



DISCUSSION PAPER

No more Plastics in the Ocean

Gaps in Global Plastic Governance and Options
for a Legally Binding Agreement to Eliminate
Marine Plastic Pollution

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Summary

Marine plastic pollution is a fast growing problem and it is not yet possible to estimate how severe the impacts currently are. In 2017, 335 million metric tons (Mt) of plastics were produced, and this number is projected to increase almost fourfold to 1,100 Mt by 2050 (Ellen MacArthur Foundation 2016). We know that about 8,300 Mt of plastic has been produced up until this point, of which only 9% have been recycled and 12% have been incinerated. The remaining 79% was landfilled or ended up in the environment uncontrolled, much of it in the world's oceans.

Between 4.8 and 12.7 Mt of plastics ends up in the ocean each year, adding to the uncontrolled plastic waste already floating around the world's seas (Jambeck et al. 2015). An estimated 5.25 trillion pieces of plastic are drifting on the ocean surface (Eriksen et al. 2014). Furthermore, it is estimated that the amount of plastics already sunken to the ground is several times higher (Bergmann 2017). Large chunks and small particles, or macro- and microplastics are negatively affecting more than 1,400 species (Tekman et al. 2018). It also costs the tourism sector hundreds of millions of US\$ each year as workers are constantly having to clean up beaches. Despite many good initiatives and action plans, the world is about to lose the overall battle. There is an urgent need to vibrantly address the plastic pollution crisis of the oceans on a global level.

Marine plastic pollution is a result of the rapidly increasing amount of plastics produced in combination with intended or unintended littering and/or insufficient or mismanaged waste collection and recycling systems. Furthermore, product designs are often too complex to accommodate recycling. The global governance of plastics is "characterized by fragmented authority, weak international institutions, uneven regulations, uncoordinated policies, and business-oriented solutions." (Dauvergne 2018: 22). The international community will have to step up its game to address this crisis head-on – not only through more voluntary and more effective measures but also through negotiating and implementing a legally binding treaty to eliminate plastic discharge into the ocean.

Although there are at least three globally binding agreements dealing with sea-based sources of marine litter (UNCLOS, MARPOL, and the London Convention), two multilateral environmental conventions addressing trade in hazardous waste and persistent organic pollutants (the Basel and Stockholm Convention), 18 regional seas programmes, some of which contain legally binding stipulations against marine litter, and a range of partnerships and other commitments, including the Global Programme of Action (GPA) and its Global Partnership on Marine Litter (GPML), glaringly obvious gaps remain in the governance structure of marine plastic pollution. The major gaps identified can be described as follows:

- 1. There is no agreement effectively preventing and minimizing marine plastic pollution, particularly from land-based sources.** Rather, there is a large number of frameworks which address various aspects of the problem. However, many of these have compliance and implementation problems, lack quantified goals, and most sources of plastic pollution in the ocean remain unregulated.
- 2. There is a lack of resources and technical cooperation,** particularly on efforts to improve waste collection systems, enabling and enhancing qualitative recycling, fostering national and local regulatory systems, monitoring compliance with existing regulations at the national level and on supporting the establishment of additional efforts.

- 3. There is a lack of coordination among the various frameworks, instruments and platforms** dealing with plastic pollution. While stronger coordination may contribute to narrowing some of the gaps, there is a need for significantly enhanced cross-sectoral coordination, for substantially boosted multi-stakeholder-driven collaborative efforts and for much closer intergovernmental cooperation.
- 4. There is no institutionalised effort for assessing the state of plastic pollution**, and a lack of standards for monitoring the release of plastic waste or for the current state of plastic waste in the environment, including oceans.¹ As a consequence, there are considerable uncertainties about the amounts, sources and transmission pathways of marine plastic pollution.

A new legally binding international agreement would be essential to closing these gaps and to effectively addressing marine plastic pollution. A convention on the elimination of marine plastic pollution should contain the following essential elements:

- 1. A clear goal to stop further marine plastic pollution** by prohibiting the discharge of plastic waste into the ocean from land- and sea-based sources. This would build on UNEA Resolution 3/7 outlining “the importance of long-term elimination of the discharge of litter and microplastics into the ocean”.
- 2. Binding national plastic pollution reduction targets** which address all sources and outline clearly the responsibilities of governments. The reduction targets should be connected to national plans for action, which should also address the responsibilities of business.
- 3. A technical cooperation and financing mechanism**, providing the means of implementation and technical assistance for adopting a range of tools on the regional, national, and local level, for instance supporting sustainable financing of waste management systems, by schemes based on extended producer responsibility, for example.
- 4. A follow-up and review mechanism, as well as an enhanced science-policy interface**, are needed for tracking progress towards objectives and targets and for continued observation of environmental conditions. The treaty should contain measures to assess conditions in the marine environment in order to monitor implementation of the treaty.
- 5. A central forum for coordination and for establishing partnerships** among governments and other stakeholders. The convention’s decision-making body and other platforms would also bring actors from the various existing platforms and frameworks together to develop programmes and make use of synergies to address the full life-cycle of plastics.

Table 1 illustrates which of the proposed key functions of a new legally binding international agreement would address existing gaps in the governance of marine plastic pollution.

¹ GESAMP is currently preparing guidelines for monitoring and assessment of marine litter.

Table 1: Proposed key functions and (regulatory) gaps addressed

(Regulatory) gap addressed	Proposed key function
Lack of quantified goals and targets in most existing frameworks; currently not all aspects of plastic pollution are covered evenly.	Global goal to eliminate further plastic pollution of the ocean; plus binding national reduction targets
Waste collection and management systems are costly; low-income countries lack resources for implementation; the need for enhanced technical cooperation	Mechanism for technical cooperation and a financial mechanism for funding implementation of national strategies and action plans
Lack of experience with different measures, lack of knowledge regarding successful measures	Toolkit containing possible measures, including for establishing or strengthening extended producer responsibility schemes
Lack of institutionalized mechanism that monitors the state of the environment and the level of plastic pollution in the marine environment, assesses its sources and pathways and outlines its effects, and of a body that develops policy-relevant response options based on such knowledge	Knowledge-based mechanism that provides scientific assessments on plastic pollution's sources, pathways, effects, and that develops response options
Weak monitoring of the effectiveness of existing agreements and initiatives, and of progress towards the goal of eliminating plastic pollution in the ocean	Monitoring and review mechanism
Fragmented nature of plastic pollution governance, lack of coordination between existing agreements and initiatives	Central coordinating forum bringing stakeholders together and fostering inter-agency coordination in the UN System

Apart from the functions outlined here, a classical organizational structure should serve the convention well and include a Conference of the Parties (COP) as the governing body, a Bureau to make short-term decisions and to prepare COP sessions and a secretariat to prepare and facilitate meetings facilitate information exchange and manage other organizational matters.

Further changes to existing frameworks and institutions are needed as well. The oceans-based agreements (UNCLOS; MARPOL; London Convention and Protocol; Regional Seas Agreements) need to tighten their regulation and close loopholes to effectively eliminate sea-based sources of plastic pollution within their mandates, and to increase their cooperation efforts. The Basel Convention urgently needs to include plastic waste as one of the waste streams controlled through its Annex II, and make sure the Partnership on Household Waste is fully operational. While it is important to strengthen efforts within these existing conventions, their mandates are limited and most sources of marine litter remain unregulated.

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List of Abbreviations

AHEG	Ad Hoc Open-ended Expert Group on Marine Litter and Microplastics
APEC	Asia-Pacific Economic Cooperation
BC	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
BPA	Bisphenol A
BRS	Basel, Rotterdam and Stockholm Convention
CBD	Convention on Biological Diversity
CFC	Chlorofluorocarbons
CIEL	Center for International Environmental Law
COP	Conference of the Parties
CSO	Civil society organization
EEZ	Exclusive Economic Zone
EPR	Extended producer responsibility
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCTC	Framework Convention on Tobacco Control
GEF	Global Environment Facility
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GPA	The Global Programme of Action for the Protection of the Marine environment from Land-based Activities
GPML	Global Partnership on Marine Litter
GPWM	Global Partnership on Waste Management
GRB	Garbage Record Book
HLPF	High-level Political Forum on Sustainable Development
ICCM	International Conference on Chemicals Management
IGR-3	Third Intergovernmental Review Meeting to the GPA
IMO	International Maritime Organization
INDCS	Intended Nationally Determined Contributions
IPCC	Intergovernmental Panel on Climate Change
MARPOL	International Convention for the Prevention of Pollution from Ships
Mt	Million (metric) tonnes
ODS	Ozone depleting substance

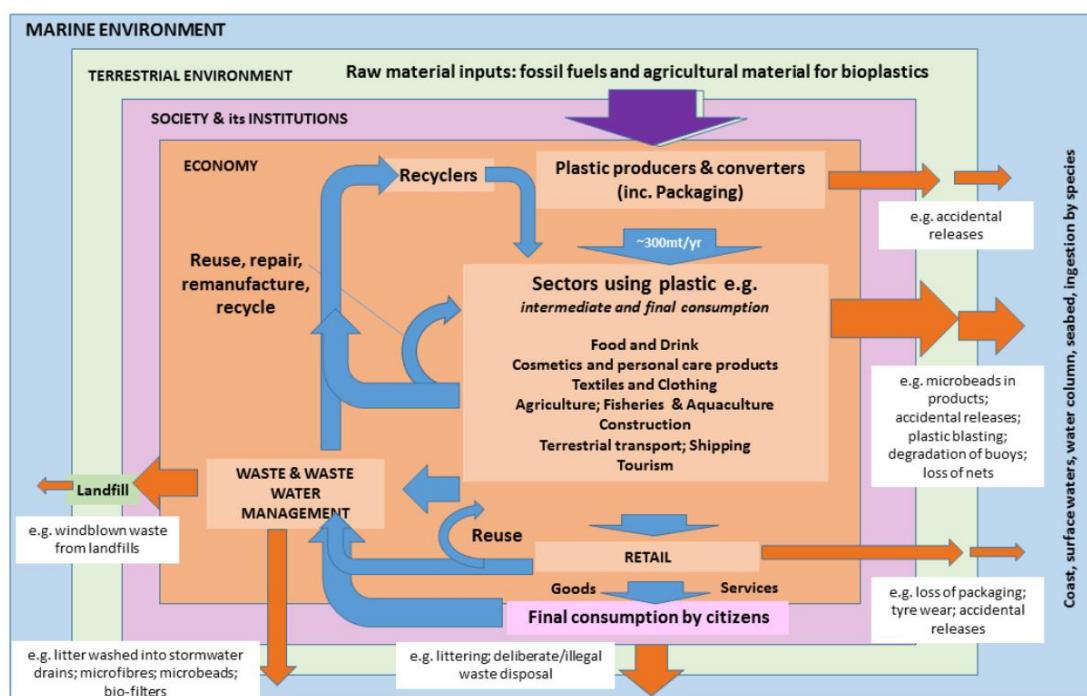
PVC	Polyvinyl chloride
RSP	Regional Seas Programme
SDGs	Sustainable Development Goals
UNDP	United Nations Development Programme
UNEP/ UN	
Environment	United Nations Environment Programme
UNEA	United Nations Environment Assembly
WTO	World Trade Organization

1 Introduction

In 2017, chemical companies and other manufacturers produced 335 million metric tons (Mt) of plastic (Plastics Europe 2018). This is 22 times more than what was produced in 1964, yet it will be dwarfed by the expected production of over 1,100 Mt per year by 2050 (Ellen MacArthur Foundation 2016). That figure is particularly troublesome if one considers that throughout modern history, a total of 8,300 Mt of plastic has been produced. From this, however, only 9% has been recycled and 12% has been incinerated, whereas 79% has been landfilled or accumulated in the environment (Geyer et al. 2017). Plastic waste ending up in the ocean is one of the most rapidly increasing environmental problems of our time. It is estimated that each year, between 4.8 and 12.7 Mt of plastic waste enters our seas (Jambeck et al. 2015).

As ten Brink et al. (2017) show, we are dealing with a complex problem with various sources and pathways and it will not be solved easily. There are many different entry points for plastic waste into the marine environment. A number of sectors in the economy from production, packaging, retail, agriculture, and fishing to the waste and recycling sector are responsible to various extents. Economic factors, consumer behavior, technological change and political decision-making all play a role. This is why the plastic pollution crisis will require a multi-stakeholder and multi-level effort to be addressed. Such an effort should be based on an international and legally binding regulatory framework – a convention to combat marine plastic pollution – as its central forum for decision-making, knowledge exchange, and implementation.

