

Research Article

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Defining an effective “plastics treaty” through national perspectives and visions during early negotiations

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Abstract

With increased international concern over the pervasive plastic pollution problem, early negotiations to develop a legally binding instrument to end plastic pollution (“the Plastics Treaty”) were supported by 175 member countries toward a sustainable plastics future. Defining features of the plastics treaty by UNEP member countries began in Punta del Este, Uruguay in November 2022 during the first session of the Intergovernmental Negotiating Committee (INC-1). However, INC-1 ended with many unanswered questions regarding the structure, scope, and targets of the treaty. Sixty-seven member countries, including members of the High Coalition Ambition, submitted their objectives, guiding principles, and expectations for the treaty before the INC-2 negotiations while also suggesting measures for its effective implementation. This paper compiles submissions of the 67 member countries and evidence-based policymaking approaches that have been described in peer-reviewed and gray literature following INC-1, but before the INC-2 negotiations in Paris, France in June 2023. Recommendations for developing an effective plastics treaty by most member countries include incorporating the complete life cycle of plastics, promotion of transparency in global trade through uniform labeling measures, capping virgin plastic production, incorporating extended producer responsibility to develop a circular economy, and addressing hazardous chemicals in plastics. Suggested implementation measures include building a multilateral fund, supporting smaller countries with technology transfer, improving local stakeholder engagement, developing subsidiary bodies, and regular national reporting. Encouragingly, many of these national plans were proposed in the Zero Draft document released in September 2023 before INC-3 in Nairobi, Kenya in November 2023 and further developed in the revised draft text which served as the provisional agenda at INC-4 in April 2024 in Ottawa, Canada.

Impact statement

Unsustainable plastic production and the growing global plastic pollution crisis are now indisputable. This increased international concern over the omnipresent global plastic pollution problem resulted in an agreement of 175 UN member countries to develop a legally binding instrument to end plastic pollution (“the Plastics Treaty”). Submissions from 67 UN member countries and evidence-based policymaking approaches from the literature reviewed before INC-2 recommend that an effective plastics treaty should include the complete life cycle of plastics, transparency in global trade via uniform labeling measures, capping virgin plastic production, extended producer responsibility for a circular economy, and eliminating hazardous chemicals. Other measures include establishing a multilateral fund and technology transfer to assist low-income or smaller countries, improving stakeholder engagement, and regular national reporting to help curb this pervasive plastic pollution problem.

Introduction

The global concern for preventing plastic pollution is as pervasive as plastic pollution itself. An estimated 450 million tons of plastic waste is produced annually across the globe and is expected to increase fourfold by 2040 (Geyer, 2020). Existing waste disposal methods are insufficient to manage plastic waste (Lau et al., 2020). Mismanaged plastic waste and resulting omnipresent plastic pollution severely impact human and ecosystem health (Deeney et al., 2022; Walker and Fequet, 2023). Despite the current global plastic pollution crisis, there is currently no single international convention that addresses plastics and their management (Raubenheimer and McIlgorm, 2018; Diana et al., 2022).

Current international policies such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, The Stockholm Convention, and The Honolulu Strategy lack the ability to effectively address all sources of plastic pollution, specifically land-based plastic litter (UNEA, 2018; Simon et al., 2021; Baxter et al., 2022). Also, existing policies tend to focus on plastic waste, and little to no policies address the design, production, and distribution of plastics which are the root causes of the issue (Simon et al., 2021). Global scientists on plastic pollution propose that international organizations need to initiate steps toward a global agreement to reduce plastic pollution (Raubenheimer et al., 2018). There is a need for comprehensive databases and inventories that include emerging legislative, regulatory, and communication-focused initiatives to promote evidence-based policymaking aimed at tackling plastic pollution (Vince and Stoett, 2018; Vince et al., 2023). Evidence-based policymaking is crucial to inform and guide development of effective policies. It involves the integration of research evidence, expert knowledge, and stakeholder perspectives to design and implement policies that address societal challenges (Head, 2013; Cairney and Oliver, 2017). Head (2013) also emphasizes that “evidence” carries intrinsic authority and this provides policymakers with a broader perspective to make more informed choices when developing strategies to combat issues like plastic pollution.

In February 2022, at the resumed fifth session of the United Nations Environment Assembly (UNEA-5.2) in Nairobi, members from 175 countries agreed to adopt a draft resolution (5/14) to develop an international legally binding instrument to end plastic pollution (“the plastics treaty”, including in the marine environment, with the ambition to complete the negotiations by the end of 2024 (United Nations Environment Programme, 2022a, 2022b, 2022c, 2022d; Walker, 2022). United Nations Environment Assembly resolutions 1/6, 2/11, 3/7, 4/6, 4/7 and 4/9 underpin this. An Intergovernmental Negotiating Committee (INC) was also established to develop the framework of this international legally binding agreement (UNEA, 2022a, 2022b).

The UNEA decided to develop an instrument that includes both binding and voluntary approaches and is based on a holistic approach that addresses the full life cycle of plastic as reported in UNEP/EA.5/L.6 (UNEA, 2022a). The assembly also decided to incorporate all the 27 principles of the Rio Declaration on Environment and Development such as Principle 8- “States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies”, Principle 13- “States shall develop national law regarding liability and compensation for the victims of pollution and other environmental

damage” and Principle 16- “the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment” (Rio Declaration, 1992; UNEA, 2022a). Other objectives in the resolution included provisions to encourage sustainable production and consumption of plastics through product design and environmentally sound waste management, and the need for national and international cooperative measures, and to develop national action plans (NAPs) (March et al., 2023, 2024). Member states also expressed interest in including mandatory national reporting to assess the implementation of the treaty and its effectiveness. Resolution 5/14 recognizes the need to promote scientific and socioeconomic assessments for plastic pollution and to generate awareness regarding the issue using education and technology transfers among states. Additionally, the assembly included the objective to encourage a multi-stakeholder action agenda, and a mutual agreement to provide technical and financial assistance to member states as required by their differing national circumstances (UNEA, 2022a).

First session of the intergovernmental negotiating committee (INC)

According to the adopted resolution, the INC would work for the development of the structure of the treaty. Proposed timeline consists of five INC meetings ending in 2024 (Figure 1; UNEP, 2022c).

Accordingly, the first session of INC (INC-1) to develop the treaty, was held from 28 November to 2 December 2022 at the Punta del Este Convention and Exhibition Centre, Uruguay (UNEP, 2022e). Representatives of all member states, intergovernmental organizations, and United Nations’ bodies participated in the negotiations (UNEA, 2022b). Key issues that were discussed during the session had emerged from 21 submissions from member parties. These issues included the need for clear definitions of the terms such as “life cycle”, “problematic plastics”, and “circular economy” (UNEP, 2022c). The scope of these terms must be defined before constructing a structure for the global plastics treaty. An international framework for the assessment of microplastics was also suggested as they comprise the greatest, yet not the most visible, portion of marine plastic pollution and have not been addressed by any policy to date (Xanthos and Walker, 2017; Rognerud et al., 2022; UNEP, 2022c). Another issue highlighted during the session was the reduction and elimination of virgin and single-use plastics (UNEP, 2022c). These legacy plastics further degrade and fragment into microplastics, and failing to curb production could lead to global dependence on unsustainable and inefficient disposal technologies (Bergmann et al., 2022). Standardizing

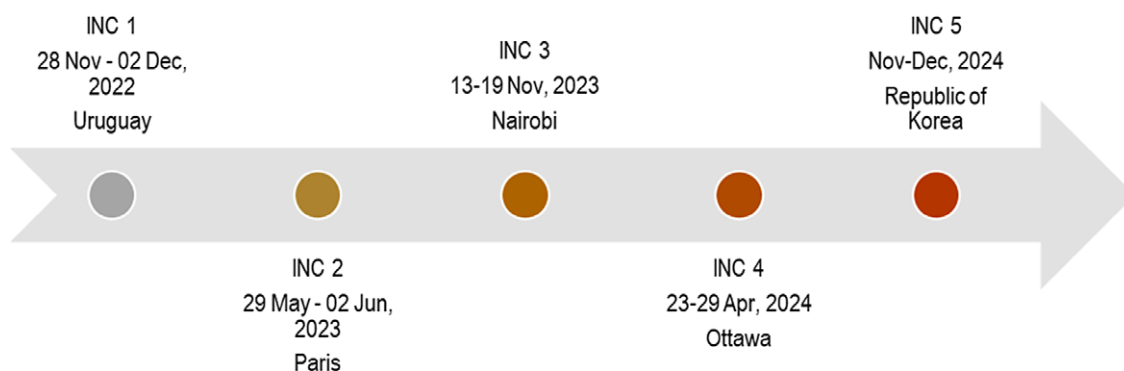


Figure 1. Timeline for INC sessions (United Nations Environment Assembly of United Nations Environment Programme, 2022c).

materials for feedstock, the need for harmonized labeling of plastic products across the world, and investing in innovations for plastic substitutes were also considered for inclusion into the treaty. The committee also identified the need for a just transition and equity for the waste industry workers while also maintaining synergies with existing international agreements such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, The Montreal Protocol and The Paris Agreement on climate change (UNEP, 2022c).

