

# *Human Health in the Global Plastics Treaty*

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■ *Policy brief*





# Human Health in the Global Plastics Treaty

**The Global Plastics Treaty must protect the human right to health<sup>1</sup> and the right to a safe, clean, healthy, and sustainable environment<sup>2</sup>**

**Plastics are a source of pollution throughout their full life cycle**, releasing hazardous chemicals, macroplastics, micro- and nanoplastics (MNPs), and greenhouse gases (GHG) to the entire ecosphere. This policy brief focuses on the direct and indirect human health hazards associated with all forms of plastic pollution across the plastics life cycle.

## **1. State of the science on the human health impacts of plastics**

**Scientific evidence of the global scale of all forms of plastic pollution, the extent of human exposure and related known and emerging health hazards constitute a serious and evolving global health concern.**<sup>3,4</sup>

- Plastic production is driving cascading health hazards throughout its life cycle. Beginning with raw material extraction, production processes emit air pollutants, toxic chemicals, and GHGs, which are associated with increased chronic disease and acute health hazards for fenceline communities and industrial workers.<sup>4</sup> Unsustainable levels of chemically complex and hazardous plastic production exacerbate all downstream health hazards.<sup>4</sup>
- Chemicals and MNPs released throughout the plastics life cycle, and present in human bodies, are a significant cause for concern due to known and emerging health impacts.<sup>4-7</sup>
- Reusing and recycling plastics can lead to unintended health hazards from chemical and MNP environmental emissions, and chemical contamination and accumulation in recycled plastics.<sup>8,9</sup> Chemical recycling is energy-intensive and can release hazardous chemicals.<sup>4</sup>
- The informal waste sector comprises 60% of global plastic recycling, with up to 20 million people working in unsafe, unhygienic conditions on the frontline of plastic waste.<sup>10,11</sup>
- Air pollutants, toxic chemicals and GHGs from incineration technologies and open burning increase the risk of respiratory diseases and cancers and contribute to climate change.<sup>4,12</sup>
- Macroplastic waste can compromise sanitation systems, exacerbating floods<sup>13</sup> and the transmission of infectious diseases caused by pathogens and vectors.<sup>14,15</sup> Plastic waste continues to release chemicals and MNPs as it degrades.

**All people are affected by plastic pollution, but not equally.** Physiological, sociodemographic and geographic disparities mean that some people are more exposed to plastic pollution and/or are at greater risk of its adverse health effects.<sup>3\*</sup> Today, lifetime exposure begins before birth, continues throughout critical stages of childhood development into adulthood, in turn exposing future children and burdening populations with compounding health risks.<sup>4</sup>

## **2. A quarter of plastic chemicals are known to be hazardous to human health**

**More than 16,000 chemicals are used or found in plastics**, which can vary widely across polymers and products (Scientists' Coalition: [Plastic Chemicals](#)).<sup>5</sup>

- **Over a quarter of plastic chemicals are known to be hazardous to human health, and 66% have no available hazard data.**<sup>5</sup>
- **Only 6% of plastic chemicals are currently regulated globally.**<sup>5</sup>

Chemicals of concern are released from plastics throughout their life cycle. Humans are directly exposed through occupational activities and physical contact with plastic products, including food contact materials, toys, and medical devices.<sup>4</sup>

\* "The plastics crisis has disproportionate impacts on groups at heightened risk of human rights violations, such as workers, children, women, persons of African descent, Indigenous peoples, coastal communities and people living in poverty. Not only present but future generations will be affected..." Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes.<sup>3</sup>



Foodstuffs are contaminated via environmental pollution and the plastics used to produce, process, package and prepare them,<sup>16</sup> including recycled and reusable plastics<sup>9</sup> (Scientists' Coalition: [Food Systems](#)). Widespread environmental pollution further contributes to **acute, chronic, and transboundary human exposures to plastic chemicals.**<sup>4</sup>

**Plastic chemicals include known endocrine disruptors, carcinogens, and mutagens,<sup>5</sup> which have been identified in human blood, amniotic fluid and urine,<sup>6</sup> with evidence of detrimental health effects even at very low levels.<sup>17,18</sup>** Health concerns include reproductive and developmental disorders, including infertility; obesity, and non-communicable diseases including diabetes, cardiovascular disease, and many cancers.<sup>4,6</sup>

**The human health costs of plastic chemicals have been estimated at \$250 billion annually in the United States alone.<sup>19</sup>** This estimate covers only a subset of all plastic chemicals, and the global burden of associated disease will be substantially higher.<sup>20</sup>

### ***3. Micro- and nanoplastics (MNPs) are ubiquitous and present emerging health hazards***

**A substantial body of evidence demonstrates MNPs' pervasiveness in natural environments and foods<sup>7, 21-23</sup>** (Scientists' Coalition: [Microplastics & Food systems](#)). Humans are known to ingest and inhale microplastics. Emerging evidence suggests MNPs could transfer from gastrointestinal tracts and lungs to other body tissues. Smaller particles present greater risks, especially those that can transgress biological membranes.<sup>24</sup> Health concerns of the presence of MNPs presence in humans include:

