

Combatting marine plastic litter: state of play and perspectives

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The first scientific reports regarding the impacts of plastic litter on the marine environment emerged at the end of the 1960s (Carpenter and Smith, 1972; Kenyon and Kridler, 1969). By the mid-1980s, experts were already considering possible legal responses to the problem (Bean, 1987; Ryan, 2015) with papers reporting plastics on the seafloor and impacting a variety of marine animals. The focus then shifted to high concentrations of plastic litter in the North Pacific, where novel studies reported the dynamics of stranded beach litter, the factors influencing plastic ingestion by seabirds, and trends in fur seal entanglement. By the early 1980s, growing concern about the potential impacts of marine litter resulted in a series of meetings on marine debris. The first two international conferences held in Honolulu by the US National Marine Fisheries Service played a key role in setting the research agenda for the next decade. By the end of the 1980s, most impacts of marine litter were reasonably well understood, and attention shifted to seeking effective solutions to tackle the marine litter problem.

Research was largely restricted to monitoring trends in litter to assess the effectiveness of mitigation measures, until the last decade, when concern about microplastics coupled with the discovery of alarming densities of small plastic particles in the North Pacific 'garbage patch' (and other mid-ocean gyres). When Captain Charles Moore reported having sailed into the "Great Pacific Garbage Patch" in 1997, marine litter began to loom large in the public consciousness. There has since been a proliferation of reports and media articles, while the international community has launched a range of initiatives, including proposing the negotiation of a legally binding international treaty. The academic literature reflects these trends, with the number of scientific articles on marine plastic pollution increasing from 50 in 2013 to 200 in 2017 (Dauvergne, 2018).

This Study provides a concise overview of these issues and highlights a selection of key initiatives to mitigate and prevent plastic pollution. Section 2 summarizes the various problems associated with plastics and Section 3 assesses the current regulatory frameworks. Section 4 highlights some of the initiatives launched by civil society, including the private sector, while Section 5 presents the ongoing discussions towards an international treaty. Section 6 concludes by suggesting possible ways forward.

KEY MESSAGES

Plastic pollution in the Ocean is alarming, threatening marine species and ecosystems, impacting human activities and wellbeing, and costing billions of dollars each year.

Since a few years, stakeholders have launched several initiatives, at different scales, aimed at reducing the use of plastics, preventing plastic waste from land- and sea-based sources from entering the Ocean, promoting a circular economy approach and encouraging innovations and research in alternatives materials.

The international community is also currently discussing the opportunity to elaborate a specific legally binding instrument to tackle plastics pollution. While it is tempting to propose new international agreements to fill identified legal gaps, recent experiences in multilateral environmental governance compel us to reflect critically on this approach.

In this context, other—and possibly complementary—options must be carefully considered, including the global coordination and monitoring of plastic-related actions, enhancing synergies between competent conventions and developing new initiatives within existing global and regional frameworks.

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1. THE PLASTIC PROBLEM	5
2. REGULATORY FRAMEWORK	7
2.1. Fragmented international governance	7
2.2. Diverse regional legal frameworks	8
2.3. A growing range of national initiatives	8
3. STAKEHOLDER INITIATIVES	9
4. TOWARDS AN INTERNATIONAL TREATY?	9
5. CONCLUSION	10
BIBLIOGRAPHY	11

1. THE PLASTIC PROBLEM

Production of plastics has grown exponentially in recent decades, generating vast quantities of waste. Global plastic production exceeded 360 million tonnes in 2018 (Plastics Europe, 2019). With less than half of this quantity being recycled or consigned to landfill (Geyer *et al.*, 2017; Rochman *et al.*, 2013), an estimated 4.8 to 12.7 million tonnes of plastic finds its way into the ocean each year (Jambeck *et al.*, 2015).