Figure 1: Leakage of plastic into the marine environment from different sectors and through different entry points



Source: ten Brink et al (2017): 2.

The global plastics industry generates an annual revenue of about US\$ 700 billion, and hundreds of billions of dollars are currently being invested in expanding production capacities, predominantly in the US and the Arab Gulf. Global governance must prepare to deal with this production increase and the likely increase in associated plastic pollution worldwide.² This is also mirrored in recent resolutions adopted by the United Nations Environment Assembly (UNEA), which mandated an expert group at the third UNEA in December 2017 to assess existing frameworks, identify gaps and discuss response options which include legally binding arrangements.

Much of the future growth of plastic production is already locked in, with existing investments totalling more than US\$ 164 billion in additional plastic manufacturing capacities in the US alone (CIEL 2017b). In the Arab region too, massive investments are underway, with Saudi Arabia aiming at becoming one of the lead producers (Blas 2017). These investments are made by an industry earning revenues of about US\$ 700 billion per year, which is closely interlinked with the fossil fuel industry providing the feedstock for virgin plastic production (CIEL 2017a; b).

The current approach has thus far not succeeded in bringing down plastic pollution, and it is unlikely to do so in the foreseeable future. As Dauvergne (2018: 29) noted, "industry is channeling the global governance of plastic towards market-friendly solutions that overestimate the value of corporate self-governance and consumer responsibility as ways to reduce pollution." There is no indication that we are reducing plastic pollution. On the contrary, there is growing evidence that the plastic crisis keeps intensifying, and that its effects are worse and affecting more species and ecosystems than previously thought. The contamination from plastic pollution comes with heavy consequences. The LITTERBASE project has accumulated evidence showing that 1,472 species are negatively affected by marine litter, and that plastic items are responsible for the majority of these effects (Tekman et al. 2018).

An increasing number of governments is starting to take the problem more seriously by imposing bans on plastic bags and other single-use items, which form one of the most visible components of the plastic pollution crisis (Knoblauch et al. 2018), as well as other regulations. In global governance, governments and other stakeholders are increasingly aware of the plastic pollution problem: The G7 and G20 have agreed on action plans, the UN Environment Assembly has passed resolutions in each of its three sessions since 2014, the Basel Convention which deals with transboundary movement of hazardous waste is extending its work on plastic, and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activity (GPA) and its Global Partnership on Marine Litter (GPML) are addressing the interface between land-based sources and ocean pollution.

Without a significantly enhanced regime to control, reduce and ultimately eliminate plastic pollution of the environment, much more plastic will contaminate cities, landscapes and the oceans over coming decades. A new and legally binding convention to combat the sources of plastic pollution of the ocean could become the cornerstone of an enhanced framework to address plastic pollution.

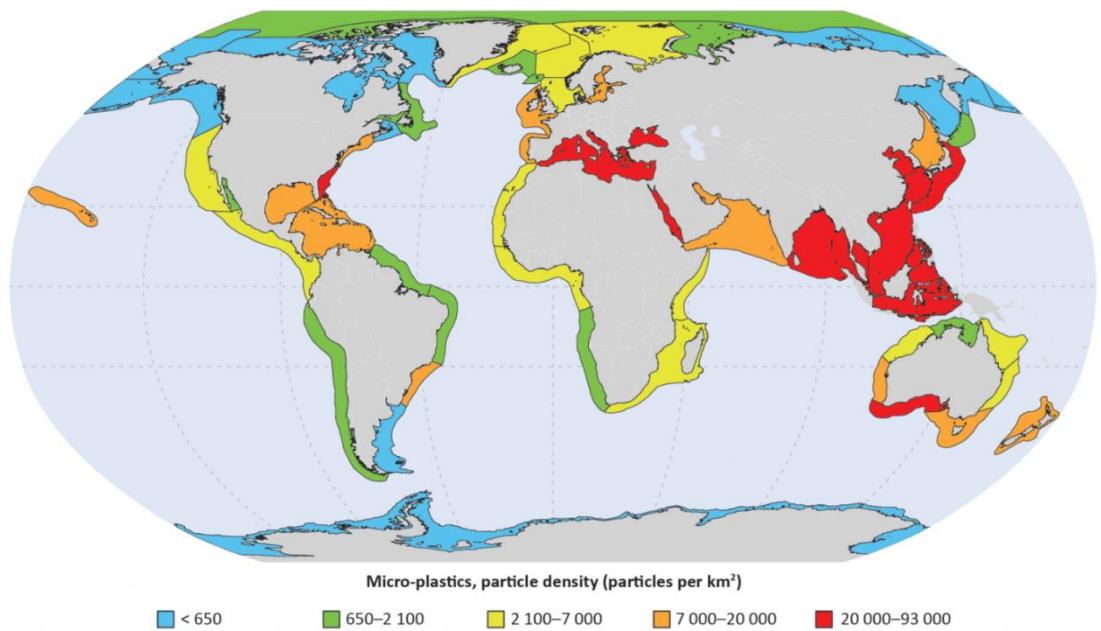
² To our knowledge, the first mentioning of enhancing plastic governance through an intergovernmental treaty comes from Gold et al. (2013). The idea for a plastic treaty was further elaborated by Simon/Schulte (2017), while Raubenheimer/McIlgorm (2017) argued such a treaty could be modelled after the Montreal Protocol. The proposal has since been taken up by a number of academics (see, e.g., Borrelle et al. 2017; Vince/Hardesty 2018; Dauvergne 2018) and civil society organizations.

2 The challenge of plastic pollution

There is no lack of images illustrating the severe nature of plastic pollution: rivers filled with plastic garbage, beaches littered with plastic bottles, seals entangled in pieces of plastic and dead birds and whales whose stomachs are filled with plastic waste. The widespread circulation of these pictures has no doubt contributed to public awareness on the problem of plastic in the marine environment. Scientific studies are providing increasing evidence of the magnitude of plastic waste and the severe impacts on economies and on human and environmental health. In 2015, the UN conducted its First Global Integrated Marine Assessment, which declared that “the accumulation of marine litter is one of the fastest-growing threats to the health of the world’s oceans.”

Marine plastic pollution cannot be treated in isolation of the design, production, use and disposal of plastic on land. In their study of the production and fate of all plastics ever produced, Geyer et al. (2015) calculated that as of 2015, a total of 6,300 Mt of plastic has been produced. Only around 9% has been recycled, 12% burned and 79% either deposited in landfills or the environment. They estimate that by 2050, about 12,000 Mt of plastic, almost twice as much as today, could accumulate in landfills or the environment. While there are many types of plastic such as fishing gear lost at sea, much marine plastic pollution comes from land-based activity. Figure 2 shows the density of particles and associated risks of plastic pollution faced by 66 large marine ecosystems.

Figure 2: Spatial distribution of micro- and macroplastics in large marine ecosystems



Source: Kershaw/Lebreton 2016.

2.1 Main plastic types and products

Plastic is not simply plastic. In today's markets, there are six basic types that dominate:³

- Polyethylene (PE, high and low density)
- Polypropylene (PP)
- Polyvinyl chloride (PVC)
- Polystyrene (PS) and Expanded Polystyrene (EPS)
- Polyurethane (PUR)
- Polyethylene terephthalate (PET)

Packaging is the largest application of plastic, accounting for over one quarter of the total volume produced globally (Ellen MacArthur Foundation 2016: 29). Plastic packaging is ubiquitous in our daily lives, appearing as food-wrappers, shopping bags, water bottles and take-away containers. The use of plastic has increased twentyfold in the past half-century (Ellen MacArthur Foundation 2016: 17).

In the year 2017 alone, 335 million tonnes of plastic were produced globally (Plastics Europe 2018). Cumulatively, an estimated total of 8,300 million tonnes of plastic had been produced (Geyer et al. 2017). Of the plastic waste that has been produced to date, 9% has been recycled, 12% incinerated, and the remaining 79% has accumulated in either landfills or the natural environment (*ibid.*). Only 14% of plastic packaging is collected for recycling, and once additional value losses from sorting and reprocessing are accounted for, only 5% of the material value is retained for subsequent use. This results in an annual loss of US\$ 80–120 billion after the short-lived use of plastic packaging (Ellen MacArthur Foundation 2016: 17).

The Ellen MacArthur Foundation expects plastic use to double over the next 20 years (Ellen MacArthur Foundation 2016: 17). If plastic production trends continue as expected and there are no significant changes to waste management, an estimated 12,000 million tonnes of plastic waste will reside either in landfills or in the natural environment by 2050.

Plastics often contain additives to create the desired characteristics such as colour, softness, stiffness or durability. Hansen et al. (2013: 12) distinguish between four types of additives in plastic:

- **Functional additives** (stabilisers, antistatic agents, flame retardants, plasticizers, lubricants, slip agents, curing agents, foaming agents, biocides, etc.)
- **Colorants**
- **Fillers** (mica, talc, kaolin, clay, calcium carbonate, barium sulphate)
- **Reinforcements** (e.g. glass fibres, carbon fibres).

Hahladakis et al. (2018) argued that many additives are potentially toxic substances (PoTS), which pose a threat at all stages of the lifecycle of plastics. They can migrate from packaging into food, be released during recycling or from recycled products, or leak into the environment. The authors note that the collection and appropriate recycling of plastic waste is the best available option to deal with these risks.

³ There is an on-going discussion on the definition of plastics. While some argue that only synthetic polymers like thermoplastics, thermosetting plastics and elastomers should be labelled as plastics, others argue that even resins and waxes should be treated as plastics – if they possess the same characteristics.

Geyer et al. (2017; private correspondence) note that in 2015, 25.4 million tonnes of additives were used in plastic manufacturing, adding to the 322 million tonnes of plastic produced. An additional 59.4 million tonnes of synthetic fibres bring the total amount of plastics produced up to 407 Mt, or 26% higher than usually referenced (e.g. by Plastics Europe 2018).

Macroplastics are relatively large plastic items with size above 5 mm visible and easy to identify (e.g. littered plastic bags or bottles or larger parts of them). In contrast, microplastics are much smaller with size below 5 mm, often so small that the particles are hardly visible to the eye. Microplastics are further categorized into primary and secondary microplastics. Primary microplastics are engineered mainly to manufacture cosmetics or preproduction pellets, whereas the secondary ones are formed due to the degradation of macroplastics. (Lisa Lahens, 2018).

2.2 Sources and pathways of marine plastic pollution

It was estimated that in 2010 alone between 4.8 and 12.7 million tonnes of plastic entered the marine environment (Jambeck et al. 2015). This, on average, is equivalent to a l garbage truck dumping its entire content into the ocean each minute (Ellen MacArthur Foundation 2016: 29). Over 62 % of all items collected during international coastal clean-up campaigns are plastic packaging (Ellen MacArthur Foundation 2016: 29). Plastic waste enters the ocean through a variety of pathways and stems primarily from land-based sources. Due to poor waste management and illegal dumping, nearly one third of the world's plastic packaging waste ends up in the ocean (Ellen MacArthur Foundation 2016: 26).

