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20 Years of Government Responses to the Global Plastic Pollution Problem

The Plastics Policy Inventory

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EXECUTIVE SUMMARY

Study Objectives, Scope, and Methods Used

Plastic pollution in the ocean is a global problem that requires cooperation from a wide range of groups (e.g., governments, producers, consumers, researchers, civil society). However, by virtue of their core regulatory powers, governments have a critical role to play in helping to solve this problem. This study aims to synthesize the policy response of governments to the global plastic pollution problem, as a basis for more rigorous monitoring of progress (as called for in Resolution 4/6 of the 2019 United Nations Environment Assembly (UNEA) meeting) and to inform future public policies.

The scope of the study is limited to public policies introduced during the period from January 2000 to July 2019, prior to the onset of the COVID-19 pandemic. As governments mobilize to respond to the pandemic, certainly these policies may change, so that this study may provide a baseline for "before-after" comparisons. Additionally, the scope of this study is limited to those polices explicitly aiming to reduce plastic leakage. At the same time, generally applicable waste management policies are considered to be fundamental to addressing the problem, even if they are not explicitly intending to do so (i.e., they were not designed at least partially in response to the problem of leakage of plastic into the ocean). For the purpose of this study, the current and future trends in these generally applicable policies are considered as part of the baseline or business-as-usual scenario, unless they have been amended or adjusted explicitly to respond to the plastic pollution problem. This study aims to identify and characterize the additional response from governments, which in combination with general waste management policies, equals the total possible government response to the marine plastic pollution problem.

To achieve the study's objectives, a noncomprehensive, global Plastics Policy Inventory was developed, based on searches of: (1) global policy databases as primary sources of data, (2) scientific literature and an ad hoc review of non-refereed literature as secondary sources, and (3) media resources. As a cross-check, ten experts were consulted to identify any gaps in the first iteration of the inventory. Searches of the scientific literature were conducted on the following interdisciplinary scientific or legal research databases: Web of Science, Google Scholar, and HeinOnline (legal literature). From these databases, over 13,000 returns were screened, resulting in a Plastics Policy Library of 136 articles studying one or more public policies aiming to address plastic pollution.

The Plastics Policy Inventory[1] currently includes 291 policy documents explicitly aiming to address plastic pollution since 2000, as well as 370 policy documents expected to have an impact on plastic pollution though not explicitly intending to do so, 75 non-English policy documents retained for future translation and screening, and finally 442 references to plastics policy documents from the scientific and grey literature reviewed (where the actual policy document has yet to be located). The inventory can currently be considered comprehensive only for policies at the international level (containing 97 percent of the total number of known policies, i.e., either found or referenced in the literature reviewed), but can be considered indicative for policies at

1. See: https://nicholasinstitute.duke.edu/plastics-policy-inventory.

the national level (containing 39 to 47 percent of the total number of known policies). At the subnational level, the inventory currently only provides scattered examples at the subnational level (21 percent of the total number of known policies). In sum, the 291 plastic policy documents in the inventory form the units of analysis to understand how governments are responding to the plastic pollution problem.

To better identify and classify the specific instruments that governments are using in policies at different levels, the 291 policy documents in the inventory were analyzed. This analysis was based on a typology of instruments developed under three broad categories: regulatory, economic, and information instruments. For each of these three categories of policy instruments, common types of instruments used to address plastic leakage were identified as subcategories, e.g., bans on specific products, recycling mandates, taxes on products, etc. Initially more than 30 different subcategories of plastics policy instruments were found in the literature, but after testing for applicability to a wide and diverse set of policy documents, this number was condensed to 14 subcategories in total.

Subsequently, to understand what instruments were "working or not," that is, which instruments were most effective in different contexts, articles in the Plastics Policy Library were reviewed in order to synthesize any measures of outcomes attributed to the policy instruments. The results from this review provide a state of the science on the effectiveness of plastics policy instruments (see Chapter 4).

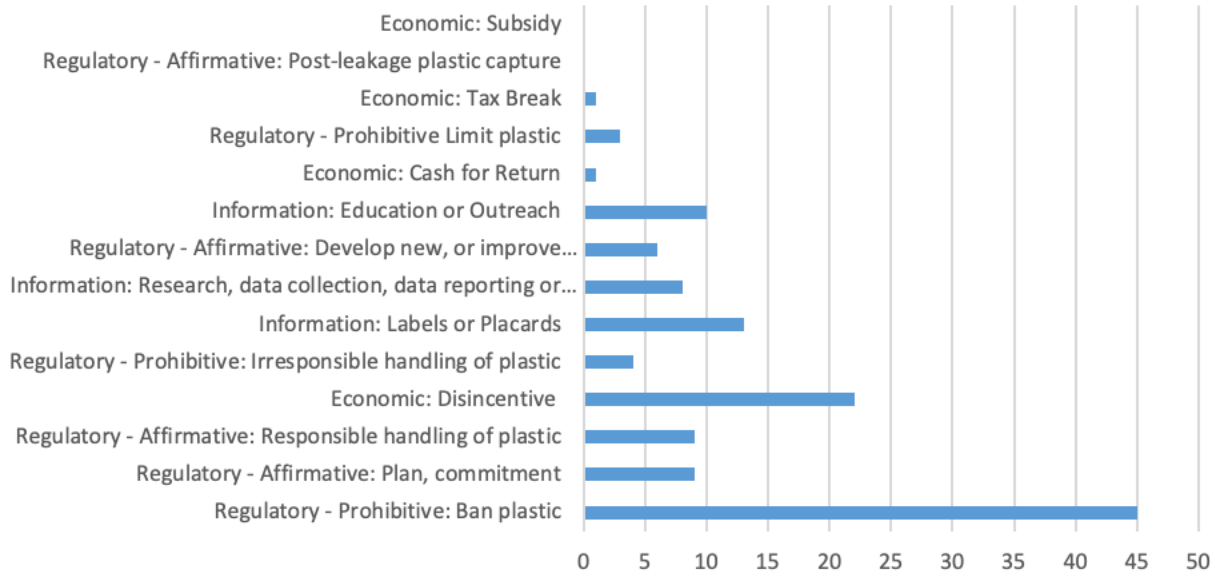
Key Findings

Trends in Policy Design: How Governments Have Responded to the Problem

- ***Overall***, analysis of the Plastics Policy Inventory shows a clear upward trend in the number of public policy responses to the plastic pollution problem over the last decade, at global, regional and national levels.
- ***At the global level***, prior to 2000 five binding international policies were agreed that are applicable to the problem, but only maritime sources of pollution were directly addressed. Since 2000, the 28 international policies that aim to address the problem have typically been nonbinding agreements (forming a growing body of "soft law") and focused largely on land-based sources. However, the analysis of international policies highlights key gaps in the response at this level, namely that there are no global, binding, specific, and measurable targets agreed to reduce plastic pollution.
- ***At the regional level***, the upward trend in the overall number of policies adopted has been similar to the global level (if not slightly leading global policies in aggregate). These regional policies are essentially a European phenomenon: almost 62 percent of the regional policies in the inventory were largely developed within Europe (with almost half of these from the Mediterranean). Even when binding upon participating states, these policies have almost always depended upon national legislation, and have frequently been nonbinding regional "action plans" facilitated by the United Nations Environment Programme (UNEP) in conjunction with the Regional Seas Programme.

- ***At the national level***, this upward trend in the overall number of policies largely reflects new policies introduced solely to address pollution from plastic bags at the production, import, selling, and use stages of the life cycle. By far the instrument most frequently used in these policy responses was a regulatory ban on plastic at some stage in the life cycle: national governments used regulatory instruments 3.5 times more frequently than economic instruments in the sample analyzed, and 3 times more frequently than information instruments in the sample (the figure below illustrates this trend for plastic bag pollution). Similarly, the subnational examples found used regulatory bans far more frequently than economic instruments, at a ratio of roughly 2 to 1 for instruments targeting plastic bag pollution, and 23 to 6 for instruments targeting macroplastics more broadly.

Figure 1. Instruments Most Frequently Used by National Governments to Specifically Address Pollution from Plastic Bags in the Nonrandom Sample Analyzed (Number of National Policies Using Each Instrument)



- The growth over the last decade in national regulations banning some form of plastic carrier bags is one of the major features of global plastics policy in the inventory. As national policies to address plastic carrier bags have increased, by the end of the first half of 2019, within the sample of policies analyzed, national governments had banned, taxed, or levied fees on various forms of bags in at least 43 countries around the world. These policies cover a population of 952 million in 2018 if the policies in China and India are excluded, and a total of 3.7 billion if they are included. The East Africa Community's "Polythene Material Control Bill" would add another 22.2 million people to these totals (given that four of its six members already have national policies included in this list). The instrument most commonly used in these policies was a punitive regulatory ban, which

was used twice as frequently to address pollution from plastic bags than the second most common instrument: economic disincentives (e.g., taxes on bag use). Over half of the policies analyzed with bag bans were enacted in sub-Saharan Africa.

- Instruments for education and outreach in the sample analyzed were often not paired with national regulatory or economic instruments to reduce plastic bag pollution, despite evidence and consistent recommendations from researchers that this enhances effectiveness. Of the 48 national policies in the sample that include a ban, tax, or levy on plastic bags in some form, only 18 also include a supporting information instrument, and only six of these were aimed at education and outreach. Overall, throughout the sample of national policies analyzed in the inventory, national governments used instruments for education and outreach in only 15 instances.
- National policies in the inventory that introduced a ban, tax, or levy on some form of plastic bags were largely a phenomenon in low-income and lower-middle-income countries. Of the 43 countries where national governments introduced a ban, tax or levy on some form of plastic bags in the inventory, 33 were in sub-Saharan Africa, Pacific Island countries or territories, or Latin America and the Caribbean. In this sample, Africa leads the world in national policies to ban, tax, or levy plastic bags.
- Analysis of national policies in the inventory suggests that some governments in countries with high levels of mismanaged plastic waste from coastal land-based sources may not yet have formulated responses. Of the top 20 coastal countries producing mismanaged plastic waste from coastal land-based sources (based on estimates from 2010 in Jambeck et al. 2015), seven do not have a national policy document (or reference to one in the literature reviewed) in the inventory: Philippines, Thailand, Egypt, Algeria, Brazil, Myanmar, and North Korea. Another four countries have only national policies targeting plastic bags in the inventory or referenced in the literature: Nigeria, Bangladesh, South Africa and Morocco. This does not suggest with certainty that no national policies exist in these countries to address land-based sources of plastic pollution. Nor does the presence of a national policy in some countries indicate effectiveness of the government's response to plastic pollution. However, the result that essentially over half of the top 20 countries either do not have a policy in the inventory or only have a policy in the inventory targeted to plastic bags, indicates that some of these nations may not yet have formulated comprehensive national policy responses. Similarly, of the top 20 plastic-polluted rivers identified by Lebreton et al. (2017), at least four have some or all of the riparian countries with no national policy in the inventory or referenced in the literature (but not found for analysis in the inventory): the Amazon (Brazil and Ecuador with no policy in the inventory); the Pasig (Philippines), the Irrawaddy (Myanmar), and the Mekong (Cambodia, Laos, Myanmar, and Thailand).
- ***At all levels***, the definition of the plastic pollution problem in policies analyzed has evolved, for example moving at the global level from more general to more complex, focusing on a number of different types of pollutants, rather than just "all" plastics or "macroplastics."

- As the number of policies has increased and the problem definition evolved, more policies have emerged in the inventory that are comprehensive and represent an "all of the above" approach, aiming to address multiple stages of plastic product lifecycles. For example, over time, national governments have increasingly deployed these instruments at different parts of the problem (i.e., stages of the plastic product life cycle), for example, with 25 percent of national policies analyzed using instruments to address multiples stages of the plastic product lifecycle from 2000 to 2005, as compared to 59 percent in 2018 (and 19 percent with instruments addressing all stages).
- Land-based sources of plastic pollution (excluding plastic bags) have largely been addressed by policies at the national or subnational levels, with notable exceptions such as the European Union. Some form of plastic packaging or other single-use plastic product (excluding plastic carrier bags) was banned in at least 25 countries in the sample analyzed, representing a population of almost 2 billion people in 2018. However, the vast majority of this population was covered by two policies in India and Pakistan, for a total of 1.56 billion. The remaining 23 countries, covering a population of only 355 million in 2018, have legislation including some form of national ban. Across geographies, while EU policies typically include a broad range of instruments (most frequently regulatory affirmative instruments such as recycling requirements), many of the other regions were characterized by regulatory prohibitive instruments such as a ban on plastics of some type, including sub-Saharan Africa, East Asia, and the Pacific, Latin America and the Caribbean, and South Asia.
- On the opposite end of the spectrum from responses to plastic bag pollution, there are relatively few policy responses to microplastic pollution in the inventory at any level. At the national level, within the inventory only nine national governments had policy responses to microplastic pollution by the end of 2019's first half, and eight of these were adopted within the last five years, largely in Europe and North America. Throughout these initial responses, the problem has largely been defined in terms of plastic microbead ingredients in cosmetic products, as only one instrument in the entire sample is targeted to microplastic pollution from synthetic tire abrasion (in order to conduct research and collect data). Across the nine policies, the instruments used were either regulatory bans of plastic microbeads or planning requirements.
- Maritime sources of plastic pollution were the first addressed in international policy by the binding London Convention and the MARPOL Convention treaties in 1972 and 1973, respectively, that have subsequently been translated in many cases into national laws. The general consensus among legal scholars is that these two international treaties can be considered at least partially effective in driving government responses.

Trends in Policy Effectiveness: What Has Worked and What Has Not

- The scientific literature on plastics policy effectiveness is small and limited, albeit growing. Of the 136 articles reviewed, 41 provide either quantitative and/or qualitative observations of outcomes attributed to instruments for only 24 national policies and 36

subnational policies (and one international policy—a regional directive issued by the European Commission). In terms of coverage of the national policy documents in the inventory, as well as those with references in the literature but for which the documents have not yet been found as of publication (see Chapter 2), at most only 6 to 8 percent of national policies and 11 percent of subnational policies aiming to address plastic pollution have outcomes observed and reported in the scientific literature (though the number and trend are increasing).

- The vast majority of this literature is focused on the short-term effects of policy instruments aiming to reduce plastic carrier bag pollution, largely economic instruments in high-income countries. Across the policies studied, regardless of whether a regulatory ban or an economic instrument (i.e., a levy or tax) was used, significant reductions in the consumption of plastic bags were consistently measured in the short-term (within 24 months of the introduction of the instrument, and typically within 12 months). The degree to which these instruments achieved consumption reductions varied, and in some cases a lack of enforcement on retailers, or charges fixed too low in economic instruments, led to smaller effects. Essentially, the literature suggests that these instruments may not necessarily be eliminating plastic bag pollution, nor likely to change consumer behavior completely, but they are likely to have a significant impact if enforced. At the same time, the literature consistently documented examples of unintended consequences where demand for plastic carrier bags shifted into alternatives, such as paper bags or plastic garbage bags—though in some cases less so for economic instruments than for regulatory bans. However, even when consumption of plastic carrier bags decreased and paper bag consumption increased, the latter was typically less than the former when taxes or fees are imposed on paper bags, such that net consumption of disposable bags (plastic and paper bags) decreased.
- Over the longer-term, the number of studies of plastic bag policy effectiveness is smaller, but still suggest sustained reductions in consumption. Across 10 cases where effects were reported at least 24 months after the instrument was introduced, consumption reductions have remained significant, at 50 percent or above. Sustaining these effects depends in part on combating the rebound effect when economic instruments are used, whereby consumers internalize the charge and start to increase demand—such that the charge may also need to be increased.
- The choice of a regulatory ban or economic instrument to address plastic bags does not appear to be determinant, as both have shown significant and consistent reductions in plastic bag consumption in the scientific literature. Regardless of the choice, across both types of instruments, the literature suggests that key factors to effectiveness may include: (1) setting the fee high enough for economic instruments to affect behavior and in some cases adjusting it upwards over time to counteract the rebound effect; (2) focusing on provision of inexpensive reusable alternatives; and (3) emphasizing public awareness and acceptance of the policy to enhance compliance, through coupling regulatory and economic instruments with information instruments.

- Studies of economic instruments to incentivize increased recycling of plastic beverage containers by providing cash for return of the used containers, have consistently shown significant effects over a small sample size largely in the European Union and North America.
- Beyond studies of the effects of policy instruments on plastic bag pollution and plastic beverage container pollution, only a handful of studies have considered instruments addressing other types of pollutants or sources. Notably, given that they have been introduced only recently, there are no studies of the effects of policy instruments aiming to address microplastic pollution (e.g., regulatory bans of the use of plastic microbeads in cosmetic products).
- This review provides further data to illustrate the significant research gap on the effectiveness of plastic policy instruments. This gap may in part reflect the time lag between the introduction of policies and the publication of studies with quantitative measures of effectiveness in the scientific literature, which for the articles reviewed in the Plastics Policy Library was on average 6.5 years. The geographies where plastics policy effectiveness was studied in the scientific literature reviewed were almost exclusively limited to North America (40 percent), Europe (28 percent), and East Asia and the Pacific (24 percent). Notably, no national policies in Latin America or South Asia have observed measures of outcomes recorded in the scientific literature. Additionally, the policy instruments studied have largely been confined to those targeting plastic bag pollution—comprising almost 82 percent of the instruments studied for which effective measures were reported in the scientific literature reviewed. The remainder is largely focused on economic instruments to enhance recycling of plastic beverage containers, typically through cash for return instruments. The majority of these studies are not able to conclusively determine the effects of the instruments (e.g., as opposed to changing sociocultural norms), due to the absence of controls for comparison. Additionally, the majority of the studies focus on economic instruments introduced in wealthier countries, even though regulatory bans are the most prevalent instrument to address plastic pollution worldwide. Lastly, the vast majority of studies report effects of the policy instruments in the short-term, but very few measure effects over a longer-term.

Summary of Policy Recommendations Proposed in the Scientific Literature

- For responses to all land-based sources of plastic pollution, increased use of information instruments is recommended. A number of policy recommendations throughout the scientific literature highlight the importance and effectiveness of education or outreach campaigns to consumers about other instruments (e.g. plastic carrier bag bans), as public support for and compliance with these instruments improves where the environmental benefits are better understood.
- For land-based sources of macroplastic pollution, improved solid waste management systems are fundamental to solving the problem (e.g., at the disposal, collection and recycling stages of product lifecycles), particularly in lower and middle-income countries.

For these same pollutants, instruments that extend producer responsibility are also consistently recommended.

- For instruments targeted specifically to addressing plastic carrier bag pollution, researchers consistently recommend using a mix of policy instruments, notably for education and outreach to accompany regulatory or economic instruments.
- For regulatory bans of various forms of plastic bags, the simplicity of the instrument and costs of monitoring compliance relative to economic instruments may be a benefit where government capacity is limited, but leakage (i.e., increase in consumption of alternatives to plastics targeted by a policy) into disposable alternatives is a key challenge.
- For economic instruments imposing a charge on various forms of plastic bags, researchers emphasize the importance of setting the charge high enough to influence behavior.
- For other single-use macroplastic pollutants (e.g., plastic bottles), some researchers suggest that regulatory bans for plastic carrier bags could be extended to these other products, at least in the short-term (taking into consideration consequences of increased demand for alternatives).
- For plastic bottles, economic instruments that provide cash for return have been effective in increasing recycling rates and recommended for wider use (based largely on studies in Europe and North America).
- For microplastic pollutants, regulatory bans of plastic microbeads in all types of cosmetic and personal care products are recommended at all levels, even in countries with complete coverage of tertiary wastewater treatment programs.
- Finally, across all land-based sources of plastic pollution, scientists have consistently called for a binding global treaty, drawing from precedents such as the Montreal Protocol, the Stockholm Convention, or the Paris Agreement. Across the 28 international policies agreed since the beginning of 2000, none include a global, binding, specific, and measurable target to reduce land-based sources of plastic pollution, limiting the extent of plastic pollution reduction that they can achieve. For this reason, a number of researchers have called for a binding global treaty to reduce land-based sources (e.g., Dauvergne 2018, Haward 2018, Raubenheimer and McIlgorm 2018, Worm et al. 2017), for example what Worm et al. (2017) termed a "Global Convention on Plastic Pollution." Researchers have recommended that such a global treaty include at least two key elements, among others: (1) binding and measurable targets for plastic pollution reduction and (2) robust monitoring, reporting, and enforcement mechanisms. There are a number of precedents or models for such a treaty, notably the Montreal Protocol, the Stockholm Convention, and the Basel Convention. The Montreal Protocol, for example, demonstrates an effective regulatory ban of products (ozone-depleting substances) at a large scale, though not necessarily of products at the scale of plastics production.

CHAPTER ONE: INTRODUCTION TO THE PLASTIC POLLUTION PROBLEM IN THE OCEAN[2]

1.1 Scale of The Plastic Pollution Problem in the Global Ocean

Growth in Global Plastic Production.

Plastics are an entirely new class of materials—synthetic polymers—created largely from petrochemicals through addition reactions and condensation reactions that produce resins and fibers which are now the most widely used human-made substances on the planet (Geyer et al. 2017, Worm et al. 2017, American Chemistry Council 2019, PlasticsEurope 2019). Since the 1907 invention of the first plastic of commercial importance, the growth of global production has occurred in three distinct phases: (1) slow initial growth from 1910 to 1950, (2) large-scale production and exponential growth from 1950 to 2000, and (3) linear growth more in lockstep with economic growth from 2000 to 2015 (Worm et al. 2017). Since 1950, global production (both polymer resins and synthetic fibers) increased from two million tons annually to 382 million tons in 2015 (407 million tons when additives are included, i.e., global primary plastics production)—a faster growth rate than the global economy (as measured by gross domestic product) (Geyer et al. 2017). The cumulative amount of plastic produced over this period was 7.8 billion tons, half of which was produced since 2002, and over half of which is produced each year in Asia (China is the world's leading producer at over 29 percent) (Geyer et al. 2017, PlasticsEurope 2018). The largest use of this plastic in 2015 was for packaging (accounting for over a third of global primary plastics production), followed by building and construction (16 percent), textiles (14 percent), and consumer and institutional products (10 percent), among others (Geyer et al. 2017).

Direct or Indirect Plastic Leakage into the Ocean

Plastic waste leaks (i.e., is discharged) directly into the ocean from ships and human activities on the sea (i.e., maritime sources) or from terrestrial activities (i.e., land-based sources) via three types of pathways: inland waterways, wastewater outflows, and transport by wind or tides (Jambeck et al. 2015). Although a relatively small portion of global waste at the time, plastics have been reported in the ocean since the 1960s (Ryan 2015). Research on the topic increased in the 1970s and 1980s but tapered off in the 1990s (Ryan 2015). Then in 1997 existence was confirmed of the "Great Pacific Garbage Patch" where floating debris (largely comprised of small pieces of plastic) converged in a gyre (Moore et al. 2001). In 2010 a similar area was discovered in the Atlantic Ocean (the "North Atlantic Garbage Patch") (Law et al. 2010) and subsequently in other mid-ocean gyres of floating debris such as that of the South Pacific (Eriksen et al. 2013). In the mid-2000s research on plastics in the ocean intensified (UNEP 2018)—the number of articles published annually on the topic in the Web of Science core collection quadrupled from 50 in 2013 to 200 in 2017 (Dauvergne 2018). As a result of this increase, during the last decade researchers have generated initial estimates of the scale of plastic leakage into the ocean.

While global production of plastics is known with reasonable confidence, the proportion that has leaked into the ocean is unknown, nor the total quantity currently residing there (GESAMP

2. See Appendix 1 for a more in-depth overview of the problem of plastic pollution in the ocean.

2019). As a starting point, annual plastic waste is expected to roughly track annual plastic resin production (with differences resulting from the time lag in disposal of durable goods, for example), so that proxy evidence of use and disposal can be used to generate estimates of leakage into the ocean (Jambeck et al. 2015). On this basis in 2015 scientists provided a first order-of-magnitude estimate of the total amount of this plastic waste potentially entering the ocean from the coastal population (within 50 kilometers of the coast), using the proportion of global plastic waste classified as mismanaged in different geographies (with differences across geographies due to coastal population size, plastic consumption, and waste management practices). Results suggested that 4.8 to 12.7 million tons of plastic potentially leaked into the ocean from coastal populations in 2010 (over half of which came from five countries: China, Indonesia, Philippines, Vietnam, and Sri Lanka), an amount predicted to increase by an order of magnitude by 2025 under a business-as-usual trend in waste management practices (Jambeck et al. 2015). This trend is less likely if observed decoupling of economic growth and waste generation is considered, together with the stagnation of plastic production in Europe from 2005 to 2015, and waste management improvements in some countries (Worm et al. 2017).

In addition to these estimates of plastic waste inputs to the ocean from coastal populations, models have suggested that another 0.8 to 1.5 million tons of plastic waste generated by inland populations is transported to the ocean each year via rivers (Lebreton et al. 2017). The total amount of plastic waste transported annually by rivers to the ocean from both inland and coastal populations was estimated to be 1.2 to 2.4 million tons, 86 percent of which occurred in Asia (with three of the top four rivers in China: Yantgtze, Xi, and Huangpu rivers) (Lebreton et al. 2017). In the aggregate, these types of studies have provided indications for the scale and geographical distribution of plastics leakage into the ocean (though have not included inputs from maritime activities or shoreline activities such as beach tourism), and a focus on inadequate solid waste management in a relatively small number of countries, rather than higher per capita use of plastics (UNEP 2018).

