Abstract. The amount of municipal solid waste (MSW) generated continue to increase in response to rapid growth in population, change in life style and accelerated urbanization and industrialization process. The study on MSW is important in order to determine the composition further seeks an immediate remedy to minimize the waste generated at the early stage. As most of the MSW goes to the landfill or dumping sites, particularly in Malaysia, closure of filled-up landfill may become an alarm clock for an immediate action of proper solid waste management. This research aims to determine the waste composition generated from selected residential area at Gambang, Kuantan, Pahang which represent Old residential area (ORA), Intermediate residential area (IRA) and New residential area (NRA). The study was conducted by segregating and weighing solid waste in the residential area into 6 main components ie., food waste, paper, plastic, glass, metal and others. In a period of four weeks, samples from the residential unit were taken and analyzed. The MSW generation rates were recorded vary from 0.217 to 0.388 kg person$^{-1}$ day$^{-1}$. Food waste has become the major solid waste component generated daily which mounted up to 50%. From this research, the result revealed that the recyclable composition of waste generated by residents have a potential to be reuse, recycle and reduce at the point sources.

1. Introduction
Nowadays, solid waste management becomes the biggest issues to be discussed which may lead to intractable environmental issues. According to Ajadi et al., 2010 has reported that solid waste results from rapid increase in population, massive expansion of the urban areas and the changing lifestyle [1]. According to various report, waste generation in Malaysia has been increasing gradually since year 2000 [2].

The Municipal Solid Waste (MSW) generation rate in Kuantan, the capital of Pahang is continuously rising up every year due to the uncontrollable consumption. Presently, the amount of solid waste produced in Kuantan is about 500 tons daily, consisting of 60% of domestic waste and 40% of industrial and construction waste [3] In Malaysia, the average components of MSW are quite

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similar with the largest categories consisting of food waste (45%), plastic (24%), paper (7%), iron (9%) and others (3%) [4].

As disposed of waste in Malaysia is totally end-up in landfill, proper management of solid waste in the point sources need to be emphasized. There were about 230 official dumping site gazetted in Malaysia based on statistic data in 1998. By the year 2002, only 161 disposal sites are actively operated in Peninsular Malaysia [5]. Most landfill in Malaysia were small scales operations with varying levels of design sophistication, while majority of them were poorly manage. The National Strategic Plan for Solid Waste Management was formulated the following service targets to focus plans to improve MSW management and monitor the efficiency of its implementation. Table 1 illustrated the reduction target for 2020 revised by Malaysia’s government where in 2015, closure of dump sites are targeted to achieve 100% with source separation will highly encourage to be done especially in urban area.

**Table 1.** Reduction target for 2020 was revised by the Government of Malaysia

| Level of Service                  | Present | 2003-2009 | 2010-2014 | 2015-2020 |
|-----------------------------------|---------|-----------|-----------|-----------|
| Extend collection service         | 75%     | 80%       | 85%       | 90%       |
| Reduction & Recovery              | 3-4%    | 10%       | 15%       | 17%*      |
| Closure of dump sites             | 112 sites | 50%       | 70%       | 100%      |
| Source Separation (Urban)         | None    | 20%       | 80%       | 100%      |

*National Strategic Plan for Solid Waste Management in Malaysia, 2005

1.1 Objectives

The main objectives of this study are:

i. To determine the waste composition in three different residential

ii. To analyzed the waste generation rate

2. Methodology

2.1 Overview of the study area

The study was conducted in Kuantan, a capital city of Pahang. As Kuantan consist of several counties, Gambang has been chosen as a study area due to the vast development and expected to face a rapid growth within 10 years due to many development project such as institutional, tourism centre and economic and social hub. The study on MSW composition and management covered 3 residential area at Gambang namely, Taman Tas, Taman Mahkota Aman and Taman Indera Semporna which each of them represent Old Residential area (ORA), Intermediate Resdiential Area (IRA) and New Residential area (NRA), respectively. The selection of the study area was based on the rapid development due to available public accommodation and the population concentration. Although the ages of the residential area is different comprising new (< 5 years), intermediate (5-10 years) and old residential (10-15years), but the rapid growth of accommodation had caused the residential development is skyrocketed at the same level.

2.2 Sample collection, sorting, measurement and recording.

During the data collection at point sources, a few plastic bags were distributed to the sample unit by providing the target sample with two different colour of plastic bag namely black colour of plastic bags for non-biodegradable waste or dry waste; while blue colour of plastic bags for biodegradable or wet waste collection. The waste was segregated into 6 classes which are food waste, plastic, paper, glass, metal and others waste. The waste was weighted and recorded according to its types. The data collection at point sources was administered in four weeks to obtain monthly data of solid waste generation.
3. Result and discussions

The purpose of the analysis is to determine the composition and the average rate (kg/person) of solid waste generated. Table 2 reveals that in ORA, represented by Taman Tas, food wastes constitutes the largest components of solid waste generated by the people which about 71.74%. This followed by plastics, paper, glass and metal waste with 12.85%, 6.64%, 3.68% and 1.13% respectively. No recorded data was found under other waste category.