Following its identification as a key treaty aspect, the plastics life cycle was divided into three phases – Upstream, Midstream, and Downstream during INC-1 as reported in UNEP/PP/INC.1/11 to plan specific actions for each of them (United Nations Environment Programme, 2022c). The ‘Upstream’ phase involves extraction of fossil fuels and production of plastics. The priority segments for countries involved in the upstream phase would include measures to reduce virgin plastic production, harmonized feedstock guidelines, and providing incentives for encouraging recycled plastic use. Key challenges such as lack of regulation for operation licenses and industrial dependence were identified for the Upstream phase (United Nations Environment Programme, 2022c). The Midstream phase includes designing and production of plastic-containing products and distribution and trade of plastic products. Priority actions for this sector would include eliminating unnecessary plastic packaging and addressing the socioeconomic impacts of plastic trade (United Nations Environment Programme, 2022c). The Downstream phase consists of plastic disposal, including controlled and uncontrolled waste management. The priority for this phase includes adoption of a circular economy while challenges include lack of awareness at the household level, lack of advanced technology for sustainable disposal of plastics, illegal dumping, and trade of plastic litter, respectively as reported in UNEP/PP/INC.1/11 (UNEP, 2022c).

Improving waste management technologies, increasing community awareness, and capacity-building were some key priorities identified for Small Island Developing States (SIDS) (Ambrose and Walker, 2023). However, lack of technical resources, funding, and workers, as well as heavy dependence on single-use plastic imports remain a challenge (UNEP, 2022c), which has been highlighted by the global research community (Ambrose et al., 2019; Clayton et al., 2021; Walker, 2023). Existing national policies to treat plastic pollution using strategies such as extended producer responsibility (EPR), eco-designing, national zero waste plans, and carbon tax were also discussed as potential tools to be integrated into the treaty (UNEP, 2022c). EPR strategies leverage corporate financial and technical resources to reduce plastic waste generated by consumers and allows local jurisdictions to gain greater control over their waste streams (Diggle and Walker, 2020, 2022; Diggle et al., 2023).

Regarding the treaty structure, opinions differed between member states favoring either a specific legally binding convention or a framework convention that is based on voluntary NAPs, such as is adopted by the Paris Climate Agreement through the submission of Nationally Determined Contributions (IISD Earth Negotiations Bulletin, 2022; Ammendolia and Walker, 2022; March et al., 2023, 2024). Some also emphasized a hybrid treaty that contains both legal obligations as well as voluntary approaches by member states (IISD Earth Negotiations Bulletin, 2022). For implementation, some delegates wanted common monitoring and reporting as in The Minamata Convention on Mercury, while some pointed out the need for a single and stricter global framework for monitoring and evaluation that holds all the stakeholders accountable throughout the plastics life cycle. Many essential questions regarding the

implementation of the treaty, application of global measures, ambitious baselines, and scope of the treaty remained unanswered by the end of the INC-1 (IISD Earth Negotiations Bulletin, 2022). This paper provides a summary and compilation of all the pre-session submissions before the INC-2 negotiations in Paris, France in June 2023 by member countries and global expert opinions ahead of INC-2 on the framework of the treaty, to support policy makers in decision-making.

Methods

A literature review was performed using the TOPIC search (Title, Abstract, and Keyword) in Scopus database to look for articles related to the plastics treaty. The keywords used were “United Nations”, “plastic treaty”, “plastics treaty” and “resolution to end plastic pollution”. The search was limited to only peer-reviewed articles and gray literature published until January 2023. Papers not published in English were excluded from the search. Of the total ‘24’ potential articles discovered, only nine mentioned evidence-based suggestions for the plastics treaty structure. These articles were shortlisted and included in this paper. Based on these articles, eight most mentioned criteria were identified and used for further analysis (Table 1.)

All the pre-session submissions to INC-2 made only by member states were considered ($n = 67$). The literature review was completed in February 2023, so only member state submissions made by February 24, 2023, were considered. In addition to submissions from member states, Norway, and Rwanda as co-chairs of the high ambition coalition (HAC) also submitted a document. All these submission documents included opinions for potential guiding principles and implementation measures for the treaty (Table 2). The official United Nations documents were also retrieved from the UN Official Documents System using the following search, Symbol: UNEP/EA.5; Keyword: “plastic”. These documents were used to get official information about the process of negotiations for the plastics treaty.

International submissions for the second session of the intergovernmental negotiating committee (INC-2)

All member states and stakeholder organizations of UNEA were invited to submit their inputs on guiding principles and objectives of the plastics treaty and methods that could be used for its effective implementation before the INC-2 from 29 May to 2 June 2023 at the United Nations Educational, Scientific and Cultural Organization (UNESCO) Headquarters in Paris, France (UNEP, 2023). The secretariat was also asked to draft a document outlining the potential elements of the treaty (UNEP, 2023). These submissions served as the basis for negotiations at INC-2. Submission documents revealed varying opinions due to differing national circumstances, yet multiple objectives were seemingly agreed upon.

Status of coalitions formed by member countries on an international legally binding agreement to end plastic pollution

Following the historic UN Environment Assembly resolution 5/14 passed in March 2022, Norway and Rwanda launched the “High Ambition Coalition to end Plastic Pollution (HAC)” with 18 like-minded countries that included Canada, Peru, Germany, Senegal, Georgia, Republic of Korea, UK, Switzerland, Portugal, Chile,

Table 1. Summary of reports and peer-reviewed articles by global experts proposing objectives and guiding principles prior to the INC-2 negotiations in Paris, France in June 2023

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular monitoring	Addressing Chemicals of concern	Comments
Bergmann et al. (2022)	✓					✓		✓	Virgin plastic production should be completely banned.
Deeney et al. (2022)	✓	✓							Fossil fuel industry should be regulated. Human health impacts must be taken into account.
Diana et al. (2022)	✓	✓			✓		✓		Research that yields evidences for policymaking must be promoted. Single-use plastics must be controlled.
Raubenheimer and McIlgorm (2018)	✓	✓	✓	✓	✓	✓	✓	✓	Promotion of circular economy and protection of human health should be the focus for the treaty. Inter-organizational collaboration should be encouraged for better implementation.
Raubenheimer et al. (2018)	✓	✓	✓	✓	✓	✓	✓		The agreement should fill the gaps in the existing governance frameworks. Honolulu strategy should act as foundation for the treaty. Indicators should be used to measure effectiveness.
Simon et al. (2021)	✓	✓			✓	✓			Global value chain should be calculated. Incorporating a circular economy should be promoted using financial incentives.
Walker (2022)	✓				✓	✓	✓		Multi-stakeholder involvement can be beneficial. Measurable indicators should be used to evaluate effectiveness. Plastic production should be regulated.
Wang (2023)	✓	✓		✓		✓	✓	✓	Marine plastics and microplastics should be included in the scope of the treaty. Biodiversity conservation could be used as an instrument. Principle of common but differentiated responsibilities must be integrated.
Wang and Praetorius (2022)	✓		✓			✓		✓	Chemical composition in plastic manufacturing should be made transparent.

