What are the benefits of regulating chemicals of concern?

Why regulate chemicals of concern in the plastics treaty?

The release of chemicals from plastics throughout the life cycle is a major contributor to the overall adverse impacts of plastics on human health and the environment. Strong scientific evidence links plastic chemicals to reproductive, neurodevelopmental, immune, and metabolic disorders in humans[1,2] incurring substantial costs.[3,4] However, existing multilateral environmental agreements (MEAs) lack the mandate and scope to address chemicals in plastics because they either target a very specific set of chemicals (e.g., Persistent Organic Pollutants in the Stockholm Convention) or a single phase of the plastics life cycle (e.g., waste in the Basel Convention). Accordingly, there is a substantial governance gap on harmful chemicals in plastics, with limited regulation of and hazard data for chemicals of concern in plastics (Figure 1).[2] This governance gap extends to the regional and national level, with governments lacking the capacity to assess and regulate the 16,325 known plastic chemicals, which can be persistent, bioaccumulative, mobile, and/or toxic. For the treaty to effectively protect human health and the environment from the adverse consequences of plastic production, use and pollution, chemicals of concern should be addressed comprehensively within the new treaty. This includes a mechanism to strengthen the regulation of chemicals of concern.

What are the core elements for a successful Article 3?

To effectively address chemicals of concern, Article 3 would need to contain six core components, addressing scope, criteria, listing mechanism, subsidiary body, binding obligations, and transparency and traceability, with the latter currently missing in the Chair's text. The **scope** allows reducing the most harmful chemicals of concern in all plastics, especially during their use. From a scientific perspective, regulating groups of chemicals of concern in all plastics is the most efficient way to protect human health, as opposed to product-specific regulation (see case study below). Evidence-based **criteria** are key to providing clarity on which chemicals of concern are regulated under the treaty. In combination with an efficient **listing mechanism** for new chemicals, these criteria will allow for a "start-and-strengthen" approach to the treaty and for flexibility as new scientific evidence emerges. A **subsidiary body** with experts free of conflicts of interest can guide implementation and update

