STUDY ON T AL SOLID WASTE IN L AREA

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ABSTRACT

Municipal Solid Waste (MSW) is anything that been consume and discards from human's activities on daily basis. These waste also known as trash, garbage, refuse, and rubbish. Increasing of MSW production in commercial is one of government concern, especially in Kuantan. In order to reduce and handle the MSW, suitable methods must be chose for their efficiency and effectiveness. This research was focus on solid waste composition and solid waste generation rate in Mahkota Aman commercial area. The commercial premise divided into three categories; public, product, and service with total 20 participants. For this study, two methods of data gathering were applied; on site sampling involving weigh and segregate solid waste generated, and questionnaire distribution. On site sampling Based on the study, solid waste generation rate were dominated by product type premise at 4.77kg/units.day from 10 units participants. Compare to 1.77kg/unit.day by public type premise (2 units), and service type premise generation rate were 0.96kg/unit.day (8 units). The relationship between solid waste composition and solid waste generation is based on type of the premise. Each premise generated different type of waste with different generation rate.

ABSTRAK

Sisa pepejal ialah apa sahaja yang telah digunakan, terhasil, dan disingkirkan daripada aktiviti harian manusia. Ia juga dikenali sebagai sampah. Peningkatan penghasilan sisap pepejal merupakan salah satu kebimbangan kerajaan terutamanya di kawasan Kuantan. Dalam usaha untuk mengurangakn dan menguruskan sisa pepejal di Malaysia, kaedah pengurusan yang sesuai harus dilaksanakan berdasarkan keberkesanannya. Kajian ini akan memfokuskan komposisi sisa pepejal dan kadar penghasilan sisa di kawasan komersial Mahkota Aman. Premis komersial akan dikategorikan kepada jenis awam, jenis produk, dan jenis servis dengan jumlah keseluruhan 20 buah peserta. Untuk kajian ini, 2 kaedah pengumpulan maklumat digunakan iaitu; kerja lokasi dengan menimbang dan mengasingkan sisa dan kaji selidik. Berdasarkan kajian, kadar penghasilan sisa didominasi oleh premis jenis product dengan kadar 4.77 kg/unit.hari. Manakala premis jenis awam menghasilkan sisa dengan kadar 1.77 kg/ unit.hari dan premis jenis servis dengan kadar 0.96 kg/unit.hari. hubungkait diantara komposisi sisa dengan kadar penghasilan sisa adalah berdasarkan jenis premis itu sendiri. Setiap premis menghasilkan jenis sisa yang berlainan dengan kadar yang berbeza.

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MSW	:	Municipal Solid Waste
US EPA	:	United State Environmental Protection Agency
US	:	United State
UK	:	United Kingdom
DoE	:	Department of Environment, Government of Tamil Nadu
NSWAI	:	National Solid Waste Association of India
DOC	:	Degradable Organic Carbon
IPCC	:	Intergovernmental Panel on Climate Change
SWDS	:	Solid Waste Disposal Site
ASTM	:	America Standard Testing Methods

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CHAPTER 1

INTRODUCTION

This chapter explains the background, research problem, objectives of this research, research questions, and significance of this study.

1.1 Preamble

In many develop countries; management of municipal solid waste is important, due to increase number in populations in populations and social economics. Nowadays, the municipal solid wastes become one of the biggest problems in our country. For example, in Kuantan, the waste generation rate is continually increase by year due to uncontrolled waste consumption. By these rates, the amount of solid waste produce in Kuantan will multiple in the next twenty years from now. So, handling and disposal of Municipal Solid Waste (MSW) is a growing concern as the volume of waste generated in Malaysia continues to increase.

Municipal Solid Waste (MSW) is anything that been consume and discards from human's activities on daily basis. These waste also known as trash, garbage, refuse, and rubbish. As defined by the U.S. Environmental Protection Agency, municipal solid waste is total waste excluding industrial waste, agricultural waste, and sewage sludge; which means it includes durable goods, non-durable goods, containers and packaging, food wastes, yard wastes, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. In the other hand, "solid waste includes residential, light industrial, commercial, and institutional waste that is collected by a municipality or by contracted collectors on behalf of the municipality", (Chandler; 1997). In the nut shell, MSW can be define as any form of waste that produces by humans or animals from their daily activities, and all these waste is collected by the authorities or municipality.

The composition of waste is difference due to difference activities. For example; for agriculture activities, they produce animal waste, and for mining activities, lots of waste rock produce by digging an open pit mine. But, for MSW, the source of waste is from residential, commercial area, open or public areas, and treatment plant sites. For residential; which is normally single or multifamily dwelling, produce food waste, rubbish, ashes, and special wastes from their daily activities.