Plastic Pollution in the Ocean

Once in the ocean, plastics with a density lower than seawater should float, as seen in the subtropical gyres where debris converges. However, estimates suggest that there are over five trillion plastic particles floating on the surface weighing 268,940 tons—an order of magnitude lower than the estimated input to the ocean (though petroleum-based plastic constitutes up to 80 percent of the marine litter found in surveys) (UNEP 2016, Eriksen et al. 2013). One hypothesis for the "missing plastic" at the ocean's surface is that much of the buoyant plastics leaking into the ocean is captured by the shoreline, with only a small fraction eventually escaping the coastal environment to accumulate in offshore waters (Lebreton et al. 2019). The authors of this hypothesis predict that of the mass of buoyant plastic larger than 0.5 cm that has entered the ocean since 1950 (an estimated 70 to 189 million tons), roughly two-thirds is stored by the world's shoreline, where debris is stranded, settled and/or buried, undergoing episodes of capturing and resurfacing (Lebreton et al. 2019). Beyond the visible floating plastic, smaller particles are widespread in the ocean from the poles to the equator, and from the surface to the deep sea (Thompson 2015, Browne et al. 2011).

In aggregate, the effects of this plastic pollution on marine wildlife are considered to be severe as a result of ingestion and entanglement. The number of different species affected by marine debris has increased from 693 (Gall and Thompson 2015) to over 2,200 (Litterbase 2020). The problem is persistent at sea, as degradation of plastics generally takes much longer in the ocean than on land, because infrared and ultraviolet light is readily absorbed by water (Andrady 2003). Although there are uncertainties surrounding the amount of plastic pollution in the ocean, the United Nations Environment Programme (UNEP, 2018) has written that "despite these caveats, we can state with a high degree of confidence, that there is too much plastic in the ocean, that it causes unwanted social, economic and environmental impacts, and that too much continues to enter each year."

1.2 The Role of Governments in Addressing Plastic Pollution in the Ocean

Plastic Pollution as a Social Dilemma Requiring a Government Response

Pollution has been characterized generally by social scientists as a social dilemma—where rational decisions by individuals lead to irrational outcomes for society (Dawes 1980), or more specifically by economists as a market failure—where the production and/or consumption choices of one person or firm involuntarily affects others (Kolstad 2011). Essentially, individual producers and consumers make rational decisions that result in collective losses for society in the form of leakage of plastics in the environment. Like plastic pollution, many of the most challenging problems society faces are at their core social dilemmas (Kollock 1998), and the motivations for human behavior contributing to these problems have occupied the attention of thinkers for millennia, from Aristotle to Hume among many others (Ostrom 2009). Scholars across a range of disciplines have studied social dilemmas such as pollution and have generally agreed on the need for cooperation to find a solution, in some cases facilitated by government institutions (North 1990).

Although plastic pollution in the ocean is a social dilemma that requires cooperation from a wide range of groups (e.g., producers, consumers, or researchers), by virtue of their core regulatory powers, governments have a critical role to play in helping to solve the problem (Dauvergne 2018). While by many estimates Asia is the epicenter of the marine plastic pollution problem (Garcia et al. 2019), its scale is global, spread by winds and ocean currents and spanning cultural, geographical and jurisdictional boundaries (Raubenheimer and McIlgorm 2018). As such, governments have responded to the problem at national and subnational levels, but also in cooperation at the international level (Carlini and Kleine 2018). From municipal governments responding with plastic product bans/taxes in the 2000s (Fromer 2010), to the United Nations' "war on ocean plastic" and the launch of the #Cleanseas campaign in 2017, government responses to the problem have been increasing over the last decade (Carlini and Kleine 2018). These responses have likely had a significant but poorly measured and understood effect on plastic pollution in the ocean, reflecting that many are too recent to have been studied (Xanthos and Walker 2017).

1.3 Objective and Scope of this Study

Study Objectives

This study aims to synthesize the policy response of governments to the plastic pollution problem in the ocean, as a basis for more rigorous monitoring of progress and to inform future policies that governments may develop. To achieve these objectives the synthesis includes:

(1) Construction of a noncomprehensive inventory of government policy responses at local, national, and international levels to this global problem;

(2) Analysis of the design of a subset of these responses, in order to identify and characterize the specific instruments used by governments;

(3) Review of previous measures of the effectiveness of plastics policy responses;

(4) Summary of recommendations from the scientific community to governments; and

(5) A matrix (i.e., menu) of the types of policy responses governments have taken to date in different contexts.

Scope of the Study

The study focuses on government responses, in the form of public policies, to the problem of plastic pollution in the ocean. Plastic pollution is used here synonymously with the term plastic marine litter (i.e., any plastic material discarded, disposed of, or abandoned in the marine and coastal environment), and is distinguished by whether the sources were land-based activity or maritime activity, consistent with international monitoring guidelines (GESAMP 2019). Because discarded, disposed or abandoned plastic material can be transported to the ocean from inland sources via rivers (Lebreton et al. 2017), any leakage of plastics throughout their product life cycle is considered within the definition of the problem.

There are of course a number of other social dilemmas associated with the production and consumption of plastics, aside from pollution of the ocean, including emissions of greenhouse gases contributing to climate change and ocean acidification (with plastic production and incineration projected to generate more than 850 million tons of greenhouse gas emissions in 2019), and adverse effects on human health in some cases (e.g., from specific chemical additives), among others (CIEL 2019a; 2019b). While this study defines plastic pollution in the ocean as the problem of focus, available information on unintended consequences and spillover effects of policies is also considered where possible, in order to help take into account other social dilemmas associated with plastic use. Similarly, while the focus is on government responses to address the marine plastic pollution problem, the costs of these responses (or of addressing the problem in the absence of government intervention) are often borne by those who are not responsible for the pollution (Raubenheimer and McIlgorm 2018) and/or are least able to bear them. For this reason, the summary of public policy recommendations references relevant internationally agreed principles of equity in sustainable development (United Nations 1992), as a basis for government responses.

Given that research and global attention to the marine plastic pollution problem intensified in the mid-2000s (UNEP 2018), in order to be conservative this study considers government responses for the time period beginning in the year 2000, continuing until July 2019 (excluding policies adopted during the month of July, e.g., Antarctic Treaty Resolution No. 5 "Reducing Plastic Pollution in Antarctica and the Southern Ocean"[3]). In terms of the scale, because of the global nature of the problem, the study includes public policies at the international, national, and subnational level, to cover the full range of government responses. Similarly, the study considers leakage of plastics into the environment at any stage in the life cycle of the substance, which has typically been categorized as follows (taking into account the diversity of plastic products): (1) plastic production, (2) materials and product design, (3) waste generation, (4) waste management, (5) litter capture, and (6) leakage into and degradation in the environment (ocean) (PlasticsEurope 2018, Jambeck et al. 2015).

Organization of the Report

Based on the scope, the report is organized into the following sections:

- Summary of the methods used,
- Government responses to the marine plastic pollution problem, including:
  - A noncomprehensive inventory of public policy responses—the Plastics Policy Inventory—and
  - Analysis of the design of a subset of these responses
- State of the science on the effectiveness evaluation of these responses
- Summary of the policy recommendations from the scientific community, and
- Elements of an effective government response, based on the literature, including a menu of the types of policy responses governments have taken in different contexts.

Contribution of the Study to Existing Knowledge

Building upon several meta-reviews in recent years, our study adds to existing knowledge by conducting both a systematic review and a replicable content analysis of the instruments used in public policies introduced at the international, national, and subnational levels to reduce plastic pollution. More specifically, this report adds to multiple literature reviews conducted in recent years to describe existing public policies to reduce marine plastic pollution, by utilizing both a systematic search methodology (adding to methods used by Dauvergne 2018, Lam et al. 2018, Jambeck et al. 2018, Wagner 2017, Kasidoni et al. 2015, Ocean Conservancy 2019) or systematic content analysis through qualitative coding (adding to methods used by Dauvergne 2018, Lam et al. 2018, Jambeck et al. 2018, Schnurr et al. 2018, Wagner 2017, Kasidoni et al. 2015, Ocean Conservancy 2019, Xanthos and Walker 2017, UNEP and WRI 2018). Prior to the publication of this report, UNEP and WRI (2018) appear to have conducted the most thorough literature review of the legislation passed to reduce plastic pollution. In UNEP and WRI (2018), in-country

3. See: https://ats.aq/devAS/Meetings/Measure/705.

researchers, if available, reviewed public policies (i.e., legislation) from 192 countries introduced as of July 2018. This report aims to build upon that review through the addition of a systematic qualitative coding methodology for analysis of instruments defined in the public policy documents collected into a global inventory. Further, this report aims to include subnational legislation to the extent possible to help fill a gap in the understanding of these policies, though the review is not comprehensive. A 2019 Ocean Conservancy report detailing a nonsystematic review of plastic pollution-related legislation summarized steps that public and private sector actors in five target countries (China, Indonesia, Vietnam, Philippines, and Thailand) could take to reduce plastic pollution, highlighting those that are viable to implement and would have economic, environmental, and social impacts (Ocean Conservancy 2019). Approximately 45 interviews were analyzed, adding to the existing knowledge base through a different approach than taken in this report.

Another more targeted review has focused on legislation aimed at reducing plastic bag consumption and littering in European Union member states, finding that there is no one effective voluntary initiative or piece of legislation that works the best for all member states (Kasidoni et al. 2015). Jambeck et al. (2018) summarized the challenges and opportunities of marine plastic legislation in Africa, noting the lack of consistency in national measures across the continent, despite the broad international laws that apply to almost all countries in Africa. Dauvergne (2018) provides an overview of the governance structure that is failing to protect the oceans from marine plastic pollution, due to multiple challenges, including lack of consistency across jurisdictions, waste management and infrastructure, and industry pushback. Overall, our report aims to provide the most thorough, global systematic review and analysis on international, national, and subnational legislation aimed at reducing plastic pollution to date.

CHAPTER TWO: METHODS USED[4]

2.1 Conceptual Framework

Government responses to the marine plastic pollution problem are defined as public policies—particular courses of action or inaction pursued by governments, individually or collectively (Heidenheimer et al. 1990). Synthesis of public policies can be guided by the conceptual framework provided by the standard public policy cycle, typically described as policy design, policy delivery, and evaluation and adaptation (Gupta 2010). This study focuses on the first two: synthesizing the state of knowledge on the design and delivery of public policies to address the marine plastic pollution problem, by analyzing the specific instruments designed by governments to achieve policy objectives, and their effectiveness in doing so (Bemelmans-Videc et al. 1998). Hence, the public policy documents articulated and enacted by governments form the units of analysis in this study (i.e., the written statements of policy by one or more governments or organs of government, at the international, national or subnational level), and the policy instruments they describe are the variables of interest.

Government responses to the problem are also defined as those polices explicitly aiming to reduce plastic leakage. At the same time, generally applicable waste management policies are considered to be fundamental to addressing the problem (Jambeck et al. 2015), even if they are not intending to do so (i.e., were not designed at least partially in response to the problem of plastic leakage). Essentially, the current and future trends in these generally applicable policies are considered as part of the baseline or business-as-usual scenario, unless they are adjusted explicitly to respond to the plastic pollution problem (see section 3.1). This study aims to identify and characterize the additional response from governments, which in combination with general waste management policies, equals the total government effect on the marine plastic pollution problem. In the final chapter of this report, the available information on the role of generally applicable policies in reducing plastics leakage, is combined with the results of the analysis of policies specifically responding to the plastics problem, to form a more comprehensive set of options and recommendations for governments.

2.2 Methods

In order to identify and characterize the public policy instruments governments have used to address the marine plastic pollution problem, synthesize the available information on how effective these instruments have been, and summarize the recommendations of scientists to policy makers, the following steps were followed:

- *Step one*: Construct a noncomprehensive Plastics Policy Inventory;
- *Step two*: Analyze the content of the policy documents in the inventory, to identify and characterize the instruments;
- *Step three*: Review the literature for measures of the effectiveness of the instruments; and

4. See Appendix 2 for a more detailed description of the methods used.

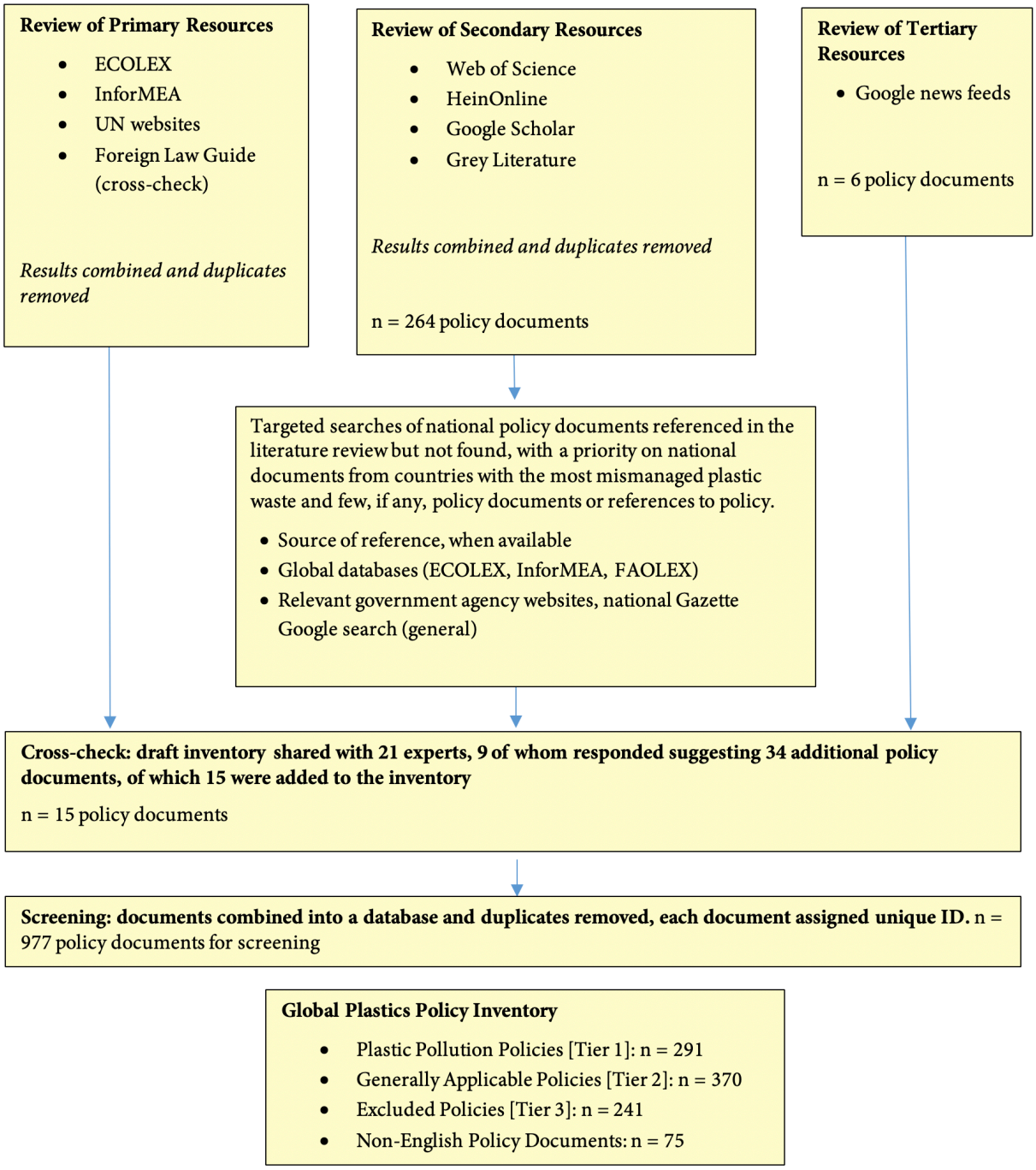
- *Step four*: Summarize the recommendations for policy makers from the scientific literature.

Step One: Constructing a Noncomprehensive Plastics Policy Inventory[5]

The inventory of public policy documents describing government responses to the marine plastic pollution problem was constructed through several phases of searches that included: (1) global policy databases as primary sources of data, (2) scientific literature and a review of key grey literature selections as secondary sources, and (3) media resources. As a cross-check, 22 experts were consulted to identify any gaps in the first iteration of the inventory. Of them, 10 reviewed our inventory and methods and provided us with input and additional policy documents to review, and 12 did not respond. For the secondary sources, a library of scientific literature about public policies aiming to address marine plastic pollution was compiled, from searches of the following interdisciplinary scientific or legal research databases: Web of Science, Google Scholar, and HeinOnline (legal literature). From these databases, over 13,000 returns were screened, resulting in a library of 136 articles on plastics pollution policy. These phases of searches were completed as summarized in Figure 2 (next page).

5. See: https://nicholasinstitute.duke.edu/plastics-policy-inventory

Figure 2. Summary of Steps to Construct a Global Plastics Policy Inventory



The result is a first global Plastics Policy Inventory that includes 291 policy documents explicitly aiming to address plastic pollution since 2000 until July 2019, as well as 370 policy documents expected to have an impact on plastic pollution. The Inventory is certainly not comprehensive, and is limited by a number of constraints, including: (1) language constraints, as searches were conducted in English; (2) subnational policies (e.g., at the municipal level) are not maintained in global databases and those that are studied in the literature may reflect a publication bias; and (3) the searches may simply not have been conducted for enough sources or extensively enough to capture all of the public policy responses to the marine plastic pollution problem.

That said, the initial searches and cross-checks conducted suggest that the inventory of international plastics policy documents could be considered representative of the international agreements made from 2000 to July 2019, including both global and regional agreements. At the national level, the inventory of plastics policy documents could be considered indicative of the diversity and types of government responses, though not necessarily representative given the English language limitation of the searches. Nonetheless, the subset is large enough and diverse enough to give some indication of how governments are responding at the national level to the marine plastic pollution problem. Finally, the inventory of subnational plastics policy documents should be considered as neither representative nor indicative, but simply a collection of available examples that may serve as a resource for policy makers.

Step Two: Content Analysis of the Plastic Pollution Policies in the Inventory

Each of the 291 explicit plastics policy documents in the Inventory was analyzed using NVIVO qualitative analysis software in order to identify and characterize the policy instrument (the design of the policy response) and the enforcement mechanisms defined to help deliver these instruments, drawing upon the conceptual framework described previously. Building upon this framework, public policy instruments are defined as the tools by which governments use power in attempting to ensure support and effect social change (in this case to reduce leakage of plastics into waterways and the oceans), which can be classified into three mutually exclusive categories: regulations, economic incentives, or information (see Glossary for definitions of each) (Bemelmans-Videc et al. 1998). For each of these three types of policy instruments, a number of common and specific instruments used to address plastic leakage were identified as subcategories (e.g., bans on specific products, recycling mandates, taxes on products). These subcategories were tested on a wide range of policy documents, which given the heterogeneity of the data, required revisions and consolidations until a streamlined typology of plastic policy instruments was developed that could fit to the dataset. This typology is given in Section 3.2, as applicable for all of the policy documents in the Inventory.

Step Three: Review the Literature for Measures of the Effectiveness of the Instruments, Creating a "Plastics Policy Library"

The library of scientific and grey literature was reviewed in order to synthesize any measures of outcomes attributed to plastics policy instruments, including unintended outcomes, as well as any contributing factors (i.e., enabling conditions) or constraints to those outcomes. Given that this literature had already been reviewed to identify relevant policy documents, all outcomes could be linked either to a policy document in the Inventory, or a reference to a policy document not yet

found. The results from this review provide a state of the science on the effectiveness of plastics policy instruments (considering articles published up to the end of the first quarter in 2019).

Step Four: Summarize the Recommendations for Policy Makers from the Scientific Literature

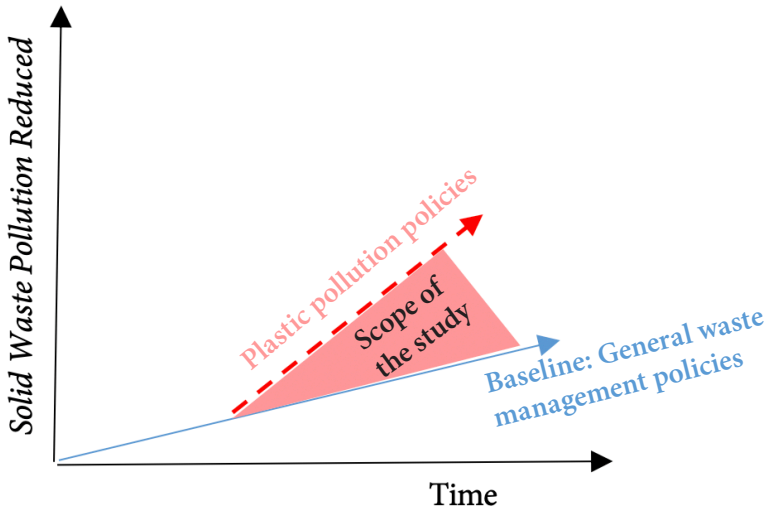
An extensive review of the scientific literature on plastics policies was conducted in order to extract and summarize the recommendations for design and delivery of public policy. This review included: (1) the plastics policy effectiveness literature identified in the literature review conducted in step one above (n = 136 papers); (2) the additional papers generated from that review that included articles that primarily give proposals for how to improve current public policy or introduce new policies (n = 41 papers); and (3) recommendations emerging from 67 articles about public policies observed or expected to have an impact on reducing plastic leakage, but were not introduced with the explicit intention of doing so (e.g., solid waste management policies). The recommendations or proposals for public policy to address the marine pollution problem were identified and then summarized to identify similar groups of recommendations and proposals, as well as any key trends.

CHAPTER THREE: GOVERNMENT RESPONSES TO THE PLASTIC POLLUTION PROBLEM

3.1 The Baseline for Government Responses to the Plastic Pollution Problem: Solid Waste Management

As described in Chapter 2, this study aims to synthesize the policy response of governments to the plastic pollution problem in the ocean, building upon the business-as-usual scenario for how countries and society manages waste (Fig. 3). Essentially, governments have introduced and supported policies for managing and disposing of solid waste, many of which have been enhanced over the years as countries, cities and communities wrestle with growing litter and waste disposal challenges. While these policies are generally applicable to plastic waste, and have a significant effect on plastic pollution, unless they can be shown to have intended to do so (i.e., to explicitly respond to the plastic pollution problem), they are considered as part of the baseline or business-as-usual scenario.

Figure 3: Scope of the Study: Public Policy Responses to Plastic Pollution



The World Bank's report "What a Waste: A Global Snapshot of Solid Waste Management to 2050" (2018), provides perhaps the most comprehensive review of the baseline for this study—the state of information on solid waste management policy around the world. According to this report (World Bank 2018), waste collection in low-income countries increased from roughly 22 to 39 percent from 2012 to 2016, reflecting a focus on urban areas. Although the total collection rate is still low, this progress is complemented by the global trend of increased recycling and composting. In upper-middle income countries waste-to-energy incineration increased from from 0.1 to 10 percent (from 2012 to 2016, driven by China's shift to incineration) (World Bank 2018).

Underlying estimates of mismanaged plastic waste (e.g., Jambeck et al. 2015) indicate that the East Asia and the Pacific region generate the largest portion of the world's solid waste (23 percent), while the regions with the fastest growing volumes of solid waste are sub-Saharan Africa, South Asia and the Middle East and North Africa, where by 2050 total solid waste generation is expected to nearly triple, double and double, respectively (World Bank 2018). High-income countries generate roughly a third of the world's solid waste, while low-income countries generate approximately five percent (World Bank 2018). Globally, most solid waste is currently dumped or disposed of in some form of a landfill (37 percent of the total, eight percent of which is disposed of in sanitary landfills with landfill gas collection systems), followed by open dumping (33 percent), recovery through recycling and composting (19 percent) and 11 percent incinerated for final disposal (World Bank 2018). Incineration is used primarily in high-income and land-constrained countries, while lower-income countries generally rely on open dumping (93 percent of waste), as compared to high-income countries (two percent) (World Bank 2018).

Most governments aim to address solid waste management at the subnational or local level (approximately 70 percent of waste services are delivered directly by local entities), even while nearly 70 percent of countries have established government agencies with the mandate to develop policies and administer regulations for solid waste management (World Bank 2018). Roughly two-thirds of countries have adopted policies for solid waste management, though delivery and compliance vary dramatically, and significantly more waste is collected in urban than rural areas (World Bank 2018). Specific instruments local governments use include separation of waste at source, establishment of disposal sites, bans on specific waste materials, household and commercial user fees to help recover costs, and in some cases cost recovery by sale of recycled materials and compost, or taxing consumer goods (World Bank 2018).

3.2 Defining the Additional Policy Response to Address Plastic Pollution: A Typology of Plastics Policy Instruments

The additional policy responses from governments to current and expanding efforts to manage solid waste, in order to address the plastic pollution problem, have been organized into a classification framework for analysis. This framework is based on identifying and categorizing the policy instruments used by governments specifically to address the plastic pollution problem, based on the three broad categories of instruments referenced in Chapter 2: regulatory, economic and information instruments. For each of these three categories of policy instruments, a number of common and specific instruments used to address plastic leakage were identified as subcategories (e.g., bans on specific products, recycling mandates, or taxes on products, among others). Initially, more than 30 different subcategories of plastics policy instruments, under each of the three broad types of instrument (regulatory, economic, or information), were found in the literature. These subcategories were tested on a wide range of policy documents, which given the heterogeneity of the data, required revisions and consolidations until a far more streamlined typology of plastic policy instruments was developed that could fit to the dataset. For example, content analysis of policy documents could not distinguish consistently between an instrument labeled as a "prohibition on recycling below certain standards," and an instrument labeled

as a "requirement to recycle to certain standards" (the former being considered a prohibitive regulatory instrument, the latter an affirmative regulatory instrument).

