

Article

# CO<sub>2</sub> Emissions from Plastic Consumption Behaviors in Thailand

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**Abstract:** Plastic waste is an environmental crisis that is becoming increasingly well-documented. The rapid expansion of plastic manufacturing and consumption has led to a harmful cycle of pollution and greenhouse gas emissions due to petroleum-based production and plastic waste disposal. Plastic production and disposal depend on the consumption behavior of people. This study aimed to examine the plastic consumption behavior in Thailand and its impact on climate change at the end-of-life stage. The general information, plastic consumption, and plastic waste management were collected via questionnaires for each product lifetime, including single-use, medium-use, and long-use plastics. Based on 567 questionnaires, the results showed that people consumed single-use plastic, e.g., plastic bag, food container, cutlery, straws, and bottles, at a rate of about nine pieces/household/day or three pieces/cap/day. The medium-use and long-use plastic were 10 pieces/household/month and 50 pieces/household/year, respectively. It should be remarked that population density, education, and number of household members affected plastic consumption behavior, especially for single-use plastic. Regarding the disposal of end-of-life plastics, Thai people, on average, contribute 0.15 kg CO<sub>2</sub>eq/household/day to climate change. Many households have mismanaged waste by open dumping and open burning. Therefore, practicing proper waste management will help Thailand on the path to carbon neutrality in the future.

**Keywords:** municipal solid waste (MSW); waste management; greenhouse gas emissions; climate change; circular economy



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## 1. Introduction

Plastics are essential raw materials for daily commodities, such as food containers, cutlery, clothes, and appliance components. Before the COVID-19 pandemic, global plastic production was around 370 million tons per year. Then, it increased to 390.7 million tons in 2021 [1]. The product manufacturers and consumer behaviors drive the demand for plastics. Lightweight flexibility is a unique property of plastics. Many industries have used plastics to reduce product weights and enhance the possibility of a product design [2]. In Thailand, more than 34.3 million tons of plastics were produced for daily-life products in 2022 [3]. In total, 96.7% of them were used for shoe manufacturing. Other applications included bags, pipes and joints, packaging, color, film, sheet, big bags, and tableware and toilet ware, respectively. Most plastic products are fossil-based products [1]. The general types of plastics are polyethylene terephthalate (PET), low-density polyethylene (LDPE), high-density polyethylene (HDPE), polypropylene (PP), polystyrene (PS), and polyvinyl chloride (PVC), which can be recycled [1,4].

Nowadays, global plastic use has grown exponentially, as well as plastic production. In 2016, the world plastic consumption rate was 45 kg per capita per year (kg/cap/year), or 0.12 kg/cap/day [5,6]. North America had 139 kg/cap/year, which was the highest plastic consumption in the world. Europe had 48–136 kg/cap/year because Western and Eastern Europe have a difference in production and waste policies. Asia, with the exclusion