Most plastics are extremely long-lasting and remain in the environment for hundreds of years.¹ Plastics nonetheless begin to deteriorate once in the water,² fragmenting into smaller pieces and into tiny plastic particles ("microplastics")³, that can act as absorbents of organic pollutants and metals (Wang *et al.*, 2018). Plastic waste accumulates in all corners of the ocean, from beaches, mangroves and wetlands, to the water column of the open ocean and the deepest reaches of the sea floor.⁴ Marine litter damages and degrades habitats, entangles and injures animals and is potentially a vector for the transfer of invasive species (Sigler, 2014; Yogalakshmi and Singh, 2020). Marine organisms of all sizes ingest plastic, providing a pathway for harmful chemicals to enter into food webs (Setälä *et al.*, 2018). Plastic particles can now be found in seafood and table salt (Karami *et al.*, 2017; Rochman *et al.*, 2015; Smith *et al.*, 2018.)

The dynamic nature of marine ecosystems and currents makes it challenging to precisely quantify the sources (TARA, 2020) and pathways of marine litter, although much research has been done to better understand these patterns (Figure 1). Rivers are known to be a significant vector for the transport of marine litter, with an estimated 1.15 to 2.41 million tons of plastic waste flowing from rivers into the ocean annually (Lebreton *et al.*, 2017). The main drivers of plastic litter from land-based sources appear to be high population density, mismanagement of plastic waste, incorrect consumers disposal behaviour and high production rates (Lebreton *et al.*, 2017).

BOX 1. HOLISTIC APPROACHES FOR THE REDUCTION OF POLLUTANTS IN THE OCEAN

- Improve wastewater and stormwater management
- Adopt green chemistry practices and new materials
- Implement coastal zone improvements
- Practice radical resource efficiency
- Recover and recycle materials
- Build local systems for safe food and water

Source: High Level Panel for a Sustainable Ocean Economy ("Leveling Multi-Target Strategies to Address Plastic Pollution in the Context of an Already Stressed Ocean" (2020), https://oceanpanel.org/sites/default/files/2020-05/Addressing%20Ocean%20Pollutants%20Full%20Report%20Final_0.pdf.)

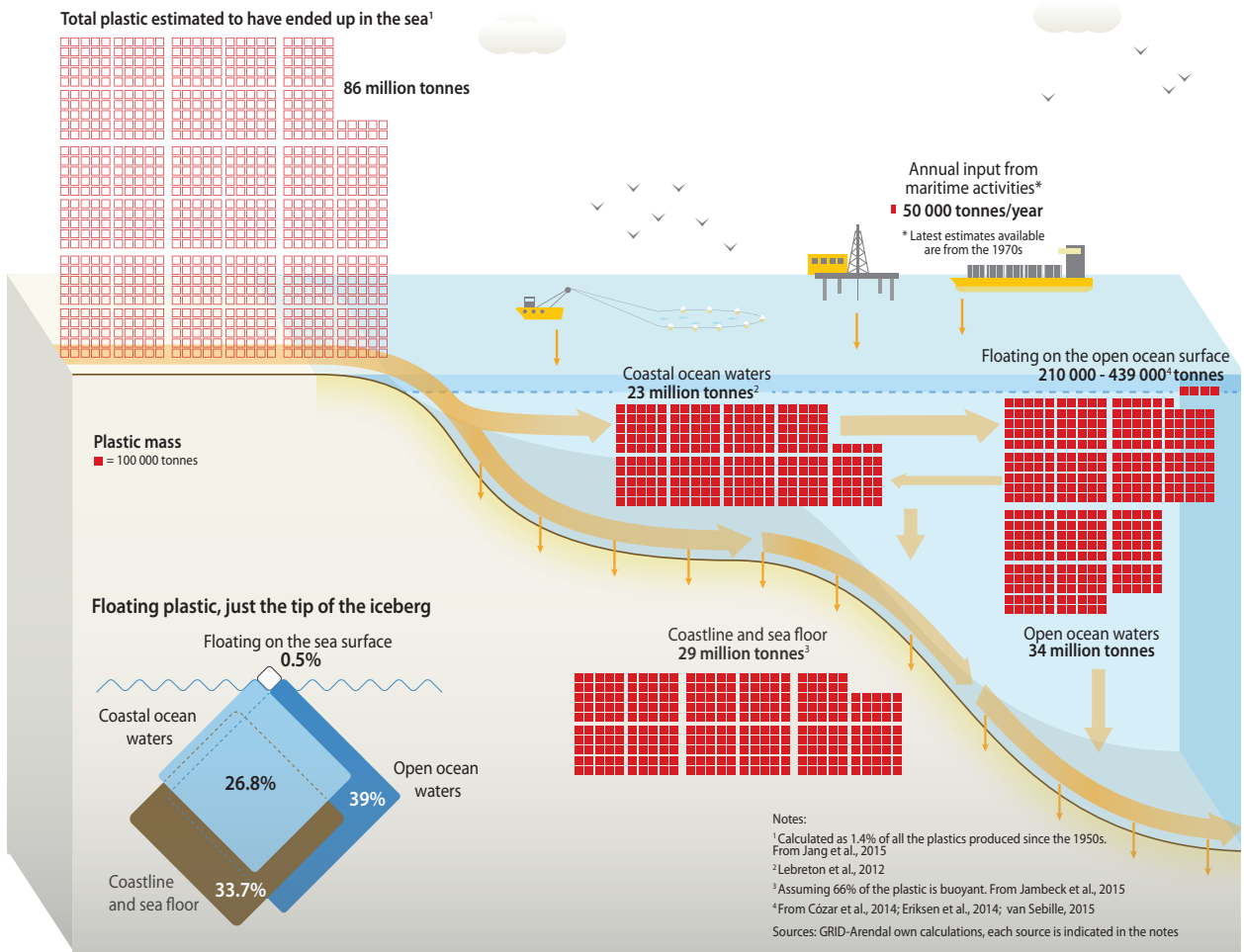
¹ A plastic bottle takes around 450 years to biodegrade; fishing lines takes around 600 years (<https://www.telegraph.co.uk/news/2018/01/10/stark-truth-long-plastic-footprint-will-last-planet/>).

