

Chapter 3

Waste Disposal: Sustainable Waste Treatments and Facility Siting Concerns

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ABSTRACT

Through the human municipality growing and industrialization process, productions of municipal solid waste have been growing in parallel line. The properties and composition of municipal solid waste as the main solid waste produced by human has cultural, regional, social habits and behavior, beside the economic condition, influences the properties and compositions of waste disposal, which contains process that start after collecting and transporting MSW to landfill site. After site selection, the process of recycling, waste composting and incineration will be assessed as intermediate disposal methods. Our final goal in waste disposal focused on environmental protection. This chapter will have a review on recycling merits and as effective ecofriendly methods for disposing municipal solid waste (MSW) for saving greenhouse gases (GHGs). Incineration as a commercial waste disposal will also be reviewed. Making decision about waste disposal is a multi-criteria issue because of MSW mixture, climacteric of area, cultural and economic condition, technical support, and environmental impact.

INTRODUCTION

Civilization and industrialization cause to produce of municipal solid waste (Parfitt, Barthel et al. 2010, Lim, Chen et al. 2013). Global solid waste production was 1636 million tons per year (Robinson 2009), meanwhile (Soltani, Hewage et al. 2015) indicate that ten years ago global MSW production was 0.6 billion tones /year, so it equal 0.64 kg of MSW / person /day and nowadays MSW generation had been reached

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to 1.3 billion tones /year which is equal to 1.2 kg /person/day. For the year of 2025 municipal solid waste production is estimated to reach 2.2 billion tons per year (Soltani, Hewage et al. 2015). Most common waste disposal methods are incineration, composting, recycling and landfilling (Magrinho, Didelet et al. 2006, Narayana 2009). Nevertheless some literatures indicate to recycling and landfilling as final waste disposal (Demirbas 2011). As a matter of fact, municipal solid waste (MSW) has mutable composition, with the main ingredients being; (40–60%) edible waste Products; (20%) paper and cardboard; and up to 40% glass plastic and metal (Costa, García et al. 1991). Meanwhile, Zhang et al. (2015) presented their waste disposal research on long term manned spacecraft and (Tanabe & Hoshino 2015) concentrated on secondary waste generated from wastewater treatment and as well as these issues should be added to our waste disposal subject, but we will concentrate on the ground side of waste disposal. With considering specification and characteristic of MSW, process of waste disposal should be planned. A fundamental activity, which should be in the first level of importance, is the site selection. Following siting process is another critical basic; managing recycling metals (mostly iron), plastic, paper and glass will be carried out. Other disposal methods that are the same as incineration and composting, decrease the volume of MSW and increase the suitability of application in other industry such as filler in construction (incineration ash) or agricultural nutrient (compost). Based on the local, national, and global limitation, merit of this chain of managing waste system may be arranged in different respect. Managing system for waste disposal mainly depends on the composition of MSW and the rate of development has the most critical effect on mixture of solid waste as well as social and regional factors (Denafas, Ruzgas et al. 2014).

SITE SELECTION

One of the most important parts of waste disposal process is site selection, which nowadays going on to be converted as critical factors by countries such as China (Zheng, Song et al. 2014), Brazil (Kannan, de Sousa Jabbour et al. 2014) and India (Suthar & Sajwan 2014). These countries are improving their standards to tackle this issue. Also Swartzbaugh (1993) mentioned that site selection is one of the three major phases in his presented method in USA, and the strategy and planning of waste disposal starts after site selection.

Critical Factors

There are many effective elements, which normally considered for site selection. Ekmekçioğlu et al. (2010) compared four alternative locations in Turkey for selection of best site for waste disposal. They carried out the study considering elements such as hydrology, topography and soils, adjacent land use, climate, flora and fauna, site capacity, road access and cost of the land. Some of the related elements and their relationship is presented based on obtained data from researches. The following points are related researchers on above-mentioned factors in siting issues:

- Generally, sites with slopes exceeding 1:5 are not considered good, as there might be a risk of soil erosion (Tadros 2009).
- The leaching process has critical impact on the environment, depends on two factors: The landfill hydrology and, the geochemistry of landfill material (Johnson, Richner et al. 1998). Hydrological

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