Denmark, Finland, Sweden, Costa Rica, Iceland, Ecuador, France and the Dominican Republic (High Ambition Coalition to End Plastic Pollution, 2024; TRT World, 2022). The HAC aims to develop a legally binding instrument with strict obligations for environmentally sound disposal of plastic and to end plastic pollution by 2040. They have listed seven key deliverables to ensure success that include elimination of problematic plastics through bans, global sustainability standards for plastic products, establishing sustainability targets throughout the plastics life cycle, ensuring transparency in the plastics value chain, strengthening commitments, better monitoring and reporting at every stage of plastic life cycle, and providing technical and financial assistance for effective implementation of the treaty (High Ambition Coalition to End Plastic Pollution, 2024). Many other member countries joined this coalition after INC-1, forming a total of 51 countries, to show their support toward a strict legally binding treaty and the number is still growing with 65 member countries (Figure 2) as of March 2024 (High Ambition Coalition to End Plastic Pollution, 2024). In contrast, before the meeting in Nairobi, a group of countries including Saudi Arabia, Iran, Cuba, Russia, and others came together to establish the “Global Coalition for Plastics Sustainability,” informally known as the “low ambition coalition” (Bruggers, 2023; Fillion, 2023).

This U.S.-led coalition includes countries like China, and Saudi Arabia, whose economy is dependent on fossil fuel and plastic production and who advocate for a treaty that includes voluntary approaches and individual NAPs (Ammendolia and Walker, 2022; March et al., 2023, 2024; Geddie and Volcovici, 2022). The U.S. proposes promoting national plans that allow individual governments to prioritize sources and types of plastic pollution, while China believes it is difficult to effectively reduce global plastic pollution with one or even many global agreements. Saudi Arabia also agreed to let countries determine their own action plan without standardization or obligations (TRT World, 2022).

Suggestions for guiding principles and objectives

Most submissions prior to INC-2 aimed to have a legally binding international instrument to end plastic pollution that addressed the complete life cycle of plastics and considered the impacts of plastic pollution on human health as a primary concern (Tables 2 and 3). However, countries like the U.S., Japan, China, and Bahrain emphasized the benefits and non-hazardous nature of plastics. They mentioned the need to develop a criterion for environmentally safe and sound disposal of plastics. Bahrain wanted the treaty to focus on solving plastic pollution through sustainable design and production of plastic products, without eliminating them (Bahrain, 2023; China, 2023; Japan, 2023; US, 2023). Malaysia also called for the negotiations to include potential economic benefits of plastics (Malaysia, 2023). The Syrian Arab Republic and the U.S. recommended making the treaty a “country-driven” instrument. Each country should be obligated to create their own national plan as per its national circumstances and implement it (Syrian Arab Republic, 2023; US, 2023). Australia and New Zealand both favored a hybrid approach involving a few legal international obligations as well as national coordination of treaty parties (Australia, 2023; NZ, 2023).

Thailand preferred the format of a specific convention and annexes over a framework convention for the structure of the accord, while The Alliance of Small Island States (AOSIS) strongly confirmed that any structure similar to the existing Paris agreement would be unacceptable (AOSIS, 2023; Thailand, 2023). Morocco suggested that the treaty have smaller and clear objectives with

realistic targets (Morocco, 2023). Countries such as Argentina, Peru, Russian Federation, Canada, Australia, and the United Kingdom expressed that the objectives and principles of this global plastics treaty must be linked and guided by the existing Multilateral Environmental Agreements such as the Basel, Stockholm, Rotterdam, and Minamata Conventions (Argentina, 2023; Australia, 2023; Canada, 2023; Peru, 2023; Russian Federation, 2023; UK, 2023). The Group of African States and Indonesia urged that the principles of the Rio Declaration must also be considered (Indonesia, 2023; The Group of African States, 2023). However, Japan conveyed that there should not be any overlap among agreements (Japan, 2023).

Sierra Leone and African states wanted the implementation of the treaty without any adverse effects on biodiversity, climate or food security (Sierra Leone, 2023; The Group of African States, 2023). Considerations to national circumstances must also be given as situations for developing and developed countries may differ. Hence, Argentina, Ecuador, and AOSIS wanted the treaty to include the principle of equity and encourage participation from small countries as well (AOSIS, 2023; Argentina, 2023; Ecuador, 2023). AOSIS even mentioned the involvement of SIDS in promoting sustainable production technologies for plastics. Other important inclusions mentioned were of “marine litter management” by Bosnia and Herzegovina as well as the Federated States of Micronesia and “microplastics management” by countries such as Ecuador, Monaco, and Japan (Bosnia and Herzegovina, 2023; Ecuador, 2023; Federated States of Micronesia, 2023; Japan, 2023; Monaco, 2023). Along with these, the countries demanded a clear and broader scope of definitions for the terms like “lifecycle”, “problematic plastics”, “environmentally sound management”, and “bioplastics” (Egypt, 2023; Japan, 2023; Sierra Leone, 2023). Inconsistently applied definitions and the general lack of regulation for bioplastics remain a hurdle to the successful development and implementation of the Global Plastics Treaty (Ammendolia and Walker, 2024).

Nearly two-thirds (65.6%) of the 67 submissions before INC-2 agreed to put a cap on virgin plastic production (Table 2). Norway, Sri Lanka, Singapore, and many others mentioned the need to phase-out problematic and single-use plastics from the environment (Norway, 2023; Norway and Rwanda as co-chairs of the High Ambition Coalition to End Plastic Pollution, 2023; Singapore, 2023; Sri Lanka, 2023). Monaco stressed the urgent need to keep the production rates of both fossil-based and bio-based plastic polymers under sustainable limits. Secondary or recycled plastics should be encouraged, while there should be a complete global ban on single-use plastics (Monaco, 2023). To this, the United Kingdom added an exception for medical plastics that might be necessary under certain circumstances (UK, 2023). New Zealand suggested the introduction of fossil fuel subsidy reforms to curb production (NZ, 2023). The Cook Islands also stated that priority must be given to dealing with legacy plastic waste and pollution (Cook Islands, 2023).

New Zealand, Ecuador, and the Syrian Arab Republic supported the consideration of waste hierarchy in the treaty that involves reduction in plastics ending up in landfills or incinerators (Ecuador, 2023; NZ, 2023; Syrian Arab Republic, 2023). The principles of reuse and recycling were advocated for (China, 2023; Mauritius, 2023). More than 75% of member state submissions before INC-2 supported the inclusion of measures that promote development of a circular economy globally. The European Union along with many other members suggested the application of economic incentives such as landfill taxes and incineration taxes

Table 2. Pre-session submissions (prior to the INC-2 negotiations in Paris, France in June 2023) by all member parties of UNEP representing proposed objectives and guiding principles. Countries highlighted in green represent High Coalition Ambition members and the other member parties are highlighted in red

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular government monitoring	Addressing chemicals of concern	Comments
Norway & Rwanda as Co-Chairs of High Ambition Coalition to end plastic pollution	✓	✓	✓	✓	✓	✓	✓	✓	Negative fiscal incentives supporting plastic production should be removed and treaty should ensure a coordinated global action for sound disposal of microplastics.
Armenia	✓					✓			Redesigning and recycling of plastics must be given attention (Armenia, 2023).
Australia	✓	✓	✓		✓		✓	✓	Treaty should be able to control human health impacts of plastic. Circular economy must be supported through promotion of market-based instruments.
Azerbaijan	✓		✓	✓		✓		✓	Plastic waste collection and recycling technologies must be improved and biodegradable substitutes to plastic must be addressed through the treaty (Azerbaijan, 2023).
Burkina Faso]	✓	✓				✓	✓		Alternatives for plastics must be promoted (Burkina Faso, 2023).
Canada	✓	✓		✓		✓	✓	✓	Incorporating circularity in the production industry through harmonized standards for product designs and labeling must be included.
Colombia	✓	✓	✓	✓	✓		✓		Financial incentives for producers to promote EPR can be adopted. Eco-labeling for plastics and quality standards for substitute products must also be listed in an annex.
Cook Islands	✓	✓		✓	✓	✓	✓	✓	Control measures to avoid green washing should be decided. The treaty must adopt a rights-based approach and subsidies on fossil fuels should be eliminated.
Ecuador	✓	✓						✓	Set criteria for identifying polymers, chemicals of concern, and plastic products to be listed in an annex.
European union	✓	✓	✓	✓	✓	✓	✓	✓	Reduction in supply of primary plastic polymers must be ensured. A ban on microplastics which are intentionally added into consumer products should be mandatory. The treaty should also introducing non-party trade measures.
Federated States of Micronesia	✓	✓		✓		✓		✓	Extraction, refinement and use of fossil fuels for plastics should be regulated.
Georgia	✓					✓		✓	Special conditions to allow plastic production and provision of incentives to support circular economy must be enlisted.
Ghana	✓			✓		✓	✓		Adoption of Global Plastic Pollution Fee (GPPF) could be an answer to all the implementation and production challenges. Investing in environmentally safe and sound global waste management infrastructure should be promoted.

