

How is plastics material to different sectors?

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Apparel

The apparel industry has faced reputational damage in recent years due to its significant consumption of resources and the millions of clothes that end up in landfills every year. Synthetic fibres represent over two-thirds of textiles. This percentage is predicted to rise to 73% by 2030¹. Synthetic fabrics often use complex textile blends that inhibit circularity. Changing Markets Foundation highlighted the lack of progress that has been made by the fashion industry to reduce its heavy reliance on synthetic fabrics². Apparel companies may use plastic packaging, the most wasteful and polluting application of plastic³.

Every time textile garments are used or washed, they shed millions of plastic microfibres which pass through wastewater treatment plants and end up in the ocean. In fact, the apparel sector is one of the major contributors of microplastic pollution in marine ecosystems⁴. Due to microplastics' larger surface area to volume ratio relative to macroplastics, microplastic pollution can absorb persistent, bioaccumulative, toxic chemicals, such as polychlorinated biphenyls (PCBs), polybrominated biphenyl ether (PBDE) flame retardants and dioxins, which

¹ Changing Markets Foundation (2023). [Synthetics Anonymous 2.0: Fashion's persistent plastic problem • Changing Markets](#)

² Changing Markets Foundation (2023). Ibid.

³ World Economic Forum (2020). [How sustainable packaging can reduce plastic waste | World Economic Forum \(weforum.org\)](#)

⁴ Ellen MacArthur Foundation (n.d.). [Redesigning the future of fashion.](#)

may be ingested by organisms and accumulate up the food chain⁵. There is growing evidence that endocrine disrupting chemicals in plastics and other sources pose risks to human health⁶.

Biotech, health care & pharma

Plastics – usually single-use and disposable – are ubiquitous in the medical sector owing to their high versatility. The COVID-19 pandemic caused a growing demand for single-use plastics, and the environmental presence of plastic personal protective equipment (PPE) debris is an emerging source of plastic pollution⁷. Common medical applications of plastics include sterilization wrap, irrigation bottles, basins, pitchers, trays, Tyvek, and flexible clear packaging. Plastic accounts for at least 20% of medical waste, which is often disposed of in landfills rather than recycled⁸. Medical plastic recycling is challenging due to lack of knowledge about recyclability, poor labelling of plastic products with recycling classification symbols, and difficulties involved in sorting and cleaning⁹.

Food, beverage & agriculture

Plastics have become ubiquitous in agrifood systems due to their low cost and adaptability. Examples include mulch films, irrigation pipes, fishing nets, and coatings on fertilizers, pesticides, and seeds. These agricultural plastic products, which are often single use, can degrade into microplastics and contaminate soil and aquatic ecosystems, posing a threat to human and environmental health and agricultural productivity. Microplastic pollution has the potential for bioaccumulation, as well as the risk of carrying other contaminants, like pesticides, which can also enter the food chain. In a recent report¹⁰, the Food and Agriculture Organization suggested that the land we use to grow our food is contaminated with large quantities of plastic pollutants, and the IUCN¹¹ suggests that macroplastic pollution from lost fishing nets constitutes a significant proportion of yearly marine plastic leakage.

Plastic packaging for food and beverage products is also a major source of pollution. Plastic

⁵ Chemtrust (2015). [Chemical pollution and microplastics: a present danger to marine life.](#)

⁶ Endocrine Society (2024). [Latest Science Shows Endocrine Disrupting Chemicals in Plastics, Pesticides, and Other Sources Pose Health Threats Globally | Endocrine Society](#)

⁷ Ammendolia et al (2021). [An emerging source of plastic pollution: Environmental presence of plastic personal protective equipment \(PPE\) debris related to COVID-19 in a metropolitan city.](#)

⁸ Azouz et al (2019). [Managing barriers to recycling in the operating room - ScienceDirect](#)

⁹ Blessy et al (2021). [Recycling of medical plastics.](#)

¹⁰ FAO (2021). [Assessment of agricultural plastics and their sustainability: A call for action.](#)

¹¹ IUCN (2020). [The marine plastic footprint.](#)

items from take-out food and beverages dominate global litter, followed by those from fishing activities.¹² Plastics Europe reports that agriculture, farming, and gardening products contained only 25.4% post-consumer recycled content in 2021¹³. There is growing evidence that endocrine disrupting chemicals in plastics and other sources pose risks to human health¹⁴.

