# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

Increasing population, industrial development, change of consumption patterns and many other factors caused the increase in environmental pollution (Claudia and Mosler, 2007; Agamuthu, 2009). This affects human life directly and indirectly. Some of these sanitary pollutions are non-compensated. The increase in solid waste generation is one of the most serious environmental problems since it disrupts the ecological and ecosystem balance (Omran, 2008).

Many countries in the world have taken efforts to recycle and reuse waste materials in different sectors of the production. It proves to be an option to reduce environmental pollution and increase the duration of natural resources (renewable and non-renewable). Annually, 8 million tonnes of solid waste in Malaysia are generated (MHLG, 2010). One type of waste component which can be recycled is plastic. Recycling of plastic helps to improve environmental safety and creates economic saving. The consumption of plastic has increased over the last years (Penjor, 2007). Increasing plastic consumption in daily life is a result of various factors: light weight, density, flexibility, resistance to heat, transmission of light and tensile strength, easy transportation, cheap market price, easy application, and long duration (Sangobtip *et al.*, 2008).

Over the past few decades, the use of plastic in consumer goods has grown tremendously. Plastics are the main sources of non-biodegradable municipal solid

waste. Its disposal is a major problem although they make up only 6–7% by weight of the total solid waste (Lopez, 2009). The growth of plastic utilization requires larger space for disposal in landfill is necessary, since it reduced the capacity of landfill areas and caused environmental pollution. Furthermore, the raw materials for these plastics are obtained from petroleum, a limited non-renewable resource and are highly non-degradable (Lopez, 2009).

To reduce the demand for landfill space and the consumption of limited petroleum reserves, recycling of plastic has become a subject of concern. Plastic is one of the most recyclable materials in municipal solid wastes (MSW) with a high application rate over the last decades. Recycling helps to reduce the volume of solid wastes and prevent environmental pollution.

Over these last several decades, the process in plastics recycling has attracted the attention of many scientists. Plastic recycling is very important for at least two main reasons: firstly, to reduced the ever increasing volume of plastic waste coming from many sources (from packaging materials and disposables) and secondly, to generate value-added materials from low cost sources by converting them into valuable materials similar (to some extent) to virgin materials

## 1.2 RECYCLING OF PLASTIC

Nowadays plastics are very useful for its good characteristics such as their high resistance against fraction, temperature and gases penetration, as well as, its low density and price compared to other materials like metals and glass. Plastic has excellent brightness and gleam, has good barrier properties against carbon dioxide and oxygen.

These are the reasons that increased the production of plastic bottles in the last few years (Showartez and Godman, 1999).

Plastic contributes a large portion in solid waste stream. With growing rate of plastic consumption, environmental and health concerns have been simultaneously increased. Increase in plastic consumption not only increased the volume of MSW but also inducing more problems in collection and disposal of plastics into sanitary landfill. Also, plastic is stable and non degradable (Gradic *et al.*, 2002). And also low weight of plastic and its high volume in MSW transportation caused increasing costs and urban traffic. Plastic bottles and polystyrene containers made up the most components of MSW by considering the current consumption methods. Dedications of big place for burying this kind of wastes due to its high volume and non-decomposability in nature are the factors that imposed importance to plastic recycling (Omrani, 2005).

The recycling of plastic represents one of the most successful and widespread programs. The major factors for this are its widespread use, particularly in the beverage industry which has made plastic the main target for recycling. Plastic is the second highest material value after aluminum. High Volume/Density (V/D ratio) and difficulties during collection, transportation and disposal stages, made Polyethylene Terephthalate (PET) recycling very crucial. In case of non-standard plastic recycling, some hazardous health problems could occur, and therefore, prevention of such condition is suggested (Lu, 2001; Pruss *et al.*, 1999). Plastic recycling and use of proper techniques in regards to climate conditions, technology, economy and cultural factors will help to analyze plastic productions in Malaysia.

