Scientists' Declaration on the Need for Governance of Plastics Throughout their Lifecycles

(Released for signatures before the UN Environment Assembly (UNEA) 5.2)

In response to the most recent United Nations Environment Programme (UNEP) global assessment on plastic pollution, we, the undersigned scientific experts, underscore that current practices of production, design, use and disposal of plastics have severe negative consequences for ecosystem health, biodiversity, human health including fertility and cancers, climate, sustainable livelihoods, cultural diversity and therefore human rights worldwide.

Approaches currently proposed for addressing plastics challenges which focus primarily on waste management and actions lower down the zero-waste hierarchy and are limited to pollution by marine litter do not adequately reflect the findings of UNEP's Scientific Advisory Committee for Marine Litter and Microplastics, which concluded that a full life cycle approach is needed which principally focuses on prevention, reduction and redesigning problematic plastics out of the global economy.

The pollution caused by plastics throughout their life cycles is transboundary and transgenerational. Thus, the impacts of plastics are akin to climate change, biodiversity loss, ozone layer depletion and the effects of persistent organic pollutants, all of which already have associated multilateral environmental agreements (MEAs) in place today. We call on governments to support the establishment of a new global treaty based on independently peer-reviewed scientific consensus and local and Traditional Knowledge, Innovations and Practices (TKIP) of Indigenous peoples and local communities to meet the global scale of the plastics crisis at hand.

Virgin plastic production has risen from two million tonnes per year in 1950 to 367 million tonnes in 2020. This is projected to exceed one billion tonnes per year by 2050, and this production is a driver of climate change. Plastic leakage into the biosphere, as litter and as waste in managed systems, has also grown sharply in recent years and is projected to nearly triple from 2016 – 2040. Approximately seven billion of the estimated 9.2 billion tonnes of the plastics produced between 1950 and 2017 is now waste, three-quarters of which is either deposited in landfills or accumulating in terrestrial and aquatic ecosystems.

Irreversible, compounding and planetary-scale exposure of our environment, ecosystems and organisms, including humans, to plastics and associated toxic monomers, oligomers, additives, catalysts, polymerization aids and non-intentionally added substances is occurring.

While knowledge gaps remain, there is clear and unequivocal evidence that the pollution caused by plastics throughout their lifecycles is negatively impacting all levels of biological organisation, from the genetic and epigenetic, cellular and subcellular, through to organismal, population and ecosystem levels, contributing to biodiversity loss and adding to climate change. There is also evidence that the safe operating space for the 'chemical pollution and novel entities' planetary boundary (including plastic pollution) is already exceeded.

Furthermore, the economic costs of plastic pollution in the marine environment alone are significant. In 2018, it is estimated plastic pollution cost $6-19 billion globally from impacts on tourism, fisheries and aquaculture. This is expected to grow in line with projected production, trade and use trends. This number grossly underestimates the true costs since it does not account for lost future income through habitat degradation and ecological impacts contributing to biodiversity loss, nor does it include the substantial direct and indirect costs related to human health, cultural and societal wellbeing and further economic, social and environmental impacts that are difficult to quantify.

As experts who have read and contributed to the multidisciplinary literature on plastic pollution, based on empirical and applied research, we conclude that the rapid rise in plastic production has entirely omitted consideration of the precautionary principle, lacked recognition for the multiple negative externalities and lacked consideration for end-of-life at the design stage of plastic products.

We recognise the efforts taken by governments and organisations around the world to combat the plastics crisis but emphasise that no one country can tackle this deeply systemic challenge alone and that existing commitments will only facilitate a seven per cent reduction of plastic waste emissions to the environment. A largely unregulated plastics industry and the national and international policy frameworks that support and subsidise polluting industries present a grave threat to human and ecosystem health, human rights and climate stability. We also recognise that plastic recycling alone is not a solution to a problem of this magnitude since only a small portion and very few types of monomaterial plastics are currently recyclable, manufacturing with recycled materials requires the use of virgin plastics, the issue of toxic residues in recycled plastics is not being addressed, recycling carries its own environmental burden and recycling campaigns have often been used to increase rather than decrease plastic product consumption.

We identify restricting plastic production, designing product and delivery systems which support reuse and repair infrastructure, as well as alternative and in some cases traditional materials and new business models that avoid plastics as the most promising route towards plastic pollution prevention. We emphasise that existing relevant multilateral environmental agreements are fragmented and insufficient. As with the

climate and biodiversity emergencies, connecting the actions of governments, businesses and citizens into effective global cooperation grounded in scientific consensus is critically important.