Campaigns like Break Free from Plastic's (BFFP) Brand Audit Reports pose significant reputational risks to food, beverage, and tobacco companies. BFFP's Branded report¹⁵ summarized the thousands of audit events that took place across the globe from 2018-2022 and found that smoking materials and food and beverage packaging were the most common items of plastic pollution across all regions. The World Health Organization has also highlighted tobacco products as the most littered item on the planet¹⁶. Disposable single-use e-cigarettes and vapes are made from a mixture of materials and therefore difficult to recycle¹⁷.

Fossil fuels

Petrochemicals that are derived from fossil feedstocks form the building blocks of 90% of all plastics¹⁸. Currently about 4% of annual total use of oil and gas globally is for plastic production¹⁹. The global response to climate change will reduce demand for fossil fuels in the transportation and energy generation sectors, which will cause petrochemical companies to invest more in plastics production. This is expected to drive half of oil demand growth between now and 2050²⁰. The World Economic Forum predicts plastic production will double in the next 20 years²¹. This move away from transportation and energy generation and towards plastic production has been widely publicized and poses a significant reputational risk to petrochemical companies undertaking this controversial transition. The Minderoo Foundation has published a list of 100 petrochemical companies that produce 90% of all single-use plastic

¹² Morales-Caselles et al (2021). [An inshore-offshore sorting system revealed from global classification of ocean litter.](#)

¹³ Plastics Europe (2022). [Plastics – the facts 2022.](#)

¹⁴ Endocrine Society (2024). [Latest Science Shows Endocrine Disrupting Chemicals in Plastics, Pesticides, and Other Sources Pose Health Threats Globally | Endocrine Society](#)

¹⁵ BFFP (2022). [Branded: five years of holding corporate plastic polluters accountable.](#)

¹⁶ WHO (2022). [Tobacco: poisoning our planet.](#)

¹⁷ Greenpeace (2024). [Are disposable vapes bad for the environment? | Greenpeace UK](#)

¹⁸ Plastics Europe (2022). [Plastics – the facts 2022.](#)

¹⁹ British Plastics Federation (2019). [Oil Consumption.](#)

²⁰ Client Earth (2020). [Big Oil's Plan B: Plastic.](#)

²¹ WEF (2016). [The New Plastics Economy: Rethinking the future of plastics.](#)

waste generated globally²².

Minderoo Foundation found that recycling is failing to scale fast enough and remains a marginal activity for the plastics sector. Minderoo Foundation found that from 2019-21, growth in single-use plastics made from virgin polymers was 15 times that from recycled feedstocks. Across all polymers and technologies, only 3 MMT of additional on par recycling capacity is expected to be brought online by 2027 (0.7 MMT by the petrochemical industry)²³.

'Cancer Alley', is the nickname given to an 85-mile stretch of the Mississippi River, where communities live on the frontlines of 200 fossil fuel and petrochemical operations. Residents of Cancer Alley face severe health consequences including elevated risks of cancer, reproductive, maternal, and newborn health harms, and respiratory ailments²⁴.

Hospitality

Plastic packaging plays a significant role in the hospitality and food service industries and many of the plastic items used in these sectors are single-use²⁵. Indeed, plastic packaging is the most wasteful and polluting application of plastic²⁶. Examples of single-use plastics in hospitality may include food packaging, water bottles, coffee cups, toiletries, and laundry bags. 'Back of house' uses of plastic include packaging, cling film, plastic cups, single-use wipes, gloves, and masks²⁷. These plastic products are generally not captured for recycling and end up in landfill, incineration, or as pollution in the natural environment. The contribution of the hospitality sector to plastic use and pollution is becoming more widely recognized. The UK Plastics Pact urges the hospitality sector, among other sectors, to set ambitious targets for reducing plastics impacts at all levels of the supply chain²⁸.