Plastic recycling includes mechanical and chemical recycling, incineration and energy recovery (Gradic *et al.,* 2002). The aim of incinerating waste polymers is to recover energy. It is currently the most effective strategy to reduce the volume of organic plastics. This method however is considered as ecological (Lopez, 2009; Achilias and Karayannidis, 2004). Mechanical recycling requires the washing and grinding of plastic materials. Resulting flakes are then processed and blended with virgin polymers. Chemical recycling is another method to recover reclaimed post–consumer wastes though the equipment is relatively expensive (Tchobanoglous *et al.*, 1994).

In Malaysia, plastic applications are growing. Multiple industries import and use plastic pellets as raw material in making food and beverage packaging, as well as, textile, fiber, car flooring, bottle resin, film, engineering polyester resins production. With the development and operation of petrochemical projects in Malaysia, PET usage needs a comprehensive recycling program (Minoru *et al.*, 2003).

## 1.3 PLASTIC RECYCLING IN MALAYSIA

Plastic constitutes the third largest waste volume in Malaysian MSW, next to organic waste and paper (Osman *et al.,* 2009; Agamuthu and Faizura, 2005). The plastic component in MSW from Kuala Lumpur averages 24% (by weight), whereas the national mean is about 15% (Osman *et al.,* 2009). The 230 waste disposal sites in the country receive about 95% of the MSW, including plastic waste. The useful life of the landfills is fast diminishing as the plastic waste stays undegraded for more than 50 years (Agamuthu and Faizura, 2005).

Solid wastes in Malaysia do not go through any formal processing activities for recycling. However in 1993, a recycling program was launched in 23 Local Authorities and the recycling activities are being carried out in these areas in varying extents. As waste recycling is an effort towards achieving a sustainable urban development, several NGOs in Klang Valley are rapidly expanding their activities to increase waste recycling. As such, TrEEs (Treat Every Environment Special) and Pure Life Society Recycling Program has been organizing a community based recycling program since 1996 (MPMA, 2011). There are two parts to this program such as

i) an in-house recycling program where staff and children use special bins to recycle waste and

ii) Drop-off program where the public can leave their recyclables into recycling bins.

TrEES also conduct training workshops for companies and organizations, as well as, initiating in-house recycling programs. Petaling Jaya Community Centre Recycling program is a voluntary community group established a recycling program in Section 17 of Petaling Jaya since 1997. The public is encouraged to donate or sell recyclable items such as glass, aluminium cans, wearable cloths, paper, plastics and household items such as refrigerators, washing machines and furniture. These items are sold for a nominal price or donated. In reality, the recyclable items accepted by Alam Flora, PJCC and TrEES do not vary much in terms of type and price.

Most plastics in Malaysia are recycled mechanically (MPMA, 2011). The national target, 22% of the total solid waste can be recycled by the year 2020 (Agamuthu *et al.,* 2009). The Recycler's Network consists of various levels, such as the itinerant

recyclable item buyer (usually called the old newspaperman), scavengers, middlemen, manufacturers and producers. Table 1.1 lists out the buyers/purchasers of recyclable items who make up the recyclers' network in the Klang Valley (Malaysia country report, 2001).

**Table 1.1:** Recyclers' Network in Klang Valley

| Items | Recycler |
|---|---|
| Paper | Genting Sanyen Industrial Paper Sdn Bhd |
| | Malaysian Newsprint Industries Sdn Bhd |
| | Persis Hijau Sdn Bhd |
| Glass | Kuala Lumpur Glass Manufacturers Co Sdn Bhd |
| - Aluminium cans and<br>- Metal tins/cans | Kian Joo Can Factory Sdn Bhd |
| Plastic | Malaysian Plastic Manufacturers Association |
| Old clothes | Charity and goodwill homes |