(Continued)

Table 2. (Continued)

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular government monitoring	Addressing chemicals of concern	Comments
Guinea	✓	✓	✓	✓	✓		✓	✓	Establishing international standards for waste exports and determination of plastic waste export quotas after prior consent should be considered (Guinea, 2023).
Monaco	✓	✓	✓	✓	✓	✓	✓	✓	Set criteria for identifying hazardous polymers must be listed in an annex. Non-party trade measures should be addressed.
New Zealand	✓	✓	✓			✓	✓	✓	The treaty should have time-bound and measurable targets. Traditional Indigenous knowledge should be considered. Product Stewardship models can be encouraged. Countries should invest into finding alternatives to plastic.
Norway	✓	✓	✓	✓	✓	✓	✓	✓	The scope of treaty should include microplastics. Non-party trade measures and introduction of incentives, fee, and tariffs at national level must be included.
Peru	✓	✓		✓	✓	✓		✓	Single-use plastic products should be eliminated across the globe and a circular economy must be promoted.
Rwanda	✓	✓	✓	✓	✓	✓	✓	✓	Global cooperation regarding product designing and use is expected. Targeted development programs must be organized for specific sectors acting as plastic waste source. National Reporting can be a useful tool (Rwanda, 2023).
Switzerland	✓	✓	✓		✓	✓	✓	✓	Waste hierarchy should be taken into account. Improved remediation and management of legacy plastic waste must be included.
United Kingdom of Great Britain and Northern Ireland	✓	✓	✓	✓	✓	✓	✓	✓	The scope should include microplastic management. Harmonized labeling of plastic products and providing economic incentives for businesses can promote circularity. Illegal waste dumping must be tracked.
Uruguay	✓	✓			✓	✓	✓	✓	The focus of treaty should be complete phase-out of microplastics and nanoplastics. A list of alternatives to plastics that should not be promoted due to their impact on human health or the environment must be added. An intersessional working group should be established for negotiations.
Argentina	✓	✓	✓		✓				The focus of this treaty should be on protection of human health while linking objectives with other existing international policies. The principle of common but differentiated responsibilities must be adopted.
Bahrain	✓						✓		Treaty should make shifting toward a circular economy mandatory while addressing the socioeconomic impacts of plastic production.
Bangladesh	✓	✓			✓	✓	✓		A special fund for developing countries to combat plastic pollution must be introduced. Microplastic management

(Continued)

Table 2. (Continued)

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular government monitoring	Addressing chemicals of concern	Comments
									must be given priority. Strengthening institutional capacities and integrating national and international organizations should be done. A yearly reward system can be initiated for encouragement and recognition.
Bosnia and Herzegovina	✓	✓		✓	✓	✓	✓		Management and regulation of marine litter and microplastics must be addressed. Introduction of penalties for countries who fail to manage plastic pollution and strengthening science and policy interfaces would be beneficial.
Brazil	✓	✓			✓		✓	✓	Addressing health and social impacts of plastics should be the priority and assessment of microplastics must be done (Brazil, 2023).
Cambodia		✓		✓	✓	✓	✓		Financial support to low and middle income countries must be given for better plastic management. Increasing green jobs can create opportunities for development (Cambodia, 2023).
China		✓			✓				Improving the system to reuse of plastics must be addressed. Indicators of plastic recycling must be set and control on transboundary movements of plastic should be regulated.
Egypt	✓	✓	✓	✓				✓	Treaty should support just transition to sustainable livelihoods for waste recyclers and workers and adopt the principle of Common but differentiated responsibilities. Eco-labeling and support to green initiatives can promote circular economy.
Equatorial Guinea	✓				✓				Taxes must be put on use of disposable plastics and circular economy should be adopted (Equatorial Guinea, 2023).
Gabon	✓	✓		✓	✓	✓		✓	Remediation system for ocean plastic litter and positive credit mechanisms for producers must be adopted (Gabon, 2023).
Group of Latin America and the Caribbean Countries (GRULAC)	✓					✓			Traditional Indigenous knowledge and socioeconomic assessment of plastic pollution must be considered. Research and Development projects related to plastic alternatives should be increased (GRULAC (Group of Latin American and Caribbean States), 2023).
Indonesia	✓	✓		✓	✓	✓	✓		Balance between environmental protection and economic development must be maintained. The principles under Rio declaration 1992 and Principle of common but differentiated responsibility must be added.
Islamic Republic of Iran	✓	✓				✓	✓		New laws and policies to reduce hazardous plastic production should be developed nationally. Provisions for

(Continued)

Table 2. (Continued)

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular government monitoring	Addressing chemicals of concern	Comments
									enforcing capacity-building programs for waste management and providing financial and technological support, considering national circumstances must be included (Islamic Republic of Iran, 2023).
Japan		✓				✓	✓		Overlapping with other international agreements must be avoided and a global common goal to reduce plastic should be set. Demand side management should be dealt in addition to supply side alternatives. Development of nation-wide environmentally sound waste management infrastructure should be promoted.
Kenya	✓	✓	✓		✓	✓	✓	✓	Tracking the use of plastic polymers and feed stocks should be done transparently. Definition of Environmental Sound Management (ESM) for resource efficiency should be made clear (Kenya, 2023).
Kuwait	✓	✓		✓					A risk framework should be developed (Kuwait, 2023).
Libya	✓	✓			✓	✓			High-risk and leakage-prone plastic products must be eliminated completely. Technological and financial support should be provided for developing circular alternatives.
Malaysia	✓	✓	✓				✓		Potential economic benefits in ending plastic pollution must be included in the negotiations.
Mauritius		✓	✓		✓		✓		3Rs concept should be promoted and a No transboundary plastics waste dumping policy must be created. National Action Plans and capacity building to be included as well.
Morocco	✓			✓	✓	✓	✓	✓	Promoting research and development to encourage circularity in economy should be done at each level. The polluter pays principle can also be integrated with it.
Nepal	✓					✓	✓		Community based regulatory plastic waste disposal mechanism should be adopted with mandatory segregation of plastic wastes at source. A pollution control fund could be established (Nepal, 2023).
Nigeria	✓	✓		✓		✓	✓	✓	Just transition for waste recyclers and frontline workers should be ensured. Buy-back model through incentives targeting improved sorting-at-source strategy can be a good approach.
Oman	✓	✓	✓		✓		✓	✓	Addressing worker safety in waste management sector and developing uniform structure for analyzing and sampling marine plastic litter should be prioritized (Oman, 2023).
Palau	✓	✓	✓	✓	✓	✓		✓	Clear downstream measures for waste sorting, recycling and export of plastic waste should be identified and island nations must be promoted to participate in circular economy. Marking and tracking of fishing gears to

(Continued)

Table 2. (Continued)