The resulting categories and subcategories form a typology of the one or more plastics policy instruments identified within policy documents, for analysis:

1. **Regulatory instruments:**
    - Affirmative regulatory instruments (rules of an obligatory nature that describe what shall be done), including:
        - Develop plans to address the plastics problem (e.g., at international level)—Fundamentally new or enhanced stewardship practices or products to minimize plastic leakage
        - Capture plastic post-leakage—Use technology and mechanical interventions to capture litter[6] (based on Worm et al. 2017)
        - Handle plastic responsibly—Waste stewardship practices to minimize plastic leakage, including instruments used to encourage "extended producer responsibility" (EPR)[7]
        - Develop new, or improve existing processes or products—Agreement or pledge to act OR a detailed formulation of a program of action (e.g., as part of policies prescribing innovation)
    - Prohibitive regulatory instruments (rules of an obligatory nature that are negative, disallowing certain phenomena or actions), including:
        - Limit plastic—To prescribe a maximum amount, quantity, or number of plastic material or product allowed at any stage(s) in the life cycle
        - Ban plastic—To fully or partially prohibit a specific type of plastic at any stage(s) in the life cycle
        - Prohibit irresponsible handling of plastic—To prohibit poor waste stewardship practices
2. **Economic instruments:**
    - Subsidies (incentives)—A grant by a government to a private entity to assist an enterprise deemed advantageous to the public
    - Cash for return (incentives)—To give back used plastic in exchange for money
    - Tax break (incentive)—A lower tax rate for responsible plastic stewardship

6. Based on Worm et al. 2017. "Plastic as a Persistent Marine Pollutant." Annual Review of Environment and Resources 42:1–26.
7. EPR has been defined by the OECD (2001) as "a policy approach under which producers accept significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products."

- Disincentive (Fee, Tax, Levy, Duty)—A sum or charge paid by an entity for irresponsible plastic stewardship (including use of single-use plastics)

3. **Information instruments:**

- Research, data collection, data reporting, or record keeping—The assemblage, analysis, maintenance, management, or dissemination of information related to plastic
- Education or outreach—The act or process of informing the public about the impacts of plastic pollution (e.g., awareness campaigns aiming to change consumer behavior)
- Labels or placards—To display information about a product (e.g., recycled content, recyclability, hazard, or what the consumer must do with it end-of-life) to people using labels or placards

As indicated in the above typology, instruments introduced with the goal of extended producer responsibility (EPR)—whereby producers are required or encouraged to accept significant responsibility for waste treatment or disposal—have been considered in this analysis under affirmative regulatory policy instruments, more specifically, as a form of responsible handling of plastic. While public policies that aim to encourage EPR may also include economic instruments together with regulatory, for consistency in the coding and subsequent content analysis, the instruments were categorized as affirmative regulatory instruments.

3.3 The Global Plastics Policy Inventory of Government Responses to The Plastic Pollution Problem

To collect the data for classification and analysis based on the typology above (Section 3.2), a global Plastics Policy Inventory was created. The creation of this inventory represents an effort to begin to capture a comprehensive measure and picture of the world's response to the problem, in addition to the baseline of solid waste management policies.

The global Plastics Policy Inventory includes 291 policy documents explicitly aiming to address plastic pollution since 2000, as well as 370 policy documents expected to have an impact on plastic pollution, and 75 non-English policy documents retained for future translation and screening, and finally 442 reference to plastics policy documents from the scientific and grey literature reviewed have been logged, where the actual policy document has yet to be located. The policy documents in the inventory are organized by the year adopted and the area of jurisdiction, from the beginning of 2000 through the first half of 2019.

The inventory is comprehensive for policies at the international level (containing 67 of 69 known policies, either found or referenced in the literature reviewed, or 97 percent), indicative for policies at the national level (147 of the range of 309 or 377 policies found or referenced in the literature reviewed, or 39 to 47 percent), and provides only examples at the subnational level (77 of 362 known policies, or 21 percent). Figures 4 through 6 illustrate the geographic distribution of the national and subnational policies included in the inventory and those analyzed (e.g., policies for which the documents are available and could be analyzed, those referenced in the literature but not available for analysis, and those policy documents only available in languages for which the analysis could not be conducted).

Figure 4. Distribution of National-Level Policies in the Inventory (2000 to July 2019)

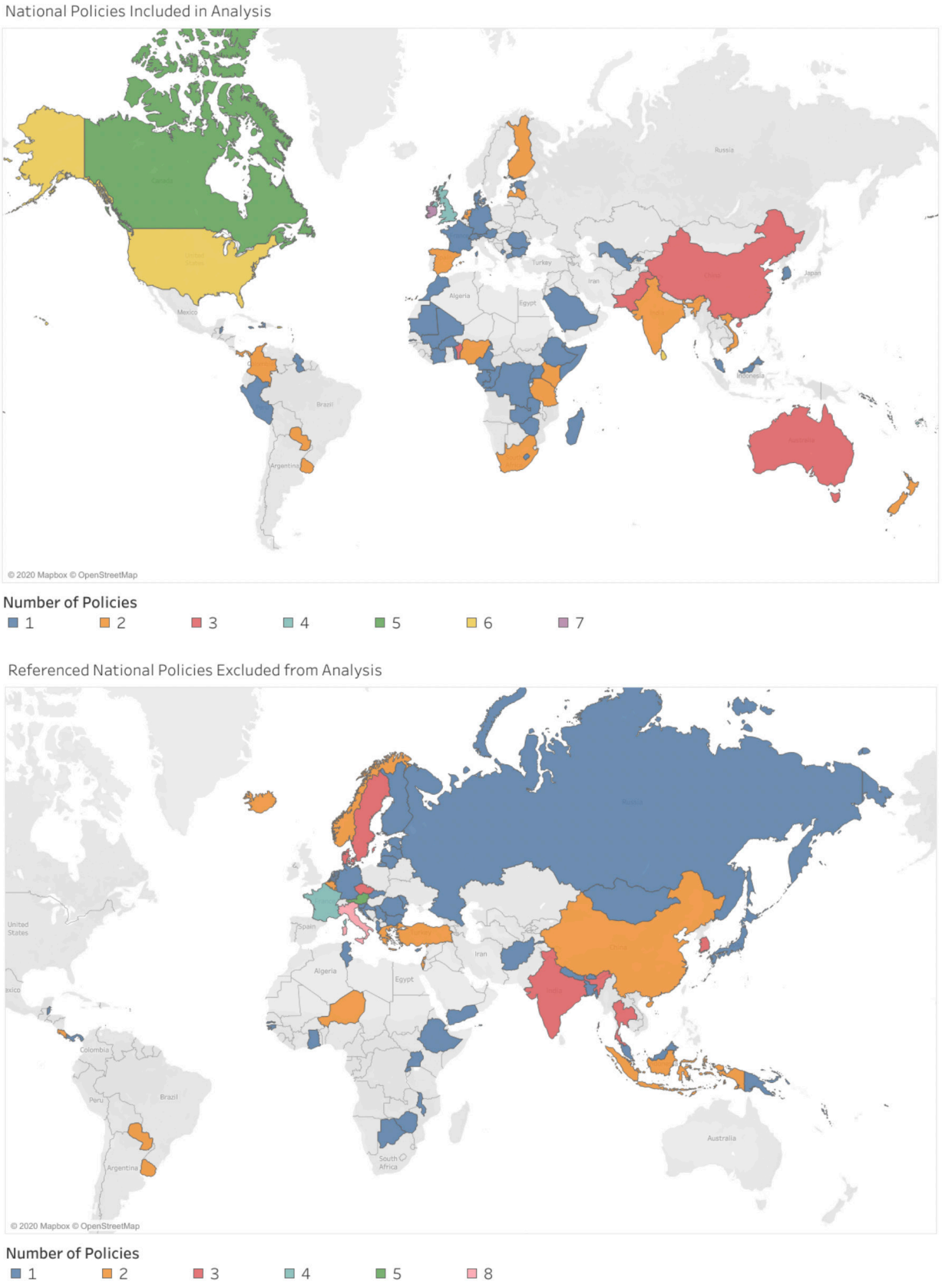


Figure 4 (continued).

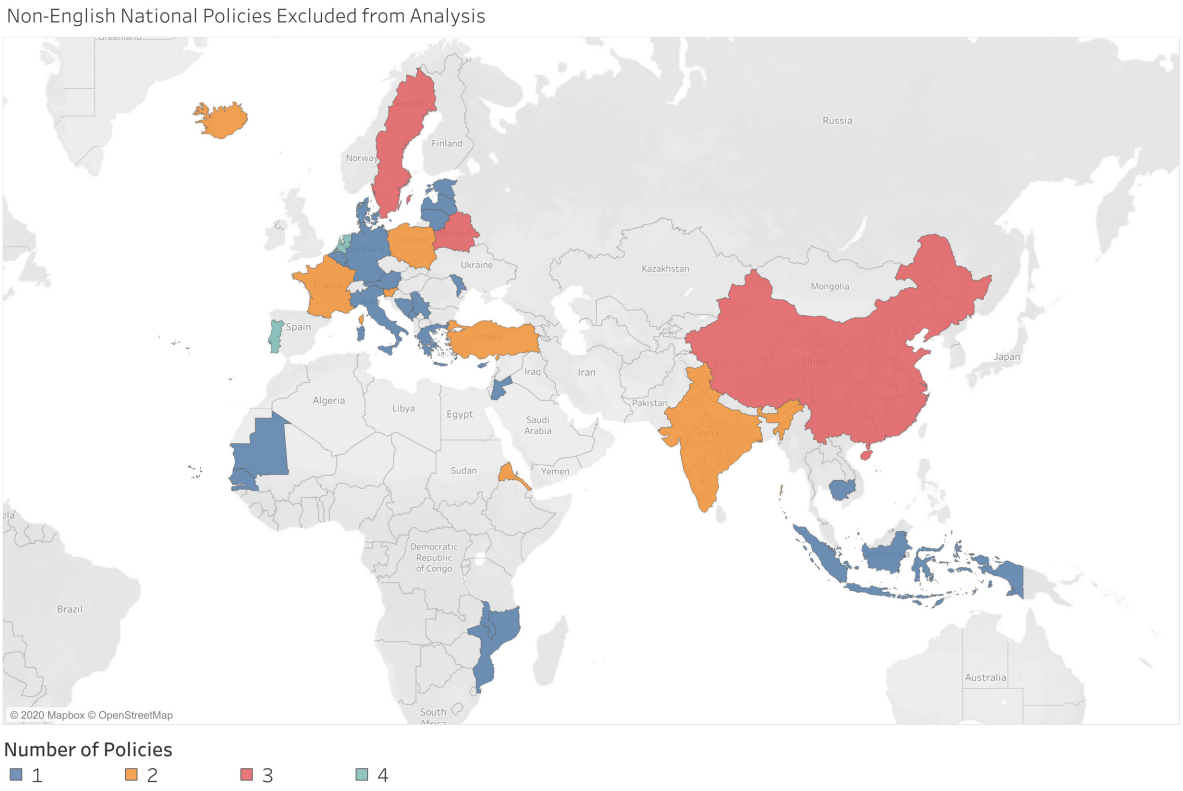
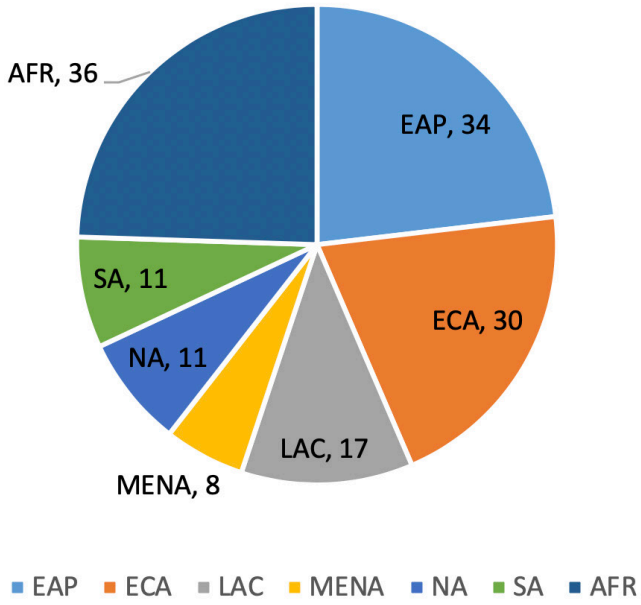
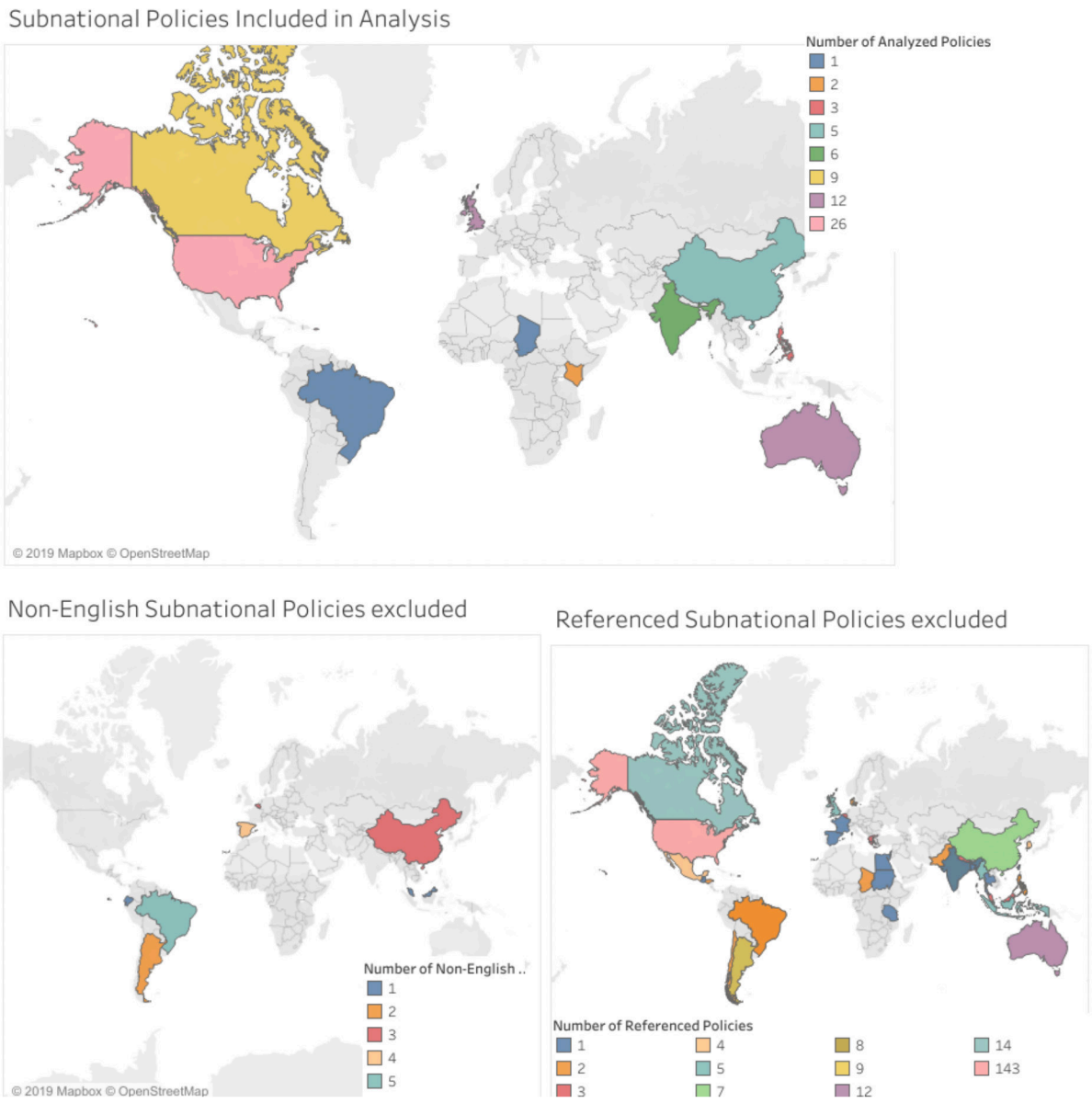


Figure 5. Distribution of National Plastics Policies Analyzed, by Region



AFR = Sub-Saharan Africa; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; NA = North America; SA = South Asia

Figure 6. Distribution of Subnational-Level Policies in the Inventory (2000 to July 2019)



3.4 Responses at the Global Level: International Policy[8]

Applicable International Policies before 2000

From the literature reviewed in the Plastics Policy Library, eight global policies adopted or in force prior to 2000 were consistently cited as being applicable to efforts to address the problem of plastic pollution, even if many did not include measures specifically targeting plastic pollution. These eight policies are listed here in chronological order:

(1) International Convention for the Prevention of Pollution from Ships (MARPOL) adopted in 1973 and the Protocol signed in 1978;

(2) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) signed in 1972 and the Protocol signed in 1996, and subsequently amended in 2006;

(3) Convention on the Conservation of Migratory Species of Wild Animals (CMS) signed in 1979;

(4) United Nations Convention on the Law of the Sea (UNCLOS) signed in 1982;

(5) Convention on Biological Diversity signed in 1992;

(6) Agenda 21 agreed in 1992;

(7) FAO Code of Conduct for Responsible Fisheries agreed in 1995; and

(8) UN Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) agreed in 1995.

Of these eight, only the GPA mentions plastics (as part of a focus on "litter and marine debris" among other types of pollutants) and is the international policy that most directly addresses land-based sources of plastic pollution prior to 2000 (Goncalves and Faure, 2019).

Key International Policies to Address Plastic Pollution

From the year 2000 onwards, based on the global Plastics Policy Inventory, 28 global policy documents were agreed with instruments intended to address the plastic pollution problem, of which only three (the Antarctic Treaty, amendments to the London Convention and Protocol, and MARPOL Annex V) are considered as binding upon the participating states. Essentially the Inventory reconfirms that, although MARPOL and the London Convention address plastic pollution from maritime sources, there is no binding international policy (i.e., "hard law") to address land-based sources of plastic pollution (Goncalves and Faure 2019). Among the 28 policies within the Inventory, those with the most text coded as addressing plastic pollution, or those policies with clear targets and/or commitments by states to act to address the problem, were the following:

8. See Appendix III for more detail on the key actions recommended for states, by policy. An additional useful resources is "A History of the International Response to Plastic Pollution" from the Plastic Pollution Emissions Working Group: https://www.plasticpeg.org/.

(1) 2010: Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity at its Tenth Meeting (UNEP/CBD/COP/DEC/X/2) "The Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets"

(2) 2011: The Honolulu Strategy – A Global Framework for Prevention and Management of Marine Debris

(3) 2011: Resolution MEPC.201(62) Amendments to the Annex of the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 1973 "Revised MARPOL Annex V"

(4) 2012: UNGA Resolution A/Res/66/288 "The Future We Want"

(5) 2014: UNEP/CMS/Resolution 11.30 Eleventh Meeting of the Conference of the Parties to the Convention on Migratory Species – Management of Marine Debris

(6) 2014: UNEA/Resolution 1/6 "Marine Plastic Debris and Microplastics"

(7) 2015: UNGA Resolution A/Res/70/1 "Transforming Our World: The 2030 Agenda for Sustainable Development"

(8) 2016: CBD/COP/DEC/XIII/10 "Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity – Addressing Impacts of Marine Debris and Anthropogenic Underwater Noise on Marine and Coastal Biodiversity"

(9) 2016: UNEA Resolution 2/11 "Marine Plastic Litter and Microplastics"

(10) 2017: Thirteenth meeting of the Conference of the Parties to the Basel Convention – BC-13/11: Technical assistance; Work Programme 2018–2019

(11) 2018: UNEA Resolution 3/7 "Marine Litter and Microplastics"

(12) 2019: UNEA Resolution 4/6 "Marine Plastic Litter and Microplastics"

(13) 2019: UNEA Resolution 4/9 "Addressing Single-Use Plastic Products Pollution"

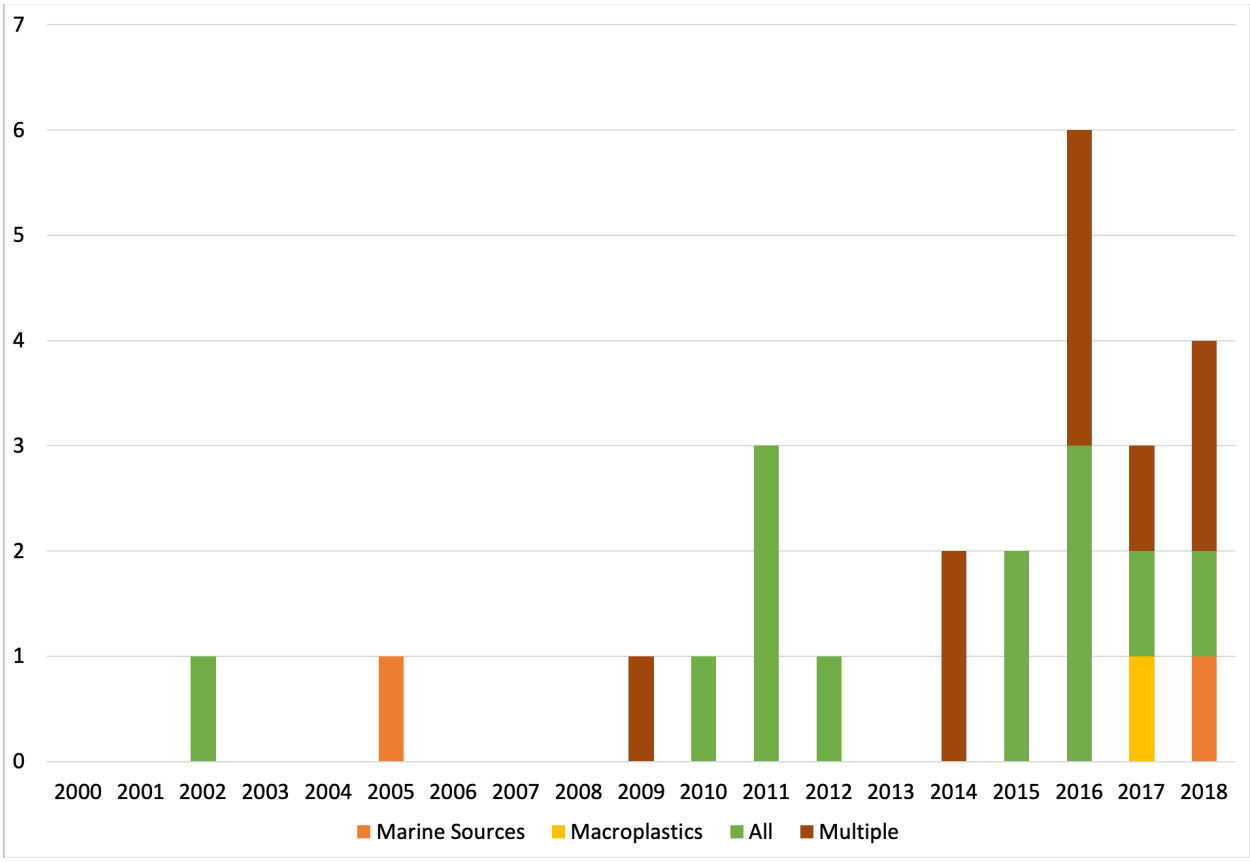
(14) 2019: BC-14/13 Fourteenth Meeting of the Conference of the Parties to the Basel Convention – Further actions to address plastic waste under the Basel Convention

Based on the volume of text related to plastic pollution, and/or the presence of clear targets or commitments to address the problem, these fourteen policy documents could be labelled as "key international policies to address plastic pollution," at least at the global level (the 2017 G20 action plan for marine debris and the 2018 G7 plastics charter could also be considered as key international policies, though they apply to a smaller group of countries). Within these policies, almost all of the measures defined to address the plastic pollution problem are "plans," e.g., recommending or urging government at some other level or in the future to develop new or enhanced instruments to minimize or reduce plastic leakage. This reflects the nature of these provisions as guidance, recommendations (e.g., "urges States") and strategies for future actions, rather than stronger commitments by participating states to take action.

Evolution of the Problem Definition: Types of Plastic Pollutants Addressed in Policies

Over time, international policies have defined the plastic pollutants to be addressed in increasingly specific terms, from earlier policies focused only on the problem of plastics more broadly (categorized as targeting "all" types of plastic pollutants), and/or those targeting all plastic pollution from maritime activities, to policies increasingly focusing on one or more specific types of plastic pollution ("multiple" types of plastic pollution targeted, or specifically "macroplastics") (see Fig. 7 below).