² E.g. through exposure to sunlight (photo-degradation) or through physical and chemical deterioration.

³ "Microplastics" generally refers to fragments smaller than 5mm. When produced through deterioration, these are called secondary microplastics. Primary microplastics are those produced either for direct use, such as for industrial abrasives or cosmetics, or for indirect use, such as pre-production pellets or nurdles.

⁴ <https://www.theguardian.com/global/video/2019/may/14/underwater-explorers-say-theyve-found-plastic-in-deepest-ocean-trench-video>

FIGURE 1. Estimated quantities, sources and locations of marine plastic litter



Source: UN-Environment, GRID-Arendal (2016), Maphoto/Riccardo Pravetton (Marine Litter Vital Graphics: <http://www.grida.no/resources/690>).

2. REGULATORY FRAMEWORK

2.1. Fragmented international governance

Various global agreements covering marine and land-based pollution include plastics to some extent (Table 1). These include:

- The United Nations Convention on the Law of the Sea (UNCLOS, 1982);
- The London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and its Protocol (1996);
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989);
- The International Convention for the Prevention of Pollution from Ships (MARPOL, 1973/1978); and
- The Stockholm Convention on Persistent Organic Pollutants (2001).

A Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) was adopted by 108 governments and the European Commission in 1995, and a Global Partnership on Marine Litter (GPML) was launched in 2012. Plastic litter is also relevant to several of the United Nations (UN) Sustainable Development Goals (SDGs), including SDG 9 on industry, innovation and infrastructure, SDG 12 on responsible consumption and production and SDG 14 on oceans. Four UN Environment Assembly resolutions have been dedicated to marine litter and microplastics.⁵ The plastic problem has also recently caught the attention of world leaders; in 2019, for example, the members of the G20 agreed to “reduce additional pollution by marine plastic litter to zero by 2050 through a comprehensive life-cycle approach that includes reducing the discharge of mismanaged plastic litter by improved waste management and innovative solutions while recognizing the important role of plastics for society”.⁶

While important in their own right, the aforementioned instruments do not specifically address marine plastic litter and therefore do not provide a comprehensive response to the problem: the Stockholm Convention only covers certain component chemicals (Raubenheimer & Mcllgrom, 2018); the London

and MARPOL conventions only cover pollution from ships at sea; and other instruments, such as the Basel Convention and UNCLOS, include only general obligations or have a limited legal mandate (Simon & Schulte, 2017).