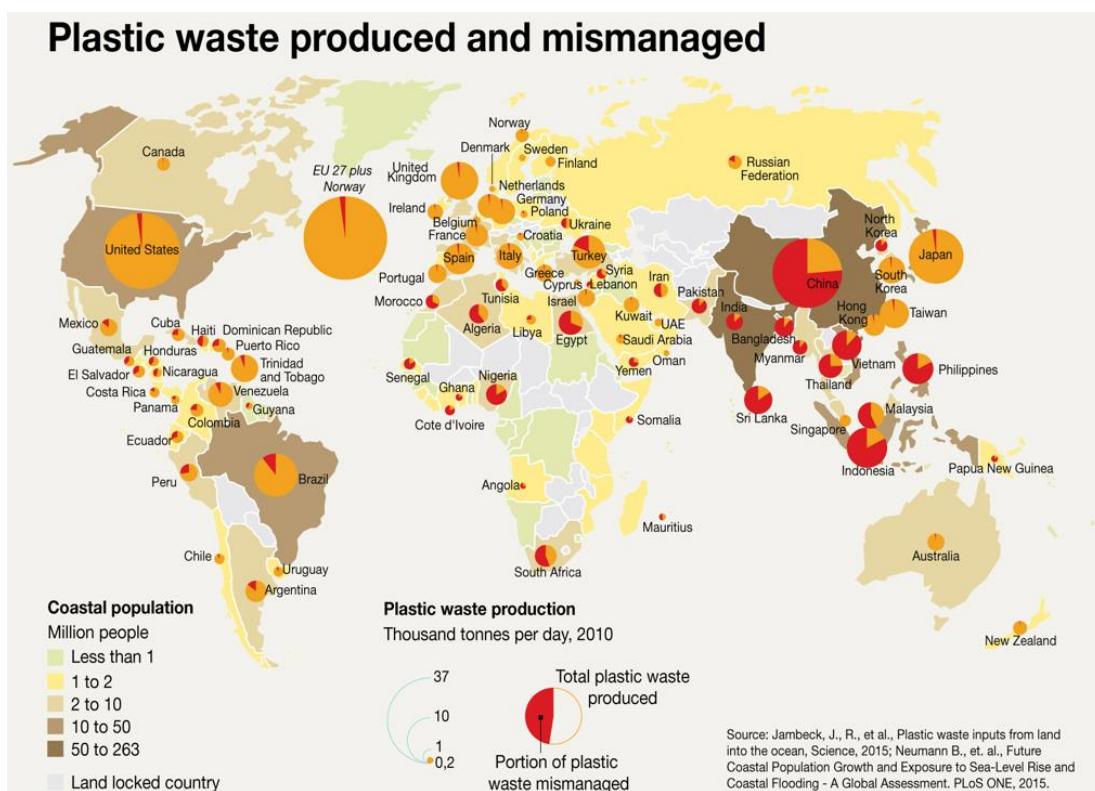
Table 2: Main global marine plastic litter sources and drivers

Source	Drivers
Macroplastics discharged directly to the ocean from coastal zones	Use of plastic (particularly in coastal regions)
Macroplastics emitted from rivers	Use of plastics (particularly in river basins)
Macroplastics from abandoned, lost or otherwise discarded fishing gear	Fishing
Primary microplastics	Use of primary microplastics; production pellets or microbeads used in PCCPs, or industrial abrasives both on land and at sea
Secondary microplastics	Weathering and fragmentation of macroplastics; wear and tear of tyres; fragmented (single-use) packaging

Source: Adapted from Löhr et al. 2017

Mismanaged waste, i.e. material that is either littered, inadequately disposed off or not formally managed (disposal in dumps or uncontrolled open landfills) is a major source of marine plastic pollution. As Figure 3 shows, particularly in Asia and Africa the portion of mismanaged waste is very high, leading to massive inflows of plastic debris into waterways and ultimately into the ocean. Schmidt et al. (2017) argued that large rivers flowing through densely populated areas contribute a large share of plastic waste that is transported to sea. According to Lebreton et al. (2017), between 1.14 and 2.41 million tons of plastic waste are estimated to flow from rivers into the ocean each year. Smaller microplastic particles enter marine environments through road runoff containing particles from worn vehicle tyres, urban waterways containing polymer fibres from washed clothing or microbeads used in cosmetic products.

Figure 3: Estimated amounts of plastic production and share of mismanaged waste



Source: GRID-Arendal and Maphoto/Riccardo Pravettoni, <http://www.grida.no/resources/6931>

2.3 Effects of plastic pollution

The effects of plastic pollution are both profound and far-reaching. Whereas microplastics are currently considered less of a concern when it comes to the associated risks (Burns/Boxall 2018), macroplastics cause considerable damages. A 2014 UN report determined the cost of damages to marine ecosystems from plastic waste to be US\$ 13 billion, adding that this was likely to be an underestimation (UNEP 2014). The damage

caused by marine debris for the 21 countries of the Asia-Pacific Economic Cooperation (APEC) has been estimated at US\$ 1.26 billion per year, with the tourism sector being hit with the largest share of the costs, at US\$ 622 million (McIlgorm et al. 2011).

The full economic costs of marine plastic litter are not easily quantified. Ecosystem degradation, for example, includes both the effects of marine litter on biodiversity as well as on ecosystem services, such as food provision or being a driver of tourism. Furthermore, costs need to be differentiated between direct costs (for beach clean-ups or costs generated by health impacts on humans), costs due to a loss of revenue (due to decreased fish populations or fewer tourists visiting polluted beaches), and welfare costs (Newman et al. 2015: 368).

In addition to negative impacts on aquatic environments, plastics have a range of other externalities that should be taken into account such as the effects on global climate change through emissions from production and end-of-life incineration. Plastic production requires fossil fuel feedstock and currently represents about 6% of global oil consumption. If the production of plastic continues to increase as predicted, the plastic sector will account for 20% of the total oil consumption and 15% of the annual carbon budget by 2050 (Ellen MacArthur Foundation 2016: 17).

The myriad effects of plastic pollution are so manifold and potentially grave that academics have begun thinking about an upper threshold which would constitute a planetary boundary (Villarrubia-Gómez et al. 2018). Authors have argued that plastic pollution is both irreversible and globally ubiquitous, meeting two of the three proposed conditions for chemical planetary boundaries (the third one being a disruptive effect on Earth system processes) (MacLeod et al. 2014). While they were unable to quantify a limit of plastic pollution beyond which disruptive effects may occur, they cautioned that its variety of effects require a preventive approach and careful observation.

2.4 Technological response options and their limits

No single solution can prevent plastics from entering the aquatic environment or provide the answer to what to do once this happens. Several technological options are available, and since each has their limits, a more sustainable plastic economy will require technological innovation and still have to rely on a combination of these:

One proposed technological solution is biodegradable plastic. However, this material often requires temperatures of 50°C or above to degrade – conditions that can be found in industrial composting plants, but neither in the environment on land nor in the ocean. Replacing products made from conventional plastic with biodegradable ones would not significantly decrease the amount of marine plastic litter or reduce the associated risks (UNEP 2015). Plastics labeled as “biodegradable” can even encourage consumers to abandon it in the environment or add it to their private compost – assuming it will degrade by itself without any effort. This solution may, in fact, have additional negative environmental externalities.

Furthermore, some consider bio-based plastic as another potential solution. Since this type of plastic is made from renewable resources, it may appear as sustainable at first sight. However, most of the available products use either genetically modified organisms for feedstock manufacture or toxic chemicals in the production process – or both. Some contain co-polymers from non-renewable resources (Álvarez-Chávez et al. 2012). Furthermore,

biomass for bio-plastics means more competition between food and bio-plastic production for land and water resources – on top of existing competition between food and energy production.

Wastewater treatment plants can reduce the amount of plastic entering oceans via rivers. Existing research shows they can remove 85-95% of microplastic particles during treatment. While such plants are quite common in the Northern hemisphere, they are largely absent in many countries of the Global South. Furthermore, this is an end-of-pipe solution ignoring the precautionary principle and can at best only be an additional measure to deal with the symptoms, not to cure the underlying cause.

For non-plastic alternatives, it has to be noted that not all of these are environmentally beneficial. From a sustainability perspective, they can come with higher costs and other externalities (Trucost 2016). In fact, much replacement of alternative packaging materials was driven by the lower costs and weight of plastics. However, these calculations are based on the figures that analysts attribute to long-term costs of plastic pollution in the ocean and elsewhere.

There are attempts to “clean” the ocean, i.e. to collect the plastic that has already entered and come out of the water again. One very prominent effort is *The Ocean Cleanup* by Boyan Slat, a project which started extensive real-world testing in 2018. However, many scientists working on the subject agree that removing plastics from ocean systems would do more harm to the ecosystem than good. Such interventions could destabilise the fragile balance at the surface of the oceans (Thiel 2018). As plastic particles can be found throughout the water column and even in deep sea sediments, removing them all mechanically is out of the question. Last but not least, trying to remove marine litter while up to 13 million tonnes of plastic are entering the oceans each year is a truly Sisyphean task with no realistic chance of ever being completed. Clean-up efforts can be important in particularly fragile ecosystems or in points of accumulation, but can never replace measures to prevent plastic pollution from taking place. The problem needs to be tackled at its roots.

The only effective strategy is to prevent plastics from entering the ocean in the first place. This requires, in principle, perfect waste collection systems and the elimination of all direct inputs e.g. through lost fishing gear, microplastic in cosmetics or car tyre abrasion. In reality, a complete elimination of plastic pollution is only achievable in the long term, whereas a significant reduction can be achieved through a mix of already existing instruments. A global treaty with the main goal to eliminate further marine plastic pollution can both guide the direction of innovation and solutions in order to reach the long term goal, and contribute to accelerating the implementation of the best available instruments.

3 National and regional initiatives to address plastic pollution

3.1 On the national level

Initiatives to reduce marine plastic litter and microplastics at the national level vary considerably in scope and in their aims. Nonetheless, it is clear that the number of such initiatives is growing. The level of political activity is arguably a sign of the emergence of a new environmental norm (Clapp/Swanston 2009). Nation states are taking a range of approaches (see Table 3). Measures to reduce plastic bag pollution tend to focus on behaviour-changing methods such as bans and taxes while measures to reduce microbeads have also included preventive schemes to reduce their presence from the manufacturing stages. Worldwide, more than 60 national governments have introduced regulations on plastic bags and Styrofoam products, and the number of these regulations is set to grow (UN Environment 2018a). However, we lack robust data on impact and effectiveness as most measures are recent, and/or lack the required monitoring and reporting systems (UN Environment 2018a). Compared to action taken against plastic bags, most interventions to reduce microbeads were adopted only recently (since 2014). As such, the interventions on microbeads have been much lower in number and bans on these products have yet to take effect (and be evaluated) due to the 2-3 year phased approach that many countries have adopted (UN Environment 2018a).

Despite their limited immediate geographical reach, national-level actions can have wide repercussions as the example of China shows. In mid-2017, China announced to the World Trade Organization (WTO) that it will ban the import of plastic waste (and a number of other scrap materials) beginning in early 2018. The ban has since taken effect, and many countries which used to export a considerable amount of their plastic waste to China for recycling or other treatment are struggling to manage it domestically (Millar 2018; Toscano 2018). China has historically imported 45% of plastic waste since 1992 (Brooks et al 2018). Single-use food packaging materials amounted to 89% of these imports, which sped up the search for better, more sustainable or simply reduced packaging solutions (Citi 2018).

Table 3: Management schemes addressing marine litter

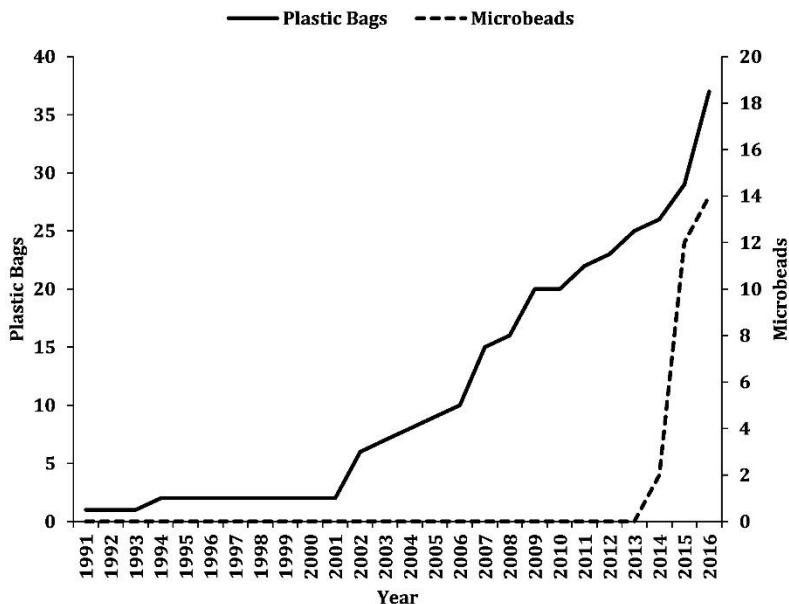
Type	Examples of measures	Examples of application
Preventive	Source reduction (e.g. eco design), waste reuse and recycling, waste converted to energy, port reception facilities, gear marking, debris contained at points of entry into receiving waters, various land-based waste management initiatives	Milk-protein based thermoplastic packaging material that is biodegradable and water-soluble at low temperatures in the space of weeks.

Type	Examples of measures	Examples of application
Mitigating	Various debris disposal and dumping regulations, i.e. waste discharged outside a certain radius from waterbodies wastes not containing harmful substances to the marine environment allowed for discharge, prohibition of waste discharge into ecologically sensitive areas, prohibition of the disposal of certain types of garbage into seas	MARPOL Annex V preventing discharge of all plastics into the sea, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products which may contain toxic or heavy metal residues
Removing	Beach and seafloor cleanup activities, derelict fishing gear retrieval programmes, marine debris monitoring	The Ocean Conservancy's International Coastal Cleanup has been running since 1986 with the goal of collecting and documenting litter along coastlines worldwide.
Behaviour-changing	Educational campaigns, economic/incentive tools	Container deposit legislation (e.g. in some US states and Germany) – charge on plastic bottles that is refunded when bottle is returned.