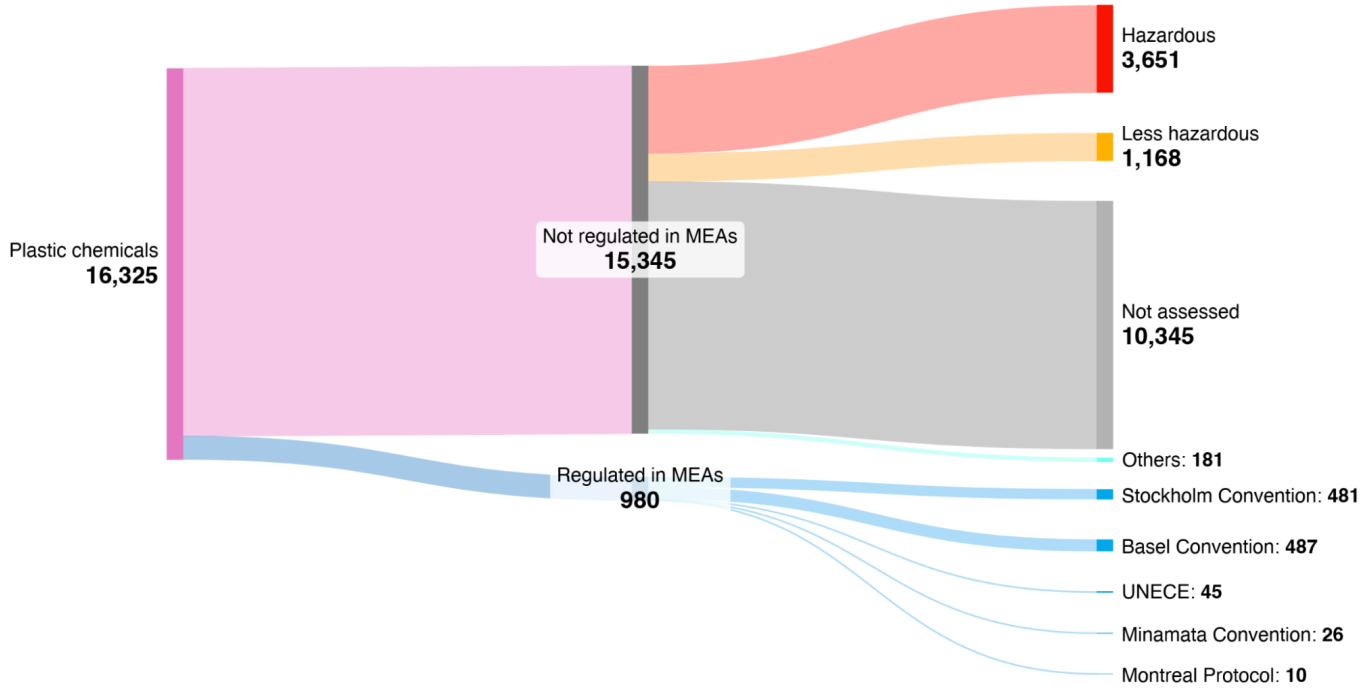

Figure 1: Share of plastic chemicals regulated in other multilateral environmental agreements (MEAs, adopted from [2]).

criteria. Clear and globally **binding obligations** that cover the production, trade, and use of chemicals of concern will ensure accountability and provide a level playing field for businesses to make plastics safer. Importantly, requirements regarding **transparency, traceability, and trackability** of plastic chemicals are lacking in the Chair's text. Obligations to disclose the chemical composition of plastic products and a global watch list of chemicals are impactful ways to improve the safety of plastics. Additionally, Article 3 should be fully integrated with Articles 5, 6, 7, and 11.

What are the benefits of regulation? A case study on Bisphenol A-associated childhood obesity

To convey the benefits of regulating chemicals of concern, we modeled the health benefits and associated costs savings using a single chemical of concern, **Bisphenol A**, and a single health outcome, **childhood obesity**, based on the fact that robust evidence links exposures to 75,400 additional cases of childhood obesity per year in the US and EU alone.[5] We note that Bisphenol A, related bisphenols, and additional chemicals of concern are associated with a number of other diseases such as respiratory issues, neurodevelopmental conditions, and reproductive disorders.[1] Accordingly, this case study only reflects a minor fraction of the health benefits related to obesity that can be achieved by regulating such chemicals.[3,4] Bisphenol A is used to make polycarbonate plastics (e.g., baby bottles) and plastic epoxy resin (e.g., liner in food and beverage cans). Accordingly, 97.5% of human exposure originates from plastics, in particular via diet contaminated from food contact plastics.[6] We used three scenarios to understand the health benefits of regulating Bisphenol A in Article 3: (1) a business-as-usual scenario (zero option), (2) a scenario for regulating it in specific products, and (3) a scenario in which Bisphenol A is regulated in all plastics. We took a range of simple assumptions (see **methods document**) to model outcomes of different options for Article 3 (see **Figure 2**).

Key findings

1. **Regulating chemicals of concern in all plastics would deliver substantial health and economic benefits.** In the case of Bisphenol A, up to 61,800–66,400 children can be protected from childhood obesity in the US and EU every year and associated health costs of 3.6–3.9 billion USD per year can be saved (Scenario 3). We expect much larger benefits globally and over time and note that expanding the scope to all plastic products would also simplify implementation and reduce compliance costs compared to a product-specific approach.

2. **Regulating chemicals in specific products reduces the associated health impacts and costs but is less efficient.** In the case of Bisphenol A, the product-specific approach can prevent 8,500–20,300 cases of childhood obesity per year, representing an 11–27% reduction of cases (Scenario 2). The lower benefits are due to the fact that indirect exposures via breastmilk and formula prepared with drinking water are dominant. This highlights the need to reduce parental