There is overwhelming evidence for immediate and decisive action at the global level to cap and phase down plastic production, standardise and reduce the diversity of plastics, plastic products and delivery systems, harmonise monitoring and reporting as well as ensuring compliance and enforcement to prevent and mitigate further harm.

Therefore, we hereby declare that a new legally binding global treaty is the appropriate response towards decisively tackling one of the most pressing human health, human rights, climate and man-made environmental crises of our time.

Such a treaty should strive to prevent and reduce the harm caused by current practices of plastic production, design, use and disposal, including pollution in the environment by promoting a non-toxic circular economy and addressing the full lifecycle of plastics. The 'full lifecycle' should include fossil fuel extraction for feedstock; monomer, polymer and additive production; product design and manufacture; transportation; consumption; waste collection; management; disposal and retrieval of legacy plastics.

We recommend the agreement include the following essential elements to ensure its effectiveness and utility:

- **Establish a credible, salient and agile scientific body to provide scientific, socio-economic and policy evidence and guidance in a democratic and open access manner to ensure the human right to science and freedom of information. Such a body should also ensure local and traditional knowledge, innovations and practices are shared with informed consent.**
- **Specify objectives and establish measurable and time bound targets, universal definitions and indicators and harmonised data collection and analysis protocols inter alia.**
- **Establish a standardised global framework for monitoring and reporting on plastic production, plastic product manufacture, trade, consumption, waste management and retrieval, alongside monitoring of plastic pollution including microplastics and plasticsrelated toxic pollutants in all environments (land, sea, freshwater, groundwater and air) and in biota with support from sustainable global funding mechanisms.**
- **By 2030, substantially reduce virgin plastic production and plastic waste generation primarily through prevention and reduction and secondarily through reuse and non-toxic recycling in alignment with Sustainable Development Goal 12 (SDG-12).**

- **Address product design and use through rigorous safety and sustainability criteria for chemicals and products, including the prohibition or regulation of the use of additives, monomers, catalysts, polymerisation aids, intentionally added nano-and microplastics while enhancing repairability, durability for reuse, bio and eco-safety and allows for recycling only when it is safe and effective.**
- **Require regular reporting on national, regional and international progress on implementation of the agreement.**
- **Specify financial and technical arrangements, including technology transfer to support implementation of the agreement, while considering and responding to developing country needs.**
- **Promote research and development into innovative reuse, refill, traditional and plastic-free solutions while ensuring a sufficient evidence-base to avoid regrettable substitutions and make choices grounded in scientific evidence.**
- **Promote cooperation and coordination with relevant regional and international instruments and existing technical and scientific bodies to ensure synergies and avoid duplication.**

Drafting committee

Dr. Terry Collins, Carnegie Mellon University
Dr. Jane Muncke, Food Packaging Forum
Associate Prof. Trisia Farrelly, Massey University
Dr. Sascha Fuller, University of Newcastle/SPREP
Dr. Steph Borrelle, BirdLife International
Dr. Neil Tangri, GAIA
Malelili Rokomatu, Fiji Water
Professor Jorge Emmanuel, Silliman University
Dr. Leslie Adogame, SRADeV Nigeria / GAIA
Felipe Torres, University of Sao Paulo
Dr. Thomas Aneni, Sustainable Environment Development Initiative (SEDI)
Patricia Villarubia-Gomez, Stockholm University
Dr. Tosca Ballerini, THALASAA Marine Research
Dr. Shahriar Hosseni, ESDO
Professor Richard Thompson, OBE, Plymouth University

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VIEW SIGNATORIES

References:

- Arp, H. P. H., Kühnel, D., Rummel, C., MacLeod, M., Potthoff, A., Reichelt, S., & Jahnke, A. (2021). Weathering Plastics as a Planetary Boundary Threat: Exposure, Fate, and Hazards. Environmental Science & Technology. Available here.
- Beaumont, N. J., Aanesen, M., Austen, M. C., Börger, T., Clark, J. R., Cole, M., ... & Wyles, K. J. (2019). Global ecological, social and economic impacts of marine plastic. Marine pollution bulletin, 142, 189-195. Available here.
- Borrelle, S. B., Ringma, J., Law, K. L., Monnahan, C. C., Lebreton, L., McGivern, A., ... & Rochman, C. M. (2020). Predicted growth in plastic waste exceeds efforts to mitigate plastic pollution. Science, 369(6510), 1515-1518. Available here.
- Brouwer, M. T., Alvarado Chacon, F., & Thoden van Velzen, E. U. (2020). Effect of recycled content and rPET quality on the properties of PET bottles, part III: Modelling of repetitive recycling. Packaging Technology and Science, 33(9), 373-383. Available here.
- Brouwer, M. T., Thoden van Velzen, E. U., Ragaert, K., & ten Klooster, R. (2020). Technical Limits in Circularity for Plastic Packages. Sustainability, 12(23), 10021. Available here.
- Cabernard, L., Pfister, S., Oberschelp, C., & Hellweg, S. (2021). Growing environmental footprint of plastics driven by coal combustion. Nature Sustainability, 1-10. Available here.
- Galloway, T. S., & Lewis, C. N. (2016). Marine microplastics spell big problems for future generations. Proceedings of the national academy of sciences, 113(9), 2331-2333. Available here.
- Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. Science advances, 3(7), e1700782. Available here.
- Goldberg, R. F., & Vandenberg, L. N. (2021). The science of spin: targeted strategies to manufacture doubt with detrimental effects on environmental and public health. Environmental Health, 20(1), 1-11. Available here.
- Harfoot et al. (2017). 'Present and future biodiversity risks from fossil fuel exploitation', Conservation Letters (11)4 e12448. Available here.
- Heller, M. C., Mazor, M. H., & Keoleian, G. A. (2020). Plastics in the US: toward a material flow characterization of production, markets and end of life. Environmental Research Letters, 15(9), 094034. Available here.
- Lau, W. W., Shiran, Y., Bailey, R. M., Cook, E., Stuchtey, M. R., Koskella, J., & Palardy, J. E. (2020). Evaluating scenarios toward zero plastic pollution. Science, 369(6510), 1455-1461. Available here.
- Liboiron, M. (2016). Redefining pollution and action: The matter of plastics. Journal of material culture, 21(1), 87-110. Available here.
- MacLeod, M., Arp, H. P. H., Tekman, M. B., & Jahnke, A. (2021). The global threat from plastic pollution. Science, 373(6550), 61-65. Available here.
- Matouskova, K., & Vandenberg, L. N. (2022). Towards a paradigm shift in environmental health decision-making: a case study of oxybenzone. Environmental Health, 21(1), 1-12. Available here.
- Minderoo (2021). The Plastic Waste Makers Index: Revealing the source of the single-use plastics crisis. Available here.
- Muncke, J., Andersson, A. M., Backhaus, T., Boucher, J. M., Almroth, B. C., Castillo, A. C., ... & Scheringer, M. (2020). Impacts of food contact chemicals on human health: a consensus statement. Environmental Health, 19(1), 1- 12. Available here.
- Persson, L., Carney Almroth, B. M., Collins, C. D., Cornell, S., de Wit, C. A., Diamond, M. L., ... & Hauschild, M. Z. (2022). Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. Environmental science & technology. Available here.
- Plastics Europe (2021). Plastics: The Facts. Available here.
- Rochman, C. M., Browne, M. A., Halpern, B. S., Hentschel, B. T., Hoh, E., Karapanagioti, H. K., & Thompson, R. C. (2013). Classify plastic waste as hazardous. Nature, 494(7436), 169-171. Available here.
- Schyns, Z. O., & Shaver, M. P. (2021). Mechanical recycling of packaging plastics: A review. Macromolecular rapid communications, 42(3), 2000415. Available here.
- Simon, N., Raubenheimer, K., Urho, N., Unger, S., Azoulay, D., Farrelly, T., & Weiand, L. (2021). A binding global agreement to address the life cycle of plastics. Science, 373(6550), 43-47. Available here.
- Stahel, W. R. (2016). The circular economy. Nature, 531(7595), 435-438. Available here.
- Stubbins, A., Law, K. L., Muñoz, S. E., Bianchi, T. S., & Zhu, L. (2021). Plastics in the Earth system. Science, 373(6550), 51-55. Available here.
- UN Environment Programme (2021). Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity, and pollution emergencies. Available here.
- UNEP (2021). From Pollution to Solution: A global assessment of marine litter and plastic pollution. Available here.
- UNEP (2021). Addressing Single-use Plastic Products Pollution Using a Life Cycle Approach. Nairobi. Available here.
- Zheng, J., & Suh, S. (2019). Strategies to reduce the global carbon footprint of plastics. Nature Climate Change, 9(5), 374-378. Available here.