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## Chemical simplification and tracking in plastics

The zero draft of the Global Plastics Treaty (1) affirms that the presence of hazardous chemicals poses a substantial barrier to the safe and environmentally sound management of plastics. Additives, nonintentionally added substances (NIASes), and contaminants in plastics complicate their reuse and disposal (2) and hinder plastic recycling (3), which has been touted as a key solution to the plastics pollution crisis (4). Studies show evidence of accumulation of hazardous substances even in relatively close-loop plastic recycling systems, such as those for food-grade polyethylene terephthalate (5), but recyclers lack the tools and information needed to identify these chemicals in waste streams, or to isolate and remove them from plastic products.

Hazardous chemicals present risks to recycling workers and consumers, as well as to the wider society and environment (6). However, current regulations do not require plastics producers to track or make available information on the levels of harmful chemicals (2). Because upstream producers lack the incentives to disclose this information, recyclers are unable to control hazardous substances.

Before recycling can contribute to tackling the plastics pollution crisis, the plastics industry must limit hazardous chemicals. International regulations and innovations can drive “chemical simplification”—i.e., the reduction of the extensive number of chemicals used in plastics production (7).

Chemical additives known to cause harm to human health and the environment must be rapidly phased out, and NIASes must be identified and limited. To ensure these changes, plastics producers should transparently report chemicals production and use, which should be tracked and monitored throughout the plastics life cycle. Finally, strict regulations specifying where recycled plastics can be used should be implemented to prevent harmful chemicals in, for example, toys and food packaging. Including obligations to increase the safety, transparency, and traceability of the components in plastics in the plastics treaty represents one of many necessary steps toward safer recycling.

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To submit, go to [www.science.org/nextgen-voices](http://www.science.org/nextgen-voices)

Deadline for submissions is 17 November. A selection of the best responses will be published in an upcoming issue of *Science*. Submissions should be no more than 150 words. Anonymous submissions will not be considered.

Hazardous chemicals in plastics pose challenges to ensuring that recycled materials are safe.



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#### COMPETING INTERESTS

B.C.A. is an unpaid steering committee member of the Scientists’ Coalition for an Effective Plastics Treaty. M.W. is an unpaid member of the Hazardous Substances Advisory Committee.

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## Plastics treaty text must center ecosystems

Plastics pollution is now ubiquitous (1, 2) and affects the environment at all stages of the plastics life cycle. Plastics manufacturing involves thousands of chemicals that can pollute ecosystems. Once in the environment, plastic litter can entangle and choke wildlife, and plastic objects can act as a reservoir for invasive species and concentrate other pollutants (1, 3, 4). Plastics can then break down into potentially toxic micro- and nanoplastics. Negotiations for the plastics treaty (the legally binding instrument on plastic pollution, including in the marine environment) (5, 6) must ensure that its text centers the effects of plastics on ecosystems, as services that ecosystems provide are essential for biodiversity and human health and well-being.

Plastic does not occur in isolation. Terms in the treaty’s current draft such as “hotspot,” “accumulation zone,” “cleanup,” and “sectors” focus on the distribution and concentration of pollutants rather than the natural systems these pollutants affect. Ignoring impacted ecosystems implies that

mitigating plastics pollution can take place without ecological restoration.

The current terms should be replaced by language that centers ecosystems, such as “habitats polluted by plastic products” or “ecosystems affected by plastic-associated pollution.” This phrasing makes the treaty’s key goals clear and tangible: Ecosystems and biodiversity must be conserved and protected from pollutants at all stages of the plastics life cycle. This language also acknowledges that each affected ecosystem will require an individualized approach to restoration, depending on where the pollution is generated, the drivers of the pollution, and the impacts to local habitats and biodiversity. Prioritizing increased ecosystem stability, protection, and restoration will be more effective long term than limited, and possibly dangerous (7), stopgaps.

To reduce plastics’ impact on the environment, the underlying drivers of ecosystem degradation through the plastics life cycle must be addressed (8). Such drivers include large-scale production and consumption patterns, facilitated by fossil fuel subsidies (9), a lack of reuse and safe recycling options, and destructive disposal practices. Through an effective, legally binding agreement, the plastics treaty can help to implement the commitments of the Kunming-Montreal Global Biodiversity Framework (particularly targets 6, 7, 14, 16) and the Sustainable Development Goals (particularly goals 12, 14, 15). The plastics treaty should include obligations to decrease global plastics production, eliminate hazardous substances, and develop safe and sustainable plastic consumption (10). It should also include a timeline and roadmap for making the required changes. Resources should be allocated to each aspect of this transformation and adhere to the principle of zero waste hierarchy (11), which prioritizes pollution prevention over waste management measures.

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#### COMPETING INTERESTS

M.Wang is an unpaid member of the Hazardous Substances Advisory Committee. B.C.A., M.F., and R.R.H. are unpaid steering committee members of the Scientists’ Coalition for an Effective Plastics Treaty. M.F. is an unpaid member of the Endocrine Society’s delegation to the Intergovernmental Negotiating Committee on Plastic Pollution. S.W. is affiliated with the Australian Microplastic Assessment Project. R.R.H. is a paid scientific consultant for the nonprofit OceanCare.

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## Finance plastics reuse, redesign, and reduction

Negotiations on a new international agreement to end plastic pollution are in progress, with the next committee meeting expected to focus on the list of control measures proposed in the initial “zero” draft (1). The document rightly urges nations to channel financial resources toward environmentally sustainable projects. However, this treaty draft disproportionately emphasizes waste management investment and neglects opportunities for reduction, redesign, and reuse.

Supporting improved recycling is a positive but insufficient step to address plastic pollution, given that only about 10% of plastics are recycled (2). The majority of plastic waste is deposited in landfills (50%) or incinerated (20%), with the remainder disposed of in uncontrolled ways or leaking to the environment (2). Beyond recycling, essential strategies include reducing aggregate plastics production and consumption and transitioning to reuse systems (3). Achieving these goals will require tackling

the fossil fuel–entwined political economy of plastics, which currently incentivizes investments that secure the future growth of plastic production and consumption (4).

Only 4% of investment capital for circularity is directed to reuse solutions, whereas recovery and recycling receive 88%, with major industry players investing heavily, especially in chemical recycling (5). This imbalance threatens to escalate the problem of growing volume of plastic waste (6). For a just and effective transition, the treaty’s provisions must prioritize financial investment in other interventions. The treaty should require polymer producers to address plastic pollution by paying a substantial fee pegged to the quantity of primary plastics produced. This mechanism would disincentivize growth in fossil-based production. The treaty should also define criteria for strong and independent Extended Producer Responsibility (EPR) schemes, establishing requirements for the design, manufacturing, and management through end of life for plastic products (7). Governments should then transparently implement the obligations, which would incentivize private entities to invest in upstream and midstream solutions for sustainable product design, management, and reuse. As negotiations progress, the parties involved should foster a shared understanding of the imperatives to finance systems and services in line with zero draft hierarchy, including those that reduce consumption and production, encourage product redesign, and support reuse solutions. These priorities will guide the development of an effective plastics treaty.

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#### COMPETING INTERESTS

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