A global plastic treaty must cap production

In March, the UN Environment Assembly adopted a resolution to combat plastic pollution with a global and legally binding plastics treaty by 2024 (*1*). In his News In Depth story “United Nations to tackle global plastics pollution” (25 February, p. 801), E. Stokstad discusses many of the ambitious provisions that were included, such as a consideration of the whole plastic life cycle and binding targets. However, it is unclear whether the treaty will include a cap on production or cover plastic chemicals. Despite interventions by the industry (*2*) and objections from the United States and other delegations, reducing plastics at the source by curbing production is critical.

The current mass of plastic production is at about 450 million tons annually and set to double by 2045 (*3*). The immense quantity and diversity of both plastics and plastic chemicals, the total weight of which exceeds the overall mass of all land and marine animals (*4*), already poses enormous challenges. Ensuring the safety of every available plastic and chemical is impossible, as their rates of appearance in the environment exceed governments’ capacities to assess associated risks and control problems (*5*). Plastic pollutants have altered vital Earth system processes to an extent that exceeds the threshold under which humanity can survive in the future (i.e., the planetary boundary) (*5*). Because legacy plastics in the environment break down into micro- and nanoparticles (*6*), this form of pollution is irretrievable and irreversible (*6*). In addition to the risks for human and environmental health, the whole life cycle of plastic accounts for 4.5% of our current greenhouse gas emissions (*7*) and could consume 10 to 13% of our remaining CO2 budget by 2050 (*8*). The growing production and inevitable emissions of plastics will exacerbate these problems (*6*).

Failing to address production will lead to more dependence on flawed and insufficient strategies. Some waste management technologies, such as forms of thermal and chemical recycling, cause socioeconomic and environmental harm (*9*). Much of the plastic waste is currently exported from the North to the Global South, which poses a substantial threat to marginalized and vulnerable communities and their environments (*10*). Even when applying all political and technological solutions available today, including substitution, improved recycling, waste management, and circularity, annual plastic emissions to the environment can only be cut by 79% over 20 years; after 2040, 17.3 million tons of plastic waste will still be released to terrestrial and aquatic environments every year (*11*). To fully prevent plastic pollution, the path forward must include a phaseout of virgin plastic production by 2040 (*12*).

Melanie Bergmann1\*, Bethanie Carney Almroth2, Susanne M. Brander3, Tridibesh Dey4, Dannielle S. Green5, Sedat Gundogdu6, Anja Krieger7, Martin Wagner8, Tony R. Walker9

1Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, D-27570 Bremerhaven, Germany. 2Department of Biological and Environmental Sciences, University of Gothenburg, Gothenburg, Sweden. 3Department of Fisheries, Wildlife, and Conservation Sciences, Coastal Oregon Marine Experiment Station, Oregon State University, Corvallis, OR 97331, USA. 4Department of Sociology, Philosophy, and Anthropology, University of Exeter, Exeter EX4 4PY, UK. 5Applied Ecology Research Group, School of Life Sciences, Anglia Ruskin University, Cambridge CB1 1PT, UK. 6Faculty of Fisheries,Cukurova University, 01330 Adana, Turkey. 7Berlin, Germany. 8Department of Biology, Norwegian University of Science and Technology, Trondheim, Norway. 9School for Resource and Environmental Studies, Dalhousie University, Halifax, NS B3H 4R2, Canada.

\*Corresponding author. melanie.bergmann@awi.de

References and Notes

1. United Nations Environment Assembly of the United Nations Environment Programme, “End plastic pollution: Towards an international legally binding instrument”(2022); https://wedocs.unep.org/bitstream/handle/20.500.11822/38522/k2200647\_-\_unep-ea-5-l-23-rev-1\_-\_advance.pdf?sequence=1&isAllowed=y.

2. J. Geddie, V. Volcovici, J. Brock*,* M. Dickerson, “U.N. pact may restrict plastic production: Big Oil aims to stop it" (Reuters, 2022).

3. R. Geyer, in *Mare Plasticum—The Plastic Sea: Combatting Plastic Pollution Through Science and Art,* M. Streit-Bianchi, M. Cimadevila, W. Trettnak, Eds. (Springer International Publishing, Cham, 2020), pp. 31–47.

4. E. Elhacham, L. Ben-Uri, J. Grozovski, Y. M. Bar-On, R. Milo, *Nature* **588**, 442 (2020).

5. L. Persson *et al.*, *Environ. Sci. Technol.* **56**, 1510 (2022).

6. M. MacLeod, H. P. H. Arp, M. B. Tekman, A. Jahnke, *Science* **373**, 61 (2021).

7. L. Cabernard, S. Pfister, C. Oberschelp, S. Hellweg, *Nat. Sustain.* **5**, 139 (2022).

8. L. A. Hamilton, S. Feit, "Plastic & Climate: The hidden costs of a plastic planet" (Center for International Environmental Law, Washington, DC, 2019).

9. F. Demaria, S. Schindler, *Antipode* **48**, 293 (2016).

10. C. Wang, L. Zhao, M. K. Lim, W.-Q. Chen, J. W. Sutherland, *Resour. Conserv. Recycl.* **153**, 104591 (2020).

11. W. W. Y. Lau *et al.*, *Science* **369**, 1455 (2020).

12. N. Simon *et al.*, *Science* **373**, 43 (2021).

Competing Interests

S.M.B. has served as a cochair and microplastics expert on an advisory panel for the California Ocean Science Trust.

10.1126/science.abq0082