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular government monitoring	Addressing chemicals of concern	Comments
									incentivize retrieval of lost gears should be mandatory (Palau, 2023).
Papua New Guinea	✓	✓					✓		A robust financial mechanism like the Multilateral Fund of the Montreal Protocol should be developed (Papua New Guinea, 2023).
Philippines	✓	✓		✓	✓	✓	✓	✓	Establishment of alternatives to plastic packaging and an international compliance of plastic pollution free products must be done (Philippines, 2023).
Qatar	✓	✓	✓			✓	✓		Harmonized labeling of plastic polymers should be done. Nationally determined baselines and targets for plastic production reduction must be promoted (Qatar, 2023).
Republic of Moldova	✓	✓			✓	✓	✓		Socioeconomic assessments must be made through subsidiary bodies and global sustainability standards should be listed for plastics (Republic of Moldova, 2023).
Russian Federation	✓	✓		✓	✓				Marine plastic litter must be addressed. Implementation of innovative wastewater treatment facilities must be done. Technical and financial assistance should be provided to developing countries.
Saudi Arabia		✓		✓		✓	✓	✓	Open and transparent communication channels should be encouraged throughout the supply chain and cross-parties collaboration is encouraged (Saudi Arabia, 2023).
Sierra Leone	✓	✓	✓	✓	✓	✓	✓	✓	Just transition for workers and avoiding adverse consequences of treaty implementation to biodiversity, climate or food security must be ensured. Regulations for plastic packaging across brands should be harmonized.
Singapore	✓	✓		✓		✓	✓	✓	Prevention of leakage of plastic pollution into marine environment should be ensured. Use of market-based incentives to promote circularity can be included.
Sri Lanka]	✓	✓	✓	✓	✓	✓		✓	There should be a control on transboundary movement of plastic waste. Standards for recycled plastic products should be developed.
State of Palestine	✓	✓			✓		✓		Prevention of marine litter and plastic chip discharge should be addressed. Strict regulations on illegal waste export should be made (State of Palestine, 2023).
Syrian Arab Republic		✓					✓		Countries should have the independence to create their own action plan. Capacity building and introduction of modern technology to analyze and address the plastic waste should be encouraged.
Thailand	✓	✓	✓	✓		✓		✓	Reduction in plastic packaging from e-commerce should be immediately addressed. Harmonized plastic product standards must be developed.

(Continued)

Table 2. (Continued)

Contributors	Legally binding treaty	Life-Cycle Assessment	Clear and Broader definitions	Extended Producer Responsibility	Transparency in global trade	Cap on production	Regular government monitoring	Addressing chemicals of concern	Comments
The Alliance of Small Island States (AOSIS)	✓	✓		✓	✓	✓		✓	A structure similar to the Paris Agreement would not be acceptable and the scope must include microplastic management. Elimination of ghost-gear pollution should also be addressed.
The Group of African States	✓	✓	✓	✓	✓			✓	Principle of just transition for all the waste workers & common but differentiated responsibility should be adopted. Harmonized product design standards and labeling approach should be included in the treaty.
Tonga	✓	✓			✓	✓	✓		Targets and reporting similar to Montreal protocol should be established (Tonga, 2023).
Tunisia	✓	✓		✓			✓		Economic instruments like tariffs and taxes should be used. Establishing minimum recycled content requirements for plastic products should be one of the objectives.
Turkiye	✓	✓							Developing zero waste hierarchy, encouraging research and creation of green jobs should be addressed. Interactions with other multilateral environment agreements must be considered while deciding obligations of the treaty (Turkiye, 2023).
Uganda	✓	✓		✓		✓			Approach for providing financial incentives to promote circularity can be used. Single-use plastics must be strictly banned (Uganda, 2023).
United Republic of Tanzania		✓			✓	✓	✓		The treaty should be in synergy with the Basel convention and Bamako convention. Tracking of the ingredients of plastics, plastic feedstock and polymers must be done. Biodegradable technologies for industries must be promoted.
United States of America]		✓	✓	✓			✓		Treaty should be a country-driven instrument with a provision for withdrawal. Public procurement policies to reduce plastic waste must be developed. Measures for transparent labeling of plastic products and to strengthen demand for secondary plastics should be taken. National reporting should be made mandatory.
Yemen	✓	✓			✓	✓	✓		Prevention of illegal dumping and burning of plastic waste must be looked into. A pilot model to promote waste segregation at source should be developed (Yemen, 2023).

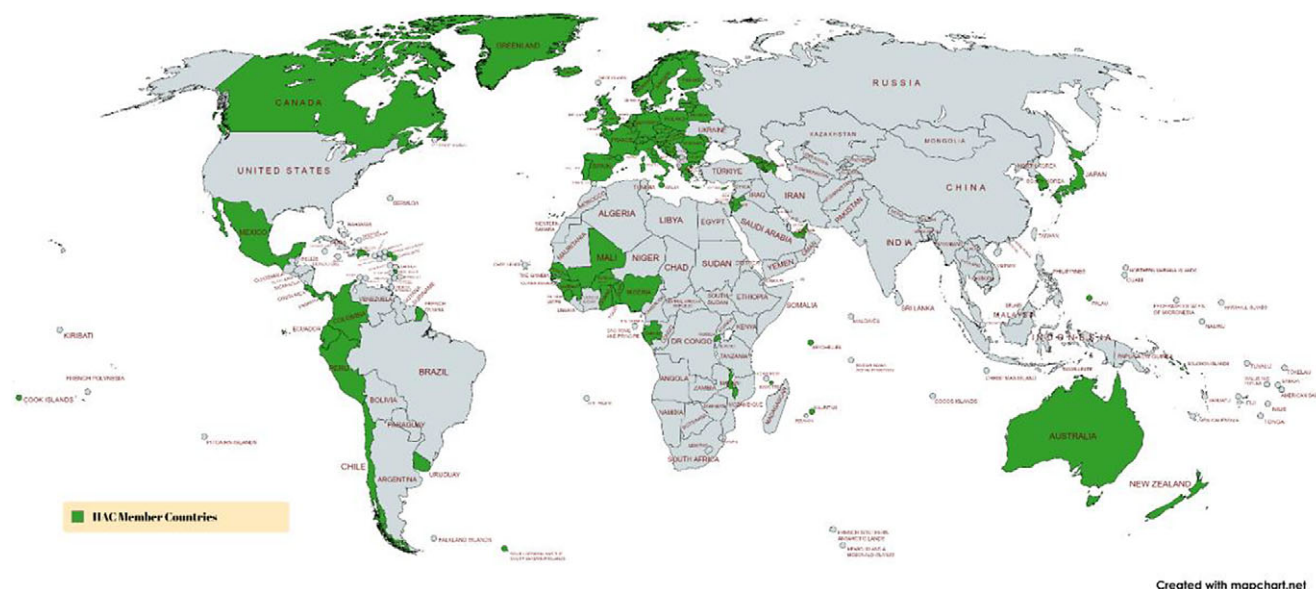


Figure 2. Countries forming the High Ambition Coalition (Data from: High Ambition Coalition to End Plastic Pollution, 2024).

Table 3. Summary of the number and percentage of pre-session submissions (prior to the INC-2 negotiations in Paris, France in June 2023) by category by member countries including guiding principles proposed by global experts

Contributors	Legally binding treaty	Life-cycle assessment (LCA)	Clear and broader definitions	Extended producer responsibility (EPR)	Transparency in global trade	Cap on production	Regular monitoring	Addressing chemicals of concern
High Ambition Coalition Members (n = 22)	22 (100%)	18 (81.8%)	12 (54.5%)	14 (63.6%)	13 (59%)	18 (81.8%)	16 (72.7%)	18 (81.8%)
Other Countries (n = 45)	37(82.2%)	40 (88.8%)	13 (28.8%)	21 (46.6%)	26 (57.7%)	27 (60%)	29 (64.4%)	16 (35.5%)
Global Experts (n = 9)	9 (100%)	6 (66%)	3 (33%)	3 (33%)	5 (55.5%)	7 (77.7%)	5 (55.5%)	4 (44.4%)

to help shift the plastic waste up in the hierarchy (EU, 2023). Tunisia also suggested plastic taxes as control measures (Tunisia, 2023). Other members suggested standardizing product designs internationally that encourage sustainability (Canada, 2023; Colombia, 2023; Georgia, 2023; Morocco, 2023). Designs must extend product lifespan, and ensure durability, recyclability, and safety. Nigeria also supported the “buy-back model” through incentives as a control measure that targets improved sorting-at-source strategies (Nigeria, 2023). In contrast, the U.S. believed that the treaty should not directly establish standards as it would duplicate the work of existing international standard-setting bodies like ISO and ASTM (US, 2023). Morocco also supported the inclusion of product stewardship models like the polluter pays principle to extend circularity in the industry (Morocco, 2023). A total of 35 out of 67-member state submissions prior to INC-2 called for mandatory inclusion of EPR into the legal instrument (Tables 2 and 3). However, Russia stated that the limits of such responsibilities should be left on parties to determine (Russian Federation, 2023).