1.2 Problem statement

Solid waste management industries play an important role in handling and disposing the waste. This industry has four common methods; which are recycling, land filling, composting, and turn waste to energy via incineration. The problems that always come along with MSW management are the quantity and diversity of the waste and financial limitations on municipal services in large area.

Increasing of MSW production in commercial is one of government concern, especially in Kuantan. In order to reduce and handle the MSW, suitable methods must be chose for their efficiency and effectiveness. There are many methods in handling MSW, but not all methods suitable to all waste. It's all depending to the waste compositions. In order to choose the best methods, data gathering must be done to the area.

1.3 Research Objectives

There are several objectives that must be achieved in the end of this research, which are;

i To collect data of the municipal solid waste composition.

ii To study the solid waste generation in commercial area.

iii To analyse the relationship between solid waste generation and the composition of municipal solid waste in Mahkota Aman.

1.4 Scope of Study

The main priorities of this study are data gathering for MSW; based on composition such as organic and inorganic waste, and solid waste generations. Factors to be considered are type of premises and week of the month. This study will be focussing on commercial area, which is Mahkota Aman commercial area. To collect MSW data from this area, sample will be collected with the cooperation given by premise owner.

1.5 Significance of Studies

This study is important in order to collect data for further MSW management. From this study, the composition of waste in the area will be classified. Furthermore, it will show the relationship between solid waste generation and the composition of MSW in the area.

This study would be beneficial to the Government or any contractors that involve in MSW management. Based on the data, they can choose the most suitable MSW management method, that not only effective but also give benefits to society. MSW management will steps forward in order to bring bright future for the next generation. As human being, the result from the research will be more helpful to save our environment and gives us healthy nature.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will define the variables in this study based on several literature reviews. The variables been discussed in this study are; municipal solid waste: its origin and effect, waste composition, waste generation, and the data collection technique. This chapter discussed the origin of the municipal solid waste and how its effect the environments. This chapter also will talk about waste composition, type of composition; organic and non-organic. This chapter also discussed about waste generation: definition and effecting factors. The last topic that will be discussed in this chapter is the data collection methods.

2.2 Municipal Solid Waste: Its origin and Effect to Nature

2.2.1 Introduction: Solid waste

Solid wastes are term used to describe all of the waste produce from human and animal. Usually, all this wastes are discarded as useless or unwanted material, which normally in solid form. Solid waste can be defined as the useless and unwanted products in the solid state derived from the activities of and discarded by society. Solid waste means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 1342 of title 33, or source, special nuclear, or by product material as defined by the Atomic Energy Act of 1954, (United State Nuclear Regulatory Commission). Zero Waste America defines waste as "a resource that is not safely recycled back into the environment or the marketplace." This definition might consider the value of waste as a resource, as well as the threat of unsafe recycling to the environment and public health. The word 'waste' and the act of 'wasting' are from human inventions. Waste doesn't exist in naturally in the environment. In nature, everything has a purpose. Waste was created by humans for short-term convenience and short-term profit. Wasting results in long-term harmful consequences for humans, nature, and the economy.

Solid waste can be categories according to its sources or activities. Three general categories are considered; municipal wastes, industrial wastes, and hazardous waste (Howard, 1985). According to EduGreen, solid waste can be classified into household waste or generally known as municipal waste, industrial waste as hazardous waste, and biomedical waste or hospital waste as infectious waste. Each of these categories belongs to different sources. For examples, industrial wastes usually arise from industrial or commercial activities, such as factory, paper industry, textiles and so on. These industries usually produce rubbish, ashes, and special waste. For

hazardous waste, it usually came from high prospect activity which involving chemical usage. Industrial and hospital waste is considered hazardous as they may contain toxic substances. Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive; and react when exposed to certain things such as gases.

Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biological. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infected. (Edugreen). These wastes are dangerous to environments and need expensive treatment to dispose it.

2.2.2 Municipal Solid Waste: Origin

According to United State Environmental Protection Agency (US EPA), Municipal solid waste (MSW) which commonly known as trash or garbage (US), refuse or rubbish (UK) can be define as a waste type consisting of everyday items we consume and discard. It predominantly includes food wastes, yard wastes, containers and product packaging, and other miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Garbage is define as MSW which includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes MSW consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. (National Solid Waste Association of India)

Table 2.1 illustrates the source of solid waste and locations where this kind of waste normally generated. Each sources generated different type of waste according to activities involves.