More broadly, UN Environment underlines that existing frameworks suffer from a limited recognition of the potential human health impacts of plastic production, inadequate application of the precautionary principle and freedom of information, and a lack of coverage of microplastics from land-based sources and fisheries/aquaculture (UN Environment, 2017).

TABLE 1. Key global instruments addressing plastic pollution

Instrument	Relevant legal provisions	Limitations
UNCLOS	Article 1(4) includes plastic litter in the definition of “pollution of the marine environment”. Part XII provides general obligations to protect and preserve the marine environment.	As a “Constitution for the Ocean”, UNCLOS does not provide specific provisions on marine plastic litter.
London Convention and Protocol	Article 2 binds Contracting Parties to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea.	The Convention only applies to dumping or incineration of waste at sea. Moreover, the Protocol allows the dumping of sewage sludge and dredged material, which may contain plastic, into the marine environment (UN Environment, 2017).
Basel Convention	Plastic is included in the scope of the agreement, and 2019 COP decisions better integrate plastic issues into the collaboration framework, including through (i) specific amendments to the Annexes of the Convention (COP Decision 14/12), (ii) the creation of a “Basel Convention Partnership on Plastic Waste” (COP Decision 14/13).	The Basel Convention tackles marine plastic litter through the specific angle of transboundary movements.
MARPOL Convention	MARPOL Annex V sets rules relating to the prohibition of the discharge of any types of garbage into the sea. Garbage covered by this prohibition include “plastics, synthetic ropes, fishing gear, plastic garbage bags”.	MARPOL Convention only applies to shipping activities.
Stockholm Convention	According to Article 1, the objective of this Convention is to protect human health and the environment from persistent organic pollutants.	The scope of the Convention is limited to certain chemical components used in the production of certain types of plastic.
Global Programme of Action for the Protection of the Marine Environment from Land-based Activities	An intergovernmental mechanism to counter the issue of land-based pollution under which a Global Partnership on Marine Litter (GPML) was created in 2012.	A voluntary intergovernmental programme, therefore not legally binding.
Sustainable Development Goals	SDG 9 on industry, innovation and infrastructure; SDG 12 on responsible consumption and production; SDG 14 on oceans.	A policy initiative and not legally binding.

⁵ UNEP/EA.1/Res.6: Marine plastic debris and microplastics (2014); UNEP/EA.2/Res.11: Marine plastic litter and microplastics (2016); UNEP/EA.3/Res.7: Marine litter and microplastics (2017); NEP/EA.4/Res.6: Marine plastic litter and microplastics (2019).

⁶ G20 Osaka Leaders' Declaration, https://www.g20.org/pdf/documents/FINAL_G20_Osaka_Leaders_Declaration.pdf. Note however that in 2018 members were close to agreeing on a more ambitious declaration that would have set targets and included a follow-up mechanism. The 2019 commitment has therefore been criticised for lacking binding targets and focussing on waste management rather than on reducing production. See, e.g. “G20 plastic trash reduction goal doesn't address 'excessive' production: activists” (Reuters, 1 July, 2019), <https://www.reuters.com/article/us-g20-summit-plastics/g20-plastic-trash-reduction-goal-doesnt-address-excessive-production-activists-idUSKCN11TW10>.