Another recommendation was harmonized labeling of plastic products and polymers. Producers should be made to incorporate transparent labeling of plastic materials that can allow informed consumer decisions and facilitate reuse and recycling (US, 2023). Along with this, 34 member states have shown increasing concern over the chemicals used in plastic production along with the growing body of knowledge on the toxic effects of chemicals used in plastics

(Dey *et al.*, 2022). Countries including African States, Peru, Ecuador, Canada, Uruguay, and Monaco suggested to enlist all the toxic and hazardous chemicals such as tris(2-chloroethyl) phosphate, phthalates, and brominated flame retardants, all used in plastic production, in an annex as prohibited materials (Canada, 2023; Ecuador, 2023; Monaco, 2023; Peru, 2023; The Group of African States, 2023; Uruguay, 2023). Further, Cook Islands expressed that these annexes should be easily updated with time while the European Union urged these listings to be clearly defined and science-based (Cook Islands, 2023; European Union, 2023). The treaty should also be able to specify if chemical restrictions apply to certain sectors only (EU, 2023). Peru suggests that all parties should be obligated to phase out the use of chemicals, polymers, and plastic products listed in the annex (Peru, 2023). Moreover, each member party should ensure the transparent disclosure of these chemicals or polymers in the composition of products along the value chain for manufacturers, importers, users, consumers, and recyclers through marking or labeling (Monaco, 2023). Monaco also suggested that the secretariat establish a “central data exchange registry” where information is accessible to all member states. This would help with sustainable global trading (Monaco, 2023).

Another important input for inclusion of a specific annex was from Switzerland: an annex of source categories for plastic chemical releases into water, soil, and air. Including sewage, industrial facilities, aquaculture, agriculture, fishing, and unintentional

microplastics releases from textiles, all member parties must implement certain regulations and to regularly monitor these sectors (Switzerland, 2023). An annex that lists all the substitutes for plastic products and criteria for determining their sustainability must be added as well (Colombia, 2023). Countries like Sri Lanka, Mauritius, and China expressed their concern to address the transboundary movement of hazardous plastic waste and its illegal dumping into countries through the treaty, preferring the plastic waste trade to be transparent and regulated internationally (China, 2023; Mauritius, 2023; Sri Lanka, 2023). Over 65% of member states' submissions agreed to make regular government monitoring and reporting mandatory at the national level (Tables 2 and 3).

New Zealand, Australia, and Cook Islands desired the treaty to have a provision for the inclusion of traditional and indigenous knowledge. The prior and informed consent of indigenous people and their nature-based solutions could be an asset when dealing with increasing plastic pollution (Australia, 2023; Cook Islands, 2023; NZ, 2023). Egypt advocated including the principle of common but differentiated responsibilities from the Rio Declaration, the principle of just transition, and clear differentiation in implementation between developed and developing countries, while Uruguay suggested that an intersessional working group which is expected to be established during INC-2 should focus its work in developing prioritization criteria to support the decision-making process related polymers, chemicals, and plastic products of concern measures to be included in the international legally binding instrument (Egypt, 2023; Uruguay, 2023). Additionally, Monaco, Japan, and other countries wanted the treaty to include non-party trade measures as well (Japan, 2023; Monaco, 2023). Lastly, the U.S. wanted a withdrawal provision that could be invoked after being a party to the treaty for at least 3 years, expressing that there is no benefit in keeping parties tied to the instrument if they do not wish to be bound (US, 2023).

Recommendations for implementation of the accord

Funding

Funding plays an integral part for the implementation of any accord and all member countries expressed various strategies to manage funding for the treaty. Thailand, Libya, the Group of African states, Malaysia, Sierra Leone, the Federated States of Micronesia, and many others found that the successful multilateral fund model of the Montreal Protocol should be adopted for this treaty (Thailand, 2023; Libya, 2023; The Group of African states, 2023; Malaysia, 2023; Sierra Leone, 2023; Federated States of Micronesia, 2023). Financial mechanisms need to provide adequate and timely finances to the deserved member parties (The Group of African States, 2023).

The Syrian Arab Republic expressed that developed nations could be donors and the Secretariat must facilitate funding from these donor countries to the ones with limited financial capacity (Syrian Arab Republic, 2023). The U.S., along with Canada, supported a blended financial mechanism that involved both private sectors and international financing institutions (Canada, 2023; US, 2023). A suggestion by the AOSIS involved a country-driven financing system where each country would be obligated to determine its needs and manage its funds through EPR and by undertaking the National Budget Implication calculations (AOSIS, 2023). Ghana's suggestions around treaty funding focused mainly on developing the Global Plastic Pollution Fee through this treaty. This would not only help control plastic pollution and consumption but would also generate annual revenues worth USD \$300 billion, which would be

sufficient for the full implementation of the obligations of this treaty (Ghana, 2023). Funding from the Global Environment Facility was another option included in member state submissions before INC-2 for funding (Japan, 2023).

Technology expansion

Nearly 77% of submissions from member parties before INC-2 wanted a global instrument for plastics that has provisions for countries to promote advancement in product designing and developing circularity in their economy (Table 2). Sri Lanka, Bangladesh, and other developing countries encouraged cooperation among members in sharing new innovations that can help end plastic pollution (Bangladesh, 2023; Sri Lanka, 2023). In support, AOSIS mentioned the importance of SIDS for technology development due to their small geographical and population advantages (AOSIS, 2023). The AOSIS also stated that the need for technology transfer to non-SIDS would be essential for them to meet their targets and obligations. Egypt also mentioned the need to develop a plastic technology center that could supervise research and innovation projects for developing sustainable plastic substitutes. This instrument should also ask private sectors and international technical and scientific bodies to contribute toward building green technology to end plastic pollution (Egypt, 2023).

National reporting

Member state submissions before INC-2 emphasized making national reporting mandatory on the domestic implementation of the treaty obligations. Russia stated the submission of these periodic reports should be every 3 years for adaptive management, while Egypt suggested adopting harmonized formats and definitions for reporting to make the assessment of implementation easy through comparable statistical data (Egypt, 2023; Russian Federation, 2023). Developed countries must also report their support to developing countries during that period (Egypt, 2023). The U.S. stated the national reporting should be binding, precise, and relevant to obligations of the treaty. It should be able to promote transparency and accountability. Simultaneously, the U.S. suggested that the reporting should not be "too burdensome", and that the governing body should try to avoid duplicate reporting through other agreements (US, 2023).

National Action Plans (NAPs)

Another important implementation measure that was included in every member state submission before INC-2 was the development of NAPs that cover the entire plastic life cycle (March et al., 2023, 2024). Implementation must be at the national level and should include timelines and targets for nations according to their national circumstances (EU, 2023). Certain requirements must be decided during the negotiations, for example, the inclusion of awareness-raising activities, strengthening the economy through circularity, and stakeholder engagement at local levels (EU, 2023). Effective policies could thereafter be shared and promoted across other countries. Japan recommended a Plan Do Check Action mechanism for assessing the actions of member parties, urging peer reviews and global assessments in 5-year cycles (Japan, 2023).