²² Minderoo Foundation (2022). [Plastic Waste Makers Index: Top 100 Polymer Producers.](#)

²³ Minderoo Foundation (2022). [Plastic Waste Makers Index - Minderoo Foundation](#)

²⁴ Human Rights Watch (2024). ["We're Dying Here": The Fight for Life in a Louisiana Fossil Fuel Sacrifice Zone | HRW](#)

²⁵ WRAP (n.d.). [Hospitality and food service.](#)

²⁶ World Economic Forum (2020). [How sustainable packaging can reduce plastic waste | World Economic Forum \(weforum.org\)](#)

²⁷ Sustainable Hospitality Alliance (2021). [Single-use plastic factsheet.](#)

²⁸ WRAP (2022). [A Roadmap to 2025: The UK Plastics Pact.](#)

Infrastructure

Well-developed waste management is essential to reducing leakage of plastic into marine, aquatic, and terrestrial environments. Infrastructure companies play an important role in the circulation of materials back to cooperating firms²⁹. But at present, conventional grey infrastructure does not adequately address circular economy requirements and plastic pollution issues. Minderoo Foundation states that only 3 MMT of additional on par recycling capacity is expected to be brought online by 2027³⁰. Plastics Europe reports that plastic waste recycling rates are 13 times higher when collected separately compared to mixed waste collection schemes³¹.

The majority of marine macroplastic pollution comes from coastal mismanaged waste, and an additional 2 MT per year of marine macroplastic pollution comes from inland mismanaged waste³². Microplastic leakage is also pervasive and tends to be released through household wastewater and road run-off, passing through treatment systems and ending up in aquatic environments.

Construction was one of the largest applications of plastics globally in 2021. In the construction industry, plastic is used for seals, pipes, cables, flooring, and insulation, as well as plastic films for packaging. Post-consumer recycled plastics accounts for only 18.1% of all building and construction products³³.

Manufacturing

Packaging is the largest applications of plastics globally, using 44% of all plastics. Post-consumer recycled plastics accounted for only 8.5% of all packaging³⁴. Flexible packaging is the fastest growing plastic packaging category and is mostly single-use with very low recycling and high leakage rates³⁵.

²⁹ UNEP (2021). [Future-proofing Infrastructure to address the climate, biodiversity and pollution crises](#).

³⁰ Minderoo Foundation (2022). [Plastic Waste Makers Index - Minderoo Foundation](#)

³¹ Plastics Europe (2022). [Plastics – the facts 2022](#).

³² IUCN (2020). [The marine plastic footprint](#).

³³ Plastics Europe (2022). [Plastics – the facts 2022](#).

³⁴ Plastics Europe (2022). [Plastics – the facts 2022](#).

³⁵ Ellen MacArthur Foundation (n.d.). [Flexible packaging](#).

Automotives account for 8% of global plastics applications, electrical & electronics account for 7%, and household, leisure, and sports, for 7%³⁶. These non-packaging applications of plastics can be challenging to recycle due to mixed materials within complex products and the presence of additives that are hazardous or may reduce the cost-effective reuse of materials³⁷.

Materials

Petrochemicals that are derived from fossil feedstocks form the building blocks of 90% of all plastics, therefore companies that convert fossil feedstocks into polymers, or produce, commercialize, and/ or use plasticizers and other additive chemicals play a significant role in marine plastic pollution. There is growing evidence that plastics and chemical additives have negative impacts on human health. PlastChem report found that over 16,000 chemicals are used or present in plastics and of the 5,800 that have been tested, 73% are hazardous³⁸.

The global response to climate change will reduce demand for fossil fuels in the transportation and energy generation sectors, which will cause petrochemical companies to invest more in plastics production. The World Economic Forum predicts plastic production will double in the next 20 years³⁹. This move away from transportation and energy generation and towards plastic production has been widely publicized and poses a significant reputational risk to petrochemical companies undertaking this controversial transition. Minderoo Foundation has published a list of 100 petrochemical companies that produce 90% of all single-use plastic waste generated globally⁴⁰.

Plastic pellets, or nurdles, can be released into the environment from plastic plants or during shipping. This form of plastic pollution can absorb persistent, bioaccumulative, toxic chemicals which may be ingested by organisms and accumulate up the food chain⁴¹. Each year an estimated 445,970 tonnes of nurdles enter the environment worldwide⁴². Nurdle spills have

³⁶ Plastics Europe (2022). [Plastics – the facts 2022](#).

³⁷ European Environment Agency (2022). [Managing non-packaging plastics in European waste streams – the missing part of the plastic puzzle](#).

