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Mismanaged waste and tyre abrasion: scientists map key types and sources of marine plastic pollution



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There is mounting global concern about marine plastic pollution and a growing focus on ways to address this environmental problem. In 2015, 9.2 megatonnes (Mt) of plastic was lost to the environment globally; in order to remedy this issue, it is essential to quantify the amounts, types and sources of plastic waste in the global environment (both geographically and within industry). This study estimates the loss of plastics to the environment across the plastic value chain, finding that mismanagement of municipal solid waste and tyre abrasion are key contributors of macro- and microplastic waste, respectively.

Plastic waste is increasingly polluting the oceans and, according to one estimation, by 2050 the oceans could contain more plastic than fish by weight¹. An important focus of global and national action is therefore to prevent more plastic from entering our oceans.

To this end some of the single use plastic (SUP) items of marine litter most commonly found on the shore — such as SUP straws, plates and cotton buds — will be banned in the EU, effective by 2021. Member States will also reduce the consumption of plastic food containers and cups, by national reduction targets, making alternative products available at the point of sale, or by ensuring that single-use plastic products cannot be provided free of charge. A collection target of 90% by 2029 for SUP drink bottles (for example via deposit refund systems) is also being implemented, alongside extended producer responsibility, for producers to help cover the costs of clean-up and awareness-raising — inter alia for tobacco companies, whose cigarette filters contribute greatly to marine plastic litter.

A study now provides a detailed breakdown of plastic loss to the environment by different polymers, applications, geographical regions and stages of the plastic value chain in 2015. The need for this information was highlighted in the 2019 EU report *A circular economy for plastics*¹. The researchers build upon methods and sources used in previous studies and complement these with newer data, also including comprehensive sensitivity and uncertainty



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Mismanaged waste and tyre abrasion: scientists map key types and sources of marine plastic pollution (continued)

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1. Smet, M.; Linder, M.; Crippa, M.; De Wilde, B.; Koopmans, R.; Leyssens, J.; Muncke, J.; Ritschkoff, A.; Doorselaer, K.; Velis, C. and Wagner, M. (2019). A circular economy for plastics. Brussels: European Commission.

analyses to identify key drivers of plastic loss. The resulting estimates were differentiated between polymers (23), plastic applications (13), geographical regions (11) and plastic value chain stages.

At point of disposal most plastics are treated as part of the municipal solid waste (MSW), so a statistical model was created to predict annual per-capita MSW generation for 143 countries. The researchers also used available literature to produce estimates of plastic lost to the environment for a range of applications. Microplastic applications included personal care products (beads), tyre abrasion, city dust, road-markings and application of wastewater sludge on land. Macroplastic applications included wastes (industry, transportation, construction and demolition), fishing nets, and mismanaged MSW treatment.

About 322 Mt of plastics were produced globally in 2015 (excluding elastomers and synthetic fibres) — and the researchers found that 9.2 Mt of plastic was lost to the environment that same year (6.2 Mt of macroplastics, 3.0 Mt of microplastics). The largest source of macroplastic loss was mismanagement of municipal solid waste in low- and lower-middle income countries (4.1 Mt). The major sources of microplastic loss were abrasion of rubber tyres, abrasion of road markings and plastics contributing to city dust generation.

Across the product life cycle, plastics are largely lost in the use and end-of-life stages (which account for approximately 36% and 55% of total losses, respectively). Losses during production are relatively small, accounting for just 0.25% of total losses. In general, around 90% of microplastic losses are related to the use stage, about 77% of macroplastic losses are from the end-of-life stage (such as in collection), mainly by poor management of municipal solid waste in low-income and lower-middle income countries, and 13% of macroplastic losses stem from littering, where plastics are, for example, being thrown away by citizens directly into the environment.

To reduce marine plastic pollution, studies such as these are vital: they enable mapping of the amounts of plastic lost to the environment from different sources and locations, from which research can note environmental damage. The findings highlight plastic sources that should be prioritised in future research, for example — losses as part of waste management, in order to get a clearer picture of global plastic losses and help work towards a [circular economy](#) for the material.