Source: Adapted from Chen 2015

As can be seen in Figure 4, in recent years a quickly increasing number of plastic bag and microbead bans have been enacted across the globe, with developing countries among the fastest adopters of such measures (Xanthos/Walker 2017; Knoblauch et al. 2018)., in recent years a quickly increasing number of plastic bag and microbead bans have been enacted across the globe, with developing countries among the fastest adopters of such measures (Xanthos/Walker 2017; Knoblauch et al. 2018).

Table 4 brings together some of these national actions into regional groupings. Recent research has found that more than 70 % of countries adopting plastic bag bans are located in the Global South (Knoblauch et al. 2018). The study suggests that this may be due to national (local) pressure, i.e., the fact that plastic bag litter is much more visible and harmful due to the limited waste collection and recycling rates. In contrast, it is the mainly *global* public pressure that has had an influence in the Global North whose actions have tended to be less stringent than those of the Global South.

Figure 4: Timing and number of global plastic bag and microbead interventions.

Source: Xanthos/Walker 2017

Table 4: National level initiatives to address marine plastic pollution

Africa	Rwanda is seen to be an example of best practice in the region. The country banned plastic bags in 2008. The ban covers the import of all polythene bags, as well as their manufacture and sale. Africa is the continent with the largest number of countries with a total ban on production and use of plastic bags (UN Environment 2018a). The ban on plastic bags in Kenya , was implemented in 2017 (with some exemptions, for example in the hospitality and waste disposal sectors). UN Environment has partnered with Safaricom and the Kenyan National Environment Management Agency to establish an end-to-end plastic waste management programme. The partnership will see the creation of a working group that brings stakeholders (mostly manufacturers, waste collectors, and plastic waste recyclers) together to formulate a comprehensive solution to hard plastic waste (UN Environment 2018a).
Asia	Several countries have introduced bans on plastic bags. In Bangladesh , a ban on lightweight bags has been in place since 2002, but after an initial positive result, poor enforcement of regulations and lack of cost-effective alternatives have led to an increasing use of plastic bags (IRIN 2011). Furthermore, although China's plastic bag ban has reduced the usage of plastic bags by over two-thirds (IUCN 2017), the waste collection cycle is problematic: in China, 84 % of plastic leakage comes from waste that has not been collected (Ocean Conservancy 2017). The Chinese decision to stop plastic waste imports in 2017 imports has given rise to concern, particularly in the EU, which used to export 85 % of its plastic waste to China. Japan

Asia	<p>has a law and policy measures for the prevention and disposal of marine litter. The country has not instigated any kind of ban on plastic bags, but due to social norms and effective waste management, leakage is limited (UN Environment 2018a).</p> <p>In 2018, the University Grants Commission of India directed all universities in the country to ban the use of plastic cups, lunch packets, straws, bottles and bags on their campuses.</p> <p>In Singapore, the government has engaged with industry through a 2007 voluntary packaging agreement that aims to encourage the reduction of waste and higher use of recycled materials (Combal-Weiss 2018). In 2017, as part of the UN Clean Seas Campaign, Indonesia pledged a 70% reduction in marine waste within eight years. Proposed initiatives include the development of new industries that use biodegradable materials as plastic alternatives, a tax on plastic bags and is starting a mass education programme for schoolchildren (Harrabin 2017).</p> <p>The Thai government has created a 20-year strategy which includes developing financial incentives for keeping plastic out of the sea, encouraging eco-packaging design and eco-friendly substitutes for plastics as well as establishing proper disposal methods for municipal solid waste and household hazardous waste, using centralised facilities. Different branches of government have campaigned to stop using plastic cap seals on water bottles and have entered into cooperation with five plastic bottle manufacturers to remove the caps and redesign the bottles (Combal-Weiss 2018; IUCN 2017).</p> <p>Foreign embassy representatives are also collaborating with ASEAN countries to reduce marine debris. The United States Embassy is supporting innovation in materials and design, changes in consumer behaviour, and improve waste management while the Swedish Embassy is supporting the creation of a regulatory framework to address waste in the oceans (IUCN 2017).</p>
Europe	<p>In 2014, a survey found that nine out of ten Europeans were in favour of greater action on marine litter (Eurobarometer 2014).</p> <p>The EU has shared competences in the realm of environmental protection and the circular economy. As such, there is a certain level of similarity between Member States' (MS) activities to address the topic of marine plastic pollution.</p> <p>For example, as part of the Marine Strategy Framework Directive (MFSD), MS with marine waters have had to establish Programmes of Measures (PoMs) towards achieving Good Environmental Status by 2020. These PoMs include actions and targets for ensuring that the properties and quantities of marine litter do not cause harm to the coastal and marine environment.</p>

Europe	<p>The EU has had a Directive on packaging and associated waste since 1994 (including a later amendment to reduce the number of lightweight plastic bags in use by 2025).⁴ Under this directive, MS adopted measures ranging from bans, such as in Italy and France, to agreements with the private sector, such as in Austria (UN Environment 2018a). Even non-marine MS have engaged with the topic of marine plastic pollution; Luxembourg, which as far back as 2004 launched a voluntary public-private agreement to introduce a reusable 'eco-bag' which has led to 85 % of shoppers using reuseable bags, two thirds of which are 'eco-bags' (UNEP/ISWA 2015).</p> <p>In addition to their obligations as members of the EU and of Regional Seas Conventions, many MS also recently made voluntary pledges to act on marine litter in the context of international fora such as the UN Ocean Conference in June 2017. In the UK the ban on the manufacture and sale of microbeads in cosmetics and personal care products took effect in 2018. Apart from the UK, no national ban on microbeads has yet come into force, but some MS are pushing for an EU-wide ban (ChemSafetyPro 2017). The European Commission has started restricting the use of intentionally added microplastics, by requesting the European Chemicals Agency to review the scientific basis for taking regulatory action at EU level (European Commission 2018).</p> <p>The industry initiative "Zero Pellet Loss" in Germany aims to raise awareness among employees of the chemicals and plastics industry on effective management of plastic pellets and loss prevention.</p>
Latin America and the Caribbean	<p>Until recently, there was very little activity at the national level in the Latin American region to address marine plastic litter. However, since 2017 several countries have begun to act. In Colombia a plastic bag tax came into effect in 2017. In January 2018, Panama passed a law for a plastic bag ban by 2020, while in June of the same year, Chile became the first country in Latin America to prohibit the delivery of plastic bags to supermarkets and retail stores. A few days later, Peruvian Congress approved a bill that proposes the progressive elimination of single-use plastic, Styrofoam and straws. Costa Rica has one of the most ambitious pledges in the region, aiming to become the first country in the world to eliminate single-use plastics by 2021. To this end, several different bills are being discussed in the Costa Rican Legislative Assembly ranging from the prohibition of free delivery of disposable plastic bags to the promotion of alternative products. Mexico has yet to pass a law at the national level, although some initiatives in coastal states exist. In Ecuador, the Galapagos Islands' Governing Council has also announced its intention to increase control and monitoring of single-use plastics in the archipelago. Since 2002, St. Kitts and Nevis has prohibited fishing gear that has any plastics, including synthetic ropes, synthetic fishing nets and plastic garbage bags.</p>

⁴ Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags.

North America	In North America, regulations on single-use plastics and Styrofoam have been introduced mostly at the state or city level (UN Environment 2018a). In relation to microbead plastics, the US and Canada have acted at the national level. The US passed legislation to control microbeads, while Canada acted to ban their manufacture entirely. In June 2017, the Microbeads in Toiletries Regulations were passed by the Canadian government. These regulations prohibit the manufacture, import, and sale of toiletries used to exfoliate or cleanse that contain plastic microbeads, including non-prescription drugs and natural health products (ChemSafetyPro 2017).
Oceania	Most of the states in Australia have banned lightweight plastic bags and in Papua New Guinea , non-biodegradable plastic bags are banned (UN Environment 2018a). In June 2018, New Zealand passed regulations banning the sale and manufacture of wash-off products that contain plastic microbeads (MfE NZ 2018).

Despite the fact that there has been a proliferation of actions to target plastic bags and microplastics, countries are also undertaking a range of actions to reduce, redesign, collect and remove plastic waste. Indeed, a 2017 study by the Ocean Conservancy focusing on the five largest emitters of plastic waste in the marine environment found that bans on plastic bags could be effective, but only in specific retail channels and in heavily regulated locations (Ocean Conservancy 2017). The most relevant solutions also relate to what the prevailing challenges are, as these can vary considerably for each nation. For example, in China, 84% of plastic leakage comes from waste that has not been collected while in the Philippines, 74% of plastic leakage comes from waste that has been collected (*ibid.*). For the reason of local specificity, simply promoting piecemeal actions such as the reduction of plastic bag use, even if on an international scale, is inadequate as a solution to marine plastic pollution.

3.2 On the regional level

3.2.1 Regional seas programmes and action plans

The Regional Seas Programme contains 18 Regional Seas, seven of which are administered by UN Environment, seven of which are not administered by UN Environment but were established under the auspices of the Environment Programme and four which were independently established.

Some of the regional agreements do have legally binding measures to address marine litter. The Barcelona Convention, for example, adopted in 2013 a *Regional Plan on Marine Litter Management in the Mediterranean*. The plan contains measures covering land- and sea-based sources in Article 9 and specifically mentions plastic waste, including voluntary as well as fiscal and economic instruments to reduce plastic bag consumption. As can be seen in Figure 2 above, this has not prevented the Mediterranean from high levels of plastic pollution

Table 5: List of Regional Seas Programmes

UN Environment-administered Regional Seas Programmes	Non-UN Environment administered Regional Seas Programmes established under the auspices of UN Environment	Non-UN Environment administered, independently established Regional Seas Programmes
<ul style="list-style-type: none"> • Caspian Sea • East Asian Seas • Eastern Africa Region • Mediterranean Region • North-West Pacific Region • Western Africa Region • Wider Caribbean Region 	<ul style="list-style-type: none"> • Black Sea Region • North-East Pacific Region • Pacific Region • Red Sea and Gulf of Aden • ROPME Sea Area • South Asian Seas • South-East Pacific Region 	<ul style="list-style-type: none"> • Arctic Region • Antarctic Region • Baltic Sea • North-East Atlantic Region

Source: UN Environment 2017: 44.

Five of the top ten global marine polluters are ASEAN member countries. The COBSEA Regional Action Plan on Marine Litter 2008 includes signatories from Cambodia, China, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand and China with the aim of increasing action on marine litter in the region (IUCN 2017).

Figure 5: Map of regional actions plans focusing on marine litter

Source: UN Environment 2017: 54

More recently, in 2017, ASEAN hosted the Conference on Reducing Marine Debris. The Conference reviewed the status of marine debris pollution in the region, exchanged information on policies, initiatives and best practices; identified gaps and challenges and discussed two main types of solutions: policy and management and innovative policy and technology. The conference produced a recommendation to explore the development of a regional agreement on sustainable management of marine debris pollution. An ASEAN China Workshop on Best Practices for Reducing Marine Debris in the South China Sea is planned for 2019. While these efforts are valuable and can lead to some improvements, they will hardly be able to stop the flow of plastics into the ocean.

3.2.2 The EU Plastics Strategy

The EU Plastics Strategy, adopted in January 2018, sets out the EU's vision for a new circular plastics economy to change the way products are designed, produced, used and recycled in Europe (European Commission 2018). A key goal of the Plastics Strategy is to make all plastic packaging on the EU market recyclable by 2030 and to strengthen the EU's own capacity for recycling. This is to be achieved by designing products that are easier to recycle and by refining waste collection and separation processes. Any chemical substances hampering recycling processes will be replaced or phased out. The aim of these improvements is to boost demand from industry and create viable markets for recycled and renewable plastics. The strategy also outlines the importance of strengthening these internal markets given the urgent need to phase out plastic waste exports to external countries.⁵

The Plastics Strategy aims to reduce the leakage of plastics into the environment through these improvements to waste collection systems, but also through increased consumer awareness about littering and the need to reduce the level of waste generated by single-use plastics. A separate legislative initiative on single use plastics was put forward by the EU in May 2018, including bans of plastic materials in certain products. For biodegradable plastics, the Plastics Strategy seeks to establish a clear regulatory framework and points out the need for labels and standards that allow consumers to assess the effects and risks of these products. On this point, the European Parliament took a more critical stance than the Commission, and a decision is expected towards the end of 2018. The Strategy also targets plastic littering from sea-based sources. For fisheries and aquaculture this includes measures to reduce loss or abandonment of fishing gear at sea (e.g. through deposit schemes, Extended Producers Responsibility (EPR) schemes and recycling targets). To combat waste from ships, the EU made a legislative proposal in January 2018 for improved port reception facilities. The Plastics Strategy also highlights the need to develop understanding of microplastics. This includes sources and pathways through which they enter into the environment and preventive solutions such as the restriction on intentional use of microplastics (e.g. in cosmetics).

