Plastic Waste Management in Indonesia: Review

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Abstract

There is low utilization of plastic waste in Indonesia and only a fraction of plastic materials goes back into production processes through re-use and recycling practices. The human dependency on plastic consumption increasing each year. It is lightweight, flexible, relatively inexpensive, and durable and used by several purpose to carry the different daily needs from grocery bags to 3D printed rocket nozzles. The main objective of this paper is to increase the knowledge regarding awareness and inhibit demand for recycled plastics and to identify critical barriers for plastic recycling process of Indonesia. The barriers, which identified, include the lack of both supply and demand of recycled plastic attributed to the fragmented market of secondary materials. The main hotspots identified are the low demand due to price considerations, insufficient traceability and general design deficiencies in the recyclability of products.

Keywords: *Plastic waste, re-use and recycling process.*

I. Introduction

Increasing population levels, booming economy, rapid urbanization and the rise in community living standards have greatly accelerated the municipal solid waste generation rate in developing countries [1]. Indonesia is the second largest plastic polluter in the world after China. It produces 3.2 million tons (in 2014) of mismanaged plastic waste a year out of which 1.29 million tons ends up in the sea. About 10 billion plastic bags weighing 85,000 tons got dumped into the environment each year. Indonesia generates estimated amount over 190,000 tons of waste every day, the majority of which is organic waste. The studies show that approximately 10-ton truckload of plastic is dumped into the waters around Indonesia within 20 minutes. Moreover, plastic constitutes around 25,000 tons per day of which at least 20 percentbelieved to end up in rivers and coastal waters. Indonesia alone is responsible for fifteen percent of global plastic waste world's ocean.

Plastic product constitutes an increasingly important fraction of municipal solid waste (MSW) and the management of such waste is highly debated[2].Likewise, one study estimated that about 80% of plastic debris in ocean water comes from land-based sources, responsible for 0.8 million tons every year. This can often threaten marine life. At least one million sea animals and birds die from eating plastic each year, according to Ocean Crusaders (NGO). If the dumping continues at

this rate, by 2050 the plastic in the oceans will outweigh the fish.

Indonesia still lags behind developed countries inwaste management technology development such as those in Europe and America. The necessity of proper waste management system is rapidly increasing every year.Indonesia has been collaborating with Norway and Denmark for urban waste management in order to face challenges in improving its solid waste management.The government is planning to reduce the 30% of the country's waste; and process and manage for at least 70% of the country's waste in order to avoid it from being accumulated in the landfill. Indeed, the determination of whether plastics or other materials are best for the environment cannot be easily answeredand requires a clear understanding of the complex environmental tradeoffs among various materials choices, including economical, energy and waste minimization considerations.

The easiest and most obvious way to eliminate plastic waste in the future is to bring downbuying products featuring any plastic at all. Nevertheless, countries like France and Kenya are phasing out single-use plastics by banning the use of plastic ware, plates, and cups.The main objective of study is to increase the knowledge and explore the new way of waste management techniques and ide regarding the factors that inhibit demand for recycled plastics and to identify the critical barriers for plastic recycling process in Indonesia. Furthermore, this research is review several search related waste management in Indonesia and several countries, in this way, this research can increase our understanding about plastic waste management in the coastal countries like Indonesia in urban plastic waste management.2.

II.   Literature Review

Plastic waste is silent threat to the environment and their disposal is a serious problem for waste managers. Now a day's society does not have any alternatives to plastic products like plastic bags, plastic bottles and plastic sheets, etc. The use of plastic is increasing day by day in spite of all efforts made to limit its use. To circumvent this issue, many efforts had made in the past to reuse the plastic waste but no significant results has been achieved. Various attempts made through experimentations to check the feasibility of plastic waste to be use partially in concrete. Recycling is one of the most important actions currently available to reduce these impacts and represents one of the most dynamic areas in the plastics industry today. Recycling provides opportunities to reduce oil usage, carbon dioxide emissions and the quantities of waste requiring disposal. Plastics have been recycled since the 1970s, the quantities that are recycled vary geographically, according to plastic type and application. Recycling of packaging materials has seen rapid expansion over the last decades in a number of countries. Advances in technologies and systems for the collection, sorting and reprocessing of recyclable plastics are creating new opportunities for recycling, and with the combined actions of the public, industry and governments it may be possible to divert the majority of plastic waste from landfills to recycling over the next decades.

Plastic waste management has become one of a major issue in environment. This is particularly true in urban areas where population is rapidly growing and amount of waste generated is increasing like never before [3]. Urbanization

and industrialization leads to new lifestyles and behavior which also affects waste composition from mainly organic to synthetic material that last longer such as plastics and other packaging material.

The management of waste become complex and the facilities provided cannot cope with the increasing demand and needs. Generally, developed countries generate more waste than developing countries [3]. Countries in Asian and African region produce waste in the range of 0.21-0.37 tons/ capita/ year, while European countries generate higher amount of waste with 0.38-0.64 tons/ capita/ year (Intergovernmental Panel on Climate Change [IPCC], 2006). Developed countries are experiencing high waste generation while developing countries always have problems with the implementation of the management system [4].

