food or other things, articles or materials;
- ii. Any person who/places, throws or deposited or thrown or leaves behind any bottle, glass, can, food container, food wrapper, particles of food or other articles in any public places commits an offence under these By-laws.
- iii. Any person who commits a breach or contravenes any of the provision of these By-laws shall be liable to a fine of not exceeded ten thousand ringgit and in the case of a continue offense to further fine five hundred ringgit every day during offense continue (Uniform Anti-Litter By-laws, 2010).

b) Conservancy and Hygiene, By-Laws 1984

These By-laws is applied in the whole area under the jurisdiction of all Local Authority in Sabah.

- i. Every owner or occupier of any premises shall provide one or more dustbin as maybe necessary to contain the refuse there from, every such dustbin shall be:
 - Provide tight fitting cover or lid
 - Made from metal
 - Capacity not less than one and half cubic feet and not more three cubic feet
 - Design, size and shape approved by council
- ii. The occupier of any premises shall not deposit or cause or permit to be deposited any dust, filth, ashes, or refuse, discarded there from anywhere other than collected in a plastic bag.
- iii. Any person who contravenes any of the provisions of these By –laws shall be guilty of an offense and shall be conviction be liable to a fine not exceeding five hundred

ringgit and where the offence is a continuing offence to a further fine not exceeding five thousand ringgit for everyday during the offense continue (Conservancy and Hygiene By-Laws, 1984).

Solid Waste Management Practices

The activities that associated with the management of solid waste can be divided into six functional elements which are solid waste generation, storage, collection, processing, transfer and transport, and finally disposal and treatment (Tchobanoglous & Theisen, 1993).

Waste Generation and composition

Solid waste generation is waste generated at the start of any process. Generally, solid waste generated from household, commercial areas, industries, institutions and other municipal services (Ramachandra & Saira, 2004; Agamuthu *et al*, 2007). Solid waste generation was depends on the sources of municipal solid waste (MSW) been generated. The rapid population growth, urbanization, economic level and the rise in the community living standard has generated a tremendous rate of MSW across the Malaysian municipalities (Tarmudi *et al*, 2009). The MSW generation in Sabah were shown in Table 1. This clearly indicates that the quantity of MSW generation rate in Sabah is increasing year by year.

Table 1. The Estimation of MSW in Sabah.

State	2010	2011	2012	2013	Estimates MSW (Kg/Day/Capital)
Sabah	1,481 000	2,062 390	2,136 420	2,062 390	0.70

(Source: Ministry of Housing and Local Government, 2013)

Typically, mostly organic waste is the highest content in solid waste generation followed by paper, plastic, glass and others. These compositions of waste reflect the lifestyle of the population. Table 2 shows the composition of municipal solid waste.

Table 2: Composition of Municipal Solid Waste.

Item	Quantity(%) (tons/days) 2010
Organic waste	47.9
Paper	19.9
Glass	3.0
Plastics	17.5
Metals	4.6
Other	7.1

(Source: Kota Kinabalu City Hall, 2013)

Collection and Storage

Solid waste collection has been practices usually done by every day of waste collection especially at the city center, commercial areas such as shopping centers and public place. This is due to the highest waste generation rates at the place. Meanwhile, residential area usually done by three times a week where collection methods by streets are the common practice. Dustbin will be place at the hallway of residential house to facilitate the workers to collect the waste. The waste collector usually use stationary container system (SCS) because it flexible for all types of wastes and suitable for residential and commercial areas that can be access by road. However, some areas in Sabah were cannot access by road, the local authority were use hauled container system (HCS), which it suite for the collection of waste that rate of

generation is high for example water village area. The local authority has provided a bin center which use RORO (Roll On Roll Off) dustbin for the villages to throw their waste (Lim *et al.*, 2002).

Disposal

Presently, there are 23 solid waste disposal sites in the state under the jurisdiction of the City/Municipal/District council. According to (Lim *et al.*, 2002) has reported that almost all disposal site in Sabah were open dumping and not suitable located which 14 disposal site located in swamps, valleys and side slopes while 7 others disposal site were fairly suitable located (Beluran, Kinabatangan, Kota Belud, Kunak, Nabawan, Sandakan and Sipitang). Table 3 shows the location of disposal site that still operation in each district at Sabah.