***Source:*** Norshamleeda and Chamhuri, 1999.

## 1.4 PROBLEM STATEMENT

The current research aimed to investigate plastic recycling in Malaysia specially evaluation of plastic generation in the Petaling Jaya in municipal solid waste. There are many advantages in recycling such as saving energy and money, reusing items. These advantages are not the limited. We can mention more benefits. Recycling is good for the community and economy. It reduces pollution. It saves natural resources which can be used for more important things believe it or not, it creates jobs as more people are involved with recycling it's environmentally friendly and overall good for the

environment. It saves energy it prevents more landfill sites from being built, so people don't have to live near them. It protects wildlife as the forests don't need to be damaged, such as trees being cut down. It’s a positive thing as it creates demand for recycled products, resulting in profits. Many people can benefit of recycling, for example families and overall communities can save money when enough recycling facilities be available.

The current study concentrated on plastic recycling. There are some reasons behind the topic. With comparing the rate of plastic and glass in municipal solid waste (MSW). We can see the high rate of plastic in MSW and also plastic need huge space in landfill. By recycling one plastic bottle not only saves anywhere from 100 to 1000 years in the landfill but also saves the environment from the emissions in producing new bottles as well as the oil used to produce that bottle. For every1 ton of plastic that is recycled we save the equivalent of 2 people’s energy use for 1 year, the amount of water used by 1 person in 2 month’s time and almost 2000 pounds of oil.

The major recyclable items in MSW include plastics, bottles, paper, cardboard and metal. There is a great potential for resource recovery as is evident from the presence of scavenging activities in some landfill sites and at collection points. Apart from recycling, no other formal processing activity has been carried out. As recycling helps in reducing waste and it is inline with the concept of sustainable development, it has the potential of becoming one of the national tools in combating problems related to solid waste management (Ministry of Housing and Local Government Malaysia, 2000).

Quantities of plastics waste have been on the rise from a value of 7 billion RM to 16 billion RM in recent years (1998- 2010) due to industrialization and rapid improvement in the standard of living (MPMA, 2011). Unfortunately, the majority of plastic waste is not fully recycled but rather abandoned. Therefore, this had caused many serious issues such as the wastage of natural resources and environmental pollution (Park *et al.,* 2008).

Millions of tonnes of packaging materials are discarded each year. In Malaysia, the method of disposal for MSW has been largely through landfilling (90%) with a very little share of recycling (8%) and incineration (1-2%) (Plastic technology center 2008). As it becomes increasingly difficult to obtain new landfill areas due to the indifferent of public attitude namely phenomenon, the alternatives is via waste reduction either by recycling or the use of degradable polymers (Momoh and Oladebeye, 2010).

So this study was carried out to achieve the following objectives:

## 1.5 PROJECT OBJECTIVES

This study was undertaken

- To characterize the quantity of plastic generation in Petaling Jaya (PJ), Malaysia.
- To determine the degree of plastic recycling awareness in PJ.
- To determine the problems faced in plastic recycling.
- To propose suitable approaches in improving plastic recycling.

## 1.6 RESEARCH QUESTION

Basic the objectives which were provided the flowing questions where proposed:

- What are the contents of MSW Particularly plastic waste in PJ area?
- Do people aware of plastic recycling in PJ? To what extent?
- What are the problems of plastic recycling?
- Which approaches are suitable to improve plastic recycling?

## 1.7 RESEARCH HYPOTHESIS

- The contents of MSW are high rate of plastic waste.
- People are not aware of plastic recycling in general.
- The lack of recycling facilities and the degree of awareness about recycling are the major problems of recycling in PJ in Malaysia.
- Increasing the price of recycling is main approach for improving plastic recycling.

## 1.8 SIGNIFICANCE OF THE STUDY

The current research addresses itself to people in special and to environment and economy in general. Plastic recycling is essential for all cities around the world and for people who live there. There is not enough space for waste and landfill sites are filling up fast so Malaysia will be full by waste in near future. By considering this problem how people can preserve the environment of Malaysia for next generation. Recycling is an important factor for environment.