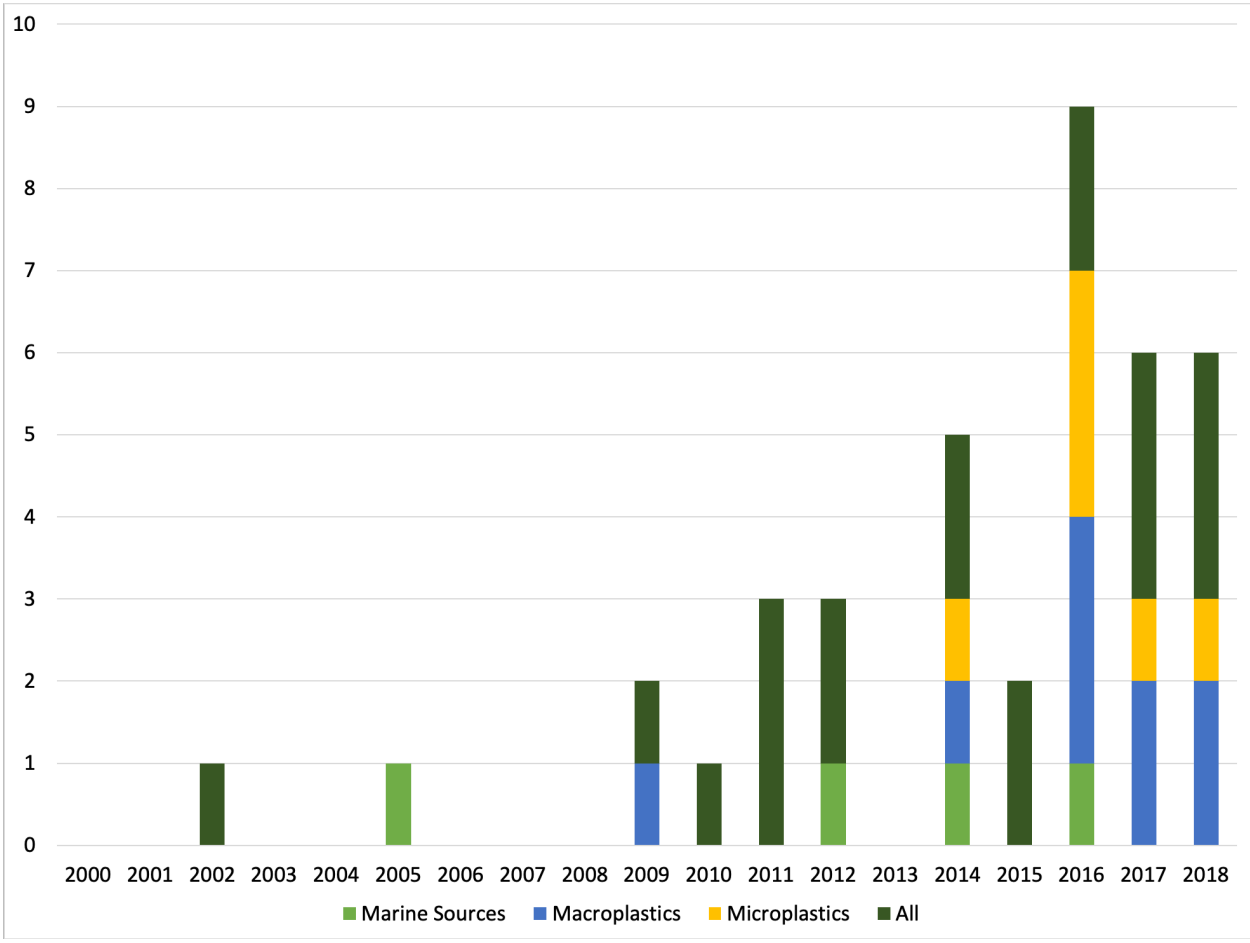
Figure 7. Number of International Policies by Type of Plastic Pollution Targeted



To understand in more detail the different types of plastic pollution targeted by these international policies, the number of policies targeting specific types of plastic pollution were measured (see Fig. 8 below). The 2011 Honolulu Strategy provided a much greater focus on both land-based sources of "marine debris" and maritime sources. In 2014 policies began to target microplastics specifically, and by 2016 the focus of policies is largely on "marine plastic litter" (the actual terminology used in the policies) and microplastics. By 2019 policies also included a focus on plastic packaging and continued to focus on microplastics. Essentially, not only has the volume of policies aiming to address the problem increased over time, but these have moved from more general to more complex, focusing on a number of different types of plastic pollutants,

rather than just "all" or "macroplastics." Additionally, policies at this level focused on leakage across all stages of the life cycle of plastic products, rather than particular stages of production.

Figure 8. Different Types of Plastic Pollution Targeted by International Policies



Global Targets Set for Addressing Plastic Pollution

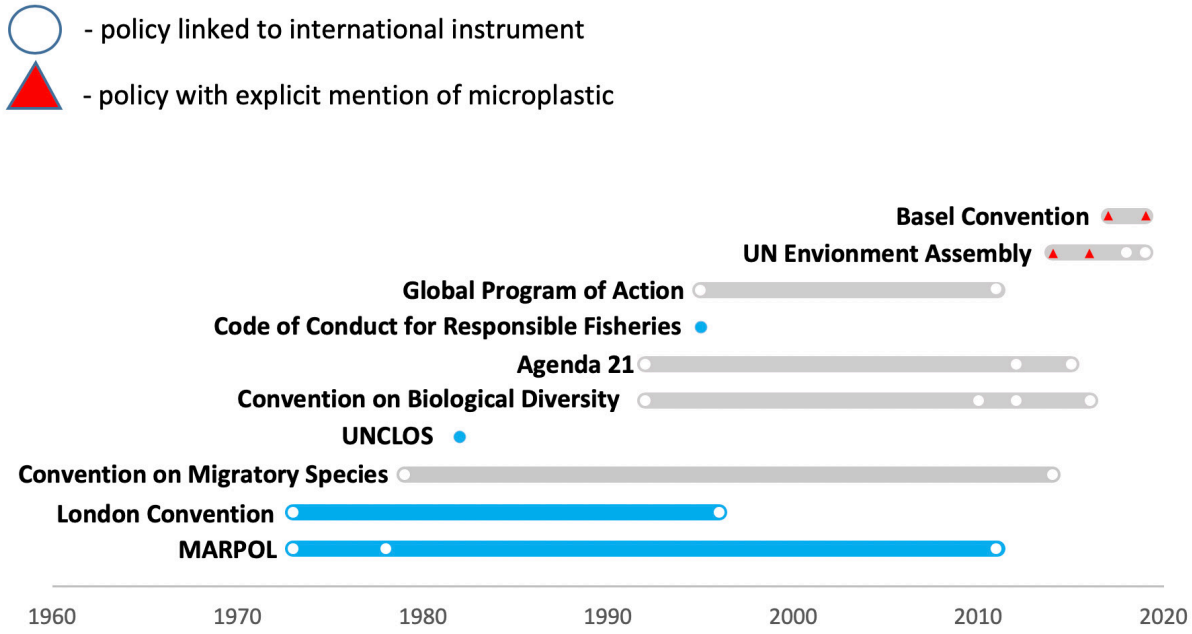
Across the international policies aiming to address plastic pollution, only two targets have been set that are generally applicable to the problem: (1) the Aichi target set in 2010 within the framework of the Convention on Biological Diversity (CBD) that, "by 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity" and (2) the target set as part of United Nations Sustainable Development Goal (UN SDG) 14 to "by 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution." Neither target focuses on plastic pollution specifically, although the indicator for the SDG 14 target includes monitoring "floating plastic debris density." While UNEA Resolution 3.7 does stress "the importance of long-term elimination of discharge of litter and microplastics to the oceans," essentially there is no binding, specific and measurable international target to reduce plastic pollution. For the sake of comparison, international policies have been agreed with specific and measurable targets related to the reduction of greenhouse gas emissions, with the

Paris Agreement setting a specific target for reaching its objective of stabilizing global average temperatures (i.e., at holding the increase in the global average temperature to well below two degrees Celsius above pre-industrial levels).

Commitments for National Governments to Address Plastic Pollution

Throughout the 28 international policies introduced since 2000 with an objective to address plastic pollution (whether binding or nonbinding upon participating states), only three commitments have been agreed (where the language of the text uses words that imply a commitment, such as "shall," "must," "will," "commit to"). These commitments are the 2006 amendments to the London Protocol, 2011 amendments to Annex V of the Protocol of MARPOL, and the 2012 United Nations (UN) General Assembly Resolution summarizing the agreements from the Rio+20 Summit (entitled "The Future We Want"). The amendments to the London Convention and Protocol and to MARPOL Annex V focused on maritime sources of plastic pollution and prohibiting "dumping of any wastes" (including plastics and "discharge into the sea of all plastics," respectively, with the latter supported by requirements for various types of vessels to display clearly marked signs notifying crew and passengers of these rules, and maintaining a "Garbage Record Book" to track discharges. The 2012 UN General Assembly Resolution included a commitment by UN member states to "take action to reduce the incidence and impacts of [marine debris, especially plastic] on marine ecosystems, including through the effective implementation of relevant conventions adopted in the framework of the International Maritime Organization, and the follow-up of relevant initiatives such as the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, as well as the adoption of coordinated strategies to this end"; and "by 2025, based on collected scientific data, achieve significant reductions in marine debris to prevent harm to the coastal and marine environment."

Figure 9. Timeline of Key International Policies Applicable to or Addressing Plastic Pollution



Policies with a grey bar next to them include land-based sources of plastic pollution in the oceans, those with a blue bar focus solely on maritime-based sources, and in both cases the bars represent the period of time between initial and supplemental policies included in the Plastics Policy Inventory (e.g. initial treaty and subsequent implementing agreements). Each dot represents a specific policy (and document), and red triangles represent policies that explicitly intend to address microplastics. The figure is not a comprehensive list of the international policies in the Plastics Policy Inventory, but the key policies prior to 2000 that were consistently found in the literature, and the policies after 2000 in the Inventory that included the largest volume of text related to plastics, or targets for plastic pollution reduction, or commitments for states to address plastic pollution.

The first international policies focused on maritime sources of plastic pollution (MARPOL and the London Convention and Protocol) are still the only binding commitments to address the problem. According to the literature reviewed, the first international policy response to the plastic pollution problem was the MARPOL Convention and Protocol signed in 1973 and 1978, respectively, focused on maritime sources only (Dauvergne 2018, Haward 2018). The principal international treaty that regulates pollution from ships, MARPOL specifically addressed plastics in 1988 with the entry into force of the voluntary Annex V,[9] which prohibits discharge[10] of ship-generated garbage (encouraging disposal at port reception facilities) (Worm et al. 2017, Goldberg 2012, Lewis 2001). The provisions in Annex V are binding on countries that opted to sign it in

9. Each annex regulates a different type of waste: Annex I covers oil, Annex II noxious liquids in bulk, Annex III packaged harmful substances, Annex IV sewage, Annex V garbage, and Annex VI air pollution (Lewis 2001).
10. "Discharge" is defined as "any release howsoever caused from a ship," but specifically excludes "dumping within the meaning of the [London Convention]" (Lewis 2001).

1988, and in 2011 it was revised to explicitly prohibit the disposal of any plastic into the oceans (Goncalves and Faure 2019, Dauvergne 2018), stating that "discharge into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products is prohibited."

Also applicable is the London Convention signed in 1972 to prevent dumping[11] of wastes at sea, in response to a 1972 resolution adopted at the United Nations Conference on the Human Environment (Lewis 2001). The treaty includes a list of wastes prohibited to dump at sea, which includes plastics, and subsequently strengthened by the Protocol signed in 1996 which prohibited dumping of all wastes unless listed in Annex I (e.g., dredged material, sewage sludge, fish waste, among others) (Goncalves and Faure 2019, Lewis 2001). The essential distinction between the London Convention/Protocol and MARPOL is that the former regulates disposal at sea of land-generated waste ("dumping"), while the latter regulates disposal at sea of ship-generated waste ("discharge") (Lewis 2001). Both policies are binding, but participating states self-regulate, as they are responsible for regulating the vessels that they register (Goncalves and Faure 2019, Ritucci-Chinni 2009). In 2007, the Consultative Meeting of the London Convention and Protocol approved the creation of a Compliance Group to monitor compliance by participating states (Goncalves and Faure 2019).

UNCLOS, as "the constitution for the oceans," provides an obligation for states to prevent pollution of the oceans and acts as a broad framework for action but contains no specific commitments to do so nor instruments to get there. The United Nations Convention on the Law of the Sea (UNCLOS) was signed in 1982 as the "constitution for the oceans" (Wang 1992), with several provisions for preventing, reducing and controlling pollution from both maritime and land-based sources (see Articles 192 onwards) (Goncalves and Faure 2019, Dauvergne 2018).[12] UNCLOS codifies an obligation of states to protect the marine environment, and is the only binding international policy that specifically addresses land-based sources of pollution in the oceans (Goncalves and Faure 2019, Goldberg 2012, Coulter 2010). However, with regard to pollution into the ocean, UNCLOS is broad, and the specific provision (Article 207) is designed as a framework provision that establishes states' basic obligation 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," but does not provide targets or specific commitments, nor guidance on the types of instruments to do so (Kirk and Popattanachai 2018). UNCLOS refers rather to "internationally-agreed rules, standards and recommended practices and procedures," though for land-based sources these did not exist (in comparison to maritime sources under MARPOL and the London Convention) (Kirk and Popattanachai 2018). However, there is no explanation of existing international standards or how states should meet them, nor minimum compliance requirements (Goldberg 2012). As a result, UNCLOS remains essentially a broad framework for regulation of land-based sources of pollution to the oceans, nonspecific to plastic (Goldberg 2012, VanderZwaag and Powers 2008).

11. "Dumping" is defined as "any deliberate disposal at sea of wastes or other matter" (Lewis 2001).
12. Article 194 contains the general obligation: "States shall take . . . all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavor to harmonize their policies in this connection." Article 207 specifically pertains to the prevention of land-based marine pollution (Goldberg 2012).

The GPA was a nonbinding agreement established to help states fulfill their UNCLOS obligations to reduce land-based pollution to the oceans. After UNCLOS was signed, the UN continued to support dialogue on the problem of "marine debris," with a focus on the topic at the 1992 Earth Summit in Rio (Coulter 2010). From these discussions, the nonbinding Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) was agreed in a 1995 conference in Washington, DC, with the United Nations Environment Programme (UNEP) acting as secretariat (Goldberg 2012, Coulter 2010, VanderZwaag and Powers 2008). The GPA's main goal is to provide a conceptual and practical guide for national and regional authorities to "prevent, reduce, control and/or eliminate marine degradation from land-based activities" (Goncalves and Faure 2019), and goes beyond Chapter 17 of Agenda 21 by recognizing "litter," particularly plastics, as its own category of marine pollution. This guidance would include rules and standards that could be used by states to meet the obligation included in Article 207 of UNCLOS (Kirk and Popattanachai 2018).

To achieve the goal, the GPA urges states to develop national programs of action to set specific objectives and targets in relation to nine categories of sources of marine pollution (of which litter is one), and also encourages states to develop regional programs of action, guided by a checklist of points to consider, e.g., harmonization of pollutant discharge standards, protection of coastal habitats and endangered species, etc. (VanderZwaag and Powers 2008). As secretariat UNEP endeavored to support states to deliver the GPA through the Regional Seas Programme already in place to support regional cooperation around shared marine waters (VanderZwaag and Powers 2008). However, since its inception, in practice the GPA has reportedly struggled to mobilize financial resources to support states to deliver on its objectives, has had limited national reporting, and has not had an enforcement mechanism since it is non-binding (Goncalves and Faure 2019, VanderZwaag and Powers 2008).

The international focus on plastic pollution began with the 2011 Honolulu Strategy. In 2011, organized by UNEP and the United States National Oceanic and Atmospheric Administration (NOAA), the Fifth International Marine Debris Conference developed the Honolulu Strategy as a planning tool or framework to improve cooperation to address marine debris broadly, including plastics (Dauvergne 2018, Haward 2018, Schnurr et al. 2018, Walker 2018). The Strategy's three main goals are to reduce the amount and impact of: (1) land-based litter and solid waste introduced into the marine environment; (2) sea-based sources of marine debris (endorsing MARPOL as the instrument); and (3) accumulated marine debris on shorelines, in benthic habitats, and pelagic waters (Goncalves and Faure 2019). Recommended actions for states included: introduce policies to support solid waste minimization and management, conduct education and outreach to improve solid waste management, introduce economic instruments for solid waste management, improve infrastructure for stormwater management and the reduction of solid waste discharges into waterways, and improve regulatory frameworks for stormwater, sewage systems and debris in tributary waterways.

To support implementation of the Honolulu Strategy, after the third of periodic intergovernmental reviews of the GPA in 2012, 65 governments and the European Commission recommended the establishment of a Global Partnership on Marine Litter (GPML), which was subsequently launched at the Rio+20 Summit (Goncalves and Faure 2019, Dauvergne 2018). To

support the GPML, in 2017 UNEP launched the Clean Seas Campaign to raise awareness about plastic pollution and other types of marine debris, with support from 42 governments (Schnurr et al. 2018).

After the Honolulu Strategy, the Conferences to binding environmental agreements provided important forums for international policies to address plastic pollution. A number of binding international policies for the environment are generally applicable to the problem of plastic pollution, and have provided forums for participating states to address the problem, e.g., the CBD, the CMS, etc. For example, while the Convention on Biological Diversity does not have as direct of a relationship with plastic pollution as other international policies, it played an important role given some of the decisions by the Conference of Parties, notably the Aichi Targets they set in 2010 (Goncalves and Faure 2019). The target set on pollution is one of only two internationally agreed targets relevant to plastic pollution. Similarly, although the Convention was adopted in 1979, given the relationship between plastic pollution and migratory species, by 2014 marine debris had entered into the discourse of the CMS Conference of the Parties (CoP). That CoP elaborated a new Strategic Plan for Migratory Species 2015–2023, laying out a wide range of instruments considered to form an effective government response by member states, including elements for comprehensive laws, specific targets, awareness campaigns, research and monitoring.

Following the Honolulu Strategy and Resolutions of the CBD and CMS CoPs, the United Nations Environment Assembly (UNEA) has provided a forum for the most specific and direct international policies to address plastic pollution, though these are nonbinding resolutions. UNEA was established in 2013 after the Rio+20 Summit, in order to serve as the policy-making body of the international community on environmental issues, using global membership and openness to civil society and other stakeholder participation to set the global environmental agenda (Carlini and Kleine 2018). At the first meeting of UNEA in 2014, the Assembly adopted Resolution 1/6 defining the problem as "marine plastic debris and microplastics," providing the first focus on microplastics in international policy. Broadly, the resolution encouraged governments to take action and work with the GPML to implement the Honolulu Strategy, and focused on improved waste management and cleaning up existing debris and litter. Following a request in Resolution 1/6, in 2016 UNEP published a study "Marine Plastic Debris and Microplastics: Global Lessons and Research to Inspire Action and Guide Policy Change," which, among others, suggested a ban or radical reduction of single-use plastics, as well as greater use of economic incentives throughout the life cycle of plastic products (Carlini and Kleine 2018).

By the second meeting of UNEA in 2016, the Assembly adopted Resolution 2/11 on "marine plastic litter and microplastics" stating that the results from research are sufficient to justify immediate action by states. The call to action was more specific to the problem (defined in terms of "marine plastic litter"), and the suggested response more comprehensive, referring to all stages of the life cycle of plastic products, and the need for behavior change by consumers. Notably, the Resolution does not propose global targets for plastic pollution reduction, nor recommend any one specific policy instrument that states should use, but urges national responses (e.g., national action plans, particularly in regions that are the largest sources) and provides voluntary guidance. At the global level the Resolution proposes steps that could contribute to agreement on pollution reduction targets and cooperation, include a general call for more research, and specifically the

establishment of harmonized international standards and methods for monitoring and assessing plastic pollution in the oceans, and cooperation among states to conduct this monitoring. Additionally, the Resolution is notable in that it is more specific on microplastics than previous policies, encouraging "manufacturers to consider impacts of products containing microbeads … and eliminate or reduce the use of primary microplastic particles in products." Finally, the Resolution requested UNEP to undertake an assessment of the effectiveness of relevant international, regional and subregional governance strategies and approaches to combat marine plastic litter and microplastics.

This assessment ("Combating Marine Plastic Litter and Microplastics: An Assessment of the Effectiveness of Relevant International, Regional and Subregional Governance Strategies and Approaches") was presented to the third meeting of UNEA, and noted key gaps in international governance: (1) lack of an institution whose mandate focuses on the coordination of existing efforts, and the management of marine plastic litter and microplastics across the life cycle; and (2) lack of globally binding standards to mitigate plastic pollution (UNEP 2017, Carlini and Kleine 2018). The assessment also highlighted geographic gaps in coverage as well as gaps in reference to human health impacts of plastic pollution, while focusing on a holistic approach to address the problem, considering the entire lifecycle of plastic products and pollutants (UNEP 2017, Carlini and Kleine 2018).

The third meeting of UNEA in 2017 continued to focus on the problem of plastic pollution, adopting Resolution 3/7 urging states to take action to reduce pollution and to prioritize cleanup. By this time the problem has been more specifically defined as land-based sources of plastics leaking into the ocean, both macroplastics and microplastics, but the instruments recommended to solve the problem are still general. The main instrument recommended remained planning–urging states to develop national action plans that address plastic pollution at all stages of the life cycle (Raubenheim and McIlgorm 2018). To inform the Assembly toward agreement on such actions and targets, the Resolution created an "ad hoc open-ended expert group" on marine litter and microplastics.

In coordinating this expert group, UNEP reiterates that binding standards to mitigate plastic pollution are lacking at the international level and focuses on the absence of a binding international policy whose primary goal is the reduction of marine plastic pollution (Carlini and Kleine 2018). UNEP has also highlighted that instruments to address microplastics originating from products that are known sources (e.g., textiles or tires) are lacking (Carlini and Kleine 2018).

Finally, the fourth meeting of UNEA in 2019 adopted a Resolution 4/6 on "marine plastic litter and microplastics" that starts to put in place more of the building blocks for agreed commitments, stressing the "importance of environmentally sound waste management, resource efficiency, the "three Rs" (reduce, reuse, recycle), sustainable materials management, innovation in related technologies, the environmentally sound clean-up of marine plastic litter, and international cooperation for effectively preventing pollution from marine litter, including plastic litter and microplastics." The Resolution calls upon states to address the problem of plastic pollution and underlines an urgent need for states to consider global coordination, cooperation and governance to more effectively implement the three previous UNEA resolutions (1/6, 2/11,

and 3/7). To inform stronger international cooperation and commitments to address the problem, Resolution 4/6 requests UNEP to provide information on: (1) sources, pathways, and hazards of litter, including plastic litter and microplastics pollution; (2) indicators to harmonize monitoring, reporting, and assessment methodologies; (3) guidelines for the use and production of plastics in order to inform consumers; and (4) any information to inform policies and action. The Resolution also requested the expert group established previously to take stock of existing activities and actions by governments, regional and global instruments, international organizations, the private sector, NGOs and other relevant contributors to reduce marine plastic litter and microplastics; identify technical and financial resources or mechanisms for supporting countries in addressing marine plastic litter and microplastics; and to assess effectiveness of response options.

In addition to UNEA, the forum of the G20 has aimed to address the plastic pollution problem, in the 2017 G20 action plan for "marine litter." This plan includes a number of recommendations for states, though no commitments. These recommendations include the development of instruments to broadly promote waste prevention and resource efficiency, and more specifically to promote strengthened solid waste management and effective wastewater treatment and stormwater management. The recommendations also focus on instruments to "significantly reduce the use of micro-beads and single-use plastic bags, and where appropriate phase them out," as well as "significantly reduce the loss of plastic pellets during production and transport." Finally, the strategy promotes information instruments to raise awareness and support education and outreach.

Lastly, the Basel Convention has emerged as a forum for states to address aspects of the plastic pollution problem. The Basel Convention establishes a broad duty for countries to reduce their generation of plastic waste to a minimum (Article 4.2), but is primarily applicable to the plastic pollution problem through its provisions aiming to ensure environmentally sound disposal of hazardous and other wastes (as listed in Annexes), the regulation of their transboundary movement, and the reduction of waste generation (Kirk and Popattanachai, 2018; Raubenheimer and McIlgorm, 2018). The Convention intends for Parties to manage waste such as plastic within the country where it is generated or imported in an "environmentally sound" manner (Raubenheimer and McIlgorm, 2018). In 2017, the 2018–2019 work program for the Convention's open-ended working group of experts includes efforts to consider options for addressing the problem of plastic pollution within the Basel Convention, based on the assessment carried out by UNEP prior to the third meeting of UNEA. As a result, at the fourteenth CoP in 2019, the parties agreed on stricter controls over transboundary movements of plastic waste, and invited parties to submit to the secretariat by June 2020, information on plastic waste exclusively consisting of one cured resin or condensation product, for consideration at the fifteenth meeting of the CoP as exempt from these controls. The parties also encouraged governments to set time-bound targets to ensure that plastic packaging is designed to be reusable and recyclable, the packaging recycling rate by weight is monitored and significantly improved, and the recycled content in plastic products is increased. Beyond setting targets, the CoP also called upon parties to address plastic pollution throughout the product life cycle, for example, including import, production, disposal, recycling and use. The CoP invited parties to submit to the secretariat by June 2020, information on plastic

waste exclusively consisting of one cured resin or condensation product, for consideration at the fifteenth meeting of the CoP.

Conclusions

Prior to 2000, a number of binding international policies (many referred to as multilateral environmental agreements) were agreed that are applicable to the plastic pollution problem, but only maritime sources were directly addressed.[13] After 2000, a growing number of non-binding international policies have sought to address the problem, often defining it in terms of land-based sources and in increasingly more specific terms such as "marine plastic litter and microplastic." Almost all of the instruments included in these policies are plans or recommendations to develop more specific instruments in the future, typically at the level of states. Across the 28 international policies agreed over the almost 20 years since the beginning of 2000, there is a binding and specific global commitment to address plastic pollution only for pollution caused by the discharge and dumping of ships at sea. Beyond this commitment, only the broad language of the UN General Assembly Resolution commits the international community to act on plastic pollution (i.e., to "take action" to "achieve significant reductions in marine debris" by 2025), though this is not binding on states.

Across the international policies agreed since 2000, only two targets have been set that are generally applicable to the problem: (i) the Aichi target set in 2010 within the framework of the CBD to reduce pollution broadly, and (ii) the UN SDG 14 target set as part of Sustainable Development Goal 14 to reduce marine pollution broadly, including "marine debris". Essentially there is no binding, specific and measurable international target to reduce plastic pollution.

While the binding international treaties have specific provisions to address key maritime sources of plastic pollution, their effectiveness depends upon states to self-regulate the vessels that they register, though in one case the states have created an international committee to help monitor compliance. For the far more diffuse land-based sources of pollution, states agreed in 1982 in UNCLOS that they have an obligation to address these sources in order to protect marine environment. However, the first international policy to explicitly aim to do so was the non-binding Honolulu Strategy in 2011, followed by the 2014 CMS Strategic Plan for Migratory Species 2015-2023. In 2016 the first UNEA meeting adopted a resolution specifically focusing on the problem, and each subsequent meeting has done the same, conducting assessments and establishing an international expert group in the process, to inform the assembly. Subsequent resolutions have urged states (particularly those who are large sources) to adopt national action plans that address plastic pollution at all stages of the product life cycle, focusing particularly on reducing single-use plastic products and eliminating or reducing the use of plastic microparticles in products.

