Chapter 6
Marine Plastic Debris:
Distribution, Abundance, and Impact on Our Seafood

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ABSTRACT

Marine pollution due to littering from anthropogenic activities is a serious global environmental problem—the main reason accumulation of debris in the environment, including in the ocean. There is a significant hazard coming from plastic debris. Besides entanglement and ingestion, marine plastics debris has more complex problems and can release additional and by-product chemical substances. If we keep producing and not doing anything, a recent study said by 2050 there would be three times more plastic than fish in the ocean. We only have a limited understanding of marine plastic debris distribution, implication, fate, and behavior. Science is the key to getting the right alternative for processing debris. To prevent marine pollution successfully requires education and outreach programs, strong laws and policies, and law enforcement for government and private institutions. This chapter explores marine plastic debris.

INTRODUCTION

Plastic is a material that is successfully made by humans. Plastic materials are durable, reliable, light-weight, and has versatility; made this material come to provide many serve a wide range of products, including packaging, building and construction, transportation, electronics and energy, agriculture, healthcare, sport,and leisure. As a result of these properties, plastics production reach 348 million tons (Rosevelt, Los Huertos, Garza, & Nevins, 2013a) withannual production reached78 million tons(Foin et al., 2014). This trend continuously uplifting about 4% per year (Rosevelt et al., 2013a) and by 2050, plastic production expected quadruple (Jovanović, 2017). However, from this massive plastics production due to litter mismanagement andillegally dumping,only 40% ofplastics litter going to landfilled and32% of plastic material trash leaks out to the environment (Foin et al., 2014), including to the ocean. Jambeck

et al.(2015), Thompson (2006) and Van Cauwenberghe et al. (2015)estimate 10% of plastic litter will be end up into the sea.The fast increment in worldwide plastic creation has expanded the number of plastic materials in marine frameworks, which as a rule has balanced the increases made by diminishing misfortunes of mechanical pellets and dumping of ship-produced litter.In 2025, plastic material in the ocean estimated to be 250 million metric tons (Jovanović, 2017). Plastic litter that leaks out, made plastic continuously increase over recent years in aquatic ecosystems worldwide, including the ocean, sea surface, shoreline,andseafloor.Plastic litter was seen as an aesthetic problem and has been ignored for a long time, but recent decades shows the presence of this litter gives negative impact to marine animals (Boerger, Lattin, Moore, & Moore, 2010; Carrasco, Harvey, & Saravia, 2009; F. Galgani, Hanke, Werner, & De Vrees, 2013; C. J. Moore, Moore, Leecaster, & Weisberg, 2001). Marine plastic litter already causes $ 13 billion in global financial damage every year (Vigiak, Ribolzi, Pierret, Sengtaheuanghoung, & Valentin, 2008). The cost of cleaning up plastic litter operations is requires very high costs, National Oceanic and Atmospheric Administration (2012)explain to clean 1% area of north plastic would need $ 489 million for the year. From these high numbers, it can be said that plastic is too expensive to be trash.

Enormous plastic litter in the aquatic environment worldwide, especially to the ocean, as the case may be new and big challenges, beside climate change and ocean acidification in human history. On 2050, plastic expected to exceed ocean fish stock by mass ratio (Foin et al., 2014; Jovanović, 2017). Whereas, ocean fish stock could disappear on 2048 (Worm et al., 2006). The majority of plastic litters entering the sea came from diffuse (Figure 1), land-based sources which are harder to control. Land-based activities contribute 80% of all pollution in seas and oceans, and the rest comes from ocean activities (Law, 2017). Eunomia Research & Consulting (2016) explain there is different area of plastics accumulation in the marine ecosystem. Average global concentration of plastic litter in the beaches is highest at 2,000 kg/km^2; in the seafloor is 70 kg/km^2, and in the sea surface is less than 1 kg/km^2(Law, 2017).

Plastic after entering the aquatic environment can be degraded by UV thermal oxidation, mechanic processes, or bacterial process up to the microscopic size(Andrady, 2011; Wagner et al., 2014). This plastic waste with the micrometers size has been known as microplastics. Besides commonly-used

Figure 1. The fate of land and sea-based plastics litter (Law, 2017)
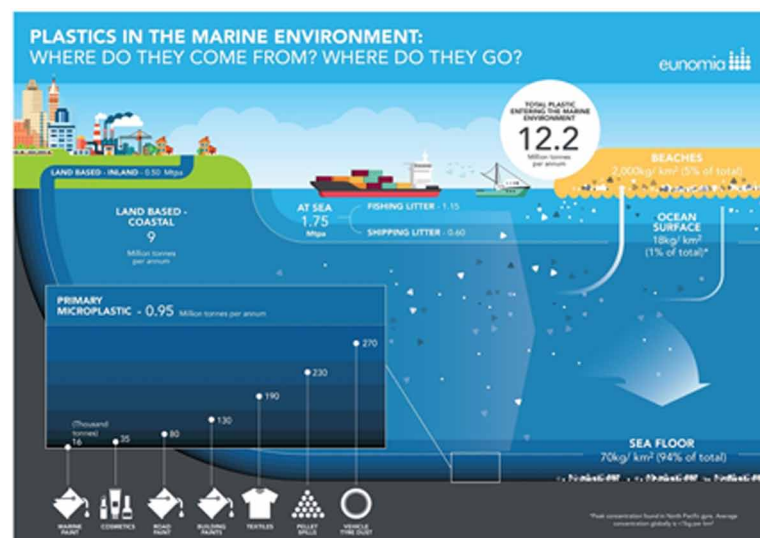
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