CHAPTER 6
PLASTIC WASTE MANAGEMENT USING INCINERATION

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6.1 INTRODUCTION

The amount of plastic trash has escalated to a critical level, compelling us to reconsider our approach to managing our growing collection of discarded plastics (Bucknall, 2020). Plastics, once praised as a revolutionary material for their versatility and convenience, have now grown into a massive ecological disaster (Dailin et al., 2022a). Their pervasive presence in our ecosystems, from the depths of our oceans to the expanses of our lands, offers a clear picture of the critical need for novel waste management solutions (Thushari & Senevirathna, 2020). Figures 6.1 and 6.2 show the breakdown of municipal solid waste (MSW) by material, as well as the tonnages of plastic waste generated from 1960 to 2018. According to these data, the production of plastic waste in 2018 was 35.7 million tonnes, which accounted for 12.2% of the overall production. Plastic is also clearly the third most prevalent of the 11 MSW types. This is a 4.3 million-tonne increase from 2010 to 2018, mostly due to durable goods and the containers and packaging categories. Plastic generation has increased from 8.2% in 1990 to 12.2% in 2018. Notably, the percentage of plastics in overall garbage creation has fluctuated between 12.2 and 13.2% in recent years. Moreover, plastic waste is non-degradable and resistant to decomposition, which further exacerbates the

situation. This plastic garbage has caused a chain reaction of environmental and socioeconomic problems (Dailin et al., 2022b).

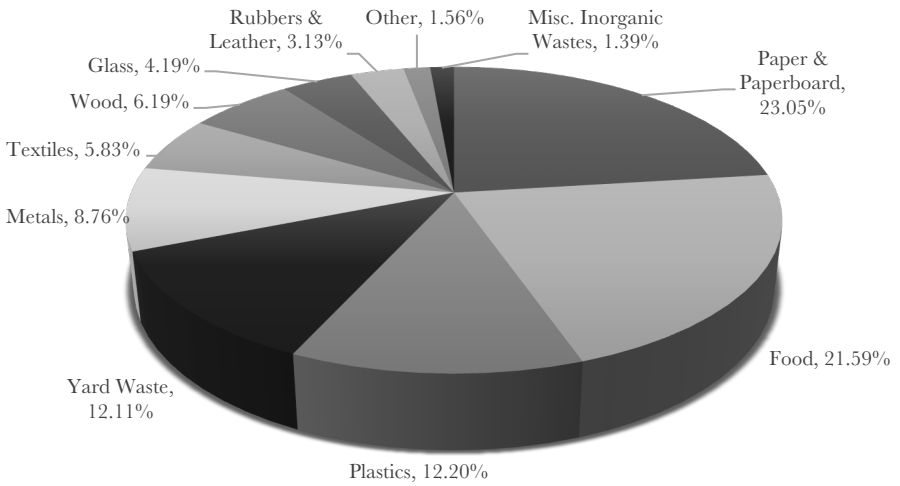

Figure 6.1 Breakdown of the 292.4 million tonnes of municipal solid waste generated by material type (Adapted from United States Environmental Protection Agency [USEPA], 2023)

Our oceans, which were once brimming with life, are now filled with plastic trash, threatening marine life and entire ecosystems. Landfills, which were designed to handle waste, are now being strained by unrelenting plastic usage, resulting in ugly landscapes and possibly groundwater contamination (Oliveira et al., 2020). Furthermore, the harmful compounds included in plastics can leach into soil and water, causing serious health dangers to both humans and wildlife. In response to these issues, a global awakening to the perils of plastic trash has ushered in an era of increased environmental awareness. Globally, governments, businesses, and communities are acknowledging the imperative for proactive measures in order to reduce plastic waste proliferation and the associated threats (Kumar et al., 2021). They are working together to find solutions that adhere to the ideals of sustainability and resource efficiency (Hopewell et al., 2009). Among the

several waste management options available to us, incineration stands out as a technology that is both celebrated for its potential and examined for its repercussions. Incineration is defined as the controlled combustion of waste materials to produce heat, energy, gases, and leftovers (Pour & Makkawi, 2021). While this technology allows for the extraction of value from plastics via energy recovery, it also raises concerns about air quality, pollutants, and the discharge of potentially toxic byproducts (Lange, 2021).

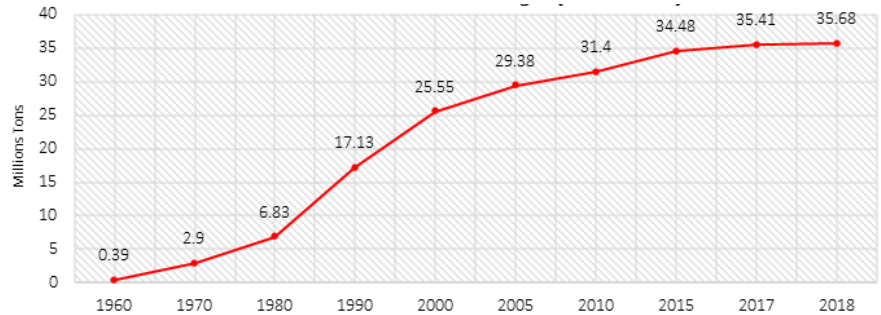

Figure 6.2 Plastic waste generation tonnages from 1960 to 2018 (Adapted from USPDA, 2023)

However, the road to accepting incineration as a feasible alternative is laden with difficulties. Therefore, the aim of this paper is to navigate the complex environment of plastic waste management by uncovering its different features and effects. We will investigate the underlying systems that control incineration, analysing the mechanics that allow garbage to be converted into energy. Furthermore, we will investigate the advantages of incineration, ranging from lowering the sheer volume of plastic garbage to creating energy for a variety of applications (Lee et al., 2022). All aspects of public perception, regulatory structures, and environmental consequences must be carefully studied. Incineration is frequently criticised for potential air pollutants, greenhouse gas emissions, and the danger of producing harmful residues (Porichha et al., 2021). Furthermore, concerns have been raised about incineration's compatibility with the ideas of a circular economy, a paradigm that