⁵ 85% of the EU's plastic waste exports are shipped to China. However, this waste trade is no longer possible. In July 2017 China announced its decision to ban the import of certain types of plastic waste, which has since taken effect. See WTO Notification G/TBT/N/CHN/1211 of 18 July 2017 and G/TBT/N/CHN/1233 of 15 November 2017, covering a range of waste types, including certain types of plastic waste.

4 Existing global governance frameworks

At the international level, a large number of frameworks deals with marine litter and plastic pollution. A list compiled by UN Environment contains 56 relevant resolutions, decisions and agreements and a total of 38 technical reports (UN Environment 2018b). This large number illustrates the fragmentation in global plastics governance, which is also mirrored in their assessment of relevant strategies and approaches for combatting marine plastic litter and microplastics (UN Environment 2017). Many conventions and other frameworks are focusing on the oceans, and despite their broad regulatory base, many loopholes and weaknesses remain (cf. Stoett 2016).

In the following section, we distinguish between legally binding agreements and non-legally binding agreements. Table 6 contains an overview of the most relevant binding and non-binding agreements and frameworks, their plastic-related scope as well as their geographic/spatial coverage. In the sections below follow more detailed descriptions for each.

Table 6: Overview of plastic-related scope and spatial coverage of frameworks

	Plastic-related scope	Geographic/spatial coverage
Binding Conventions		
Basel Convention	<ul style="list-style-type: none"> Voluntary, technical guidelines on the identification and environmentally sound management of plastic wastes and their disposal Discussions to add plastic waste to the list of wastes for “special consideration”, currently classified as non-hazardous Discussions on a <i>Global Partnership for Action on Plastic Waste</i>, a multi-stakeholder global partnership 	<ul style="list-style-type: none"> Binding for 186 parties with regards to transfer of hazardous waste, but not plastic waste Includes all top plastic waste exporters except the US, which is not among the parties. <i>Sanctioning: illegal traffic in hazardous wastes is a criminal offence, implementing legislation at national level</i>
Stockholm Convention	<ul style="list-style-type: none"> Prohibits the production, use, import & export of certain intentionally produced POPs, thus only covers plastics containing POPs 	<ul style="list-style-type: none"> Binding for 182 parties Notable non-parties include the US, Israel, Malaysia, and Italy <i>Sanctioning: compliance mechanism still under discussion, parties decide whether to make provisions for penalties via national law</i>

	Plastic-related scope	Geographic/spatial coverage
Binding Conventions		
UNCLOS	<ul style="list-style-type: none"> • Prohibits dumping at sea, (implicitly) including plastic waste • Lacks precise instruments and rules, as well as a compliance mechanism 	<ul style="list-style-type: none"> • Binding for 168 parties • Dumping by coastal states is permitted within their EEZ, provided that it does not impinge upon the rights or the environment of other states, or upon areas beyond national jurisdiction. • Also allows for dumping on the continental shelf, provided the coastal state adheres to certain rights and requirements similar to those provided in relation to the EEZ. • <i>Sanctioning: liability is under a state's own domestic law, no fines or other punishments for breaking the Convention</i>
London Convention	<ul style="list-style-type: none"> • Prohibits dumping at sea, including plastic waste, (does not cover discharges from land-based sources) 	<ul style="list-style-type: none"> • Binding for 89 parties • Covers territorial and international waters • <i>Sanctioning: only compliance procedures and mechanisms</i>
MARPOL	<ul style="list-style-type: none"> • Prohibits the disposal of garbage at sea, including to dump polymers • Unintentional losses of waste (including plastic) are not covered 	<ul style="list-style-type: none"> • Binding for 156 parties, being flag states of 99.42% of the world's shipping tonnage • All ships flagged under countries that are signatories to MARPOL are subject to its requirements, regardless of where they sail and member nations are responsible for vessels registered on their national ship registry. <p><i>Sanctioning: penalties are set for irregularities and non-compliance by each state domestically</i></p>

	Plastic-related scope	Geographic/spatial coverage
Non-binding frameworks		
Honolulu Strategy	<ul style="list-style-type: none"> Voluntary strategy that focuses on the reduction of land- as and sea-based sources of marine litter No measurable targets or timelines 	<ul style="list-style-type: none"> Covers land and waters
Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)	<ul style="list-style-type: none"> Fosters voluntary collaboration and coordination among states on the prevention of land-based marine pollution Nine source categories of marine degradation: sewage, persistent organic, radioactive, heavy metals, oils, nutrients, sediment mobilization, litter and physical alteration 	<ul style="list-style-type: none"> Adopted by 108 Governments and the European Commission in 1995 Land-based activities
G7 Action Plan to Combat Marine Litter	<ul style="list-style-type: none"> Action plan includes priority actions to address land-based and sea-based sources of marine litter, priority removal actions, as well as priority action on education, research and outreach Without quantified goals 	<ul style="list-style-type: none"> G7 countries land-based and sea-based sources
Ocean Plastics Charter (adopted at G7 summit 2018 in Canada)	<ul style="list-style-type: none"> Lifecycle approach to plastics stewardship on land and at sea, which aims to avoid unnecessary use of plastics and prevent waste Ensures that plastics are designed for recovery, reuse, recycling and end-of-life management to prevent waste through various policy measures, including a small number of quantified goals 	<ul style="list-style-type: none"> Canada, France, Germany, Italy, the United Kingdom, and the European Union Also endorsed by several companies (including Coca-Cola and Volvo), covers land and waters
G20 Action Plan	<ul style="list-style-type: none"> Action plan with operational framework addressing land-based and sea-based sources of marine litter, financial resources, 	<ul style="list-style-type: none"> G20 countries Land-based and sea-based sources

	Plastic-related scope	Geographic/spatial coverage
	<p>the implementation of the “polluter pays principle”, effective waste management as well as education</p> <ul style="list-style-type: none"> • Without quantified goals 	
Regional Seas Programme	<ul style="list-style-type: none"> • Twelve Regional Seas have to a different extent developed regional initiatives on marine litter to assess the magnitude of the problem and action plans to reduce and eliminate marine litter (as of April 2017) • Whether binding or not is variable⁶ 	<ul style="list-style-type: none"> • Covers 18 regions with 143 countries • Land- and sea-based measures (depending on the region)

4.1 Legally binding conventions

4.1.1 The UN Convention on the Law of the Sea (UNCLOS)

The UN Convention on the Law of the Sea, which came into force in 1994, aims at preventing dumping at sea. Dumping is defined as “any deliberate disposal of wastes or other matter” (*ibid.*), which is not specifically including plastic waste, but is usually considered to include it implicitly.

In Article 207(1), UNCLOS addresses pollution from land-based sources and stipulates that “States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources”, while Article 207(4) adds that states “shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution of the marine environment from land-based sources”.

In Article 210(1), the Convention contains that “States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment by dumping.” Article 210(4) makes clear that this is not merely a domestic issue, but that states “shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution.”

⁶ While the Mediterranean strategic framework includes legally binding measures, the regional action plans for the Baltic (HELCOM) and North Atlantic (OSPAR) are built around a set of fundamental principles and, similar to the G7 Action Plan, a series of regional and national actions to address land-based and sea-based sources, priority removal actions and priority actions on education, research and outreach, see http://www.minambiente.it/sites/default/files/archivio/allegati/sviluppo_sostenibile/Background_Document_ML_FIN_AL.pdf.

Since the Convention is a rather broad instrument in general, covering a multitude of pollution-sources, it seemingly lacks more precise instruments and rules, but leaves the legislation of how pollution at sea shall be prevented to its 167 member states (UN Environment 2017). Due to its imprecise use of language in its provisions, Dehner (1995) argues that monitoring of compliance is rather difficult. While the Convention lacks a dedicated compliance mechanism, states must follow compulsory procedures in accordance with the provisions of the Convention when settling disputes. Specific enforcement rights and obligations for states under UNCLOS can be viewed in Part XII, section 6 of the Convention (UN Environment 2017).

4.1.2 The Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (London Convention)

The *Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (London Convention)* was agreed on in 1972 and came into force in 1975. Article I posits that parties must “individually and collectively promote the effective control of all sources of pollution of the marine environment, and pledge themselves specially to take all practicable steps to prevent the pollution of the sea by the dumping of waste and other matter that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.” Exemptions to the general prohibition of dumping are spelled out in the annexes to the Convention.

The London Convention initially had no compliance mechanism, but the 1996 Protocol to the London Convention established both a compliance mechanism and a Compliance group, which meets annually, back to back with the meeting of the governing bodies. Representatives from all UN regions are members of the group. The London Protocol also introduced a so-called “reverse list” in which it lists substances and materials which may be disposed of at sea, thereby prohibiting the disposal of any other substance or material – including plastic.

4.1.3 The International Convention for the Prevention of Pollution from Ships (MARPOL)

Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL), prohibits the disposal of garbage at sea. Its particular focus on all forms of plastic prohibits ships from dumping polymers at sea. Compliance with the provisions of Annex V is undertaken by a so-called Garbage Record Book (GRB), in which vessels larger than 400 Giga Tons have to record any disposal of waste, both at sea and at ports. Competent authorities at ports in states that are party to MARPOL may inspect these GRBs, but not the vessels themselves even in cases where vessel operators deny the inspection of the GRBs. Where irregularities or non-compliance are discovered, penalties may be set by each state domestically. Furthermore, unintentional losses of waste (including plastic) are not covered by MARPOL and it is not clearly defined what such accidental losses include or what precautions need to be taken to prevent these (Gold et al. 2013: 13)

4.1.4 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention, or BC), which was adopted in 1989, requires prior written consent for the import of hazardous wastes and other wastes for disposal, while

prohibiting trade of hazardous wastes with non-parties. Thereby, environmental and health damage from hazardous waste shall be prevented. However, this focus on the transboundary movements of hazardous waste makes the Basel Convention ill-equipped for tackling the issue of plastic waste generation. Furthermore, its predominant focus on hazardous waste (listed in Annex xx to the Convention) excludes plastics from the legally binding control measures of the Convention.

Despite its very limited mandate with regards to plastic waste, stakeholders in the Basel Convention have been trying to expand the work on plastics under the Convention through voluntary and collaborative measures. In 2002, the sixth Conference of the Parties (COP) to the Basel Convention adopted technical guidelines on the identification and environmentally sound management of plastic wastes and for their disposal. These guidelines are voluntary and are in need of an update. In recent years, stakeholders have begun to establish partnerships dealing with plastic waste, among other things. COP13 in spring 2017 adopted a decision to establish the Partnership on Household Waste. At the 11th Meeting of the Open-Ended Working Group of the Basel Convention, which was held in Geneva in September 2018, delegates thought about the possible creation of a partnership specifically dealing with plastic waste and discussed amending the Convention to reclassify plastic waste. The latter would remove plastic waste from Annex IX, which maintains a list of wastes considered non-hazardous and includes solid plastic waste in Annex II, adding it to the list of wastes requiring special consideration (IISD 2018b).

The trade in plastic waste has become an increasingly contentious issue, especially since China banned all imports of plastic and other wastes. The Basel Convention is the primary body for regulating transboundary movement of hazardous waste. Due to pressure from environmental NGOs and based on a proposal from Norway, the Basel Convention Conference of the Parties (COP) will have to make a decision on whether plastic waste will become subject to the prior informed consent procedure enshrined in the Convention, meaning that a country that wants to export plastic waste will need written consent before the shipment takes place. It would thus not be useful for a new plastics convention to deal with the trade in plastic waste. Even if the 2019 COP didn't initially opt against this amendment, it would make more sense to put more pressure on Basel Convention parties to pass the amendment at a future COP.

4.2 Non-legally binding frameworks, resolutions, action plans and strategies on the international level

4.2.1 The 2030 Agenda on Sustainable Development

In 2015, the international community adopted the 2030 Agenda for Sustainable Development, including 17 Sustainable Development Goals (SDGs) and 169 targets. The SDGs provide a common framework for action, with the explicit goal to transform the world towards sustainability. A large number of SDGs and associated targets relate to marine litter and plastic pollution. Most notably is SDG 14 on Life Below Water, and Target 14.1 which entails to, "by 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution." Overall, at least 12 SDG targets are related to plastic waste and marine litter (Löhr et al. 2017; OceanCare 2017). A new agreement could directly deliver on reaching these targets.