- **Physical and functional damage to various cells and tissues**, including early evidence of gut lining damage, microbiome alterations, inflammatory and immune responses,<sup>4,24,25</sup>
- **Hazardous effects of leached plastic chemicals of concern.**<sup>4,26</sup>
- **Hazardous effects of adsorbed environmental toxicants**, such as persistent organic pollutants and trace metals, and the potential of pathogens rafting on MNPs.<sup>4,26</sup>

Methods for assessing human MNP exposure and health effects are in the early stages of development but studies in human cells and animal models provide a growing body of evidence.<sup>4</sup> **A precautionary approach is critical given the extent and unavoidability of human exposure to MNPs and emerging evidence of health hazards.**

### ***4. Protecting and promoting the human right to health, and to a safe, clean, healthy, and sustainable environment must be prioritised across treaty provisions.***<sup>27</sup>

**There is strong scientific consensus that transboundary exposure to plastic chemicals, plastic accumulation, plastics-associated air pollutants and GHG emissions is harming human health globally, with MNPs posing a significant cause for concern. Current regulation is insufficient to protect human health from plastics' known and emerging health hazards.**<sup>27,28</sup>

Primary plastic polymer production reduction targets will be most effective in reducing hazards across the life cycle of plastics (Scientists' Coalition: [Primary Plastics Polymers](#)).

Globally coordinated, mandatory approaches, with universally standardised safety, sustainability, essentiality (Scientists' Coalition: [Essential-Use Concept](#)) and transparency criteria, applied to plastic chemicals, polymers, products, plastic alternatives and non-plastic substitutes, and supporting technologies, systems and services will protect human health.

To facilitate the implementation of the Global Plastics Treaty, an adaptive, independent scientific body should be created to respond to emerging health concerns, ensuring regular monitoring, reporting, evaluation, and compliance.