2.2. Diverse regional legal frameworks

Many Regional Seas programmes have developed specific legally binding protocols on land-based pollution, including in the Caribbean (through the Cartagena Convention), the Mediterranean (through the Barcelona Convention), Western Africa (through the Abidjan Convention) and the Western Indian Ocean (through the Nairobi Convention). Some regions have also adopted specific plans to combat marine litter, including plastic, such as the Regional Plan on Marine Litter Management in the Mediterranean (Box 1), the Regional Action Plan for Marine Litter in the North-East Atlantic, adopted under the OSPAR Convention, the HELCOM Regional Action Plan on Marine Litter in the Baltic Sea, and the Regional Action Plan on Marine Litter in the Seas of East Asia. Dumping of waste from vessels, including plastics, is also prohibited by Regional Seas conventions in ten regions⁷ (UN Environment, 2017) and solid waste management is a focus of several of these conventions, though timelines and strategies vary considerably. These regional initiatives face considerable challenges as they are often hampered by insufficient capacity, limited engagement with the business community, and lack of financing.⁸

BOX 2. THE REGIONAL PLAN ON MARINE LITTER MANAGEMENT IN THE MEDITERRANEAN

Within the framework of the Mediterranean Action Plan, the Contracting Parties to the Barcelona Convention adopted the Regional Plan on Marine Litter Management in the Mediterranean (RPML) in 2013. The RFPML is the first-ever legally binding instrument of its kind. It provides for programmes of measures, implementation timetables, guidelines, and assessment baselines. It also promotes cooperation through the establishment of the "Regional Cooperation Platform on Marine Litter in the Mediterranean" and contains several provisions on plastics, including on the reduction of plastic bags consumption and clean-up operations ("Fishing for Litter"; National Marine Litter Clean-up Campaigns; "Adopt-a-beach"). Moreover, the Contracting Parties have committed to promoting a circular economy through the adoption and implementation of the "Mediterranean Strategy for Sustainable Development" and the "Sustainable Consumption and Production Action Plan", with a focus on the priority areas that are the main upstream drivers of pollution generation and environmental pressures on Mediterranean ecosystems.

⁷ The MARPOL Convention provides a similar obligation.

⁸ IISD Reporting Service, Marine Regions Forum Bulletin, p.3.

2.3. A growing range of national initiatives

Countries are increasingly taking domestic action at various governance levels to prevent and reduce plastic pollution. Many of these initiatives have targeted common single-use items (such as plastic bags, microbeads and cutlery) by imposing levies or taxes on consumption and banning or restricting production (Schnurr *et al.*, 2018; Xanthos and Walker, 2017).⁹

Examples of other actions and commitments of relevance include:

- **Indonesia** aims to reduce its waste volume by 30% and to properly manage 70% of its total waste volume by 2025;
- **Japan** has committed \$167 million for the development of marine litter monitoring methods and for cooperation with other Asian countries;
- **The Netherlands** has mobilised \$11.4 million for the period 2018-2022 to develop new techniques to reduce microplastics emissions from plastic waste;
- The **European Union (EU)** has developed instruments dedicated to plastics, including a Strategy for Plastics in the Circular Economy (2018), a Directive on the reduction of the impact of certain plastic products on the environment (2019), new rules for packaging to improve recycling, reduce the use of certain single-use plastics and the labelling of biodegradable plastics (2019)¹⁰ and a new Circular Economy Action Plan (2020);¹¹
- **Norway** has developed a programme for assisting developing countries to tackle waste and microplastics at sea.

However, many fundamental and systemic challenges remain and experts underline there is an urgent need to:

- Support the implementation and improvement of waste management systems, especially in developing countries;
- Improve monitoring techniques to measure the extent of waste and plastics in the marine environment;¹²
- Revolutionise our economic systems and patterns of consumption and production; based on the principles of sufficiency, circularity and "reduce, reuse, recycle";
- Implement extended producer responsibility;¹³
- Support innovation and research to develop alternative materials.¹⁴

⁹ <https://www.nationalgeographic.com/environment/2018/07/ocean-plastic-pollution-solutions/>

¹⁰ <https://eur-lex.europa.eu/eli/dir/2019/904/oj>

¹¹ https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

¹² Marine Litter Legislation: A Toolkit for Policymakers (UNEP, Nairobi, 2016).