Throughout these non-binding international policies, a consistent focus has been on increased international monitoring, and calls for states to develop and implement national action plans to address the problem. Though not firm commitments and not a comprehensive list, recent

13. Efforts related to abandoned, lost or otherwise discarded fishing gear have continued, with FAO releasing Voluntary Guidelines on the Marking of Fishing Gear in April 2019 (see: http://www.fao.org/3/ca3546t/ca3546t.pdf).

international policies have consistently recommended that states utilize the following types of instruments:

- Affirmative regulatory instruments to support responsible handling of plastics, particularly minimization and management of solid waste (notably through recycling), as well as environmentally-sound clean-ups;
- Affirmative regulatory instruments to capture litter (including microparticles), notably solid waste discharges into waterways, managing stormwater, and sewage;
- Education and outreach, particularly on the need to improve solid waste management;
- Economic incentives for solid waste management, including increased public investment;
- Economic disincentives on single-use plastics; and
- Information from increased research and monitoring.

Notably, international policies have not focused on or consistently encouraged prohibitive regulations (e.g., product bans), though these are far more common at the national level (and in available subnational examples) (see section 3.6).

3.5 Responses at the Regional Level: Regional Agreements and Strategies

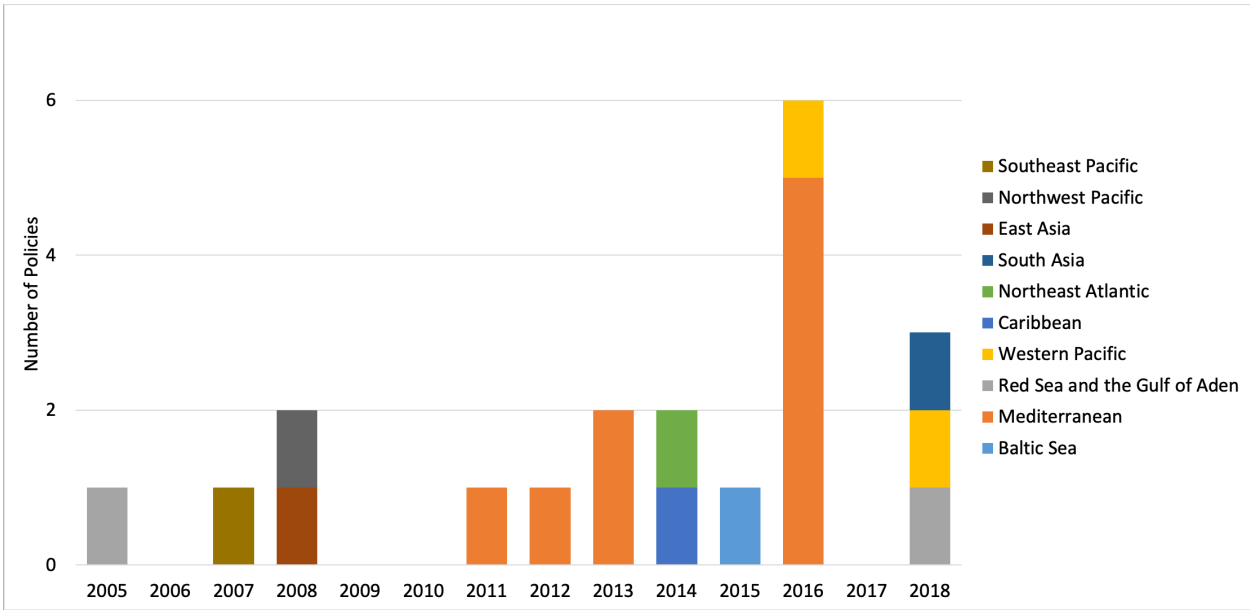
Key International Policies to Address Plastic Pollution

From 2000 onwards, based on the Global Plastics Policy Inventory, 39 regional policy documents were agreed with instruments intended to address the plastic pollution problem, of which 22 are binding (largely European Union policies and those related to the Mediterranean) and 17 are nonbinding. Over half of the regional policies in the inventory (20) were facilitated by UNEP and related to the Regional Seas Programme, most of which are nonbinding with the exception of those in the Mediterranean (linked to the Barcelona Convention).[14, 15] Frequently, UNEP helped facilitate these regional policies as mechanisms to achieve the goals of the GPA (Goncalves and Faure 2019). Of these regional policies related to the Regional Seas Programme, almost half (9) were linked to the Barcelona Convention for the Mediterranean region. Overall, these policies most commonly were formulated as regional action plans for marine litter, with eight different regions developing and agreeing on such plans, largely from 2013 to 2018 (the Baltic – 2015, the Mediterranean – 2013, the Northeast Atlantic – 2014, the Northwest Pacific – 2008, the Red Sea and the Gulf of Aden – 2018, South Asia – 2018, the South Pacific – 2018, and the Wider Caribbean – 2014). Jambeck et al. (2018) characterized the efforts of these Regional Seas Programmes as having "pioneered the development of regional seas action plans" to address plastic pollution (with the problem typically formulated as "marine debris"). Such plans follow a typical template with provisions for monitoring of the problem, as well as research; a wide range

14. The Regional Seas Programme, established in 1974, aims to reduce the degradation of the world's seas by encouraging comprehensive cooperative efforts and specific actions by nations which share those waters. Most of the Regional Seas Programmes are based on a binding treaty agreed between states in the region, often with associated protocols and/or regional action plans for specific issues (VanderZwaag and Powers 2008).
15. The Barcelona Convention was adopted in 1995 to replace the Mediterranean Action Plan of 1975 and includes 22 parties (Goncalves and Faure 2019).

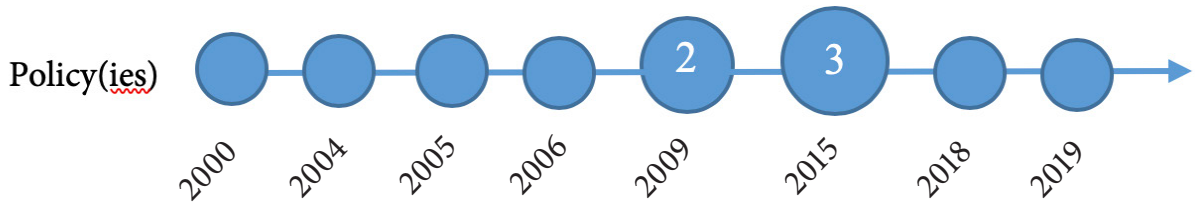
of policy instruments to be used by states to address the problem, including legal and institutional arrangements; and finally any financial mechanisms needed to support such national action (VanderZwaag and Powers 2008).

Figure 10. Policies Supported by UNEP in Relation to the Regional Seas Programme



In addition to twenty policies related to Regional Seas Programmes, 11 regional policies were agreed by the European Union, typically in the form of directives issued by the European Commission. The remaining policies included three for the Antarctic, and a ministerial declaration by the Nordic countries. Interestingly, the East African Community passed regulations on plastic bags, which are binding upon member countries.

Figure 11. Timeline of European Union Policies That Address Plastic Pollution



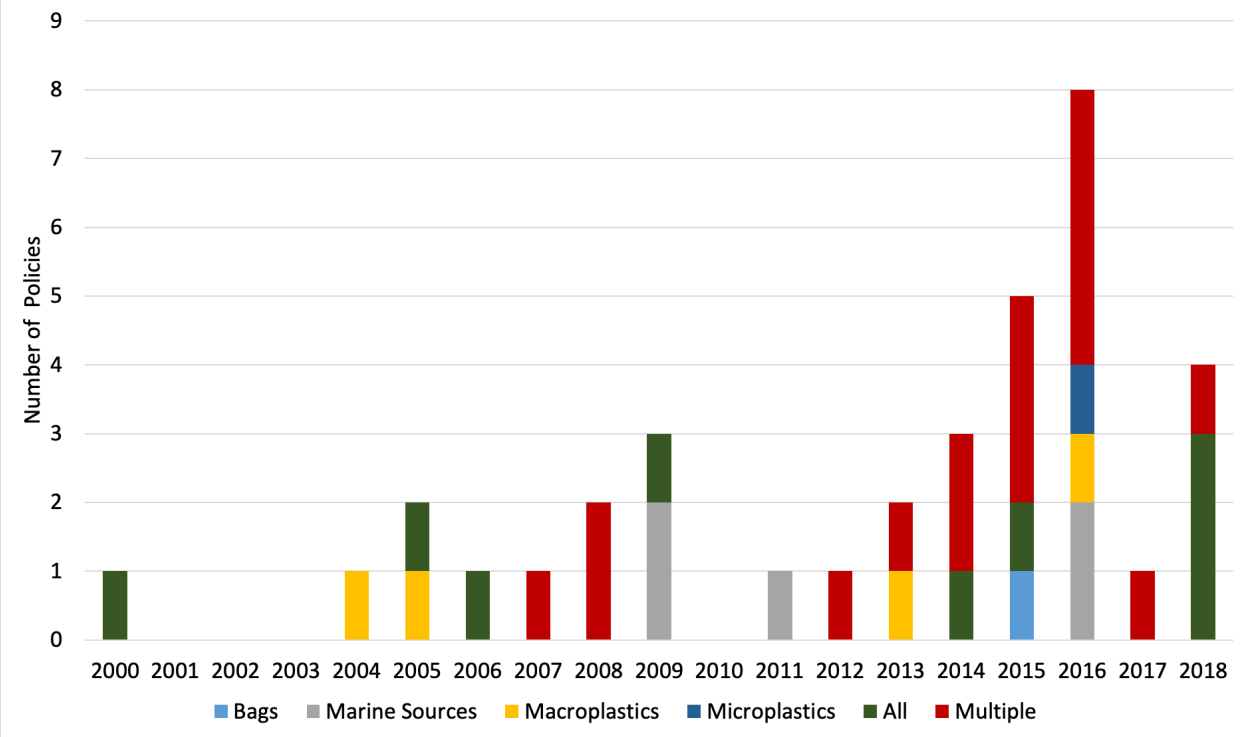
In summary, roughly a quarter of the regional policies formulated between 2000 and April 2019 to address the plastic pollution problem were agreed by countries around the Mediterranean, and another quarter were passed by the European Union. Another quarter of the policies were developed in conjunction with other Regional Seas Programmes outside of the Mediterranean, and the final quarter were a mix of regions and policies, including three for Antarctica, as well

as strategies by the Nordic countries respectively. This distribution reflects what is essentially a European phenomenon: almost 62 percent of the regional policies in the Inventory were largely developed within Europe (and almost half of these from the Mediterranean). In addition, there are four policies supported by UNEP in relation to the Regional Seas Programme in the East Asia and the Pacific region (one for east Asia, one for northeast Asia, and two for the Pacific Islands region), two for the Red Sea, two for Latin America and the Caribbean, and one for South Asia. Of the six remaining regional policies, three were focused on Antarctica, one on East Africa, one on G20 members and one on the Great Lakes region of North America. Taking into account this geographic distribution, regional policies to address plastic pollution may be most clearly categorized for further description based on the governing bodies that formulated them: (1) those developed with support of UNEP and the Regional Seas Programme; (2) other various regional policies and strategies (a third of which apply to Antarctica); and (3) EU policies binding upon members.

Evolution of the Problem Definition

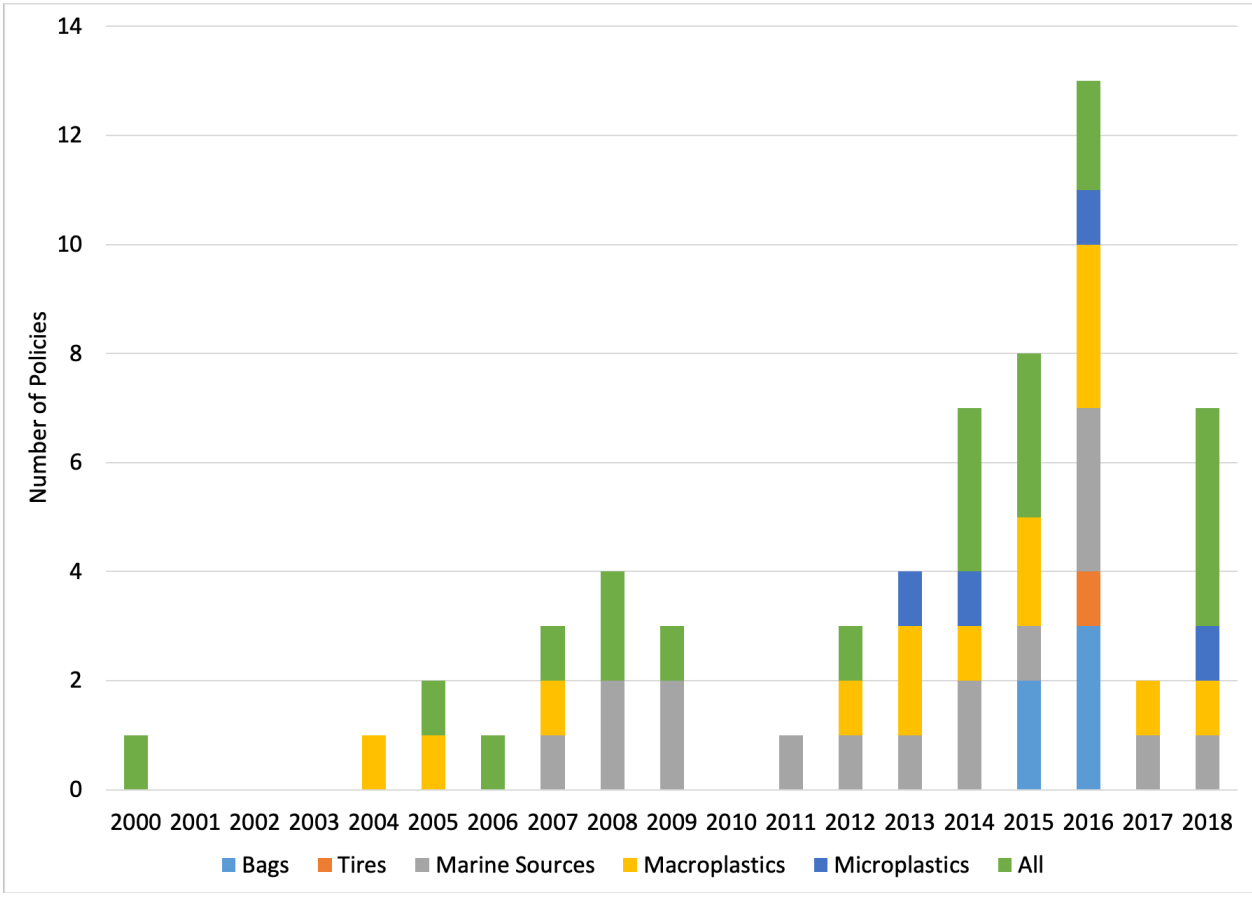
Similar to international policies at the global level, regional policies have defined the plastic pollutants to be addressed in increasingly specific terms, from earlier policies focused only on the problem of plastics more broadly (categorized as targeting "all" types of plastic pollutants, macroplastics, or multiple sources of plastic pollution), to policies increasingly focusing on one or more specific types of plastic pollution (including examples of policies targeting plastic bags or microplastics) (see Fig. 12 below).

Figure 12. Number of Regional Policies by Type of Plastic Pollution Targeted



As with the international policies at the global level (see section 3.4), to understand in more detail the different types of plastic pollution targeted by the various regional policies, the number of policies targeting specific types of plastic pollution were measured (see Fig. 13 below). In 2013 policies begin to target microplastics for the first time (just prior to the first UNEA resolution targeting microplastics at the global level), and by 2015 policies begin to target plastic bags specifically (for example in 2015 with EU Directive 2015/720 regarding regulation and consumption of light-weight plastic bags and in 2016 with the East African Community's "Polythene Materials Control Bill"). The trend in regional policies is similar to international policies at the global level, if not slightly leading them, in both an increase over time in the volume of policies aiming to address the problem, and an overall shift in policies that define the problem in more complex terms, focusing on a number of different types of plastic pollutants, rather than just "all" or "macroplastics." Similar to the global level, regional policies typically have taken a holistic approach to the problem and focused on leakage across all stages of the life cycle of plastic products, although in some cases binding regional policies from the EU and East African Community have been more targeted.

Figure 13: Different Types of Plastic Pollution Targeted by Regional Policies



Within these regional policies, the specific instruments agreed to address plastic pollution were almost exclusively plans or commitments for participating states to take future action, or to a lesser extent information instruments (e.g., education and outreach campaigns, research and monitoring, or others). Plastic pollution from maritime sources was a small exception, given some examples of regional agreements related to disposal of plastic waste from ships or at port facilities. The largest number of instruments focused broadly on all or multiple sources and types of plastic pollutants, followed by those focused on macroplastics from land-based sources (the latter included a few exceptions of regional regulations for responsible handling of waste, or limits or bans on plastic). Within this category, a very small number focused exclusively on plastic bags, though only one (in a policy from the East Africa Community) banned plastic bags – all others were again plans and commitments for future action or information instruments. Lastly, only a few instruments were targeted specifically to microplastics, again only for planning or information.

Regional policies supported by UNEP in relation to the Regional Seas Programme

Of these 20 policies, 14 (70 percent) were agreed from 2013 through 2018. From these, only policies in the Mediterranean, the Pacific Islands and the Red Sea contain commitments to address the problem. Notably, the policies in the Mediterranean and the Pacific Islands include relatively comprehensive commitments to address plastic pollution at all stages of the product life cycle, and at a number of different sources or types of plastic.

In the Mediterranean region, in 2013 the Parties to the Barcelona Convention agreed on perhaps the most comprehensive set of commitments made in conjunction with the Regional Seas Programme for states to address plastic pollution. The "Regional Plan for Marine Litter Management" includes a number of commitments for participating states to take future action to address the problem by firm deadlines, and/or develop specific types of instruments to do so. These commitments are summarized in Table 1 below, according to the instrument type envisaged, showing a focus on waste management and prevention, including recycling, as well as EPR requirements, economic incentives and research and monitoring, among others. This plan has been characterized as "one of the most advanced regional [policies] on marine debris" (Jambeck et al. 2018). That the region is furthest advanced is probably not surprising, given that Mediterranean countries first started to address the problem in 1991—and the first Regional Seas Programme was established in the Mediterranean in 1975 (Kirk and Popattanachai 2018, VanderZwaag and Powers 2008).

Table 1. Examples of Commitments in the Mediterranean "Regional Plan for Marine Litter Management" for Participating States to Take Future Action to Address Plastic Pollution

Policy Instrument Type	Type of Plastic Pollutant Targeted	Description of Commitment
Regulatory Instruments		
Capture plastic post-leakage	All or multiple types of plastics	Participating states will conduct regular cleanups, with a priority on protected areas and identification of hotspots for litter, including regular national marine litter cleanup campaigns and international coastal cleanup campaigns, as well as adopt-a-beach campaigns, and fishing-for-litter practices and campaigns
Responsible handling of plastic (i.e., waste stewardship practices)	All or multiple types of plastics	By 2017 participating states will explore and implement to the extent possible, EPR strategies to make producers, manufacturer brand owners and first importers responsible for entire life cycle of products, with rules encouraging design of more durable products for reuse, recycling and materials reduction (in weight and toxicity)
		By 2020 participating states will take necessary measures to ensure adequate sewer, wastewater treatment plants and waste management systems to prevent run-off and riverine inputs of plastic. By 2025 participating states will base urban solid waste management on reduction at source.
	Macroplastics	By 2019 participating states will implement adequate waste reducing/reusing/recycling measures in order to reduce the amount of plastic waste going to landfill or incinerated without energy recovery.
	Maritime sources of plastic pollution	Participating states will ensure that ships using their ports are aware of MARPOL Annex V requirements.
Develop new, or improve existing process or products		By 2017 participating states will work with the plastic industry to establish procedures and methods for minimizing the decomposition characteristics of macroplastics, in order to reduce microplastics
Economic Instruments		
All economic instruments	Plastic bags	Participating states will develop economic instruments to reduce plastic bag consumption
Cash for return (incentives)	All or multiple plastics	Participating states will develop deposit/return schemes for beverage packaging that prioritizes recycling and reuse
Information Instruments		
Research, data collection, data reporting or record keeping	All or multiple plastics	By 2017 participating states will design national monitoring programs on "marine litter," and monitor impacts on ecosystems, and support further research more broadly

In 2016 participating states in the Barcelona Convention followed up with the Athens Declaration, in which they committed to effectively implement national action plans to reduce land-based sources of marine pollution, with a focus on marine litter "as an emerging issue of regional and global concern" and with a goal of achieving its significant reduction by 2024. This policy explicitly states the influence of the dialogue at the regional and global level, and implicitly suggests the possible influence of international policies agreed at the global level by this time (e.g., UNEA resolutions).

In the Pacific Islands region, a pair of policies agreed in 2016 and 2018 through the South Pacific Regional Environment Programme, describe a comprehensive strategy to address the problem that includes a number of commitments for participating states. The commitments focus on all or multiple types of plastic pollutants, with an emphasis on Pacific Island countries and territories (PICTs) implementing waste prevention and reduction programs based on principles of a circular economy, including EPR schemes, and particularly targeting single-use plastic bags, Styrofoam containers and tires, among others. PICTs will develop and implement national policies and strategies for improved solid waste management, prevention and reduction, including expanding user-pays waste collection services. Notably, the policy commits PICTs to develop legislation to ban single-use plastics, Styrofoam, and plastic packaging, and cites the examples for the Republic of the Marshall Islands and Vanuatu respectively, as models to follow. The policy also commits PICTs to provide subsidies to help firms make the transition to alternatives to single-use plastics. Finally, the policy commits PICTs to develop education and outreach campaigns (e.g., "clean schools" and "clean campus" programs), and to monitor and collect data on plastic pollution via data collection app.

For maritime sources of plastic pollution, the policy commits PICTs to develop and apply relevant provisions from MARPOL to limit discharges of plastic waste from ships. Lastly, the policy commits PICTs to support international efforts to reach consensus on a global treaty for plastic pollution reduction, as well as to develop a regional framework to better address the problem.

Additionally, the 2005 policy for the Red Sea and Gulf Aden includes broad commitments for participating states to prevent or reduce solid waste generation and increase or enhance waste treatment (including recycling), in order to eliminate, "to the greatest extent possible," solid wastes and litter reaching the marine environment.

Beyond the commitments in the Mediterranean and Pacific Islands, the additional policies developed in relation to the Regional Seas Programme have recommended or urged participating states to adopt or consider a number of instruments. Similar to the trend at the global level, early policies (e.g., the 2007 Southeast Pacific, the 2008 East Asia seas, and the 2008 Northwest Pacific regional action plans) focused on maritime sources of plastic pollution, recommending that participating states ensure compliance with Annex V of MARPOL, and strengthen port waste reception facilities (e.g., ensuring standardized use fees are charged to recover costs). Additionally, these action plans recommended marking and registration of fishing gear, and fishing gear buy-back schemes modelled on the example of Korea. Later plans addressing maritime sources of plastic pollution (e.g., the 2013 Mediterranean, the 2014 Northeast Atlantic, and the 2014 Wider Caribbean action plans) would continue to encourage states to

ensure compliance with Annex V of MARPOL (e.g., in the Northeast Atlantic recommending states to harmonize penalties for noncompliance), as well as require fishing gear be marked and to charge fees for use of port waste reception facilities or include waste disposal costs in port fees. Additionally, these policies often recommended that states implement where feasible, "fishing for litter" programs to help facilitate cleanup of floating litter (including in the Northeast Atlantic to explore if participating vessels can land the waste collected at designated harbors in participating states).

Subsequent to plans to address maritime sources of plastic pollution, a number of regional action plans recommend comprehensive national responses to reduce land-based sources of plastic pollution. These plans typically recommend states to adopt national legislation with a range of instruments to address land-based sources of plastic pollution, together with instruments to be introduced at the regional level (e.g., by secretariats or agents acting on behalf of the participating states, or coordinated programs of action at the national level) for research, monitoring, education, and outreach.

Plans typically urged participating states to adopt national legislation with instruments to reduce land-based sources of plastic pollution at all stages of the life cycle, including post-leakage capture and cleanup. This included the 2014 Wider Caribbean, the 2018 Red Sea and Gulf of Aden, and the 2018 South Asia regional action plans, as well as the 2016 decision of the Conference of the Parties to the Barcelona Convention in the Mediterranean. In the case of the Wider Caribbean, the plan emphasized solid waste prevention and management practices, as well as measures to reduce and prevent sewage and stormwater entering the oceans. This plan also called for states to ensure compliance with future legislation by supporting "litter wardens or patrols" from communities, together with training for judges and enforcement officers. Additionally, the plan in South Asia emphasized that national instruments should focus on reducing plastic waste at the source, with a preference for economic instruments. The South Asia plan also recommended a focus on post-leakage capture, for example at river mouths or other entry points to the ocean, and recommended that states align instruments to international policies.

At the regional level, the policies typically envisaged a range of information instruments including for research, monitoring and education or outreach. Action plans for the Mediterranean (2013), the Northeast Atlantic (2014), the Wider Caribbean (2014), the Red Sea and Gulf of Aden (2018) and South Asia (2018), all included plans for future research programs in some form. For example, two plans (Mediterranean and Northeast Atlantic) envisaged that states would identify hotspots of "marine litter" to support cleanup programs, while the Red Sea and the Gulf of Aden plan envisaged research to determine the source, density, and composition of "marine litter" in each participating state. Both the Mediterranean and Wider Caribbean action plans called for establishing regional expert groups to advise states on the design of instruments among others, and the Wider Caribbean plan aimed to conduct research on best waste management practices the hotel, restaurant, and marine transport industries, including to share lessons learned with private operators in the tourism sector.

