

Plastic product design: Core elements

The design phase is critical to ensuring safer and more sustainable use of plastics. Decisions taken at this stage can determine the circularity of the material¹ as well as its impacts on human health and the environment, especially regarding the need for transparency and traceability of chemicals in plastics since many of them have been identified as chemicals of concern.

This article, which should be considered alongside Articles 3 and 6, will also assist in the **effective implementation** of other provisions of the Chair's text. Robust scientific evidence on the human and environmental impacts of plastic product design has informed the identification of several crucial Article 5 elements. The implementation of these elements would significantly reduce those negative impacts while fulfilling the objectives of UNEA 5/14 for a comprehensive and effective global plastics treaty. These evidence-based core elements are summarised in the **Table** and **Figure** below to support fully informed policy decision-making for safe and more sustainable product design.

Evidence-based criteria are key to identifying products/product groupings of concern, which together with an efficient **listing mechanism** provide a 'start-and-strengthen' approach to the treaty and flexibility as new scientific evidence emerges. A **subsidiary body** with technical experts free of conflicts of interest can guide implementation and updating of criteria.

The scope of the article is currently limited to products which would deviate from UNEA Resolution 5/14. Scope that comprehensively covers product design would better integrate materials and waste, align with the resolution and would simplify implementation - since it would allow for increased harmonization across countries and sectors.

Is the product...

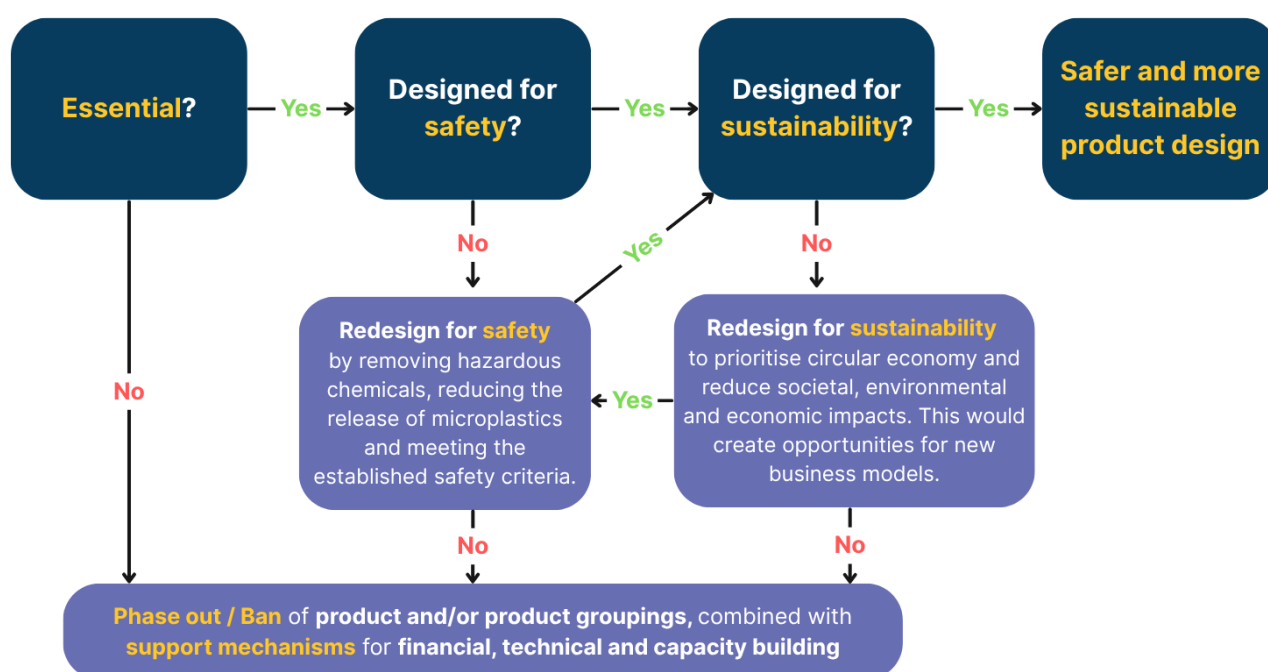


Fig. 1: Illustration of the interconnections between core elements of the decision-making process for achieving safer and more sustainable product design (Article 5).

Table 1: Summary of the core elements and the implications of excluding each on the implementation of the Treaty, to support fully informed decision-making for safe and sustainable product design. Each of the core elements are interconnected and required in unison in the Treaty text.