4.2.2 The Honolulu Strategy

Following the Honolulu Commitment to tackle marine litter, signed by the representatives of 64 governments and the European Commission in 2011, stakeholders were invited to take part in the development and implementation of the Honolulu Strategy. The outcome – “A Global Framework for Prevention and Management of Marine Debris” (UN Environment 2017: 40) – is a voluntary approach which intends to connect marine litter programs and to foster collaboration among them by sharing lessons learned and/or best practices. The strategy focuses both on land- as well as on sea-based sources of marine litter. It also encompasses a monitoring tool which aims at taking a more holistic view on the progress made by various projects. The strategy works under three overarching goals: A) to reduce the amount and impact of land-based sources of marine debris in the oceans. B) to reduce the amount and impact of sea-based sources of marine debris. C) to reduce the amount and impact of accumulated marine debris on shorelines, in benthic habitats and in pelagic waters.

Though the Strategy does not provide any measurable targets or timelines, there are specific provisions for the monitoring and evaluation of progress of the different projects that take action, as well as a number of possible actions or strategies that may be undertaken by different stakeholders (e.g. government agencies, civil society, private sector, international organisations) in order to reach the abovementioned goals. The list of actions, which includes improved research or assessments and monitoring, can be found under Annex 1 of the Honolulu Strategy.

4.2.3 The Global Programme of Action (GPA) and the Global Partnership on Marine Litter (GPML)

The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) aims at fostering collaboration and coordination among states on the prevention of land-based marine pollution. It was founded in 1995. In order to tackle the issue of land-based marine pollution, the GPA encourages action at the national, regional, and international level. It lists nine source categories of marine degradation, one of them being litter, including plastic waste, though plastic also finds mention in the source category “sewage” (UNEP 1995). It does not foresee a compliance mechanism, nor does it provide sufficient funding for the implementation of the objectives in developing countries (Meier-Wehren 2013).

At the Third Intergovernmental Review Meeting (IGR-3) of the GPA, delegates adopted the Manila Declaration on Furthering the Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities. The Manila Declaration states “that the GPA Coordination Office in the period 2012-2016 should focus its work on nutrients, litter and wastewater as the three priority source categories for the GPA” and contains a para to *“recommend the establishment of a global partnership on marine litter.”* The GPA subsequently launched the Global Partnership on Marine Litter (GPML) at the UN Conference on Sustainable Development (UNCSD; or Rio+20) in Brazil in June 2012. It is a voluntary, international and multi-stakeholder partnership hosted by UN Environment with the aim of protecting human health and the global environment by the reduction and management of marine litter. As such, it brings together a diverse set of stakeholders, including governments, NGOs, the private sector and international agencies. The GPML serves, among other things, to support the implementation of the abovementioned Honolulu Strategy and its three overarching goals (UN Environment 2017). IGR-4 was originally planned for October 2017 but had to be postponed and will be held on 31 October – 1

November 2018 in Bali, Indonesia, and is supposed to discuss, *inter alia*, new potential governance architecture on marine litter.

In February 2017, UN Environment launched its five-year long Clean Seas campaign in contribution to the GPML. Its aim is to engage with governments, the general public, civil society and the private sector to address the root-cause of marine litter by targeting the production and consumption of non-recoverable and single-use plastic.

G7 and G20 action plans

During the German G7 Presidency in 2015 and the Canadian G7 Presidency in 2018, action plans were adopted to address the problem of marine litter. Under the German G7 Presidency in 2015, the Group of Seven agreed on the *Action Plan to Combat Marine Litter*. The Action Plan mentions the GPA and the GPML as relevant instruments, and it contains nine overarching principles and a range of priority actions to address land-based sources, including the promotion of “relevant instruments and incentives to reduce the use of disposable single-use and other items, which impact the marine environment”. It further contains sections on removal actions, actions to address sea-based sources, education, research and outreach.

Under the Canadian G7 Presidency in 2018, five of the seven nations (excluding Japan and the US) agreed on the *Charlevoix Blueprint for Healthy Oceans, Seas and Resilient Coastal Communities*, which includes an *Ocean Plastics Charter* in the annex (G7 2018). The voluntary charter contains pledges on sustainable design and production, collection systems and infrastructure, sustainable lifestyles and education, on research and innovation, and on coastal and shoreline action. It proposes to “significantly reduce the use of micro-beads and single-use plastic bags and where appropriate phase them out.” While most elements of the Charter are qualitative and thus hard to measure, it entails some quantitative goals, including the pledge to work with industry “towards 100% reusable, recyclable, or, where viable alternatives do not exist, recoverable, plastics by 2030”, and the pledge “to recycle and reuse at least 55% of plastic packaging by 2030 and recover 100% of all plastics by 2040”.

In 2017, when Germany held the G20 Presidency, a “G20 Action Plan on Marine Litter” was agreed upon by all members of the group. The G20 Action Plan contains the commitment to “take action to prevent and reduce marine litter of all kinds, including from single-use plastics and micro-plastics”, in order to “reiterate our commitment to preventing and substantially reducing marine litter and its impacts by 2025 in support of the 2030 Agenda for Sustainable Development [...].” Whereas the UN Environment Assembly (UNEA) Resolution 3/7 from December 2017 referred to “the importance of long-term elimination of discharge of litter and microplastics to the oceans” (see section 0 below), the G20 Action Plan is weaker in its call for the prevention and reduction of marine plastic litter. Nevertheless, it is an important step, especially since seven of the 20 members are among the top polluters.

The G20 Action Plan contains seven priority areas with 41 policy measures which G20 member states are called upon to implement. Particular focus is given to land-based sources, as the Action Plan states that: “Given that in many regions the largest amount of marine litter entering the oceans worldwide stems from land-based sources, waste reduction and waste management, as well as waste water management, including storm water, deserve priority actions.”

Table 7: Areas of prior concern and potential policy measures of the G20 Action Plan on Marine Litter

- | |
|--|
| 1. Promote the socio-economic benefits of establishing policies to prevent marine litter |
| 2. Promote waste prevention and resource efficiency |
| 3. Promote sustainable waste management |
| 4. Promote effective waste water treatment and storm water management |
| 5. Raise awareness, promote education & research |
| 6. Support removal and remediation action |
| 7. Strengthen the engagement of stakeholders |

As can be seen from the seven areas, much attention is given to the issue of waste, including waste prevention and sustainable waste management as well as waste water treatment. These recommendations draw from the T20 recommendations issued beforehand, who issued a study on circular economy measures for the plastic sector to retain value in the economy and to reduce plastic pollution (ten Brink et al. 2017). This highlights the added value of a functioning science-policy interface and underlines the need to enhance existing interfaces, ideally in the form of an institutionalized interface attached to a new plastic convention (see section 6.4 below).

4.3 UNEA Resolutions and the Ad Hoc Open-ended Expert Group

The UNEA, the UN's principal decision-making body on environmental issues, and the governing body of the UN Environment Programme, has thus far passed three resolutions on plastic pollution and marine litter:

Table 8: Resolutions of the UN Environment Assembly on plastic pollution

Session	Year	Resolution	Title
UNEA1	2014	1/6	Marine plastic debris and microplastics
UNEA2	2016	2/11	Marine plastic litter and microplastics
UNEA3	2017	3/7	Marine litter and microplastics

Source: Compilation of the UN Environment Assembly resolutions on marine litter and microplastics; UNEP/AHEG/2018/1/INF/2.

The resolutions have, for the most part, “encouraged” governments and other stakeholders “to promote the more resource-efficient use and sound management of plastics and microplastics” and “to take comprehensive action to address the marine plastic debris and

microplastic issue “through various measures (Resolution 1/6); and they dealt a lot with issues of monitoring, assessments, or standards. While UNEA Resolution 3/7 stressed “the importance of long-term elimination of discharge of litter and microplastics to the oceans”, which is a rather strong commitment in language, there were not many tangible outcomes. However, UNEA3 did establish an Ad Hoc Open-ended Expert Group on Marine Litter and Microplastics (AHEG), with the mandate “to further examine the barriers to and options for combating marine plastic litter and microplastics from all sources, especially land-based sources.”

In its first meeting in May 2018, the UNEA ad hoc open-ended expert group on marine litter and microplastics (AHEG) discussed existing national, regional and international response options for addressing plastic pollution. One basis for the discussions was the assessment of national, regional, and international response options (UN Environment 2017), which also elaborated on the effectiveness of the current legal and policy framework to combat marine litter and microplastics, identified gaps and presented options for addressing them. The assessment found that marine litter was not the primary objective of any international legal instrument and that current governance strategies and approaches were fragmented and did not adequately address the challenge of plastic pollution. On this basis, the assessment outlined three response options to deal with plastic pollution:

- **Option 1:** Maintain status quo
- **Option 2:** Revise and strengthen existing framework, add components to address industry
- **Option 3:** New global architecture with multi-layered governance approach

Option 1 would mean to continue and encourage existing efforts at national and international level for both land- and sea-based sources. However, the authors note that in light of the worsening plastic pollution crisis, the “current fragmented framework needs to be strengthened to better address marine plastic litter and microplastics” (UN Environment 2017: 12). Therefore, merely maintaining the status quo is not considered a real option.

Option 2 would amend and strengthen the current framework. That is to say, new instruments would be adopted under existing conventions specifically addressing marine plastic litter and microplastics and including measures for the prevention, mitigation and removal of marine plastic litter and microplastics. These efforts would be coupled with a voluntary global agreement including (voluntary) reduction targets and standardised monitoring and reporting. Finally, yet importantly, Option 2 envisages industry guidelines and industry-led commitments that complement the above-mentioned political initiatives.

Option 3 describes the development of a new global architecture with a multi-layered governance in a twofold approach: On the one hand, the voluntary measures outlined in Option 2 would be implemented (Phase 1) and on the other hand, a global, legally binding framework would be developed in parallel (Phase 2) to encompass both voluntary measures and legally binding national standards. Interim efforts undertaken as part of Phase 1 would work towards the intended new framework.

A pragmatic scenario is that option 2 will be pursued immediately, while option 3 will continue to be further developed and/or provided with a negotiating mandate. Even if option 3 were pursued, the measures outlined in option 2 should be implemented as well.

As noted above, UNEA3 mandated an Ad Hoc Open-ended Expert Group on Marine Litter and Microplastics. The programme of work for the AHEG is outlined as follows:

- i. To explore all barriers to combating marine litter and microplastics, including challenges related to resources in developing countries;
- ii. To identify the range of national, regional and international response options, including actions and innovative approaches as well as voluntary and legally binding governance strategies and approaches;
- iii. To identify environmental, social and economic costs and benefits of different response options;
- iv. To examine the feasibility and effectiveness of different response options;
- v. To identify potential options for continued work for consideration by the United Nations Environment Assembly;

The first meeting of the AHEG took place on 29 – 31 May 2018 in Nairobi, and a second meeting will take place on 3 – 7 December 2018. During the first meeting of the AHEG, a wide range of participants openly favoured a new plastic convention, similar to proposed Option 3. According to the official report: “Many representatives said that a new legally binding instrument was necessary to adequately address the threat of marine litter, given the scale and complexity of the challenge” (UN Environment 2018e: 12). There was also concern that the mapping of existing activities was not yet fully complete, including assessments of what kinds of mechanisms did or did not work well among current platforms. This impedes the pace at which delegates make progress in their discussions on the need for and possible design of a binding convention. While such an argument can be easily brought forward by delegates seeking to stall talks and prevent them from moving forward, the existing governance landscape is indeed very complex and deliberations on a new treaty in such a fragmented institutional setting can be challenging.

At the first meeting of the AHEG, a wide range of participants openly favoured a new convention. According to the official report: “Many representatives said that a new legally binding instrument was necessary to adequately address the threat of marine litter, given the scale and complexity of the challenge” (UN Environment 2018e: 12). There was also concern that the mapping of existing activities was not yet fully complete, including assessments of what kinds of mechanisms did or did not work well in current platforms.

According to the co-chair’s summary from the first meeting, the complexity of the issue did not allow for a more stringent outcome: “Some experts stated a need to further examine: (i) gaps in existing governance frameworks with respect to meeting relevant SDGs; (ii) challenges to implementation of existing global and regional frameworks such as IMO instruments, Basel Convention and Regional Seas Conventions and Action Plans; (iii) global coordination; and (iv) need for immediate action.”