In addition to research, the regional action plans typically aimed to establish monitoring programs as a basis for future action (e.g., the Mediterranean, Wider Caribbean, Baltic Sea, and

South Asia regional action plans). For example, the 2013 Mediterranean plan recommended that participating states should establish a regional database on "marine litter," while the Secretariat would prepare an assessment of the state of "marine litter" in the Mediterranean every six years, drawing from national monitoring programs. In 2016 the Conference of the Parties to the Barcelona Convention in the Mediterranean agreed that the Secretariat will prepare country fact sheets on "marine litter" among participating states and share best practices on waste management (including prevention and landfill bans). Similarly, the Northeast Atlantic plan called for the creation of a "platform" to exchange "good experience" in cleanups, as well creation of a database of good examples, while the Wider Caribbean plan envisaged the establishment of a clearinghouse of information on effective waste management strategies. The Baltic Sea plan called for states to identify a set of indicators for the impact of "marine litter," as the basis for a coordinated monitoring program, as did the Wider Caribbean plan in the case of consumption of single-use plastic bags. Finally, a number of these plans proposed regional awareness and education campaigns.

Lastly, instruments addressing microplastics are less common among these plans, but the Northeast Atlantic plan provides an interesting and detailed example. The plan asks that participating states explore the possibility of reaching a voluntary agreement with industry to phase out the use of microplastics in personal care products, a commitment alreadymade by the European cosmetic industry for most rinse-off products with microbeads. The plan notes that if this does not prove sufficient, then a next step would be to propose a regulatory instrument at the regional level to achieve a complete phase-out of microplastics in personal care and cosmetic products. The plan also calls for a further evaluation of all products and processes that include primary microplastics.

In summary, UNEP has provided assistance to a number of Regional Seas Programmes to establish regional action plans to address plastic pollution (defined as "marine litter"), though only a small number provide firm commitments for national action through instruments (Kirk and Popattanachai 2018).

Other Regional Policies

In addition to those policies developed in relation to the Regional Seas Programme, countries in a number of regions have reached consensus on coordinated policy responses to plastic pollution. These include eight policies: three for Antarctica, one for the Great Lakes region, one for Nordic countries, one by the General Fisheries Commission in the Mediterranean, and finally, directives for East African states. For Antarctica, the policies focus on commitments to dispose of single-use plastics, by cutting any packaging bands (into approximately 30 cm sections) and at the earliest opportunity incinerating them on ships, with any plastic residue stored on board the vessel until reaching port (ensuring that in no case the residue is discharged at sea).

In 2019 the Nordic Council of Ministers for the Environment and Climate (Åland Islands, Denmark, Finland, Faroe Islands, Greenland, Iceland, Norway, and Sweden) called for the development of an international treaty to comprehensively deal with the problem of plastic pollution on a global level.

Interestingly, among these policies in 2016 the East African Community passed the "Polythene Material Control Bill," as regulations upon member states. For a population of approximately 168 million in 2016, this policy bans polythene bags within one year of the policy's entry into force, while providing that the governing body may establish a list of polythene materials for which exceptions can be permitted. The policy includes a mechanism to support investments by participating states or individuals in reducing polythene waste pollution or developing biodegradable packaging materials, through the East African Community Development Fund, or encourages participating sates to directly provide subsidies, grants, or tax breaks.

European Union policies. The EU policies focused at least partially on land-based sources of plastic pollution are typically "directives" which are binding upon member states, setting an outcome to be achieved, but requiring states to develop and enact context-specific legislation toward the outcome.[16] Alternatively, the policies targeting maritime sources of plastic pollution have more frequently been regulations (associated with the EU Common Fisheries Policy), which are binding upon member states and do not require further national legislation to take effect.

Maritime sources of plastic pollution. In 2009, the EU passed regulations (43/2009 and 1224/2009) to ensure management of plastic waste from fishing fleets registered to member states, as well as prevention of plastic pollution from lost fishing gear. For example, the EU's large tuna fleet operating in the Eastern, Western, and Central Pacific Ocean is prohibited from disposing of plastic waste at sea. For prevention of lost fishing gear, all fishing vessels registered to EU member states must be equipped to retrieve lost gear, and in the event of a loss attempt to recover the gear as soon as possible, and if not then to inform the government. Such regulations would cover a significant portion of the world's migratory fishing fleets ("distant-water fishing fleets") (Tickler et al. 2018).

In 2019, following a directive on port facilities,[17] the EU issued Directive 2019/904 to require regulations of responsible handling of plastic in fishing gear, including that member states ensure EPR schemes are established for fishing gear containing plastic (including that producers cover the costs of separate collection of waste delivered to adequate port reception facilities, including subsequent transport and treatment), and set national minimum annual collection rates of gear for recycling ("with a view to the establishment of binding quantitative [EU] collection targets"). Member states are required to make arrangements to monitor fishing gear containing plastic placed on their markets.

Land-based sources: macroplastics (single-use). European policies to address plastic pollution from land-based sources were introduced ahead of international policies at the global level, beginning in 2004 with the Directive 2004/12/EC on packaging and packaging waste, and continuing with the 2008 Marine Strategy Framework Directive 2008/56/EC that included monitoring of "marine litter" as part of efforts to assess the environmental status of European waters. The 2004 directive focuses on prevention of packaging waste, committing members to

16. In theory, if a member state does not pass the required legislation, the European Commission may initiate legal action against the state in the European Court of Justice.
17. EU Directive (2019/883), see: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1587415149207&uri=CELEX:32019L0883.

take such measures, notably to make producers responsible for the impact of packaging waste (e.g., EPR). This early policy included specific recycling targets for packaging waste, including that by end of 2008 between 55 percent and 80 percent of packaging waste will be recycled; and by end 2008 22.5 percent by weight for plastics contained in packaging waste.

While subsequent EU policies have addressed macroplastics broadly, and more specifically single-use plastics (e.g., the 2015 action plan for the circular economy which references plans for a more ambitious EU target for recycling of plastic packaging, or 2015 directive on packaging and packaging waste), in 2019 the EU issued a directive that amounts to an "all of the above" approach: requiring member states to adopt some form of a broad mix of instruments to "achieve an ambitious and sustained reduction in the consumption of single-use plastic products [such as beverage cups and food containers]." The 2019 Directive 2019/904 reports that single-use plastics account for approximately half of total "marine litter" counted on the beaches of member states (with fishing-related items representing another 27 percent). The mix of instruments member states are required to adopt in some form include a ban on the sale of certain types of single-use plastic products in the marketplace, regulations for responsible handling of plastic (e.g., recycling targets), and a mix of information instruments (e.g., education or outreach, labels or placards) (see Table 2 below). In aggregate, the mix of measures required by Directive 2019/904 are estimated to cover 86 percent of the single-use plastics found in beach counts of member states (p. 3).

Table 2. "All of the Above": EU Directive 2019/904 as a Package of Instruments States Commit to Introduce to Address Pollution from Single-Use Plastics

Target	
Member States shall take the necessary measures to achieve an ambitious and sustained reduction in the consumption of single-use plastic products listed in Part A of the Annex…to achieve a measurable quantitative reduction in the consumption of [these] single-use products […] by 2026, compared to 2022 […] By 3 January 2021, the Commission shall adopt an implementing act laying down the methodology for calculation and verification of the ambitious and sustained reduction in the consumption of the single-use plastic products listed in Part A of the Annex.	
Policy Instrument Type	**Description of Commitment**
Regulatory Instruments	
Develop new, or improve existing process or product	Member states may include measures to ensure that reusable alternatives to the single-use products listed in Part A of the Annex are made available at the point of sale to the final consumer
Ban plastic	Member States shall prohibit the placing on the market of the single-use plastic products listed in Part B of the Annex and of products made from oxo-degradable plastic
Responsible handling of plastic (i.e., waste stewardship practices)	For beverage bottles (Part F of the Annex), Member States shall ensure that: (a) from 2025 ["PET bottles"] contain at least 25% recycled plastic and (b) from 2030, beverage bottles listed in Part F of the Annex contain at least 30% recycled plastic Member states shall take the necessary measures to ensure the separate collection for recycling: (a) by 2025, of an amount of waste single-use plastic products listed in Part F of the Annex equal to 77%; (b) by 2029, amount equal to 90%

Policy Instrument Type	Description of Commitment
Economic Instruments	
Disincentive (fee, tax, levy, duty)	Member states may take measures that include economic instruments such as instruments ensuring that those single-use plastic products are not provided free of charge at the point of sale to the final consumer
Information Instruments	
Education or outreach	Member States shall take measures to inform consumers and incentivize responsible consumer behavior, in order to reduce litter from [single-use plastics], and shall take measures to inform consumers of the single-use plastic products listed in Part G of the Annex and users of fishing gear containing plastic about the following: the availability of re-usable alternatives, re-use systems and waste management options; the impact of littering and [waste mismanagement] on the environment.
Labels or placards	Member States shall ensure that each single-use plastic product listed in Part D of the Annex placed on the market bears a conspicuous, clearly legible and indelible marking on its packaging or on the product itself, to inform consumers of: the appropriate waste management options for the product or waste disposal means to be avoided; and the presence of plastics in the product and the resulting negative impact of littering or [waste mismanagement] of the product on the environment By 3 July 2021, Member States shall prepare a description of the measures [taken] to achieve [the target for single-use plastics listed in Part A] [and] notify…the Commission and make it publicly available.
Research, data collection, data reporting or record keeping	Member States shall [annually] report to the Commission: data on single-use plastics listed in Part A placed on the market,, […] to [measure] consumption reduction; [instruments introduced]; data on single-use plastic products listed in Part F…to demonstrate [achievement] of collection targets; information on recycled content in beverage bottles listed in Part F; data on the post-consumption waste of single-use plastic products listed in Section III of Part E of the Annex

Part A = cups for beverages, food containers; Part B = cutlery, plates, straws, cotton bud sticks, beverage stirrers, food containers made of polystyrene, sticks to support balloons, beverage containers and cups made of expanded polystyrene; Part D = sanitary towels, wet wipes, tobacco products, cups for beverages; Part F = food containers intended for immediate consumption; packets and wrappers made from flexible material containing food intended for immediate consumption; beverage containers; cups for beverages; tobacco products with filters; wet wipes; balloons; lightweight plastic carrier bags; and sanitary towels

Across these instruments, the directive focuses on feasible instruments for member states. Where alternatives are available more prohibitive instruments are recommended such as a ban, however for products where alternatives are not readily available, affirmative instruments are recommended to ensure responsible handling of waste (e.g., EPR), all combined with information instruments to help change behavior.

Land-based sources: macroplastics (plastic bags specifically). Similar to the approach taken broadly with single-use plastics in Directive 2019/904, previously a pair of directives in 2015 (Directive 94/62/EC and Directive 2015/720) include a number of requirements for member states to introduce a mix of instruments to "achieve a sustained reduction in the consumption of lightweight plastic carrier bags on their territory." The measures required to be taken include:

- regulatory instruments to ensure that annual consumption levels do not exceed 90 plastic carrier bags per person by end of December 2019 and 40 per person by end of 2025 (excluding "very lightweight plastic carrier bags");
- economic instruments to ensure that such bags are not provided free of charge at the point of sale; and
- information instruments to ensure that member states report annually on plastic bag consumption, and to encourage public information and awareness campaigns, while ensuring that biodegradable and compostable plastic carrier bags are labelled according to EU regulations to be developed.

Across the measures to reduce the consumption of single-use plastics and the volume of mismanaged waste, the Commission is committed to present a report to the European Parliament by November 27, 2021, assessing effectiveness in combating littering, changing consumer behavior and promoting waste prevention.

Land-based sources: microplastics. Microplastics "do not fall directly within the scope of [Directive 2019/904], yet they contribute to marine litter and the [EU] should therefore adopt a comprehensive approach to that problem. The [EU] should encourage all producers to strictly limit microplastics in their formulations." During the study period, no policies were introduced or required member states to introduce, instruments to specifically address pollution of microplastics, though a process has begun with a proposal by the European Chemicals Agency to restrict microplastics intentionally added to products.

Conclusions

Even when binding, regional policies to address the plastic pollution problem have almost always depended upon the development and implementation of national legislation. Such policies have essentially been a European phenomenon (62 percent of the policies in the inventory were largely developed within Europe), and/or an "action plan" facilitated by UNEP in conjunction with the Regional Seas Programme. The trend in regional policies is similar to international policies at the global level, if not slightly leading them, in both an increase over time in the volume of policies aiming to address the problem, and an overall shift in policies that define the problem in more complex terms, focusing on a number of different types of plastic pollutants, rather than just "all" or "macroplastics." Similar to the global level, regional policies typically have taken a holistic approach to the problem and focused on leakage across all stages of the life cycle of plastic products, although in some cases binding regional policies from the EU and East African Community have been more targeted.

The regional policies and action plans developed in conjunction with the Regional Seas Programme have often originated from the Mediterranean (the oldest Regional Seas Programme), and have typically represented some of the most comprehensive packages of recommended instruments to address the problem from multiple sources and across all stages of the product life cycle. These often focused on both plastic waste management and prevention, including recycling as well as EPR requirements. In the case of the Pacific Islands, the policy commits participating states and territories to develop legislation to ban single-use plastics, and cites

the examples of the Republic of the Marshall Islands and Vanuatu respectively, as models to follow. Information instruments are frequently recommended or committed for states, as well as introduced at the regional level through secretariats. However, in summary, while regional action plans facilitated by UNEP through the Regional Seas Programme have frequently provided some of the most comprehensive policy responses to the problem, with a wide range of commitments for participating states to design and introduce a mix of instruments, they have not often been binding upon the states.

In addition to the UNEP-facilitated regional policies, in 2016 the East African Community passed binding regulations to ban plastic carrier bags in member states, who have an aggregate population of approximately 168 million. The EU has also passed a number of regulations and directives committing member states to (1) regulate European-registered fishing fleets to prevent lost fishing gear containing plastic; and (2) to introduce a mix of instruments to reduce consumption of single-use plastics and increase recycling, among others. In particular, the 2019 EU Directive 2019/904 focuses on feasible instruments for member states. Where alternatives are available more prohibitive instruments are recommended such as a ban, however, for products where alternatives are not readily available, affirmative instruments are recommended to ensure responsible handling of waste (e.g., EPR), all combined with information instruments to help change behavior.

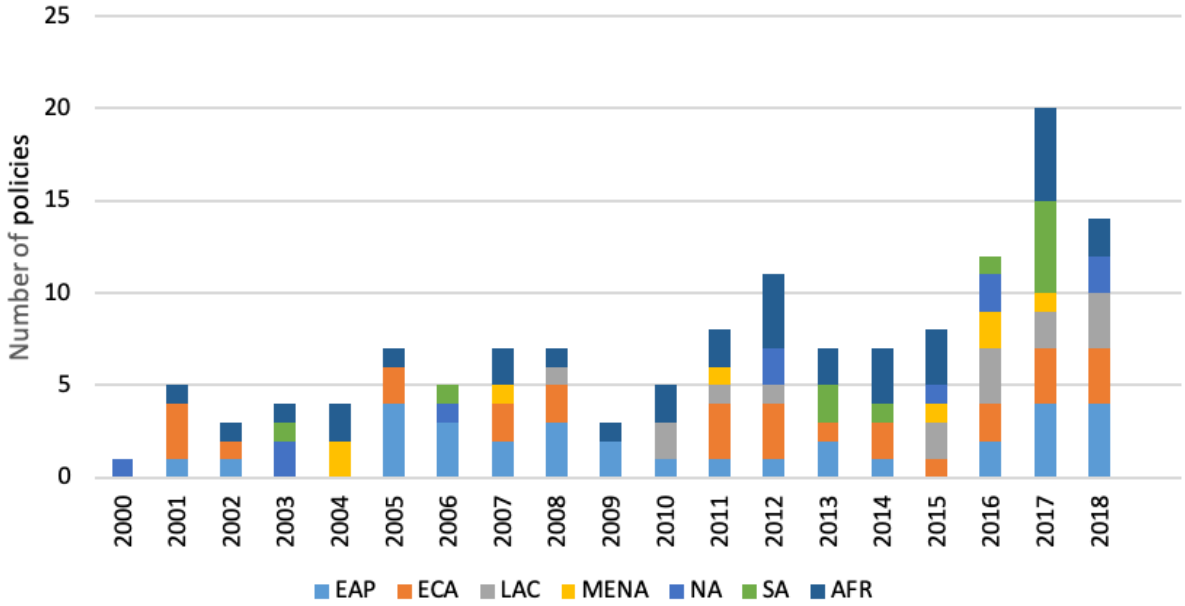
Lastly, while regional action plans and European directives focus on both maritime sources of plastic pollution and land-based sources, they include far more commitments and recommended instruments to address macroplastics than microplastics. For example, during the study period no EU policies required member states to introduce instruments to specifically address microplastics.

3.6 Responses at the National Level

Trends in National Policies to Address Plastic Pollution

The sample of 147 national policy documents in the Plastics Policy Inventory shows a clear upward trend broadly across regions over the last 20 years (from the beginning of 2000 until July 2019) (see Fig. 14, next page).

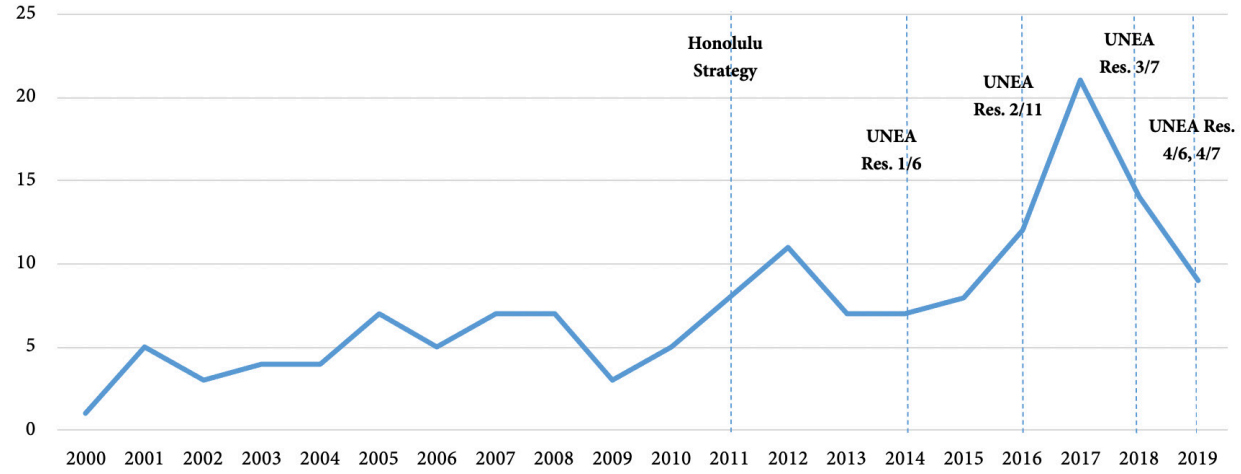
Figure 14. Number of National Plastics Policy Documents Analyzed, by Region



AFR = Sub-Saharan Africa; EAP = East Asia and the Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; NA = North America; SA = South Asia

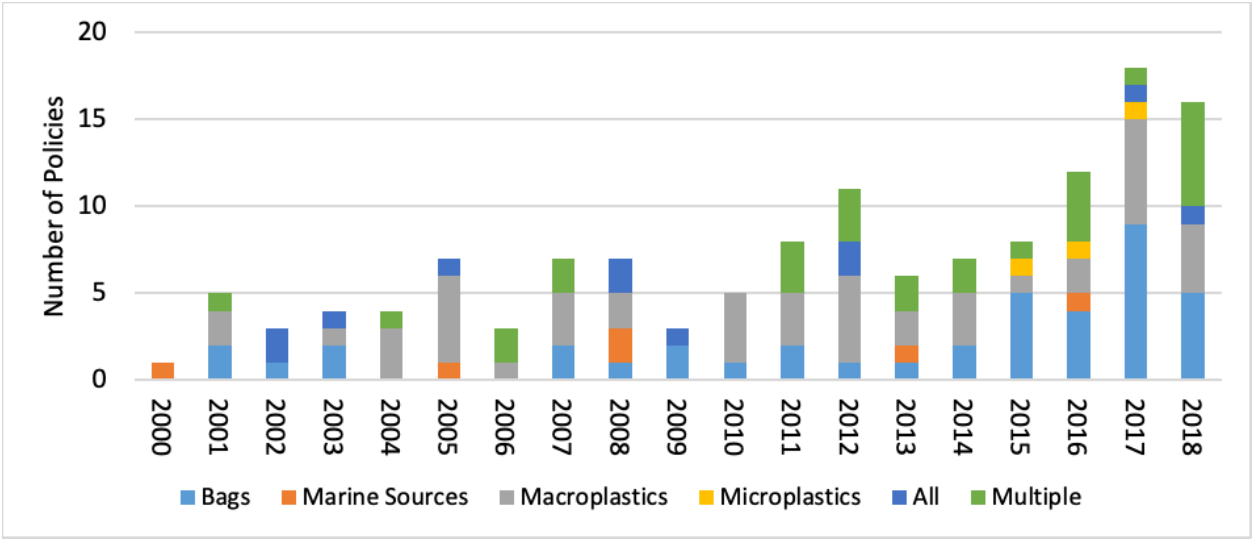
Though not a random sample representative of national plastic policies worldwide, the policy documents included in Figure 14 above can be considered as indicative of the global trend in national government responses, based on a coverage of between 39 and 48 percent of all national policies referenced in the literature reviewed (see Appendix II for more details), and consistent with recent findings in the scientific literature (Schnurr et al. 2018). The increase in the trend coincides with the increase in international policy responses at the global level, beginning with the 2011 Honolulu Strategy (see section 3.1) and continuing for example with a series of UNEA Resolutions beginning in 2014 (see Fig. 15, next page). While this does not imply causality, it does suggest an overall trend of increased public policy responses within the last decade, at several levels (global, regional, and national).

Figure 15. Number of National Plastics Policy Documents Analyzed, with Key Global Policies



In terms of the types of plastic pollution that governments have addressed in the sample of policy documents analyzed, Figure 16 shows a significant growth in policies solely targeting plastic bags (while others may still include plastic bags, e.g., macroplastics, multiple plastics), together with increasingly comprehensive national policy responses that specifically target multiple sources and/or types of plastic pollution. The trend in the increase of national policy responses targeting plastic bags in the sample of policies analyzed shows that almost twice as many policies targeting bags were passed in the years 2013–2018 (25 total) as during the entire preceding period from 2000 through 2012 (14 total). From 2013 through 2018, almost 40 percent of all new national policies introduced to address the plastic pollution problem in the sample of policy documents analyzed, solely targeted plastic bags.

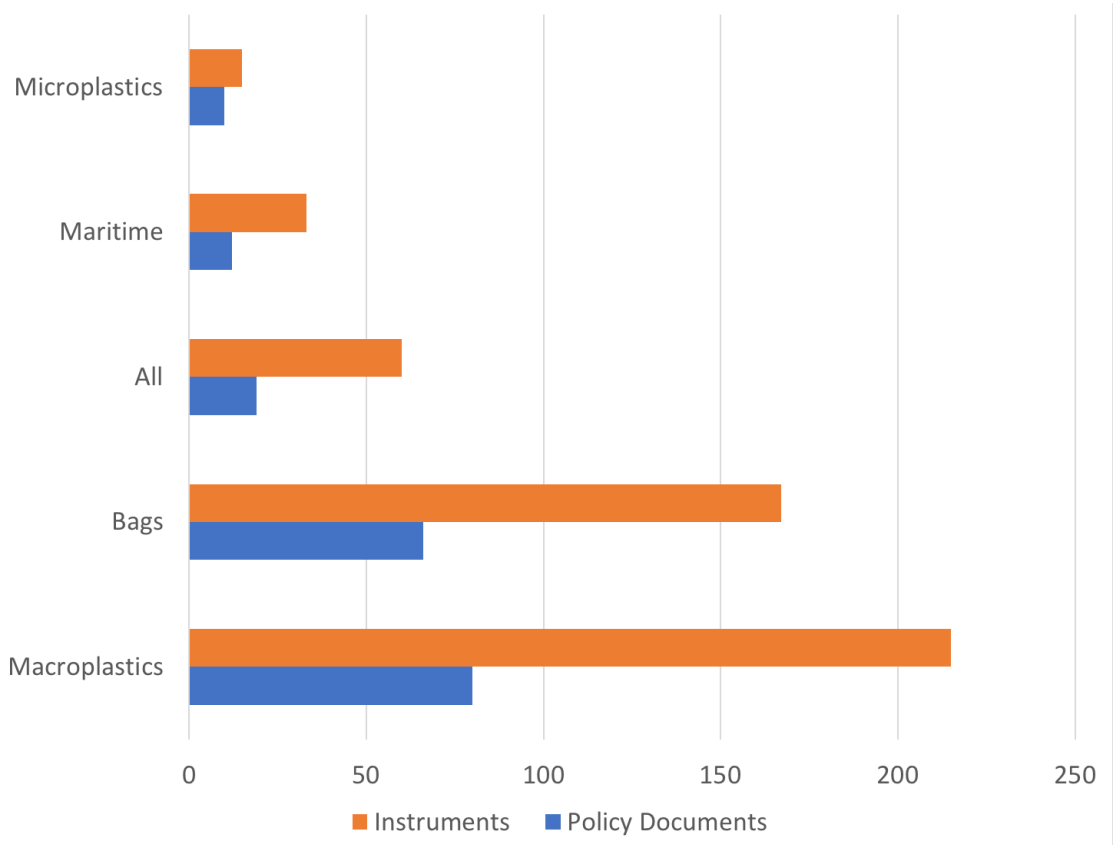
Figure 16. Type of Plastic Pollutants Targeted by National Policies in the Sample Analyzed



Note: Policies targeting more than one of the types of plastic pollutants are classified as "multiple," unless they target "all" plastic pollutants in general.