Establishment of bodies

The U.S. suggested establishing a governing body such as a conference of the parties that acts as the main decision-making authority under the treaty (Ammendolia and Walker, 2022; US, 2023). This body should be made to convene meetings, review, and evaluate implementation success, and establish further subsidiary bodies within it (US, 2023). Malaysia put forward the idea of

establishing a scientific advisory panel and a socioeconomic advisory panel to facilitate the negotiations as well as the effective implementation of the agreement (Malaysia, 2023). Libya, Monaco, New Zealand, and Malaysia also supported the idea of developing dedicated subsidiary bodies under the main governing body for effective implementation of the goals as in the Montreal Protocol model (Libya, 2023; Malaysia, 2023; Monaco, 2023; NZ, 2023). The AOSIS recommended developing scientific, technical, and economic panels that comprise global experts on plastic pollution and can guide countries over their NAPs (AOSIS, 2023). Similarly, the United Kingdom suggested forming an Evidence and Technical Body that would be responsible for regular testing of polymers, chemical additives, and the presence of microplastics in humans as well as assessing the key sources for the countries to plan their actions accordingly (UK, 2023).

Stakeholder engagement and capacity building

Morocco believed that the treaty must ensure adequate capacity building to each country (Morocco, 2023). Similarly, Indonesia wanted the treaty to acknowledge that all member states are at different capacities when it comes to material processing. Hence, capacity building in developing countries must be prioritized. It should be focused on technicalities of implementing obligations regarding the full plastic life cycle and a circular economy, and of providing technical assistance on evaluating plastic pollution (Indonesia, 2023). Some countries expressed that stakeholder engagement should be encouraged and targeted more locally to solve concerns at the local level of plastic pollution. The U.S. suggested adopting a multi-stakeholder action agenda that promotes high-level stakeholder engagement and encourages stakeholders to act (US, 2023). This agenda should promote cooperation at the global, regional, and local levels, and raise awareness among large and diverse groups of audiences (US, 2023). According to the European Union, the model for stakeholder engagement could be learned and adopted from other conventions “such as CBD, SAICM, and UNFCCC, including voluntary initiatives such as the Global Partnership on Marine Litter, and the ‘New Plastics Economy Global Commitment’ from EMF and UNEP” (EU, 2023, p. 13).

Compliance

Canada, the United Kingdom, and Monaco expressed that a compliance mechanism must be created to ensure all the countries are meeting the objectives set by the treaty (Canada, 2023; Monaco, 2023; UK, 2023). The European Union expressed that the compliance mechanism in the treaty should be like that of the Minamata Convention and must be set in the text of the agreement itself. Moreover, it should be created in a way that it interlinks all accountability processes for the progress of the implementation (EU, 2023). Additionally, the U.S. added that it should be based on the national circumstances of each country, rather than the treaty obligations. The final decision should be left in the hands of member states (US, 2023).

Reverse compensation system

Egypt recommended establishing a digital system that could be referred to as a “reverse compensation system.” This database could be used by waste collectors, intermediaries, and plastic processing facilities to “document and record the quantities of recycled plastic and get a financial return upon reaching their monthly goals” (Egypt, 2023).

Plastics treaty suggestions from global scientists

Plastic pollution has remained a topic of concern for global scientists for decades (Simon et al., 2021). Scientists have reported about the detrimental effects of plastic on ecosystem and human health since the early 1980s (Wang, 2023). Accordingly, scientists have published widely about evidence-based options for the structure of this instrument and what should be included to end the plastic problem effectively which are summarized in Table 1.

Legally binding instrument

There is currently no international treaty that addresses plastics and their waste management (Xanthos and Walker, 2017; Diana et al., 2022). There are a few conventions that address plastic waste disposal such as the Basel and the Stockholm Convention on Persistent Organic Pollutants and The International Convention for the Prevention of from Ships (MARPOL). Other recently developed policies such as the Pollution CBD Aichi Target 8 and the UN Sustainable Development Goal 14 ‘Life below water’ address plastics but lack effectiveness due to their non-binding nature (Walker, 2021; Diana et al., 2022). Therefore, to effectively target surging plastic pollution, there is an urgent need to fill existing policy gaps. Thus, experts demand for an international agreement that legally binds all countries to take necessary actions to end plastic pollution (Raubenheimer and McIlgorm, 2018).

Full life-cycle assessment of plastics

Plastic pollution is ubiquitous and is generated throughout the entire plastics life cycle (Wang, 2023). Hence, to curb plastic pollution the complete life cycle of plastics from raw extraction to end-of-life management needs to be addressed. Wang (2023) explains that the main challenge would be to decide the division of the plastic life cycle. The instrument should cover all the stages as well as stakeholders involved in each stage (Raubenheimer et al., 2018; Raubenheimer and McIlgorm, 2018). These stakeholders include governments, producers, distributors, and consumers. The INC must develop a harmonized approach for implementation of obligations at different stages of the plastic life cycle (Wang, 2023), which was also acknowledged in the Zero Draft and revised the Zero Draft of the Plastics Treaty (United Nations Environment Programme, 2023a, 2023b).

Widening the scope of definitions

Definitions are crucial in determining the scope for any policy. Analyzing existing conventions, Raubenheimer et al. (2018) found that the gaps in their effectiveness were mainly due to the lack of necessary and clear definitions. The UN Watercourses Convention defines pollution as “any detrimental alteration in the composition or quality of the waters of an international watercourse which results directly or indirectly from human conduct” (Raubenheimer et al., 2018, p. 212). This definition is too vague and does not mention microplastics or marine plastic litter, making the scope ambiguous and, thus, debatable. Similarly, MARPOL defines “all plastics” to mean “all garbage that consists of or includes plastic in any form, including synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products” but does not give any exact definition for pollution (Raubenheimer et al., 2018, p. 212). The CBD Aichi Target 8 also fails to include an exact definition of pollution, whereas the Stockholm Convention, while not providing

a definition for pollution, mentions certain criteria for chemicals to be listed as persistent organic pollutants (Raubenheimer et al., 2018). Thus, the instrument needs to include proper definitions for terms like “pollution”, “marine litter”, “problematic plastics”, “environmentally sound management”, “life cycle” and “microplastics” to ensure the scope of this instrument is clear but broad enough to deal with the complete life cycle and different kinds of plastics. Apart from the basic definitions, criteria, and standards for plastic products, the treaty text should clarify the guidelines for EPR schemes for all sectors, harmonized labeling standards, and details of national reporting strategies (Simon et al., 2021; Wang, 2023).

Extended producer responsibility (EPR)

The primary concern addressed through the treaty should be to prioritize and act according to the waste hierarchy that would lead to a reduction in plastic waste (Raubenheimer and McIlgorm, 2018). One of the most common suggestions to reduce plastic waste is to implement an EPR approach. Raubenheimer and McIlgorm (2018) suggested adapting an obligation such as the Norwegian amended waste regulation (No. 1289/2017) that addresses EPR and has shown positive results in waste reduction. However, the polluter pays principle could be much broader and acceptable in the plastics context, especially as just 56 companies are responsible for more than 50% of global branded plastic pollution found in the environment (Cowger et al., 2024). EPR places the financial burden for recycling plastics on the producers even if they are not directly polluting the environment (Diggle and Walker, 2020, 2022; Diggle et al., 2023). Additionally, lack of adequate technology could be a major challenge for the successful implementation of this approach. Hence, negotiations need to plan an effective capacity-building programs before implementing EPR through the treaty (Wang, 2023), which was also as acknowledged in the Zero Draft and revised the Zero Draft of the Plastics Treaty (United Nations Environment Programme, 2023a, 2023b).

Transparency in global trade of plastics

Despite low production rates, Asian developing countries account for most of the plastic pollution in the world (United Nations Environment Programme, 2022b). This is due to the illegal dumping and exports of hazardous plastic waste to these countries, where it ultimately gets burned or dumped in landfills (Walker, 2023). Until recently, China was reported as the world’s largest importer of plastic waste intended for recycling. However, the recent import ban, or the National Sword Policy, by China in 2018 turned global plastic waste disposal and plastic waste trade into large-scale issues as the large quantities of plastic waste previously received by China were now distributed to developing countries with critically smaller recycling capacities (Raubenheimer and McIlgorm, 2018; Walker, 2018). Therefore, the treaty must include a focus on regulating the global plastic waste trade and making distribution within the plastic life cycle more transparent (Diana et al., 2022). This could be achieved by setting guidelines and adopting common labeling measures across the world. It should also work on preventing such sudden actions such as China’s National Sword policy from happening without prior agreement between parties (Liu et al., 2018; Raubenheimer et al., 2018).