## References:

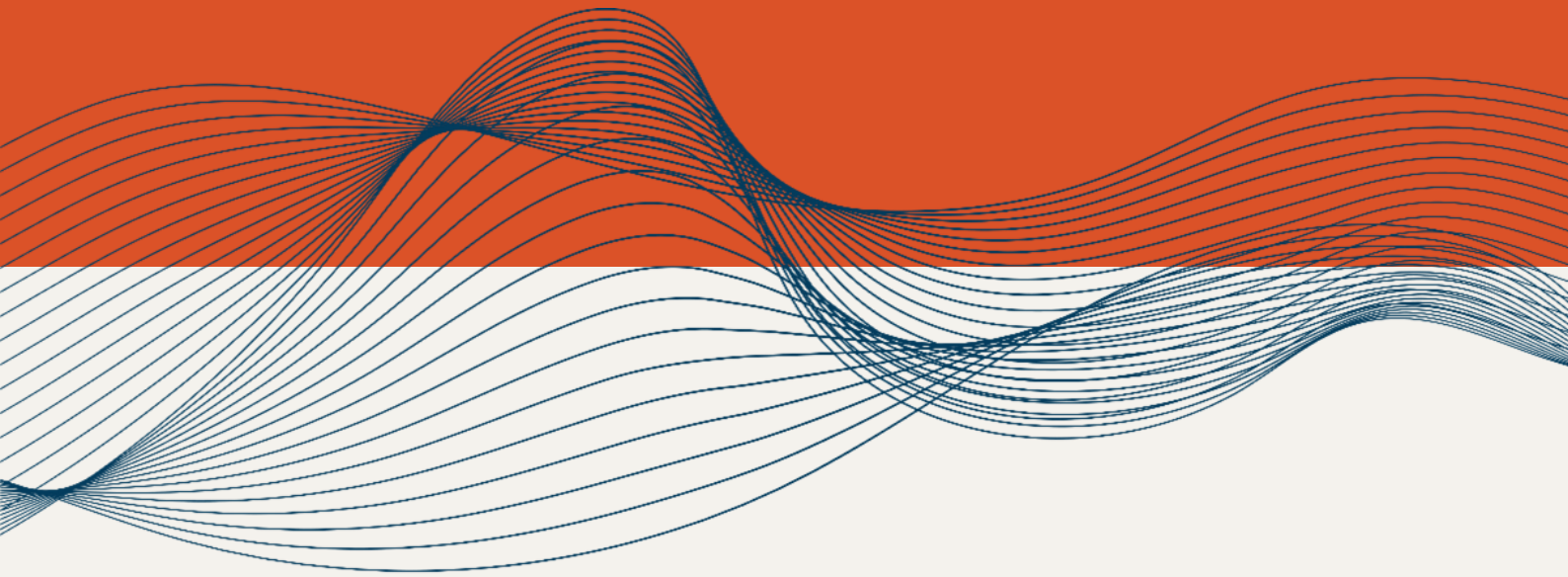
1. UNGA Res 217 A(III) (10 December 1948), Universal Declaration of Human Rights, Article 25; International Covenant on Economic, Social and Cultural Rights (New York, 16 December 1966, in force 3 January 1976), Article 12 [ICESCR].
2. UNGA Res 76/300 (28 July 2022), The Human Right to a Clean, Healthy and Sustainable Environment, UN Doc A/RES/76/300; UN Human Rights Council (UNHRC) Res 48/13 (8 October 2021), The Human Right to a Clean, Healthy and Sustainable Environment, UN Doc A/HRC/RES/48/13.
3. United Nations General Assembly. Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes, Marcos Orellana. The stages of the plastics cycle and their impacts on human rights. 2021.
4. Landrigan PJ, et al. The Minderoo-Monaco Commission on Plastics and Human Health. *Ann Glob Health* 2023; 89 (1): 1–215.
5. Wagner M, et al. State of the science on plastic chemicals - Identifying and addressing chemicals and polymers of concern. 2024.
6. Symeonides et al. An Umbrella Review of Meta-Analyses Evaluating Associations between Human Health and Exposure to Major Classes of Plastic-Associated Chemicals. *Ann Glob Health* 2024; 90 (1): 52, 1-54.
7. World Health Organization. Dietary and inhalation exposure to nano- and microplastic particles and potential implications for human health. 2022.
8. Hahladakis et al. 2018, An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling. *J Hazard Mater* 2018; 344: 179-199.
9. Geueke B, Phelps DW, Parkinson L V., Muncke J. Hazardous chemicals in recycled and reusable plastic food packaging. *Cambridge Prisms: Plastics* 2023; 1: 1–18.
10. Morais J, Corder G, Golev A, Lawson L, Ali S. Global review of human waste-picking and its contribution to poverty alleviation and a circular economy. *Environmental Research Letters*. 2022; 17: 063002.
11. Global Alliance of Waste-pickers. Submission from the Global Alliance of Waste-pickers for the 1st INC meeting in Uruguay. 2022.
12. Velis CA, Cook E. Mismanagement of Plastic Waste through Open Burning with Emphasis on the Global South: A Systematic Review of Risks to Occupational and Public Health. 2021; 55 (11): 7186-7207.
13. Van Emmerik THM. The impact of floods on plastic pollution. *Global Sustainability* 2024; 7 (e17): 1–5.
14. Ormsby MJ, Woodford L, White HL, Fellows R, Oliver DM, Quilliam RS. Toxigenic *Vibrio cholerae* can cycle between environmental plastic waste and floodwater: Implications for environmental management of cholera. *J Hazard Mater* 2024; 461: 132492.
15. Maquart P-O, et al., Plastic pollution and infectious disease. *Lancet Planet Health* 2022; 6 (10): e842–45.
16. Geueke B, et al. Systematic evidence on migrating and extractable food contact chemicals: Most chemicals detected in food contact materials are not listed for use. *Crit Rev Food Sci Nutr*. 2023; 63: 9425–35.
17. Lambré C, et al. Re-evaluation of the risks to public health related to the presence of bisphenol A (BPA) in foodstuffs. *EFSA Journal* 2023; 21.
18. Maffini M V., Geueke B, Groh K, Carney Almroth B, Muncke J. Role of epidemiology in risk assessment: a case study of five ortho-phthalates. *Environ Health* 2021; 20: 114.
19. Trasande L, Krithivasan R, Park K, Obsekov V, Belliveau M. Chemicals Used in Plastic Materials: An Estimate of the Attributable Disease Burden and Costs in the United States. *J Endocr Soc* 2024; 8: 1–9.
20. Fuller R, et al. Pollution and health: a progress update. *Lancet Planet Health* 2022; 6: e535–47.
21. Allen S, et al., Atmospheric transport and deposition of microplastics in a remote mountain catchment. *Nat Geosci* 2019; 12: 339–344.
22. SAPEA. A Scientific Perspective on Microplastics in Nature and Society. 2019.
23. Bergmann M, et al., High quantities of microplastic in Arctic deep-sea sediments from the HAUSGARTEN observatory. *Environ Sci Technol* 2017; 51,
24. Winiarska E, Jutel M, Zemelka-Wiacek M. The potential impact of nano- and microplastics on human health: Understanding human health risks. *Environ Res* 2024; 251: 118535.
25. Fournier E, t al. Exposure to polyethylene microplastics alters immature gut microbiome in an infant in vitro gut model. *J Hazard Mater* 2023; 443: 130383.
26. Seewoo BJ, et al. Impacts associated with the plastic polymers polycarbonate, polystyrene, polyvinyl chloride, and polybutadiene across their life cycle: A review. *Heliyon* 2024; 10: e32912
27. O'Meara N. Human Rights and the Global Plastics Treaty to Protect Health, Ocean Ecosystems and Our Climate. *International Journal of Marine and Coastal Law* 2023; 38: 480–515.
28. Varvastian S. The Role Of Courts In Plastic Pollution Governance. *International and Comparative Law Quarterly* 2023; 72: 635–69.

This policy brief was prepared by members of the Scientists' Coalition for an Effective Plastics Treaty

**Please cite as:** Scientists' Coalition for an Effective Plastics Treaty (2024), Human Health in the Global Plastic Treaty, DOI 10.5281/zenodo.13842722.

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