³⁸ PlastChem (2024). <https://plastchem-project.org/>

³⁹ Plastics Europe (2022). [Plastics – the facts 2022](#).

⁴⁰ Minderoo Foundation (2022). [Plastic Waste Makers Index: Top 100 Polymer Producers](#).

⁴¹ Chemtrust (2015). [Chemical pollution and microplastics: a present danger to marine life](#).

⁴² Galgani and Rangel-Buitrago (2024). [White tides: The plastic nurdles problem - ScienceDirect](#)

devastating ecological impacts and pose a reputational risk to organizations involved in the production and/ or transportation of plastic pellets⁴³.

Plastic ingredients and microbeads are also applied in a variety of personal care and cosmetics products (PCCPs), such as deodorant, shampoo, insect repellent, and baby care products. Plastic ingredients in PCCPs are poured down the drain after use, and therefore cannot be collected for recycling. These plastic ingredients pass through wastewater treatment systems and are then emitted via raw sewage, treated effluents, landfilled, or dumped at sea⁴⁴.

Mineral extraction

There are many applications of plastics in the mineral extraction/ mining sector, including acrylic, HDPE, and PC sheeting, PVC pipes for waste transfer, and UHMW-PE in sheaves, gears, and other components⁴⁵.

Power generation

Plastics are commonly used the power generation sectors, for example in wind turbines, solar panels and wave booms⁴⁶. Plastics that are difficult and/or expensive to recycle may go through a process of energy recovery. This is where combined heat and power recovery plants (CHP plants) use plastics waste and other types of waste to generate energy⁴⁷. Waste incineration produces greenhouse gas emissions, for example, in 2016, US waste incinerators released the equivalent of 12 million tons of carbon dioxide, more than half of which came from plastics⁴⁸. The incineration of plastic is a highly carbon-intense source of electricity⁴⁹.

⁴³ McVeigh (2021). [Nurdles: the worst toxic waste you've probably never heard of.](#)

⁴⁴ UNEP (2015). [Plastic in cosmetics: Are we polluting the environment through our personal care? Fact sheet.](#)

⁴⁵ A&C Plastics Inc. [5 popular types of plastic for mining applications.](#)

⁴⁶ British Plastics Federation. [Plastics applications.](#)

⁴⁷ [Plastics Europe. Recycling and energy recovery.](#)

⁴⁸ EPA (2016). [Inventory of U.S. Greenhouse Gas Emissions and Sinks.](#)

⁴⁹ Greenpeace (2022). [The Big Plastic Count Results.](#)

Retail

Plastic packaging has become ubiquitous throughout retail supply chains due to their low cost and adaptability, e.g. in processing, packaging, distribution, and retailing. An estimated 37% of food sold in the EU uses plastic as a packaging material⁵⁰, and grocery retailers are especially dependent on single-use plastic packaging. Public concern about the plastic pollution crisis constitutes a significant reputational risk for retailers; a poll by YouGov found that 85% of people in the UK want the government to make retailers cut the amount of plastic packaging they use⁵¹.

Transportation services

Plastic pellets, or nurdles, can be released into the environment from plastic plants or when shipped to factories. Each year an estimated 445,970 tonnes of nurdles enter the environment worldwide⁵². Nurdle spills have devastating ecological impacts and pose a reputational risk to organizations involved in the production and/ or transportation of plastic pellets⁵³.

Microplastic pollution can absorb persistent, bioaccumulative, toxic chemicals, such as polychlorinated biphenyls (PCBs), polybrominated biphenyl ether (PBDE) flame retardants and dioxins, which may be ingested by organisms and accumulate up the food chain⁵⁴.

⁵⁰ Rethink Plastic Alliance (2022). [What the EU can do to support the grocery retail sector in reducing packaging and plastic pollution: Policy Briefing.](#)

⁵¹ Greenpeace (2021). [Trashed: How the UK is still dumping plastic waste on the rest of the world.](#)

⁵² Galgani and Rangel-Buitrago (2024). [White tides: The plastic nurdles problem - ScienceDirect](#)

⁵³ McVeigh (2021). [Nurdles: the worst toxic waste you've probably never heard of.](#)

⁵⁴ Chemtrust (2015). [Chemical pollution and microplastics: a present danger to marine life.](#)