Core elements	Scientific background	Relation to the Chair's text	Implications for implementation
Global, legally binding controls	The science shows that plastics move across jurisdictional and territorial borders throughout their lifecycles and across a complex supply chains. These global supply chains require global controls.	The Chair's text currently contains several caveats (e.g., national circumstances and capabilities, and appropriate measures) that weaken the provisions	Excluding globally binding controls on product design would hinder global standardization and harmonization making implementation across global supply chains costly and extremely challenging if not impossible.
Transparency and traceability	There is currently little to no transparency and traceability for chemicals in plastics across the plastics lifecycle. Alongside essentiality, they are a necessity for the design of safer, more sustainable, and therefore more circular plastic products ^{2,3} . Transparency is also critical for creating consumer and supply chain actor trust in products ⁴ .	Currently missing from the Chair's text, Article 5	Excluding legally binding controls on product design transparency and product traceability will complicate implementation, given plastics' highly complex global supply chains.
Safety and sustainability	Criteria for safety and sustainability are key for achieving the objectives of the treaty since the design phase is critical in ensuring safer and more sustainable manufacture, use, and management of plastics. Safety and sustainability criteria must also apply to plastic alternatives used in plastic products and non-plastic product substitutes ^{5,6} . Studies report the release of chemicals ⁷ , nano- and microplastics, as well as emissions such as GHGs, throughout the plastics lifecycle ^{8,9} . Addressing these releases and emissions from the design phase is crucial for the protection of human and environmental health.	Safety and sustainability are mentioned in the Chair's Text but need further elaboration to emphasise the importance of criteria establishment and product groupings to be developed by a future science body/ies.	Alongside essentiality and transparency, including safety and sustainability as key product design criteria will improve the implementation of other control measures under the treaty, meet the principles of a safer and more sustainable circular design and economy, and help to efficiently and effectively achieve the objectives of the treaty.
Circular economy	Products and systems designed according to circular economy principles promote resource efficiency and move products and systems up the waste hierarchy by prioritising prevention, reduction, redesign, repair, repurpose, and remanufacture, while ensuring benefits to the environment and society ¹⁰ .	'Circular economy' is mentioned in the Chair's Text, but the emphasis needs strengthening. Currently, the text places equal weighting on reuse and recycling, which does not follow principles of circularity nor the waste hierarchy.	Failure to design for circular material flows will perpetuate the depletion of resources and increase pollution generation ¹¹ . Aligning circular economy and waste hierarchy goals will ensure that short-term solutions do not hinder long-term success ¹² .

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¹² Syberg, K. et al. (2024) Link circular economy to waste hierarchy in treaty. *Science* 384.
<https://doi.org/10.1126/science.adp4364>

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References

¹ Scientists' Coalition for an Effective Plastics Treaty (2023), Policy Brief: Transitioning to a safe and sustainable circular economy for plastics.
<https://doi.org/10.5281/zenodo.7974916>

² Carney Almroth, B. et al. (2025) Addressing the toxic chemicals problem in plastics recycling, *Cambridge Prisms: Plastics*, 3. <https://doi.org/10.1017/plc.2025.1>

³ Rumetshofer T, Fischer J. (2023), Information-Based Plastic Material Tracking for Circular Economy—A Review. *Polymers*.15. <https://doi.org/10.3390/polym15071623>

⁴ Damberg, S. et al. (2024) Consumers' purchase behavior of Cradle to Cradle Certified® products—The role of trust and supply chain transparency, *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.3919>

⁵ Scientists' Coalition for an Effective Plastics Treaty (2023) Policy Brief: The global plastics treaty: What is the role of bio-based plastic, biodegradable plastic and bioplastic? (possible core obligation 8).
<https://doi.org/10.5281/zenodo.10021063>

⁶ Scientists' Coalition for an Effective Plastics Treaty (2025), Scientists' Coalition Responses to WTO DPP Guiding Questions. <https://ikhapp.org/wp-content/uploads/2025/02/Responses-to-WTO-DPP-Guiding-Questions-Feb-2025.pdf>

⁷ Wagner, M. et al. (2024) State of the science on plastic chemicals – Identifying and addressing chemicals and polymers of concern.
<https://doi.org/10.5281/zenodo.10701706>

⁸ Scientists' Coalition for an Effective Plastics Treaty (2023) Fact Sheet: Plastic pollution at each life stage.
<https://ikhapp.org/material/fact-sheet-plastic-pollution-at-each-life-stage/>

⁹ Karali, N. et al. (2024) Climate Impact of Primary Plastic Production. <https://escholarship.org/uc/item/12s624vf>

¹⁰ Syberg et al. (2022) Circular economy and reduction of micro(nano)plastics contamination, *J. Hazard. Mater.*
<https://doi.org/10.1016/j.hazadv.2022.100044>

¹¹ Awino, F.B., Apitz, S.E. (2024), Solid waste management in the context of the waste hierarchy and circular economy frameworks: An international critical review. *Integr Environ Assess Manag*, 20.
<https://doi.org/10.1002/ieam.4774>

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