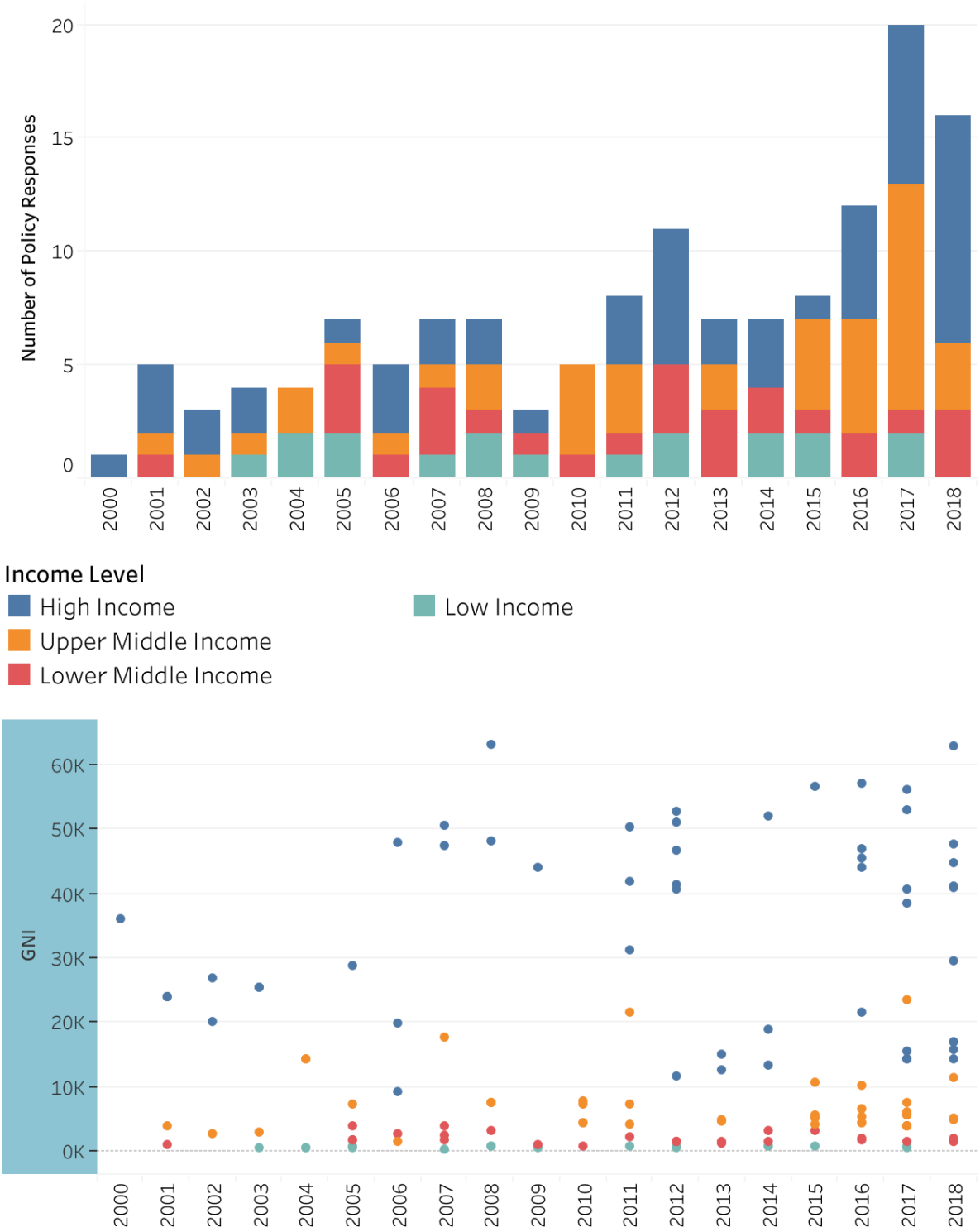
Within the national policies (i.e., documents) analyzed, many of which targeted multiple types of plastic pollution, instruments were used most frequently to address land-based sources of macroplastic pollution (excluding plastic bags), followed closely by instruments to specifically address plastic bags (Fig. 17). By comparison, relatively few instruments were used in these policies to target microplastic pollutants specifically, or maritime sources of pollution.

Figure 17. Types of Plastic Pollution Most Frequently Targeted by Instruments in the Policies



For context, the sample of national policy responses to plastic pollution shows that a majority of the growth in national policies aiming to address plastic pollution has occurred in wealthier countries (upper and upper middle income), though policy responses in lower income countries also showed a modest increasing trend (Fig. 18).

Figure 18. National Policy Responses by Income Levels and Gross National Income (GNI)

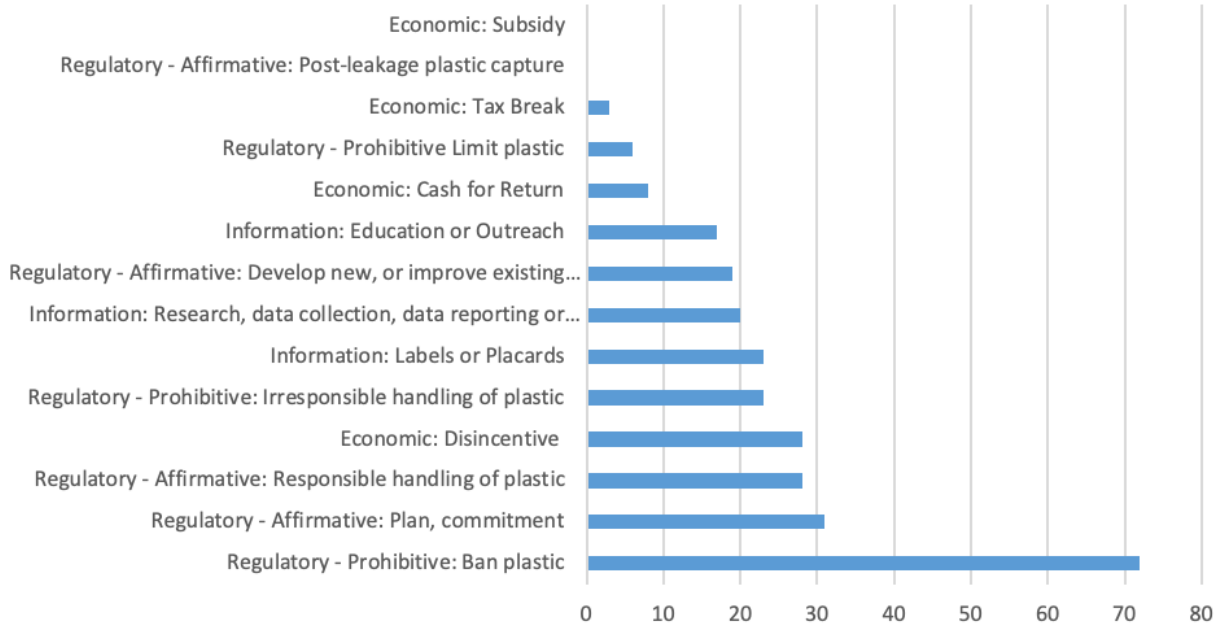


Of the top 20 coastal countries producing mismanaged plastic waste from coastal land-based sources (based on estimates from 2010 in Jambeck et al. 2015), seven do not have a national policy in the inventory or even referenced in literature (but not found for analysis in the inventory): Philippines, Thailand, Egypt, Algeria, Brazil, Myanmar, and North Korea (see Appendix VII for the full list). Another four countries have only national policies targeting plastic bags in the inventory or referenced in the literature: Nigeria, Bangladesh, South Africa, and Morocco. This does not suggest with certainty that no national policies exist in these countries to address land-based sources of plastic pollution. However, the result that essentially over half of the top twenty countries either do not have a policy or only have a policy targeted to plastic bags, is indicative that at least some portion of the governments in the estimated top plastic polluting countries still have not aimed to address the problem. Similarly, of the top 20 plastic polluting rivers estimated by Lebreton et al. (2017), at least four have some or all of the riparian countries with no national policy in the inventory or referenced in the literature (but not found for analysis in the inventory): the Amazon (Brazil and Ecuador with no policy in the inventory), the Pasig (Philippines), the Irrawaddy (Myanmar), and the Mekong (Cambodia, Laos, Myanmar, and Thailand).

Trends in the Policy Instruments Used to Address Plastic Pollution

Among the 147 policies introduced by national governments to address plastic pollution in the inventory, by far the most frequent instrument used within them was regulatory: to ban plastic at some stage in the life cycle (most frequently banning plastic at the point of sale, or 80 percent of the bans, followed by production and import stages at roughly 69 and 64 percent respectively, the use stage at 44 percent, and almost all of the remainder targeted broadly at all stages of the life cycle). Essentially, almost all bans were targeted at the point of sale or selling stage of the plastic product life cycle, followed by import and production, collectively targeted by 92 percent of bans. In the sample analyzed, national governments were 3.5 times more likely to use regulatory instruments (128 identified in total) than economic instruments (37 identified in total), and 3 times more likely to use regulatory instruments than information instruments (42 identified in total).

Figure 19: Instruments Most Frequently Used by National Governments to Address Plastic Pollution in the Sample Analyzed (Number of National Policies Using Each Instrument)



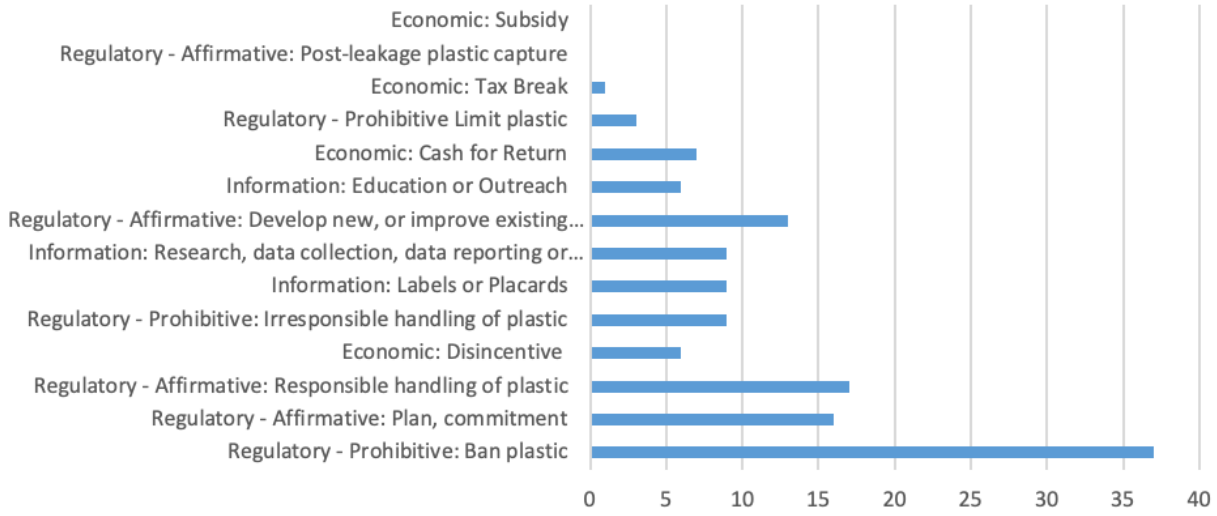
In terms of the packaging or combination of instruments, as an indication of complexity, roughly a quarter (23 percent) of the national policy responses analyzed that included regulatory and/or economic instruments, also included information instruments to accompany them. This proportion was slightly higher in some regions than others, for example higher in Europe and Central Asia (29 percent) and lower in East Asia and the Pacific and sub-Saharan Africa (14 percent each).

Policies and instruments to address maritime sources of plastic pollution. Throughout the sample, twelve national policies were introduced to address maritime sources, over half of which were enacted more than ten years ago (though a much larger body of policies has been introduced to address waste disposal in ports broadly, without specifying plastics). In these policies, the most commonly used instrument was a ban on disposal of plastic waste at sea, often accompanied by information requirements for ships to clearly mark the procedures and to record garbage disposal, in order to comply with national commitments made in the MARPOL treaty. For example, shipping regulations passed by the Government of the Solomon Islands in 2001 prohibits discharge of "synthetic fishing nets, plastic garbage bags and incinerator ash from plastic products which may contain toxic or heavy metal residues." Similarly, merchant shipping regulations enacted by the Government of Malta in 2004 prohibits "the disposal of all plastics from a ship into the sea outside special areas." In some cases, governments have also required their port authorities to recover the costs of facilities for disposal of garbage including plastic waste, to ensure sound operation for merchant ships to safely dispose of their waste. In the case of the U.S., the government passed legislation in 2000 to prohibit discharge of plastic or floating garbage from

all naval vessels. Essentially, this small sample of national policies illustrates national governments using standard instruments to comply with their commitments in the MARPOL treaty.

Policies and instruments to address land-based sources of plastics. The policy instruments used by national governments in the inventory to address land-based sources of plastic pollution broadly (and not plastic bags solely, see following section), have far and away been regulatory in nature, most frequently bans of specific plastic pollutants (e.g., packaging or other single-use plastics), followed by requirements for handling of plastic waste (e.g., recycling) (Fig. 20).

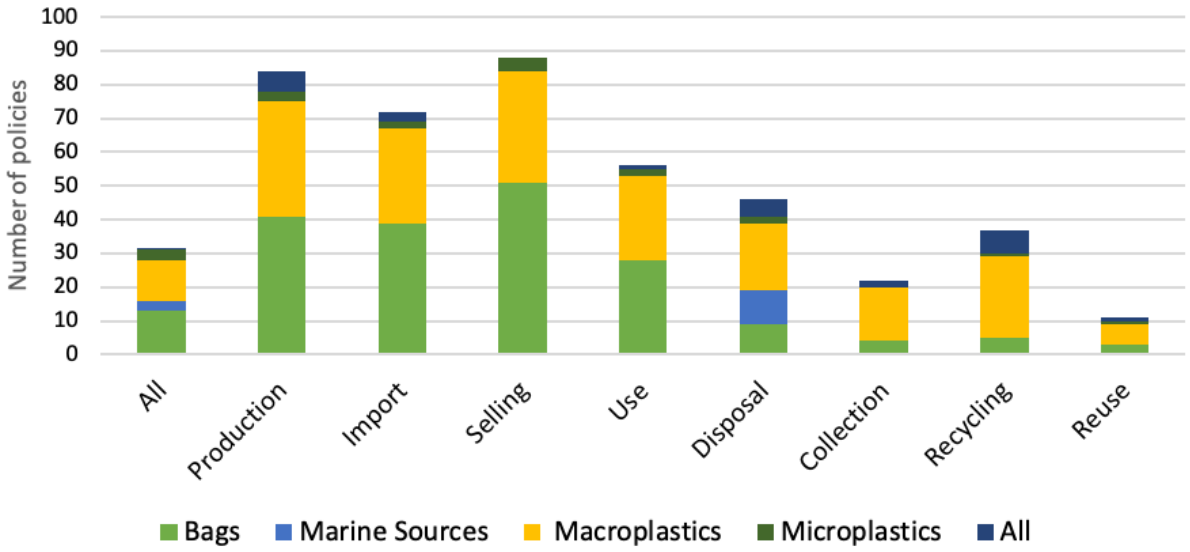
Figure 20. Instruments Most Frequently Used by National Governments to Address Land-Based Sources of Macroplastic Pollution Problem in the Sample Analyzed (Number of National Policies Using Each Instrument)



In terms of these regulatory instruments, some form of plastic packaging or other single-use plastic product (excluding plastic carrier bags) was banned in at least 25 countries in the inventory, representing a population of almost two billion people in 2018 (see Appendix VIII for full list). However, the vast majority of this population was covered by two policies in India and Pakistan, for a total of 1.56 billion. The remaining 23 countries covered by some form of national ban in 2018 spanned a population of only 355 million.

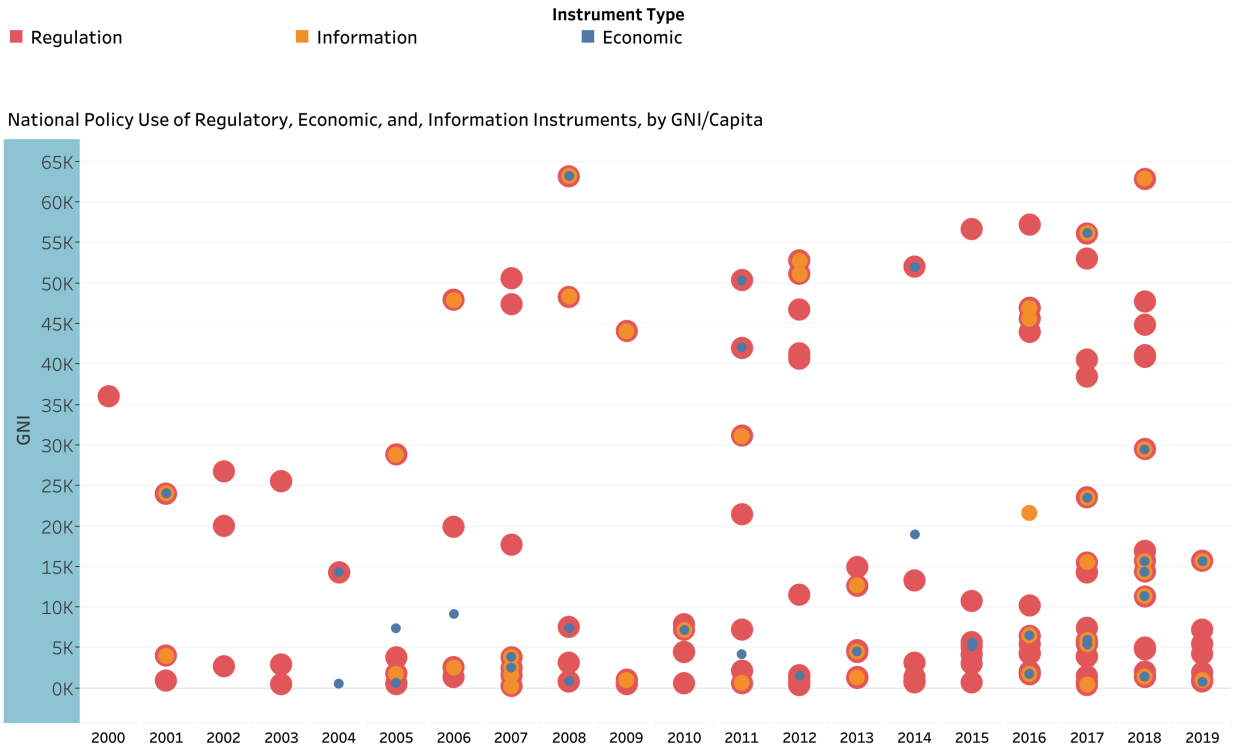
Over time, governments have increasingly deployed these instruments at different stages of the plastic product life cycle, for example with 25 percent of national policies in the inventory addressing multiple stages from 2000 to 2005, as compared to 59 percent in 2018 (and 19 percent addressing all stages) (Fig. 21). The most commonly used instrument in the inventory, bans of land-based sources of plastic pollution (macroplastics broadly, not plastic bags specifically), was most frequently targeted to the point of sale.

Figure 21. Number of National Policy Documents Containing Instruments That Address a Given Stage of Life Cycle



In terms of the context for use of different policy instruments, there is not a clear pattern by income level of countries over time, for example lower income countries use a significant portion of the economic instruments found in the policies analyzed, as well as regulatory instruments and vice versa (Fig. 22).

Figure 22. Instruments Used in National Policies, By Gross National Income (GNI) per Capita



In terms of the instruments used in specific regions in the inventory, in sub-Saharan Africa regulatory instruments were by far the most commonly used, typically to ban various forms of plastic packaging. This finding is consistent with Jambeck et al. (2018), which also cites a large number of countries in the region that have adopted regulatory bans on plastic bags (e.g., Mauritania, Senegal, Cote d'Ivoire, Mali, Ghana, Kenya, Ethiopia, Malawi, Mauritius, and Uganda). For example, a number of policies in the inventory use instruments to ban the sale of certain types of packaging where alternatives may have been feasible, while at the same time requiring permitting for other types where alternatives may not have been feasible, and requiring importers, manufacturers and distributors to be responsible for waste management (e.g., Cameroon 2012, Seychelles 2012, Democratic Republic of the Congo 2013). In some cases, it is not always clear that alternatives or substitutes to the banned products were available (e.g., Seychelles 2013, Burkina Faso 2014, Tanzania 2019).

The majority of policies analyzed from East Asia and the Pacific that targeted land-based sources of pollution broadly or types of pollutants other than plastic bags, were from Pacific Island countries (e.g., Fiji, Palau, the Republic of the Marshall Islands, Tonga, Tuvalu). These typically included a mix of instruments to address pollution from various types of single-use plastic products, for example with the Republic of the Marshall Islands banning the import, manufacture, sale or distribution of Styrofoam cups and plates, and disposable plastic cups and plates, in 2016, while Tuvalu also banned a number of different types of single-use plastics in 2019.

For East Asia, the number of policies in the inventory that include instruments targeted to land-based sources of pollution broadly were relatively few, including China's requirement for labelling of packaging to try to reduce the volume of plastic packaging used ("excessive product packaging"); Korea's introduction of standards for reducing the volume of plastic packaging used in general, while at the same time banning PVC or coated packaging materials (with a number of products exempted). Australia provided the one example of an economic instrument with the introduction in 2011 of a cash for return scheme for beverage containers generally (including plastic bottles), aiming to enhance producer responsibility and complement existing solid waste management and recycling.

In Europe, the policies in the inventory show a broad range of instruments to address land-based sources of plastic pollution (excluding those focused specifically on plastic bags). More frequently are regulatory instruments proscribing various behaviors to handle plastic and dispose of plastic waste, rather than a preponderance of regulatory instruments to prohibit behavior, e.g., banning plastic, as in other regions (though there are isolated examples, such as Uzbekistan's ban on some single-use plastics in 2018). The responsibility of plastic product producers is frequently emphasized in these instruments, e.g., in the United Kingdom (2007 and 2012) and Austria (2014) policies targeting packaging. Regulatory instruments requiring achievement of recycling targets for plastic waste broadly and/or plastic packaging specifically were a frequent feature in policies (e.g., Ireland 2007, Switzerland 2008, Malta 2011, Montenegro 2011, Spain 2011, Latvia 2013, the Netherlands 2014 and the United Kingdom 2017), often with requirements for improved plastic waste management. Finally, policies in the region included economic instruments in several

cases, which are typically cash for return instruments, or in some cases (e.g., Macedonia 2015), fees for packaging waste to cover costs of management.

Instruments used in the sample of policies from Latin America and the Caribbean are almost exclusively regulatory prohibitions, to ban single-use plastic products (in at least two cases "expanded polystyrene products") (e.g., Haiti 2012, Guyana 2015, St. Lucia 2017, Uruguay 2018, Jamaica 2018, Dominica 2019). The majority of these policies did not include packages of instruments but were designed more narrowly around bans of different types of single-use plastic products.

In North America, the relevant policies in the inventory include the 2006 Marine Debris, Research, Prevention and Reduction Act in the United States, and the 2012 amendments. These focus on information instruments to conduct research and collect data on land-based sources of plastic pollution, including providing reporting on findings to the legislature in order to guide future policy responses.

Lastly, in South Asia the handful of policies analyzed include India, Pakistan, and Sri Lanka. In the case of the Pakistan and Sri Lanka policies, the instruments used were almost exclusively regulatory prohibitions to ban broad categories of single-use plastic products.