¹³ UNEP/EA.4/12

¹⁴ https://www.ted.com/talks/leyla_acaroglu_paper_beats_plastic_how_to_rethink_environmental_folklore

3. STAKEHOLDER INITIATIVES

In recent years, there have been several initiatives launched by civil society and the private sector that aim to address the plastic problem. Figure 2 provides examples of some of these initiatives.

FIGURE 2. Examples of stakeholders' initiatives on plastic

CLEAN-UP OPERATIONS

Beach clean-up initiatives regularly organised by international, national and local NGOs; some initiatives, e.g. [The Ocean Cleanup](#) or [The Sea Cleaners](#) to extract plastic pollution from the Ocean; global clean-up campaigns such as the UN Environment [Clean Seas](#) initiative.

IMPROVING CIRCULAR ECONOMY

Voluntary commitments from the private sector, e.g. Danone, Nestlé and Unilever. Eliminating plastic waste at the source, e.g. [The New Plastics Economy Global Commitment](#), led by the Ellen MacArthur Foundation and signed by 250 organisations.

SCIENCE AND KNOWLEDGE

Various research projects on marine plastic litter (e.g. [Tara Mission Microplastics](#)), citizen science programmes (e.g. [CoastWatch Micro Litter](#)), awareness raising campaigns (e.g. [Planet or Plastic?](#)).

RESEARCH AND DEVELOPMENT

Projects on plastics innovation and alternatives, e.g. [CLAIM project](#), [Parley Ocean Plastic](#), [Global Ghost Gear Initiative](#).

4. TOWARDS AN INTERNATIONAL TREATY?

Amidst increased awareness of marine plastics and a proliferation of initiatives, there is also growing momentum for the negotiation of a legally binding international instrument to tackle the issue (Karasik *et al.*, 2020).

At the third United Nations Environmental Assembly (UNEA-3) in 2017, governments established an Ad Hoc Open-Ended Expert Group on Marine Plastic Litter and Microplastics to explore global governance issues, identify gaps and consider options. Many experts participating in the group argue that a new treaty is needed.¹⁵ At UNEA-4 (2019), several resolutions were tabled that aimed to catalyse international action. Norway, Japan, and Sri Lanka proposed a resolution that sought to strengthen international cooperation and coordination, including by considering the possible development of a new legally binding agreement.¹⁶ India proposed a global phase-out of single-use plastics. Despite broad agreement that urgent and ambitious global action is needed, these resolutions

were rejected due to the concerns of a minority of States.¹⁷ The mandate of the expert working group was nonetheless extended, including to identify technical and financial resources or mechanisms, and it will report on its progress at UNEA-5 in February 2021.

Despite these setbacks, in April 2019 the Nordic Council of Ministers for the Environment and Climate called for "the development of a global agreement to more effectively and comprehensively deal with the issue of marine plastic litter and microplastics on a global level in an integrated manner".¹⁸ In support of this ambition, Council members agreed to provide financial support for a "Nordic Report to inform decision-making, sketching out the possible elements and approaches of a new global agreement that would address the whole lifecycle of plastics with the view to stop plastic litter from land- and sea-based sources from entering the oceans". The Declaration encourages others to join the call for a new global agreement¹⁹ and participate actively in the expert group established by UNEA. Similar commitments to fight plastic pollution, possibly through a global agreement, were also made in 2019 by the Heads of States of the Caribbean Community²⁰ and African Ministers.²¹ In March 2020, the European Commission committed to "lead efforts at international level to reach a global agreement on plastics, and promote the uptake of the EU's circular economy approach on plastics".²²

At the same time, the academic and policy literature has begun to consider the potential value of a new treaty, with a number of commentators arguing in favour of a treaty that includes (Borrelle *et al.*, 2017; Hugo, 2018; Raubenheimer and Urho, 2020; Simon *et al.*, 2018; Tessnow-von Wysocki and Le Billon, 2019; Karasik *et al.*, 2020):

- A global goal to reduce marine plastic pollution;
- Binding national targets;
- National action plans that address the responsibility of the government and private sector actors;
- A technical cooperation and financing mechanism to support implementation at all levels;
- A follow-up and review mechanism;