Following this is the IRA is represented by Taman Mahkota Aman. Food wastes and plastics constitute the largest components of solid waste generated by the peoples. They constitute 52.6% and 25.67% respectively. Paper and glass waste constitute about 7.54% and 6.1%, respectively. Other wastes such as rags, rubber, grass wastes constitute 5.4% of the total percentage, lastly metal with a minute proportion of 2.69%.

In NRA represented by Taman Indera Semporna, data obtained reveals that 67% of solid waste component constituted by food waste, which still become the largest component generated. This follows by glass and plastics which constitute about 11.98% and 10.8% of the total component. Plastics and metal was become the least produce by residents with 5.5% and 5.3%, respectively, whilst no data recorded for other waste. The analysis of solid waste data reveals that food waste is a major component in solid waste generated in all residential.

Table 2. Composition of solid waste in different residential area

| Name of residential area | Food waste | Plastic | Paper | Glass | Metal | Others | Total |
|--------------------------|------------|---------|-------|-------|-------|--------|-------|
| Old Residential area (ORA) (Taman Tas) | 71.74 | 12.85 | 6.64 | 3.68 | 1.13 | 0 | 100 |
| Intermediate Residential Area (IRA) (Taman Mahkota Aman) | 52.6 | 25.67 | 7.54 | 6.1 | 2.69 | 5.4 | 100 |
| New Residential Area (NRA) (Taman Indera Semporna) | 67 | 10.8 | 5.15 | 11.98 | 5.3 | 0 | 100 |

The higher food waste generate by ORA can be likened to the socio-economic characteristics and household factors in the area. As about 80% of the residents in the ORA are low income earners encourage home-cooked lifestyle. This is very high when compared with IRA and NRA with 53.33% and 78% of the people falling into high income group, respectively (Table 2). Table 3 also reveals that even though majority of NRA residents were categorize in higher income earners, 67% of food waste were detected to be generated in their house. This may due to the less food provider in the area hence encourage peoples to prepare meal by their own.

In IRA, despite of food waste, the plastics were observed to become the second highest waste component generated by the resident. Plastic waste was composed mainly of packaging, plastic products, hard and flexible plastic household items, PET bottles, jerry can etc [5]. Common plastics component are also come from carrier bags, package wrappers and pouches. Higher percentages of plastics component may due to outside food brought by the resident in this residential area especially during Wednesday night market every week.

In NRA, the proportion of metal/aluminium and glass waste was identified as the highest percentage as compared to other residential. The socio-economic characteristics of the residents of this area can be used to explain the factor. The high status of residents makes it quite possible for them to be able to consume preservative items such as canned foods, milk, beverages, yougart etc. than people who reside in the other residential area.
Table 3. Distribution of income group in different residential area

| Name of residential area                  | Low income | High income | Total |
|-------------------------------------------|------------|-------------|-------|
| Old Residential area (ORA)(Taman Tas)    | 80         | 20          | 100   |
| Intermediate Residential Area (IRA)      | 46.67      | 53.33       | 100   |
| New Residential Area (NRA)(Taman Indera Semporna) | 22         | 78          | 100   |

Table 4 illustrated the average waste generation rate in ORA, IRA and NRA. The average waste generation rate were recorded varies from 0.217 to 0.388 kg person\(^{-1}\)day\(^{-1}\). According to Mohd Shahir Zahari et al., 2010, the national average of waste generated is at 0.5 – 0.8 kg person\(^{-1}\)day\(^{-1}\). Thus, the average waste generated by residential in Gambang area were found to be not in range. This may because of Gambang is still a remote area located 20km from the vicinity of Kuantan town.

Table 4. Average waste generation rate in different residential area

| Name of residential area                  | Total Sample | Mean | Median |
|-------------------------------------------|--------------|------|--------|
| Old Residential area (ORA)(Taman Tas)    | 10           | 0.217| 0.122  |
| Intermediate Residential Area (IRA)      | 15           | 0.282| 0.162  |
| New Residential Area (NRA)(Taman Indera Semporna) | 10         | 0.388| 0.236  |

4. Conclusion

Improper solid waste management may lead to crucial environmental issue. Total dumping of solid waste into the landfill will end up with scarcity of land use area. Separation of solid waste component in the point sources are the best way to identify the component and further reduce the volume by practising composting for organic component and recycling for non-organic component. Both urban and potential rural area should play their roles to reduce waste generation rate toward zero waste to landfill. Socio-economic status gives a greater influence to the waste generation rate to certain area. Demographic factor such as respondent’s status, household size, age, education level, occupation and income earners were a greater influence on the type of waste component generated.

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