The rapid rate of plastic consumption throughout the world has led to the creation of increasing amounts of waste and this in turn poses greater difficulties for disposal. This is due to the fact that duration of life of plastic wastes is very small (roughly 40% have duration of life smaller than 1 month, Kangal [5]and depending on the area of application, the service life of plastic products ranges from 1 to 35 years [6]. The weighted average service life of all plastics products is different in different countries and in India it is 8 years; this is much less than the weighted average service life for Germany which is estimated at 14 years. This difference in service life reflects the fact that a particularly high share of plastics is used for short life products in India (e.g. share of plastics packaging 42% in India versus 27% in Germany [6]. In the context of Indonesia, waste management service has been improving since in Indonesian cities since 1970s. The

government initiated so many long-term plan (1979-84, 1984-1989) and the main aim was to collect 50% household refuse and 100% non-refundable refuse. However, due to lack of a funding the goal was only marginally achieved[7]. There are many changes happen to collecting waste and their lack effective waste awareness and its related strong policy through government it is essential.

III. Review Results

Plastic Waste management is related to various aspect to the society and it has very much deep impact to the surrounding the environment. Increasing and booming hotel business and other industrial development and increasing waste day by day and it getting bigger. On the other hand, plastic waste has so many ways to Manage. The new technologies and economics have come to play an important role in plastics recycling. As described in previous section, plastic recycling principally refers to recovery, which divided into material recycling and energy recovery. Material recycling and again divided into mechanical and feedstock recycling. The choice between these methods will depend on the types of plastics waste, the relative ease/difficulty in total or partial segregation from other plastics and/or other waste materials, ecological and cost aspect involved in the process. Furthermore, due to the lack of landfill side and its move to smaller area and it is also affecting the other local inhabitant. Furthermore, waste management need good strategies toward sustainable and renewable energy system. Waste bank concept is quite helpful because the participation of local community is more helpful and sustainable for waste management. The planning of using thermal-based process in

waste management system in Indonesia could promise good economic feasibility.

3.1. Method of Plastic Management
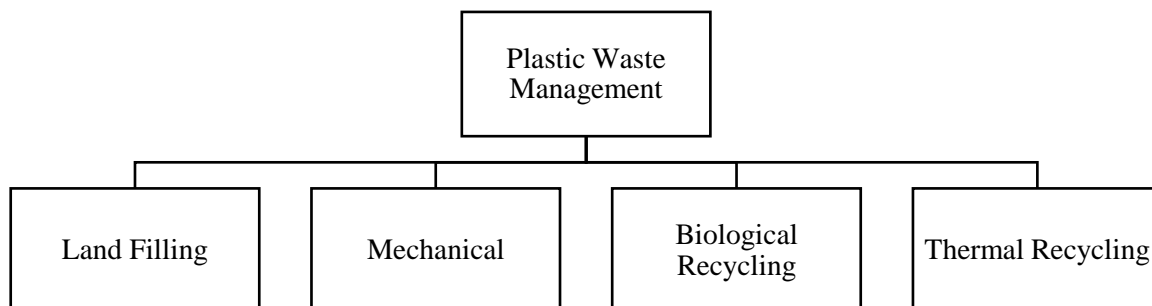
Figure 1. Method of Plastic Management

3.2 Plastic waste Management

When plastic waste is collected and transported to landfill sites, it is at risk of escaping into the environment. Even when it moves to landfills, plastic risks being blown away and ending up in rivers or oceans. The method consists of collecting plasticsbefore and/orafter they enter the municipal waste stream. Mostly the wastes from the consumers(discards from household, commercial and light industrial sources) end up in themunicipal waste stream; these plastic wastes are usually very contaminated and are thereforedifficult to recycle economically at the present time.

The technical tools and methods used for the plastic waste management are as follows.

3.2.1. Landfilling

In this light, landfilling is an effective method of dealing with portions of municipal solid waste, however plastic waste creates an eternal problem. Plastic products synthesized from petroleum are not biodegradable. For this reason, plastic waste remains in landfills, without breaking down or changing composition. The buildup of plastic waste in landfills is simply not sustainable [8]. The disposal of plastics in landfills raised some concerns from the public since the material degrades very slowly.

3.2.2. Mechanical recycling

Mechanical recycling is reprocessing of the used plastics to form new similar products. This is a type of primary and secondary recycling of plastic where the homogeneous waste plastics are converted into products with nearly same or less performance level than the original product.

3.2.3. Biological recycling

Both natural and synthetic cis-poly (isoprene) become highlyresistant to bio-degradation when made into industrial products(e.g. tyres) which is a direct consequence of the presence of highlyeffective antioxidants added during their manufacture [9]. Thishas led to intensive research both in industry and in universities todevelop polymeric materials that conform to user requirementsbut are also returned to the biological cycle after use.

3.2.4. Thermal recycling/incineration

Energy generation by incineration of plastics waste is in principle a viable use for recovered waste polymers since hydrocarbon polymers replace fossil fuels and thus reduce the CO_2 burden on the environment[10].Thermal energy

produced by incineration of polyethylene is of thesame order as that used in its manufacture. Incineration is thepreferred energy recovery option of local authorities because thereis financial gain by selling waste plastics as fuel.

IV. Conclusion

It is noteworthy to say that, Plastic waste management is biggest challenge issues in the entire world and its destroying our environmental eco-system badly. It alsocauses many health related problems. Waste Management is becoming a vital challenge of any government and their policies failure to manage effective way. In Indonesia, which is highest plastic user country in the world and have biggest costal area, which make very sensitive to marine ocean environment to affect badly and damage the ecosystem. Alternatively, there is so many modern technology of plastic waste management system. It can provide us better solution to manage plastic waste and use modern technology can convert into fuel and other gases. Interestingly, we can use plastic waste in many ways, such as; used plastic can recycle and save the cost to making over new product, using of waste plastic turn into fuel which is usable to operate vehicles, using via modern engineering can use make road and other house decorated product. Thus, people plastic waste could be able to contribute economically in urban area and rural area. In Indonesia local government as well as central government can be implementing these all of several types of Plastic waste management and able to support in country's economy.

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