Table 2.1: General sources and types of municipal solid wastes (A.Fraklin, 1994 and United Nation ESCAP, 2000)

Source	Locations of wastes generation	Types of solid wastes
Residential	Single-family homes, duplexes, town houses, apartments, etc.	Food wastes, rubbish, ashes, special wastes, Yard trimmings
Commercial and Institutional	Office buildings, shopping malls, warehouses , hotels, airports, restaurants, school ,medical facilities, prisons	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes, yard trimming
Industrial	Packing of components, factory, oil plant	Office wastes, lunchroom and rest wastes (but not industrial process wastes)
Open areas	Streets, alleys, parks, vacant lots, playgrounds, beaches, highways, recreational areas, etc.	Street sweepings, roadside litter, rubbish and other special wastes.
Treatment plant sites	Water, sewage and industrial waste water treatment processes.	Treatment plant sludge.

Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This waste is mainly generated from residential and commercial complexes or public places. With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing. According to Department of Environment, Government of Tamil Nadu it stated that in 1947 cities and towns in India generated an estimated 6 million tonnes of solid waste, in 1997 it

was about 48 million tonnes. More than 25% of the municipal solid waste is not collected at all; 70% of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste.

Over the last few years, the consumer market has grown rapidly leading to products being packed in cans, aluminium foils, plastics, and other such non-biodegradable items that cause incalculable harm to the environment. In India, (DoE, Government of Tamil Nadu) some municipal areas have banned the use of plastics and they seem to have achieved success. For example, today one will not see a single piece of plastic in the entire district of Ladakh where the local authorities imposed a ban on plastics in 1998. Other states should follow the example of this region and ban the use of items that cause harm to the environment. One positive note is that in many large cities, shops have begun packing items in reusable or biodegradable bags. Certain biodegradable items can also be composted and reused. In fact proper handling of the biodegradable waste will considerably lessen the burden of solid waste that each city has to tackle. From the review, MSW is a term to describe garbage or rubbish or waste that produces from daily activities in public area such as residential, commercial, and so on. These types of waste bring uncomfortable situations and need more attentions in order to bring more greenery to our nature.

2.2.3 Municipal Solid Waste: Effect to environment

The environment consists of every single living being on Earth, from the smallest microorganism like bacteria to the largest living things. Just as children depend on their parents for safety and continuity, mankind depends on the environment to sustain their lives. According to Global Environment Centre, solid waste is one of the three major environmental problems in Malaysia. It plays a significant role in the ability of Nature to sustain life within its capacity. Currently, over 23,000 tonnes of waste is produced each day in Malaysia. However, this amount is expected to rise to 30,000 tonnes by the year 2020. The amount of waste generated continues to increase due to the increasing population and development, and only less than 5% of the waste is being recycled.

These MSW needs to be managed carefully for better future. If all of these wastes did not carefully manage, it can bring harm to nature and become pollutant. MSW can bring global warming/ greenhouse effect, water pollution, and air pollution. If these waste been dump and burnt without control it can cause global warming. In most of the cities & towns the municipal solid waste is being dumped & burnt in open spaces without understanding the adverse impacts on the environment. Prior to 1970, sanitary landfills were very rare in United State. Wastes were "dumped" and waste organic materials in the dumps were burned to reduce volume. Waste incinerators with no pollution controls were common.(Keith, 2002).

The waste in the dumping ground; whether being burn or landfill process undergoes various anaerobic reactions produces offensive Green House gases such as CO2, CH4 etc. (NSWAI). According to United State EPA, 2009 waste that breaks down in landfills will form methane gas, which is a potent greenhouse gas. Emissions of CH4 result from the decomposition of biodegradable components in the waste stream such as paper, food scraps, and yard trimmings. The potential for global climate change caused by the release of greenhouse gasses is being debated both nationally and internationally. Due to waste biodegradable, it can cause change in

climate and thinning ozone layer. Greenhouse gasses emissions can trap heat in the atmosphere and lead to warming the planet and changing its weather.(Keith, 2002).

MSW can also cause severe health impact to mankind if did not manage accordingly. Numerous epidemiology studies have been conducted to evaluate whether the health of people living near hazardous waste disposal sites is being adversely affected (Moeller, 2005). Improper dumping can cause soil adsorption, which means the chemicals reactions from MSW composed process will be adsorb deep into the ground. It also can cause leaching; process which ground water been contaminated by waste chemical. Animals, or plant that depends on this water sources will be harm and might cause death. For example, according to Resource Conservation and Recovery Act of 1976 and the Clean Air Act in United State, waste was typically hauled to dumps with nuisances associated with odour, and occurrence of disease vectors such as rats, mice, and flies. Chemical poisoning might occur through chemical inhalation due to degradable process. It can be harmful and cause another impact; such as cancer, neurological disease, and low birth weight.