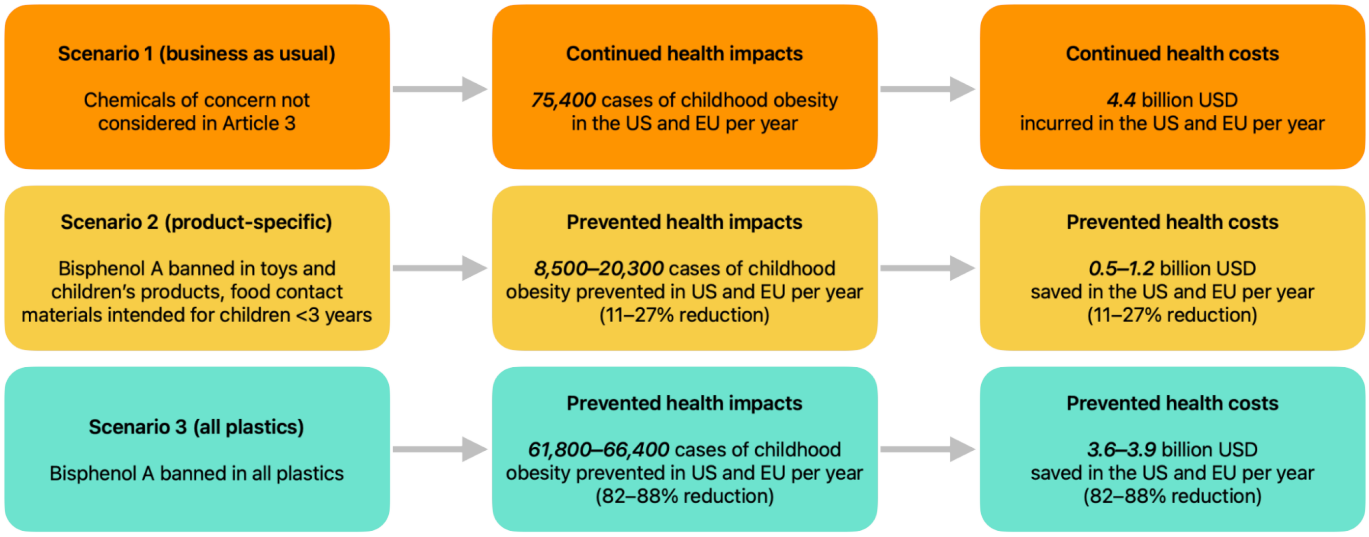

Figure 2: Health and cost benefits of regulating Bisphenol A (case study on childhood obesity)

and other indirect exposures to efficiently protect children.

3. **Regulating additional chemicals of concern in all plastics is expected to have similar health benefits.** For chemicals with similar hazards like Bisphenol A (e.g., other bisphenols), we assume similar benefits if they were to be included in Article 3. Regulating entire groups of concerning chemicals, such as all bisphenols, all phthalates or all PFAS, would be most efficient and avoid regrettable substitutions.

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References

[1] Symeonides, C.; Aromataris, E.; Mulders, Y.; Dizon, J.; Stern, C.; Barker, T. H.; Whitehorn, A.; Pollock, D.; Marin, T.; Dunlop, S. An Umbrella Review of Meta-Analyses Evaluating Associations between Human Health and Exposure to Major Classes of Plastic-Associated Chemicals. Annals of Global Health 2024, 90 (1). https://doi.org/10.5334/aogh.4459.

[2] Wagner, M.; Monclús, L.; Arp, H. P. H.; Groh, K. J.; Løseth, M. E.; Muncke, J.; Wang, Z.; Wolf, R.; Zimmermann, L. State of the Science on Plastic Chemicals - Identifying and Addressing Chemicals and Polymers of Concern, 2024. https://doi.org/10.5281/zenodo.10701706.

[3] Cropper, M.; Dunlop, S.; Hinshaw, H.; Landrigan, P.; Park, Y.; Symeonides, C. The Benefits of Removing Toxic Chemicals from Plastics. Proceedings of the National Academy of Sciences 2024, 121 (52), e2412714121. https://doi.org/10.1073/pnas.2412714121.

[4] Hyman, S.; Acevedo, J.; Giannarelli, C.; Trasande, L. Phthalate Exposure from Plastics and Cardiovascular Disease: Global Estimates of Attributable Mortality and Years Life Lost. eBioMedicine 2025, 105730. https://doi.org/10.1016/j.ebiom.2025.105730.

[5] Attina, T. M.; Hauser, R.; Sathyanarayana, S.; Hunt, P. A.; Bourguignon, J.-P.; Myers, J. P.; DiGangi, J.; Zoeller, R. T.; Trasande, L. Exposure to Endocrine-Disrupting Chemicals in the USA: A Population-Based Disease Burden and Cost Analysis. The Lancet Diabetes & Endocrinology 2016, 4 (12), 996–1003. https://doi.org/10.1016/S2213-8587(16)30275-3.

[6] 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. Journal of the Endocrine Society 2024, 8 (2), 1–9. https://doi.org/10.1210/jendso/bvad163.

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