5 Barriers and remaining gaps

5.1 Barriers to combatting marine litter

Combatting marine litter requires a holistic approach, as it is caused by both land-based and sea-based activities. There are four types of barriers that impede combatting marine plastic litter (UN Environment 2018d):

- a) Legal barriers;
- b) Financial barriers;
- c) Technological barriers;
- d) Information barriers.

Legal barriers can result from gaps in existing legislation, unclear definition of targets in legislation, lack of implementation or enforcement of legislation and/or conflicts between existing regulations in different policy fields. With regard to marine litter, there is a rather long list of existing legal barriers. To name but a few, there is a lack of legislation to reduce the production of unnecessary, disposable and difficult to recycle plastics as well as a lack of regulatory or market-based instruments to reduce the consumption of these types of plastics. Instead, perverse incentives still promote disposable or single-use products. There is also a lack of legislation to stimulate the supply and demand of recyclable plastics and to improve design for recyclability of products. What is more, most countries do not have a single authority or body that is responsible for overseeing the prevention and mitigation of marine litter. Instead, the management of plastic waste often falls under the responsibilities of municipalities without sufficient funding and staff capacities, while businesses in various sectors of the plastics industry do not take full responsibility with due diligence according to the polluter pays principle. In addition, current regional and international legal and policy frameworks do not sufficiently stimulate industry involvement in solutions.

An aggravating problem is that there are regulations that conflict with each other due to contradictory values such as hygiene rules that conflict with aims to reduce food and plastic packaging waste. Last, but not least, it should not be forgotten that not all countries are party to relevant regional and international instruments to combat marine litter.

Financial barriers exist, when high costs prevent a certain activity from being implemented. In terms of marine litter, these include

- fossil fuel subsidies, which keep plastics cheap and contribute to keeping the costs of virgin plastics below the costs for recycled plastics,
- cross-border investment challenges,
- a lack of funds to install infrastructure for collection, treatment or disposal of plastic waste in countries that currently dump (plastic) waste in landfills, and
- a lack of end-markets for plastic waste, and a limited understanding of the overall costs of marine litter at all government levels (regional to international).

Besides, the costs of dealing with plastic waste are largely left to governments, as the polluter pays principle is neither applied to marine litter in “common” areas such as the high seas, nor in most countries.

Technological barriers relate to aspects of the production, manufacturing and design of plastics, consumption systems as well as waste collection, management and recovery. In

terms of production, manufacturing and design, labelling standards are lacking, which impede product separation and efficient recycling. Moreover, products are inadequately designed to meet air and water-quality standards. Approaches to recovery as well as the existing sorting and reprocessing technologies vary widely between low-, medium-, and high-income countries. Technological solutions lack specifically in the informal recovery sector in low-income countries. The great differences between existing technologies are one of the reasons that prevent the emergence of recovery, sorting, and reprocessing markets that are financially viable and effective.

Overall, there is a general lack of knowledge among many government authorities, companies and the public regarding the best available technologies and best environmental practices to successfully address the issues of marine litter and microplastics.

Information barriers refer to the issues of research and data access, transparency, education, awareness, inclusivity and environmental justice. In terms of the latter, it is important to be aware of the fact that those most affected by marine litter and microplastics are also the least able to make their voices heard and often have the least access to information and among other reasons also due to illiteracy. Nevertheless, there is limited formal education on marine litter and microplastics and a lack of consumer information and awareness worldwide. Gaps in data and research exist with regards to sources and extent of (micro)plastics in the marine environment, plastic material and waste flows, as well as the social, economic and environmental impact of marine litter.

An overarching barrier is the **lack of coordination** at the international level (UN Environment 2017: 55). That is to say, there is currently no global institution with a mandate to coordinate efforts on combatting marine litter and managing the issue upstream from the extraction of raw materials to final treatment and disposal. Moreover, there is a lack of harmonised binding standards at the global level for environmental controls and quality specification of plastics as well as for the mitigation of pollution from plastic waste, particularly from land-based sources.

5.2 Gaps of existing frameworks

While the regulatory framework that is based on UNCLOS, MARPOL, and the London Convention and Protocol should in principle be able to prevent marine litter, there are implementation and compliance challenges that need to be urgently addressed (UN Environment 2017). In addition, MARPOL Annex V has exemptions based on vessel size and currently excludes most fishing vessels, which are responsible for the abandoned, lost or otherwise discarded fishing gear (UN Environment 2018d).

Apart from the gaps related to sea-based sources of marine plastic litter, there is an enormous lack of rules and regulations on uncollected and mismanaged plastic waste from land-based sources. For instance, only 9 out of 18 regional seas conventions and action plans have adopted protocols related to land-based sources and activities (UN Environment 2018d). This undermines a successful fight against marine plastic litter, which is in fact essentially a symptom of a land-based problem as the majority of marine plastic litter originates on land. Moreover, not only marine environments require protection from plastic waste, but also other ecosystems and humans. Thus, a lifecycle approach would be required in order to eliminate risk of leakage at all points of the value chain (Raubenheimer/McIlgorm 2018).

All existing conventions, strategies and frameworks are found to be inadequate in providing a comprehensive approach to prevent emissions of plastic waste into international waters (UN Environment 2017). This inadequacy leaves a large number of the sources of marine plastic pollution unregulated. That is because they are very limited in scope when it comes to 'ordinary' plastic waste (the Basel and Stockholm Conventions), or do not provide measurable targets and timelines, which makes it difficult to measure progress at the regional, national or global level (the Honolulu Strategy and Basel Convention) (Raubenheimer/McIlgorm 2018).

In the Regional Seas instruments, solid waste management and wastewater treatment are again better represented in the non-binding instruments. Protocols that prohibit direct dumping of wastes that contain plastics into the ocean have been developed for three regions. Coastal dumping and the location of landfills near waterways and coastlines are also not equally addressed across all regions. Measures to regulate industrial waste are provided in the binding and voluntary instruments of nearly all Regional Seas instruments. However, the application of these measures must be extended to include compliance with existing programmes that target zero pellet loss from industrial facilities. Compliance with water and air quality standards could be incorporated into lifecycle assessments to reduce the generation of microplastics from wear and tear during product use (UN Environment 2017).

Additional agreements are already in the making to address some of the glaring gaps. In December 2017, the UN General Assembly (UNGA) launched negotiations on a treaty to protect biodiversity in areas beyond national jurisdiction (BBNJ). It has been argued that plastic pollution could be included in such a treaty to strengthen the protection of marine wildlife (Tiller/Nyman 2018).

In conclusion, the gaps of existing frameworks can be summarised as follows:

1. There is no multilateral framework directly addressing the land-based sources of plastic pollution, focusing on the entire life-cycle of plastics.
2. There is a lack of coordination among the various frameworks, instruments and platforms dealing with plastic pollution.
3. There is no institutionalised effort for assessing the state of plastic pollution, and a lack of standards for monitoring plastic waste in the environment, including in the oceans.

6 Key functions of a new treaty to combat marine plastic pollution

As mentioned above, the increasing number of political initiatives to address plastic pollution may well signal the emergence of a new environmental norm (Clapp/Swanston 2009). Nonetheless, the fragmented nature of plastic pollution governance (both within countries and internationally) underlines the need for a mechanism to align and coordinate the range of activities needed to address the full scale of the challenge.

Ideally, a framework makes use of different governance instruments To achieve this, the following elements for achieving the convention's core functions are proposed in more detail below:

- First is a global goal to eliminate further plastic pollution of the marine environment as the convention's core objective.
- Second are legally binding national plastic pollution reduction targets with appropriate timelines. Third is a mechanism for technical cooperation, capacity development and financing;
- Fourth is a monitoring and review mechanism supported by a science-policy interface for assessing progress and keeping the environmental situation under surveillance; and
- Fifth is the function to operate as a platform for coordination across existing frameworks and for all relevant stakeholders dealing with the issue.

6.1 A goal to eliminate further marine plastic pollution, and legally binding national plastic pollution reduction targets

A plastic convention should set a global goal to eliminate further marine plastic pollution, including a target year. This should embody the core goal and be enshrined directly in the convention's text. It would be comparable to the objective laid out in the Paris Agreement to the UN Framework Convention on Climate Change (UNFCCC), in which Article 2 calls for maintaining the average temperature increase well below 2°C, and ideally not more than 1.5°C. A significant difference between the UNFCCC and the proposed plastics convention, however, would be the nature of reduction targets.

The convention should require parties to commit to binding national plastic pollution reduction targets and timelines, as well as to develop action plans containing their planned activities to end marine litter (see below). These would be included in a national plastic pollution reduction plan which each party should put forward. The underlying commitments would clearly outline domestic responsibilities, pathways to end marine litter emanating from each state's territory, measures to enhance national waste management systems, and other aspects relevant for substantially contributing to the global, overarching goal.

The national targets should be quantified and directly relate to the overall vision to eliminate further plastic pollution. Countries would need to report on the implementation of their goals in the various areas through tangible actions, including the strengthening of waste management systems, rising recycling rates, introducing or increasing levies, substitution

efforts etc. They should also relate clearly to the amount of plastic waste that stems from activities and leakages within their territory.

The plastic pollution reduction targets would be made public, allowing other parties to access them, enabling academics and NGOs to analyse and assess them and helping businesses to prepare accordingly. Over time, countries should review and update their plastic pollution reduction targets, moving closer towards the elimination of plastic waste discharge - directly or indirectly - into the marine environment.

6.2 National plans for implementation

In order to promote efficient implementation, draft templates for national implementation or action plans should be developed. Strategic objectives for such action plans should encompass the entire life-cycle of plastics and address all sources of marine plastic pollution, while focusing on the known main sources and pathways. They could cover diverse areas including sustainable consumption and production efforts, prevention and cleaning up of marine litter, innovation for more benign alternatives and more sustainable plastic products, waste collection and recycling among others. National action plans and measures implemented will differ considerably depending on national contexts and their main objective would be to ensure that the national pollution reduction target is met.

Table 9: Set of potential elements for national action plans

Strategic objective	Possible targets or indicators
Strengthen plastic waste management systems	Possible targets could relate to increasing the collection rate of plastic waste, and the recycling rates of collected plastic waste
Reduce the amount of single-use plastic packaging	Possible targets could relate to the reduction or ban of single-use plastic bottles or shopping bags, or the elimination of microplastics from cosmetic products
	Possible waste management targets could relate to a ban of open landfilling or the removal of plastic waste from land to prevent it from entering the oceans
Address direct sea-based and land-based sources of marine plastic pollution to prevent the entering of plastic waste into the environment	<p>One possible target could be to phase out the use of non-biodegrading plastic foils in agriculture</p> <p>Another target could address lost fishing gear, building on and enhancing existing activities in other frameworks</p> <p>Another possible target could require to establish national inventories of plastic use, waste, and transmission pathways into the environment, and reduce prevailing uncertainties</p>

Strategic objective	Possible targets or indicators
Increase knowledge about plastic pollution and its effects, and raise awareness about the benefits to prevent marine litter	One possible target could relate to the frequency and intensity of clean-up activities; or polls asking for awareness and behaviour when it comes to plastic use and pollution

The objectives and targets should also be designed to cover aspects that fall within the responsibilities of existing frameworks in the fragmented governance landscape on plastic pollution. That way, the deliberation rounds and afterwards the review process would both give life to one of the core functions of the convention, which is a central forum for coordination as described below. It would also require governments to lay out in one central document all efforts undertaken to eliminate marine plastic pollution that originates from their territory.

For achieving the objectives and targets, a range of measures and mechanisms to support the implementation of the convention's overall vision would be needed, including pledges e.g. to foster innovation, efforts made by multi-stakeholder partnerships and activities by municipalities. It is important to design each objective so that progress can be measured and made visible. Each party to the convention could use the objectives and targets to form a basic structure for their progress reporting. Based on these reports, the plastic convention secretariat, or a subsidiary body charged with review and follow-up, could compile these inputs and prepare a global report on the state of plastic pollution.

6.3 Technical cooperation and a financing mechanism

A plastic convention requires measures for capacity-development, including a financing mechanism, and a toolkit from which to draw national-level and local-level policies. A key function could be assigned to schemes building on extended producer responsibility.