Cap on production

Bergmann et al. (2022) state that the treaty must make provisions to curb virgin plastic production. The current rate of plastic

production is about 450 million tons annually and is expected to double by 2040 (Bergmann et al., 2022). These legacy plastics, if not properly managed, will degrade into microplastics in the environment and become even harder to manage (Walker and Fequet, 2023). Legacy plastic and subsequent microplastic pollution can cause irreversible damage to the environment. Hence, there is an urgent need to completely phase-out virgin and non-essential single-use plastics from our environment by 2040 (Bergmann et al., 2022; Baztan et al., 2024). Thus, the treaty must address this issue through established timelines, as acknowledged in the Zero Draft and revised the Zero Draft of the Plastics Treaty (United Nations Environment Programme, 2023a, 2023b).

Regular monitoring

To track the proper implementation of the obligations of the treaty, national reporting should be mandatory (Raubenheimer and McIlgorm, 2018; Diana et al., 2022). The reporting should include details regarding production, consumption, disposal, and trade of plastics. Apart from this, operating certain national monitoring programs could also be included (Raubenheimer et al., 2018). Diana et al. (2022) suggested incorporating corporate reporting that is also made available to researchers and governments for analyzing policy effectiveness through the implementation of this treaty.

Addressing chemicals of concern

During early negotiations, >10,000 chemicals had been identified that are added to the plastics during their production as additives, stabilizers, and processing aids (Dey et al., 2022; Wang and Praetorius, 2022). However, this number has been revised twice since the Plastics Treaty negotiations began. For example, in May 2023, it was reported that >13,000 chemicals, of which >3,200 were classified as hazardous (United Nations Environment Programme and Secretariat of the Basel, Rotterdam and Stockholm Conventions, 2023), and in March 2024, another report stated that >16,000 plastic chemicals, with >4,200 of those considered to be highly hazardous (Wagner et al., 2024). These chemicals include bisphenols, phthalates, alkylphenols, toxic metals, and flame retardants and are released from plastic products throughout their life cycle and can cause harmful effects to both environment and human health (Walker et al., 2022). To reduce this, Wang and Praetorius (2022) suggested reducing chemical complexity of plastics through standardized formulations. Also, there should be transparency in chemical compositions and quantities throughout the supply chain to be better managed. Lastly, they recommend using economic incentives such as taxes and levies to promote information transparency of chemicals used in plastics. Producers could be charged fees based on their level of transparency of chemical compositions and use of certain chemicals during manufacturing. Fees could be used to implement the treaty (Wang and Praetorius, 2022). Moreover, this important issue was highlighted in the Zero Draft and revised the Zero Draft of the Plastics Treaty (United Nations Environment Programme, 2023a, 2023b).

Other recommendations

According to Deeney et al. (2022), the treaty must address the impacts of plastics on human health and plan necessary actions accordingly. At present, there is no sufficient scientific evidence readily available to inform the agreement. Although there have been many submissions by various non-governmental organizations to the UNEP presenting current evidence for neurotoxicity,

endocrine disruption, reproductive issues, respiratory problems, inflammation, increased cancer risk, and damage to mental health because of pollutants released throughout the plastic life cycle, yet their quantification rarely occurs at a larger or global scale as that of the treaty (Deeney *et al.*, 2022). Therefore, the negotiating committee must encourage research in product design and exposure to plastic polymers and chemicals. Also, better stakeholder engagement with the health research community can deliver better results (Deeney *et al.*, 2022).

Another study by Diana *et al.* (2022) found that plastic bag bans and bag taxes or fees were commonly applied, and on average, regulatory and economic instruments reduced plastic bag consumption by 66% following policy introduction, and reductions were between 40% and 90% in high-income and low-income countries after adopting a fee (Diana *et al.*, 2022). Hence, these evidence-based measures could be adopted by the treaty to bring effectiveness at a global level. Wang (2023) also mentions adopting the principle of Common but Differentiated Responsibilities (CBDR) that originates from Principle 7 of the 1992 Rio Declaration, which emphasizes different responsibilities based on different socioeconomic considerations. This would help to balance different interests between developed and developing countries during the implementation of the plastics treaty.

While the analysis for this study was conducted ahead of the INC-2 meeting in Paris, the authors reflect on the deliberations during the five-day meeting. INC-2 was attended by delegates from 180 nations and dozens of stakeholders including civil society groups, waste pickers, and scientists from the Scientists' Coalition (<https://ikhapp.org/scientistscoalition/>). INC-2 represented the second of five meetings to deliberate over nuances of text, definitions, voting, square brackets, and wording for the new treaty, which could come into force in 2025. The five-day INC-2 meeting was marked by early exclusions of key stakeholders including independent scientists and industrial lobbying (Rognerud and Walker, 2023). Delegates were able to broadly agree on key elements that the plastics treaty should contain, laying the groundwork for the future legally binding agreement. By the end of the five-day INC-2 meeting, nation-state representatives had taken the first steps toward a legally binding plastics treaty to end plastic pollution.

Conclusions

The Plastics Treaty negotiations are lengthy, complex and include many stakeholders (too numerous to mention), with opposing views and ambitions, making any article on this topic dated even before it is reviewed, let alone revised or published which is a limitation of this study. However, this study aimed to document the evolving nature of the Plastics Treaty negotiations in this Perspective submitted to the 'Perspectives on the Global Plastics Treaty vol 1' of Cambridge Prisms: Plastics. It is also acknowledged that the Plastics Treaty negotiations are ongoing, yet this assessment was conducted after INC-1, but prior to INC-2, so another limitation of this study may be that it becomes out of date as country positions change, as they have already done so.

Existing policies for managing plastics are flawed and a legally binding international instrument that includes all stages of the plastic life cycle is crucial to curb plastic pollution. Of the 76 documents (67-member state submissions and nine peer-reviewed articles) analyzed in this paper, 68 support formation of a global legally binding plastic treaty (Table 3). Submissions indicated that, apart from being legally binding, the treaty must also include

voluntary approaches such as community awareness, public-private partnerships, and low-carbon economy alternatives, that would help balance funding for implementation. Additionally, the structure needs to have an annex that includes information on regulated or banned plastic chemicals, polymers, and major sources of plastic waste generation. The instrument must address microplastics and both land- and marine-based plastic litter while giving proper clarification for necessary definitions to widen the scope of the instrument.

Submissions from member countries were comparable to ones recommended by global peer-reviewed articles. Given the limited availability of peer-reviewed literature on this topic during the early stages of negotiations, our study included articles and suggestions from multiple disciplines. There is an overlap between different sciences and policy recommendations for addressing complex environmental challenges like plastic pollution. By integrating insights from multiple disciplines, including natural sciences, economics, and policy analysis, we can develop more robust and effective strategies for achieving environmental sustainability and advancing global cooperation on critical issues such as plastics regulation.

The key foci of different member submissions included regulating the trade of plastics in a transparent manner (44 out of 76), addressing the hazardous nature of chemicals used in plastic production (38 out of 76), curbing the production of virgin plastic (52 out of 76), and developing a circular economy by making EPR approaches mandatory (38 out of 76). In addition, a harmonized approach for designing and labeling products was generally supported by member states. For implementing this treaty, many funding alternatives were suggested. A balanced approach that includes funding from international institutions and involves the private sector, or establishing a multilateral fund like the one in the Montreal Protocol could be beneficial. National reporting, multi-stakeholder agenda, establishing compliance measures, and capacity building by giving special emphasis to developing countries and SIDS must also be included in the treaty. These suggestions were negotiated during INC-2, and many were captured in the Zero Draft before INC-3 (United Nations Environment Programme, 2023a), and subsequently expanded upon in greater detail in the revised draft text of the international legally binding instrument on plastic pollution, including in the marine environment (United Nations Environment Programme, 2023b). The latter document will serve as the provisional agenda at the fourth session of the intergovernmental negotiating committee (INC-4) in April 2024 in Ottawa, Canada in preparation to form an effective treaty by 2024.

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