

Toxics in plastic and their health impacts

Issues and concerns

Plastic can be toxic both to the environment and to human health. The extraction of fossil fuels, including the fracking of fossil gas, as well as their transformation into polymers and additives, [involves large-scale toxic releases to the air, water and soil](#). Workers and communities near extraction and processing sites are severely affected.

Some plastic polymers are inherently toxic, such as polyvinyl chloride (PVC), and polyurethane. [Bio-based plastic, such as polylactic acid \(PLA\) can be as toxic as fossil-based plastic. Micro and nano-plastics can also be specifically toxic](#) due to their small size and ability to infiltrate and disrupt bodily cells, organs and functions. They contribute to the [long-range transport of toxic chemicals across ecosystem boundaries](#).

Some plastic contains toxic additives (including brominated flame-retardants, plasticizers such as phthalates, bisphenols, and benzotriazole UV stabilizers) that may harm us through leaching. A recent review found that out of about 10,000 chemicals used as plastic additives, few have been thoroughly studied, let alone regulated. Plastic can also [attract and concentrate toxic pollutants](#) that are present in our environment.

Plastic recycling can transfer toxic additives into recycled materials and even generate new toxics. [A recent study of pellets of recycled HDPE from 23 countries](#) found toxic additives in all samples, while brominated dioxins and furans have been found in recycled plastic toys.

Highly toxic chemicals can also be [emitted when plastic is heated or burnt](#). This can occur during thermal waste-management operations such as pyrolysis and gasification (sometimes marketed as “advanced” or “chemical” recycling), and incineration. It can also occur when [plastic in housing and infrastructure is heated in very hot weather](#), or [burns in fires](#).

Toxic plastic and plastic-related chemicals often persist in the environment, move between land, atmospheric and marine environments, and accumulate in the food chain and in our bodies. Even in cases where our bodies can eliminate certain toxic chemicals found in plastic, they can still harm our health by being highly toxic at very low levels of prolonged exposure. Plastic and associated toxic chemicals [contribute to cancer, reproductive toxicity \(including infertility\), neurotoxicity, thyroid and immune dysfunction, as well as obesity and other metabolic dysfunction](#).

Recommendations

The global plastics treaty must:

- **Cover all environments and ecosystems**, and not be limited to the marine environment.
- **Prioritize reducing plastic production**. Toxic emissions from plastic occur at every stage of its lifecycle, especially in the production phase. Therefore, reducing overall plastic production is the surest way to reduce toxic emissions associated with plastic.
- **Operationalize the polluter pays principle** including through establishing a fund for the remediation of toxic pollution associated with plastic. This fund could be partly replenished through legal action against polluters.
- **Establish synergies with existing treaties** (such as the Stockholm Convention on persistent organic pollutants and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal).

More specifically:

- **Ban toxic plastic polymers and additives, controlling chemicals with similar properties as groups** (such as [bisphenols](#), perfluorinated compounds (PFAS), phthalates, and benzotriazole UV stabilizers). When they are not, banned chemicals are often replaced with other chemicals from the same group which turn out to be just as toxic.
- **Ban [primary microplastics](#) and intentionally-added microplastics in products**, and support measures to reduce the unintentional release of microplastics in the environment.
- **Establish international guidelines and requirements for the handling and transportation of plastic pellets**. They are often spilled during handling and transportation, including at sea, leading to significant environmental pollution that is difficult if not impossible to remedy.
- **Support the elimination of persistent organic pollutants (POPs)-contaminated stockpiles** required under the Stockholm Convention. This will reduce the pool of environmental pollutants that are likely to adsorb onto plastic in the environment.
- **Require producers to disclose the chemical content of plastic products**, including additives, and ensure that it is traceable across the lifecycle of plastic products. Transparency through labelling, material safety data sheets, and databases is essential for the monitoring and enforcement required for an effective global treaty.
- **Place new controls for toxic-free plastic recycling**, including material and product design requirements, controls on toxics in plastic destined for and proceeding from recycling, as well as on toxic emissions from the management of wastewater, gaseous emissions and plastic residues from the recycling process.
- **Phase out the burning and other thermal treatment of plastic waste**. Replacing one high-heat technology (such as incineration) with another one (such as pyrolysis) will only create similar toxic emissions and climate pollution.
- **Regulate plastic authorized for use in the built environment** to limit toxic emissions in situations of heating or fires.

Further reading

- Karlsson, Thérèse, Sara Brosché, Mona Alidoust and Hideshige Takada. 2021. "Plastic Pellets Found on Beaches All over the World Contain Toxic Chemicals." International Pollutants Elimination Network (IPEN). <https://ipen.org/news/new-global-studies-show-health-threats-throughout-plastics-supply-chain>
- Bell, Lee and Hideshige Takada. 2021. "Plastic Waste Management Hazards: Waste-to-Energy, Chemical Recycling, and Plastic Fuels". International Pollutants Elimination Network (IPEN). <https://ipen.org/sites/default/files/documents/ipen-plastic-waste-management-hazards-en.pdf>
- Azoulay, David, Priscilla Villa, Yvette Arellano, Miriam Gordon, Doun Moon, Kathryn Miller and Kristen Thompson. 2019. "Plastic & Health: The Hidden Costs of a Plastic Planet" Break Free From Plastic. <https://www.ciel.org/plasticandhealth>
- Muncke, Jane, Anna-Maria Andersson, Thomas Backhaus, Justin M. Boucher, Bethanie Carney Almroth, Arturo Castillo Castillo, Jonathan Chevrier, et al. 2020. "Impacts of Food Contact Chemicals on Human Health: A Consensus Statement." Environmental Health 19 (1): 25. <https://doi.org/10.1186/s12940-020-0572-5>
- "Resources." n.d. The Unwrapped Project. Accessed February 14, 2022. <https://unwrappedproject.org/resources>