6.3.1 A financing mechanism

The World Bank reported that "with more than one-fourth of waste dumped openly and many formal disposal sites managed improperly, plastic litter is increasing. Even when plastic waste is collected, many countries lack capacity to process the waste." (Kaza et al. 2018: 117) Establishing waste collection and management systems is cost-intensive. The World Bank reports that basic solid waste management systems can cost US\$ 35 per (metric) tonne and more, accounting for almost 20% of municipal budgets in low-income countries, while more advanced systems for waste treatment and recycling can cost between US\$ 50 – 100 (Kaza et al. 2018: 101). On the other hand, bolstering recycling of plastic can lead to tremendous cost-savings. The Ellen MacArthur Foundation calculated that "95% of plastic packaging material value or USD 80–120 billion annually is lost to the economy after a short first use." (Ellen MacArthur Foundation 2016: 26). These figures highlight the economic potential in fostering plastic collection and recycling, and they are in stark contrast to the costs commonly associated with bolstering waste collection systems.

Through a funding mechanism linked to a legally binding agreement, the international community can contribute with important seed funding, reduction of financial risk and catalytic funding to support the improvement and scaling up of waste management infrastructure in addition to supporting information exchange and technical assistance. These funds would have to be provided by governments, although it is also possible to imagine

more innovative set-ups that include contributions from the private sector. The plastic production industry makes annual revenues of US\$700 billion, and one option could be to introduce levies on plastic products. This would create a win-win-situation as such a levy could be designed to reduce unnecessary consumption, stimulate use of recycled content and recollection, in addition to generate the necessary funds to feed a trust fund and to invest into waste management systems. Part of the mechanism could also rely on in-kind contributions from business in the form of knowledge exchange, awareness-raising and of course to massively increase investments into better design of plastic products and more benign alternatives.

6.3.2 A toolkit for implementation, including extended producer responsibility

There is a wealth of legal instruments, many of which are already applied in numerous countries that can be used as a basis for a toolbox for the elimination of marine litter (UNEP 2016b). In section 3.1 above, a range of national-level tools and measures are presented (see Table 4). The CBD Secretariat has outlined possible instruments, including:

- Packaging and plastics reduction;
- Improved product and packaging design;
- Potential use of waste as a resource;
- Deposit return programmes;
- Economic instruments such as fees for single-use items;
- Regulatory measures to prevent marine debris;
- Bans for certain items (e.g., plastic bags, microbeads);
- Engaging with industry and corporations on sustainability, including plastics disclosure policies;
- Support for innovation in new materials, manufacturing, recycling and product design using alternatives to conventional plastics that are “fully biodegradable under ambient conditions”, with comparable performance characteristics;
- Improving waste management infrastructure to prevent debris inflow (e.g., storm-water systems);
- Improving awareness of marine debris;
- Providing viable alternatives to synthetic plastic (e.g., bioplastics and natural compounds);
- Eco-labelling / certification schemes; and
- Encouraging reuse and reduction.

Extended producer responsibility is a promising option for addressing a number of life-cycle issues of plastics, and probably to overcome some of the problems with financing. It should therefore be one element of the toolkits. The concept of EPR was originally proposed in 1990 and further elaborated upon thereafter (Lindhqvist/Lindgren 1990; Lindhvist 2000). It is defined by the OECD as “a policy approach under which producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products.” (OECD N/A) By making plastic producers responsible for the end-of-life of their

products, they incentivize the creation of public-private or purely private systems for waste collection, treatment, and recycling.

In the EU, 26 out of 28 member states currently have EPR schemes in place dealing with packaging waste (Watkins et al. 2017). Some countries have competing schemes, while the majority has opted to establish one common national EPR framework. All of them include a fee paid by the producers of packaging materials, and plastic packaging has been found to be higher than fees for more benign packaging materials. Watkins et al. (2017) outline a range of strengths of existing EPR schemes, including their contribution to “create more efficient separate collection schemes, reduce disposal and increase recycling”, while they list among the weaknesses that the “lack of a common approach leads to differing implementation and performances across the EU.” (Watkins et al. 2017: 1-2) In any case, there is a range of mechanisms from which to draw nationally appropriate EPR schemes. Hemkhaus et al. (2018) note that in emerging economies such as India, EPR already plays an important role, which could be enhanced through a range of measures and supported by bi- and multilateral cooperation and knowledge exchange. In a new plastic convention, a mechanism to develop, enhance, transfer and adapt EPR schemes for the purposes of and under the conditions within countries with considerable waste system challenges could provide many benefits.

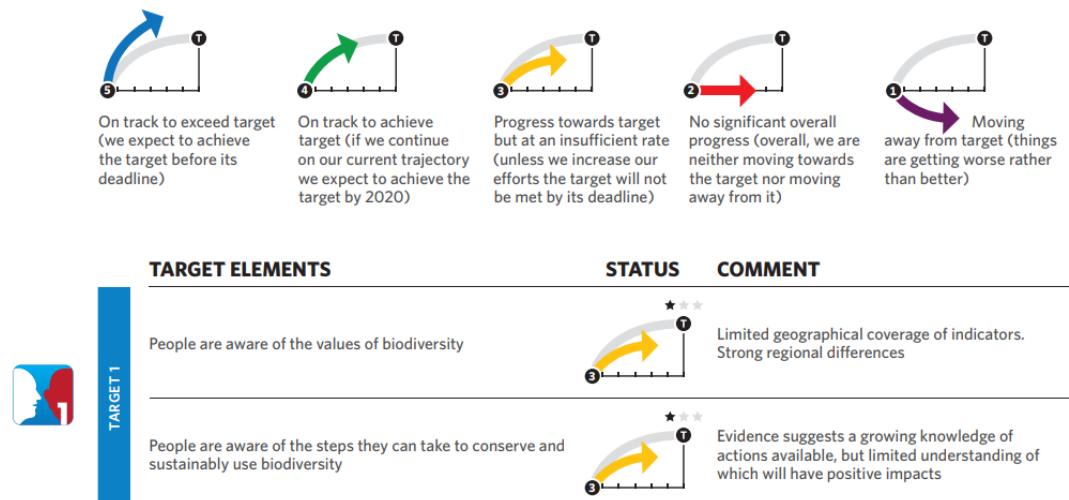
6.4 Follow-up and review and the science-policy interface

A legally binding treaty should be established with two knowledge-based mechanisms, one for providing scientific assessments on the state of knowledge on plastic pollution and its effects as well as for the development and assessment of response options; and one for monitoring implementation and reviewing compliance based on the objectives and targets agreed upon by stakeholders.

First, a science-policy interface is needed as scientific attention towards the sources and effects of plastic pollution has markedly increased over the past years, yet there are still considerable gaps in our knowledge. To date, there is no mechanism that would monitor the state of the environment and the level of plastic pollution in the marine environment, assess its sources and pathways and outline its effect. Fostering research is thus essential to develop policy proposals which are adequate and effective (Mendenhall 2018). As the Intergovernmental Panel on Climate Change (IPCC) or the International Platform on Biodiversity and Ecosystem Services (IPBES) have done for the areas of climate change and biodiversity, an SPI on plastic pollution would be a very important element in further developing global governance. The form of such an SPI should match the task at hand, and whether it would need to be a standalone body like IPCC and IPBES, or whether it could be a subsidiary body to the convention remains to be discussed. In any case, it can be expected to be considerably lighter than the IPCC.

First, a science-policy interface is not only needed for establishing a more robust science base, but also for translating this knowledge into policy-relevant proposals. The interface would summarize the state of knowledge on plastic pollution and its effects and develop policy-relevant response options that could be taken into consideration by decision-makers. To do so, the interface would not be a one-way communication effort from science to politics, but should be designed as a two-way collaborative mechanism involving policy-makers and academics in their respective roles (Koetz et al 2012; Pielke 2007).

Figure 6: The “target dashboard” system for reporting the state of overall progress in the Global Biodiversity Outlook



Source: CBD 2014: 18

Second, a binding framework requires a monitoring and review mechanism to measure progress in achieving its goals. This mechanism would assess the effectiveness of the convention and thereby make compliance with its stipulations transparent.

The review would be based on the objectives and targets that should be negotiated, as described above. It could be designed in two steps: First, it would rely on national self-reporting and provide summary reports on the implementation of the treaty. As a proposed Global Plastic Pollution Assessment, it could serve a purpose comparable to the Global Biodiversity Outlook under the UN Convention on Biological Diversity (CBD). Second, it might be used to check for plausibility by juxtaposing the results from scientific assessments including on the amount of plastic in the ocean with those derived from national reports and inventories. If all national reports claim to fully implement the convention, yet the amount of plastic waste in the ocean keeps increasing, either the reports are wrong or there are new and unaddressed sources of plastic pollution, either of which must be addressed.

6.5 A coordination forum and partnerships facilitator

Global plastic governance is marked by severe fragmentation with a variety of legally binding and voluntary agreements with institutions on a regional and global level. There is to date no main forum where coordination takes place, where the various platforms can coordinate their efforts and where cross-sectoral and multi-stakeholder cooperation can be fostered. The complexity of the various spatial, political and technical necessities required for effective coordination on sea- and land-based activities calls for a central forum and the plastic convention could provide it. In addition, a secretariat is needed to prepare and organize meetings, to facilitate information exchange, administer the science-policy interface and fulfil other functions.

The annual Conference of the Parties could be organized in a way to attract all relevant stakeholders from the various sectors. They could have a policy track for negotiation, but also a science track with meetings and discussions on new academic findings and their repercussions, and an innovative business and technology track for the private sector and

national and subnational actors to exchange information on how to enhance product design, availability of more benign alternatives and waste collection and recycling. The goal would be to not just have policy discussion and negotiations at the COPs, but to have a high-level, relevant, vibrant, and challenging conference in which many diverse voices come together and decisions can be taken based on most current scientific findings and technological developments, with immediate repercussions for the implementation on the ground.

In addition, the coordinating function of the GPA could be enhanced, and it should become an instrument administered by the new plastic convention and its secretariat. In addition, a dedicated coordination mechanism should be established within the UN, where all relevant intergovernmental organizations, treaty secretariats and other administrations are present and coordinate their activities, manage the division of labour and bring, if necessary, overlaps or conflicts to the attention of policy-makers in the respective decision-making bodies.

To illustrate the relevance of taking into account the division of labour among existing frameworks and a possible new binding convention on plastic pollution, take for example abandoned, lost and discarded fishing gear, one of the major sources of plastic pollution with a particularly heavy impact on oceanic wildlife. An assessment found that 19 global and regional bodies and institutions have the competence to pass binding rules for regulating marine fisheries operations, and 12 of these are making use of their mandate by passing rules to reduce ghost fishing (Gilman 2015). Yet out of 18 categories of available instruments, measures are only adopted from half of these categories. This shows both the need and the potential to significantly enhance activities towards bringing down the huge losses from ghost fishing, but also the difficulty of creating any added value through an international plastics convention that would become active on this issue.

The convention and its platforms could, furthermore, act as an incubator for multi-stakeholder partnerships and other voluntary measures from the local to the global level. Existing partnerships such as the GPA's GPML and the Basel Convention's Partnership on Household Waste could be invited to present their approaches, and new partnerships could be founded which could be focusing on the prevention of marine plastic pollution, on innovation for more benign alternatives, on the reduction of single-use plastics or comparable efforts. Such efforts should be designed alongside the SMART criteria, as it is the case with partnerships for achieving the 2030 Agenda, meaning their commitments should be specific, measurable, achievable, resource-based and time-bound.

Setting out clear deliverables, delineating responsibilities and providing sufficient resources are essential for making partnerships a success. Partnerships will not establish themselves, though, but they need a strong framework for action as well as a platform for presenting their efforts, for information exchange and for finding new partners and additional funds.

7 Concluding remarks

There is an urgent need for an enhanced governance framework to address marine plastic pollution. The current fragmented institutional landscape is not able to effectively deal with the problem. This failure has several causes, which include gaps and loopholes in existing agreements covering sea-based sources of plastic pollution, a much larger gap when it comes to tackling land-based sources as well as absent binding rules that would entail national-level commitments and a lack of coordination among existing initiatives and agreements.

The proposed convention on plastic pollution should be designed to address these shortcomings. Based on a common goal to prevent and eliminate further marine plastic pollution, the convention should include binding national pollution reduction targets. Together with a number of further key elements – national plans for implementation, a mechanism for technical cooperation and funding; monitoring and review and a science-policy interface; the convention should also serve as the central coordinating platform for existing initiatives and invite representatives from other frameworks to join negotiations. This would establish a common umbrella while leaving the status of existing institutions untouched.

At the same time, existing institutions would need to be strengthened, as has been proposed with the Basel Convention which could then begin to address the international trade in plastic waste. Further amendments are needed to reach agreements that address sea-based sources of plastic pollution, which have too many loopholes and implementation issues. Yet the cornerstone of future plastic governance should be a legally binding global treaty on marine plastic pollution.

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