Sabah has one sanitary landfill operated at Level IV which is located at Kayu Madang, Telipok. Kayu Madang is only the disposal site that considered suitable located (Kota Kinabalu City Hall, 2013). Total site area for Kayu Madang Sanitary Landfill is 115 acres. The landfill site received waste from Kota Kinabalu, Penampang, Putatan and Kota Belud around 450-500 tonnes/day. Kayu Madang disposal site, received all types of waste except toxic waste that does not have written approval from the DOE. However, there are some disposal sites that have been privatised such as solid waste disposal site at Sandakan and Lahad Datu by Alam Motivasi Sdn Bhd, collection of waste in Tawau by Sharijadi Sdn. Bhd. Other than that, the solid waste disposal site at Tawau are operation and maintenance by Pemborong Semarak (Tawau Municipal Council, 2013). There are 19 disposal sites which still operated as shown in Table 3.

Table 3. Disposal site in Sabah's District.

District	Site	Site Level (Operation)
Beaufort	Jln JKR Beaufort	Not sanitary
Beluran	Jln Kg. Kolapis	Not sanitary
Keningau	Jln Sedukut, Km 10, Jln Keningau-Nabawan	Not sanitary
Kinabatangan	Jln Sinar Jaya	Not sanitary
Kota Kinabalu	Kayu Madang, Telipok	Sanitary
Kota Marudu	Pekan Lama Kota Marudu	Not sanitary
Kuala Penyu	Kg. Kilugus, Kuala Penyu	Not sanitary
Kudat	Lembaga Bandaran Kudat, Bt 6, Jln Sikuati	Not sanitary
Kunak	Kg. Pengkalan Madai, Km 15, Jln Simpang Pangkalan Madai	Not sanitary
Lahad Datu	KM 31, Jln Lahad Datu	Not sanitary
Papar	Kg. Langkawit	Not sanitary
Ranau	Kg. Tanah Merah, Ranau	Not sanitary
Sandakan	Jln Fook Kim, Batu 8, Labuk	Not sanitary
Semporna	Jln Kg. Sri Sapi	Not sanitary
Sipitang	Merintaman Sipitang	Not sanitary
Tambunan	Jln Mosogit, BT 7, Mangkatai	Not sanitary
Tawau	Bukit Gemuk, KM10.5 Jln Merotai	Not sanitary
Tenom	Jln Kg Amboi II, Tenom	Not Sanitary

(Source: Ministry of Housing and Local Government, 2013)

Solid Waste Management Challenges

Local Authority Jurisdiction Area

Solid waste management is a major challenge in urban areas throughout the world. The management of solid waste has become critical and a lot of critics from the public due to the poor quality in some places which give local authority a lot of pressure to handle the waste properly (Eric *et al.* 2000). Moreover, there is a lot of area in Sabah which didn't have waste collected service due to the financial problem. The local authority responsible within their jurisdiction area, however, for the uncollected area, it will become a problem for them. Illegal dumping site, open burning, and improper waste management will make the waste management become worse

Squatters

In early 2010, the city hall found that there are about 5,000 squatters around the city with approximately 10,000 residents, mostly rebuilt on the site of the demolished house before (Mohammad Raduan, 2000). They also identified 26 areas of squatter settlements in Menggatal, Inanam, Likas and Sembulan which occupied mostly foreigners (Jain, 2001). Problem of squatting is difficult to achieve because the stubborn attitude of the residents which not tired of rebuilding the house again. Most homes built in the area of mangrove make the demolition difficult to be done. The squatters have cause pollution to rivers and oceans where they produce waste and throw to the rivers and oceans.

Illegal immigrants

According to statistic in 2009 estimate that 614,824 illegal immigrants have made Sabah as their 'second home' which mostly came from Philippines and Indonesia. This is because of the position adjacent the state is near to Philippines and Indonesia made them easier to get there either legally or illegally. The problem that the city hall had is the existence of water village where it is the place that near the sea and rivers which considered a safe residential area for them to escape from the authorities if the operation performed. Besides that, the existence of this water village has cause many serious crime and social problem such as theft, drug, prostitution and so forth (Chua, 2006).

Lack of Human Resources and Finance

Lack of human resources also make the state and local authority become handicapped which there is no expert and lack of human resources in handling the latest technology for disposal and treatment of solid waste. This will cause the deterioration of the quality of the environment. The quality of the service was unequal among the local authority which depends on their financial resources. Financial problem has become the main problem in handling the solid waste management because it too costly to manage the disposal site and treatment (Sakawi, 2011).

CONCLUSION

Improper waste management due to the fact that waste generation rates increases. This scenario will affect the state of Sabah in the future if no serious action been taken. Therefore, the local authorities in Sabah has to improved the solid waste management practices and implement the regulations regarding solid waste more strictly and systematically.

Enforcement should be carried out continuously especially for the illegal immigrants that built a squatter settlements along the Sabah coastal area which generated a lot of problem to the state. Coastal zone area were brings a lot of advantage as source of income to the several population and the government too. As the conclusion, public include all government agencies and non-government agencies should work together as a team to provide a properly facilities of waste management for the sustainable development in the future.

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