¹⁵ <https://papersmart.unon.org/resolution/uploads/k1900428.pdf>

¹⁶ https://papersmart.unon.org/resolution/uploads/final_consolidated_marine_plastic_resolution_nor_jp_sl.doc

¹⁷ <https://www.theguardian.com/environment/2019/mar/15/us-accused-of-blocking-ambitious-global-action-against-plastic-pollution-un-conference-environment>; <https://eia-international.org/press-releases/tyranny-minority-slows-international-progress-addressing-plastic-pollution/>;

¹⁸ <https://www.norden.org/en/declaration/nordic-ministerial-declaration-call-global-agreement-combat-marine-plastic-litter-and>

¹⁹ In February 2020, India committed to support global action to address plastic pollution, and to explore the feasibility of establishing a new global agreement on plastic pollution: <https://www.regjeringen.no/en/aktuelt/indian-and-norwegian-ministers-of-environment-commit-to-explore-a-global-agreement-to-stop-plastic-pollution/id2690667/>

²⁰ St. John's Declaration adopted by CARICOM Heads of Government during their 40th session held in St. Lucia July 3-5, 2019.

²¹ Durban Declaration adopted by the African Ministerial Conference on the Environment (AMCEN), November 2019.

²² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A new Circular Economy Action Plan For a cleaner and more competitive Europe, 11 March 2020.

- Provisions on assessment and monitoring conditions in the marine environment in order to monitor implementation of the treaty; and
- Appropriate institutional arrangements to provide a focal point for coordination and an opportunity to establish partnerships. This could include a conference of the parties (COP) and a scientific and technical body.

However, not all stakeholders are convinced of the need for a treaty. A key thread of this debate is the potential for a negative outcome due to “opportunity cost”, i.e. the possibility that focusing on an international treaty will detract from more immediate and effective action (Stafford and Jones, 2019). In this regard, UN Environment has acknowledged that “In recognition of the lengthy timeframes required to adopt such an agreement and the urgent need to initiate immediate and effective measures, a dual approach is warranted” (UN Environment, 2017).²³

5. CONCLUSION

Plastic pollution of the Ocean is alarming, threatening marine species and ecosystems, impacting human activities and well-being, and costing billions of dollars each year (Beaumont *et al.*, 2019). There is now a growing momentum to tackle this problem: the concerns are shared, the challenges have been identified, and some segments of society seem open to making changes to consumption patterns. However, there is no single and simple path forward. In addition to possible new measures, existing national regulations, including on circular economy, voluntary commitments from the private sector, and initiatives from scientists and NGOs must be strengthened and better implemented.

²³ https://papersmart.unon.org/resolution/uploads/unep_aheg_2018_1_inf_3_summary_policy_makers.pdf

At the same time, it is pertinent to consider whether, and how, an international legal framework may be developed. To this end, the ongoing work of the Ad Hoc Open-Ended Expert Group on Marine Plastic Litter and Microplastics, established by UNEA, is providing States with information intended to assist in agreeing on next steps.

While it is tempting to propose new international agreements to fill identified legal gaps, recent experiences in multilateral environmental governance compel us to reflect more critically on this approach. The long and winding road towards a high seas biodiversity treaty has demonstrated how time- and resource-intensive such negotiations can be, while recent setbacks for the Global Pact for the Environment indicate a limited appetite for new global initiatives. Even the Paris Agreement, seemingly a success story, now faces considerable implementation challenges and has not managed to constrain humanity’s ever-growing carbon footprint.

In this context, other—and possibly complementary—options must be carefully considered. These include strengthening the global coordination and monitoring of plastic-related actions;²⁴ enhancing synergies between competent conventions (e.g. Basel, MARPOL, Stockholm), possibly through the post-2020 Global Biodiversity framework; and developing new initiatives within existing global and regional frameworks.

²⁴ https://papersmart.unon.org/resolution/uploads/position_paper_france.pdf

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Combatting marine plastic litter: state of play and perspectives

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