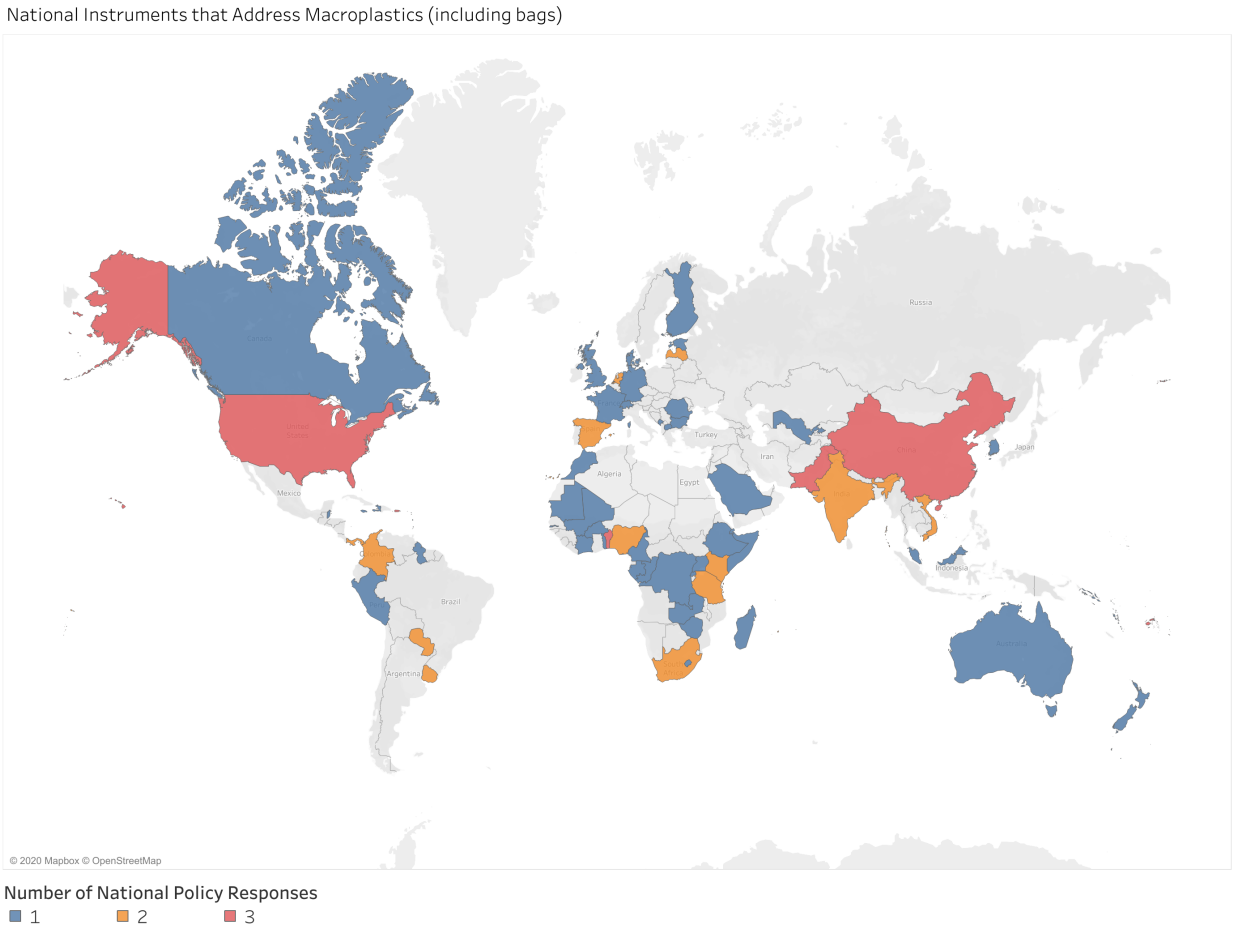
Across the regions, in recent years a number of national policies in the inventory have emerged that serve as examples of comprehensive responses to land-based sources of plastic pollution, with a package of instruments (see Denmark 2016, India 2016, Panama 2019, Rwanda 2019, and Tanzania 2019). These policies have packaged regulatory prohibitions with affirmative requirements to collect and manage waste, or education and outreach. For example, the 2016 policy in Denmark included cash for return instruments for a range of single-use plastics, combined with requirements for providers of plastic packaging to ensure that upon return for cash, the plastic is recycled if it can no longer be used. In the same year in India, the policy banned some forms of plastic packing, while for others requiring local governments to establish waste management infrastructure and establishing that producers have "extended producer responsibility." Similarly, policies in Rwanda and Tanzania banned certain types of single-use plastics, while ensuring that manufacturer, wholesaler, or retailers enhance solid waste management capabilities.

In terms of picking up the instruments consistently recommended in international policies at the global level, national governments made infrequent use of some of these instruments in their efforts to address land-based sources of plastic pollution—perhaps surprisingly only 11 percent of the national policies in the inventory included instruments for education and outreach (Table 3).

Table 3. National Policies Analyzed That Use Instruments Consistently Recommended in International Policies at the Global Level, To Address Land-Based Sources of Plastic Pollution (Excluding Instruments to Address Plastic Bags)

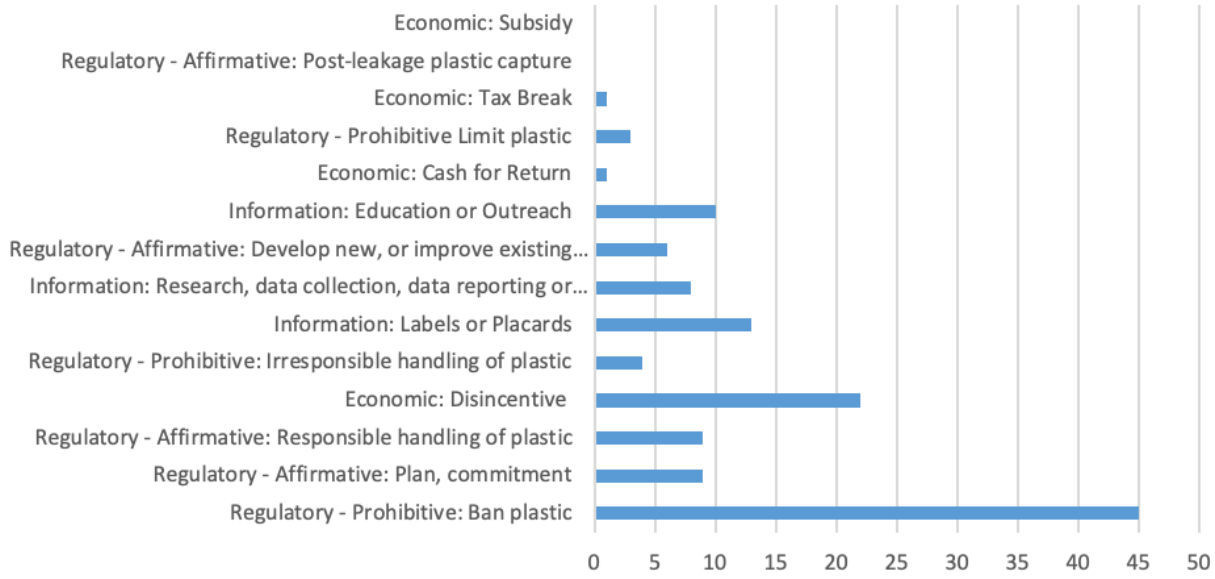
Type of Policy Instrument Recommended	National Policies Analyzed that use this Instrument (%)
Affirmative regulatory – responsible handling of plastics (particularly minimization and management of solid waste, notably through recycling, as well as environmentally sound clean-ups)	17 (24 if plastic bags included)
Affirmative regulatory – capture plastic post-leakage (notably solid waste discharges into waterways, managing stormwater, sewage)	0
Economic – disincentives for single-use plastics	6 (26 if plastic bags included)
Economic – incentives for solid waste management, notably increased public investment	0
Information – education and outreach (notably on the need to improve solid waste management)	6 (16 if plastic bags included)
Information – research, data collection, data reporting, or record keeping	9 (17 if plastic bags included)

Figure 23. Number of National Policy Responses Targeting Macroplastic Pollution



Policies and instruments to address pollution from plastic bags specifically. Across the regions and countries, the instrument most frequently used in the inventory at the national level to address pollution from plastic bags was far and away a regulatory ban—multiple times more likely to be used than the next most common instrument—an economic disincentive (see Fig. 24).

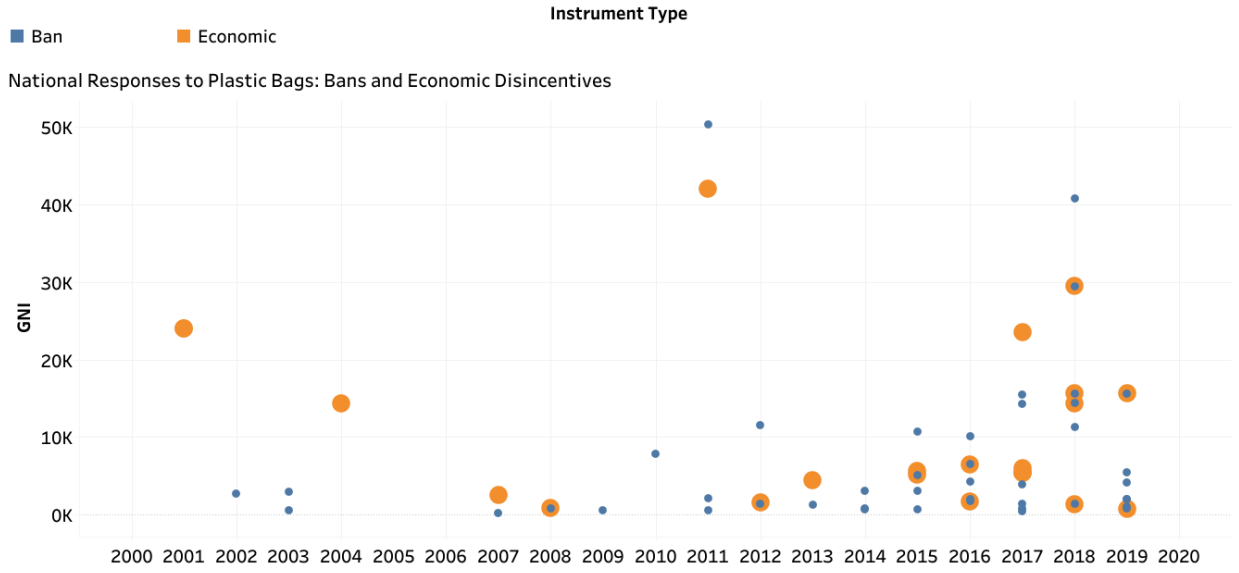
Figure 24: Instruments Most Frequently Used by National Governments to Specifically Address Pollution from Plastic Bags in the Sample Analyzed (Number of National Policies Using Each Instrument)



As mentioned previously, in the sample of policies analyzed national governments were more than twice as likely to use a regulatory instrument to ban plastic bags in some form (in 45 policies) as they were to use an economic instrument such as a tax or a levy (in 22 policies). Bans were typically deployed at several stages of the life cycle: production, import, selling, and use, while economic instruments were often more narrowly targeted to the point of sale to the consumer. Overall, instruments targeting plastic bag pollution in the inventory were deployed at the selling stage of the product life cycle most frequently.

While bans were used more frequently to address plastic bag pollution in the inventory, lower income states were more likely to use bans than higher income states, where economic instruments were more likely to be deployed.

Figure 25. National Plastic Bag Bans and Economic Disincentives



With the growth in national policies targeting plastic bags since 2013 in the sample of policy documents analyzed, by the end of the first half of 2019 national governments have banned, taxed, or levied fees on various forms of plastic carrier bags (e.g., at varying levels of thickness) in at least 43 countries around the world, covering a population of 952 million people in 2018 if the policies in China and India are not included, and a total of 3.7 billion if they are included (see Appendix IX).

In terms of policy complexity, in the 48 national policies listed in Appendix IX that include a ban, tax, or levy on plastic bags in some form, only 18 (38 percent) also include a supporting information instrument—and only six of these were aimed at education or outreach (the other 12 were focused largely on labelling and/or reporting). Overall, throughout the sample of national policies analyzed in the inventory, governments used instruments for education and outreach in only 15 instances.

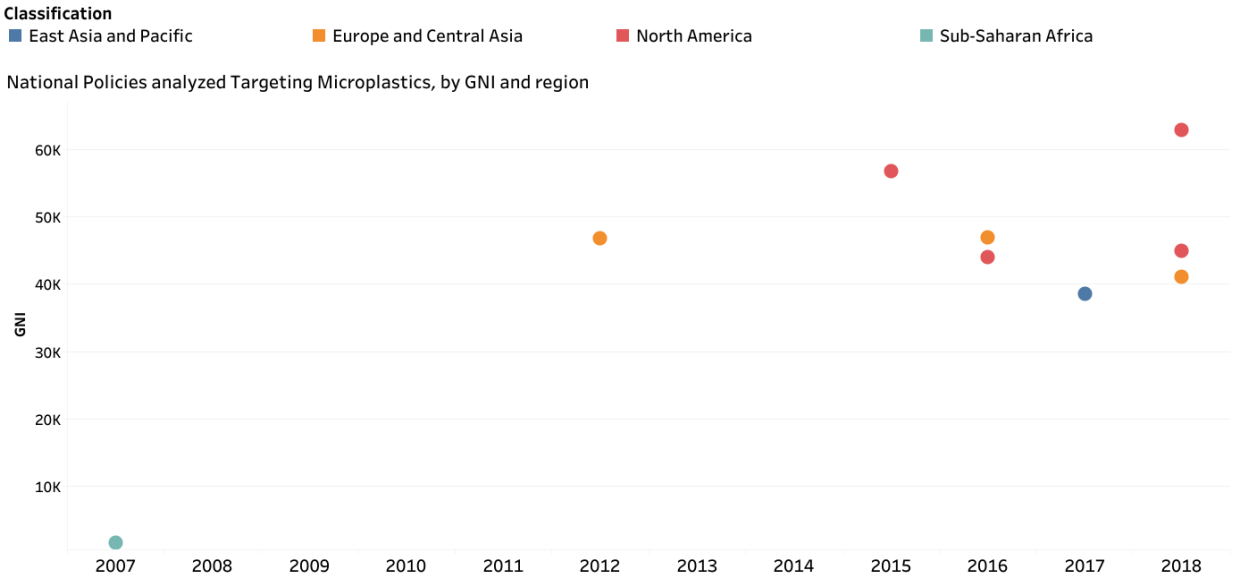
Throughout the sample of national policy documents analyzed, of the 43 countries where governments introduced a ban, tax, or levy on some form of plastic carrier bags at the national level, over half are in sub-Saharan Africa (23), followed by less than a quarter in East Asia and the Pacific (six were Pacific Island countries or territories), and then four each from the Europe and Central Asia region and Latin America and the Caribbean region. Across sub-Saharan Africa and the Pacific Island countries and territories (with the exception of Fiji in 2017 and Tonga in 2013), policies generally used regulatory instruments to ban plastic bags of varying levels of thickness, as well as in Panama, Paraguay, and Uruguay in Latin America. By contrast in North America, pollution from plastic bags is solely addressed by governments at the subnational level.

With the exception of the pioneering policy in Ireland in 2001, the most comprehensive national policies to address plastic bags in the inventory were all enacted within the last three years, in India (2016), Colombia (2016 and 2017), Panama (2018), Romania (2018), Spain (2018), and Uruguay (2018 and 2019). Some of these approaches are unique in the sample and include:

- ***India (2016):*** Couples a ban on certain types of plastic bags (less than 50 micrometers thick) with a levy on all other bags, together with extended producer responsibility for plastic waste collection where producers are stated as having the primary responsibility for collection. In addition, the policy uses a number of instruments aiming to enhance waste collection and recycling. For example, shopkeepers and street vendors that do provide plastic carrier bags must register with the appropriate local government agent and pay a fee for the costs of waste management, while the local governments must establish recycling infrastructure, focusing on segregation of plastic waste at the source. All recycling agents are required to prepare an annual report to the local government body on recycling rates, which in turn must prepare an annual report to the national government.
- ***Colombia (2016 and 2017):*** Establishes a "Program of Rational Use of Plastic Bags" focused on distributors of plastic carrier bags, who must comply with incremental reduction targets in the volume of bags distributed at the payment points, or charge market prices to consumers for bags. Distributors must submit an annual report to the appropriate national government agency on compliance, with indicators on the volume of bags distributed at the payment points in the past year as compared to the baseline year (in number and weight), in order to measure the reduction.
- ***Panama (2018):*** In addition to a ban on plastic bags, the law requires retailers and merchants to declare the price charged to consumers for any reusable bags provided, to the national government agency for consumer protection at the beginning of each year. This agency is committed by the law to control the costs to consumers of reusable bags. Additionally, the policy couples the ban with a national education and outreach campaign on "the rational use of non-degradable and non-biodegradable material, as well as the environmental benefits of using reusable bags."
- ***Uruguay (2018 and 2019):*** Together with a ban on plastic bags, the policy requires the Ministry of Industry, Energy and Mining to develop a program to facilitate the conversion of the national plastic bag industry.

Policies and instruments to address microplastic pollutants specifically. National government responses to microplastic pollutants are a relatively recent phenomenon in the inventory, with the United States enacting the first national policy solely targeting microplastics in 2015 with the "Microbead-Free Waters Act." More broadly, only nine national level policies in the sample analyzed included instruments targeted to address microplastic pollutants, and eight of these were enacted within the last five years. National responses to microplastic pollution are largely confined to Europe and North America (i.e., regions comprised largely of upper income and upper-middle income countries), with each introducing four of the nine national policies with instruments targeting microplastic pollutants (see Fig. 25).

Figure 26: National Policies Analyzed With Instruments Targeting Microplastics, By GNI and Region



Across these nine policies, a total of 20 instruments were used, eight of which were requirements for planning or future actions, while 11 were for regulatory instruments to ban microbeads. In 2015 the United States policy introduced a ban on the "introduction or the delivery for introduction into interstate commerce of a rinse-off cosmetic that contains intentionally-added plastic microbeads [defined as any plastic particle that is less than five millimeters in size and is intended to be used to exfoliate or clean the human body or any part thereof]", including toothpaste. Similarly, in 2017 New Zealand enacted a policy with a ban on "wash-off products" that contain microbeads for purposes of exfoliation, cleaning or visual appearance but does not include a medical device or medicine. In 2018, France enacted a policy banning cosmetic products with microbeads for exfoliation or cleaning purposes. Alternatively, en lieu of a public policy, in 2015 the Government of Australia engaged with companies to secure voluntary commitments to phase-out of microbeads in personal care, cosmetic and cleaning products by 2018 (Australia Department of the Environment and Energy 2018).

A comparison of national policy responses to international policy commitments would be ideal, but there are practically zero of the latter. On the basis of the analysis of the sample of national policies adopted by states to address the plastic pollution problem, ideally international policy commitments could be checked and compared. For example, have national governments met their international commitments to address this problem, at each stage of the life cycle of various pollutants, and in different regions of the world? However, as mentioned previously there simply are very few firm international commitments for national action to address the problem, rather a number of plans and commitments to identify future actions, rather than to take them.

Conclusions

Though not a random sample representative of national policies worldwide, the sample of 147 national policy responses analyzed shows a clear overall trend of increased public policy responses within the last decade, that can be considered indicative. National government responses analyzed have shown an increase since the international focus on plastic pollution began with agreement of the Honolulu Strategy in 2011, though causality cannot be confirmed. The growing number of national policy responses after the Honolulu Strategy reflects a focus largely on addressing pollution from plastic carrier bags. From 2013 through 2018, approximately 40 percent of all new national policies analyzed solely targeted plastic bags. The overall trend in the sample of a growing number of national policies adopted to address plastic pollution, was largely driven by wealthier countries (high- and upper-middle-income countries).

In the top 20 coastal countries producing mismanaged plastic waste from coastal land-based sources (based on estimates from 2010 in Jambeck et al. 2015), seven do not have a national policy in the inventory or even referenced in the literature reviewed: Philippines, Thailand, Egypt, Algeria, Brazil, Myanmar and North Korea. Another four countries have only national policies targeting plastic bags in the inventory or referenced in the literature: Nigeria, Bangladesh, South Africa and Morocco. Similarly, of the top 20 plastic polluting rivers estimated by Lebreton et al. (2017), at least four have some or all of the riparian countries with no national policy in the inventory or referenced in the literature: the Amazon (Brazil and Ecuador), the Pasig (Philippines), the Irrawaddy (Myanmar), and the Mekong (Cambodia, Laos, Myanmar and Thailand).

In terms of the tools or instruments that national governments are using in these policies analyzed, national governments were 3.5 times more likely to use regulatory instruments (in a total of 128 policies) than economic instruments (37 identified in total), and 3 times more likely to use regulatory instruments than information instruments (42 identified in total). In terms of combinations or packaging of these instruments, as an indication of the complexity of national government responses to the problem, roughly a quarter of the policies in the inventory that included regulatory and/or economic instruments, also included information instruments to accompany them (though this ratio was slightly higher in Europe and Central Asia, and lower in East Asia and the Pacific and in sub-Saharan Africa).

For instruments used specifically by governments to address plastic pollution from land-based sources (excluding those focused solely on plastic bags), some form of plastic packaging or other single-use plastic product was banned in at least 25 countries from the sample of policies analyzed, representing a population of almost 2 billion people in 2018. However, the vast majority of this population was covered by two policies in India and Pakistan, with the other 23 policies introducing some form of national ban covering a population of 355 million in 2018.

As national policies to address plastic carrier bags have increased, by the end of the first half of 2019, within the sample of policies analyzed national governments had banned, taxed or levied fees on various forms of bags in at least 43 countries around the world, covering a population of 952 million in 2018 if the policies in China and India are excluded, and a total of 3.7 billion if they are included. The instrument most commonly used by far was a regulatory ban, which was

four times more likely to be used to address pollution from plastic bags than the second most common instrument: economic disincentives. In terms of the complexity of these national policy responses, of the 48 national policies in the sample that include a ban, tax or levy on plastic bags in some form, only 18 also include a supporting information instrument, and only 6 of these were aimed at education and outreach. These policies were largely a phenomenon in low income and lower-middle income countries: of the 43 countries where national governments introduced a ban, tax or levy on some form of plastic bags in the sample analyzed, 33 were in sub-Saharan Africa, Pacific Island countries or territories, or Latin America and the Caribbean. With the exception of the pioneering policy in Ireland in 2001, the most comprehensive national policies to address plastic bag pollution were all enacted within the last three years, in India (2016), Colombia (2016 and 2017), Panama (2018), Romania (2018), Spain (2018) and Uruguay (2018 and 2019).

Within the sample analyzed, only nine national governments had responded to microplastic pollutants as of the end of the first half of 2019. Those governments that have adopted national policy responses are a recent phenomenon (eight of the nine policies were adopted within the last five years), with the first national policy solely targeting microplastics adopted in 2015 in the United States (the "Microbead-Free Waters Act"). National policy responses to microplastic pollution have largely been confined to Europe and North America, comprised largely of high or upper-middle income countries. Throughout these initial responses, the problem has largely been defined in terms of microbeads within cosmetic products, with no instruments targeted to microplastic pollution from tire abrasion, for example.

3.7 Responses at the Subnational Level

Examples of Subnational Policies to Address Plastic Pollution

The sample of policies analyzed in the inventory includes 77 subnational policies from around the world. Given the small sample size (an additional 264 subnational policies are referred to in the literature reviewed but the documents were not located for analysis), these represent examples only of the types of instruments introduced by local governments. The examples highlight predominantly four countries: the United States (26), Australia (11), the United Kingdom (10), and Canada (8), for a total of almost three quarters of the subnational policies analyzed. Beyond this sample analyzed, of the 264 additional subnational policies referred to in the literature reviewed, the composition was similar: roughly two-thirds from the four countries of the United States, Australia, the United Kingdom and Canada. Additionally, Argentina (10), India (9) and China (8) were the countries with the next largest amount of subnational policies referenced in the literature reviewed. According to the scientific literature, by 2016 242 local governments had introduced policy instruments targeting plastic carrier bags in the U.S. alone (Taylor, 2019).

In total, across the sample of subnational policies analyzed and those referenced in the literature reviewed but not analyzed, approximately half were from the United States, and another 18 percent were from Australia, Canada and the United Kingdom combined. That 68 percent of all subnational policies found in the global databases searched or referenced in the scientific and grey literature reviewed (see Appendix II) were from these four upper income countries, and half

were from the United States, may suggest that these geographies are more likely to be studied by researchers and results published, and that significant numbers of subnational policies around the world, e.g., in East Asia, Latin America and sub-Saharan Africa, have been missed in studies to date.

Types of Instruments Used in Subnational Examples Analyzed

In the examples of subnational policies analyzed, instruments were most commonly used to address pollution from plastic bags (45), followed by those addressing macroplastics in general (31), six times more frequently occurring than the next category (all plastics broadly, 5 policy documents). In terms of the stages of the product life cycle of pollutants targeted, instruments targeting plastic bags most frequently targeted the selling stage (36), followed by use (31), and the far less frequently production (8) or other stages. Similarly, the selling and use stages of the life cycle were most frequently targeted by instruments aiming to address macroplastic pollutants in general.

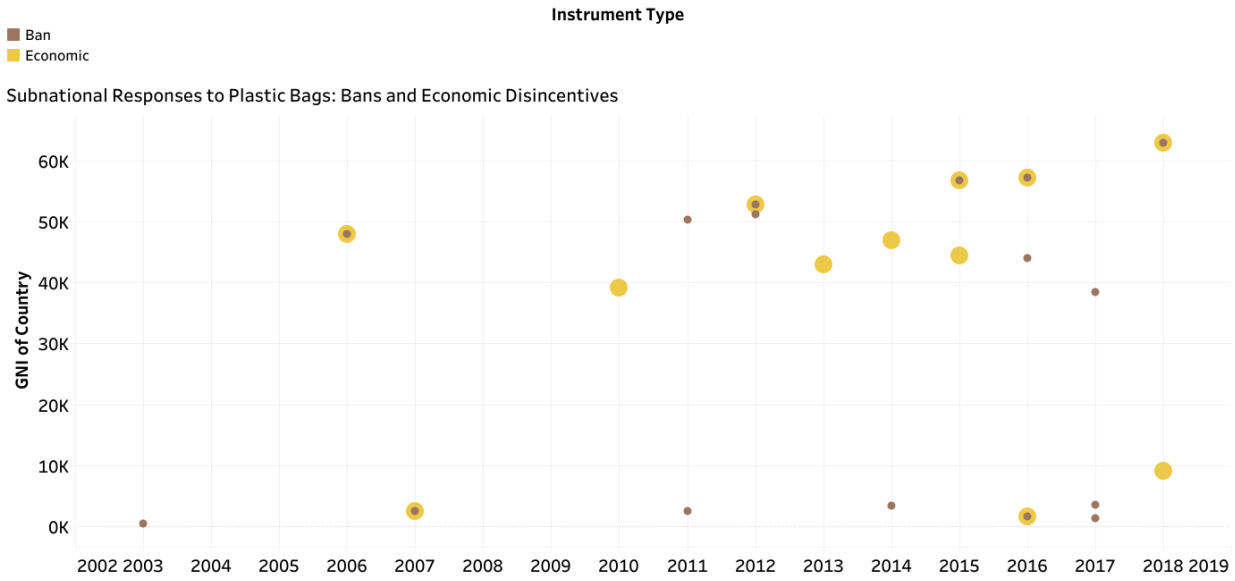
Regulatory bans were the preferred tool of local governments in these examples. Similar to the sample of national policies analyzed, these subnational examples used regulatory bans far more frequently than economic instruments, at a ratio of roughly two to one for instruments targeting plastic bag pollution (31 to 16), and 23 to 6 for instruments targeting macroplastics more broadly.

Box 1. The State of California as a Laboratory for Subnational Plastic Policies in the U.S.

Over 14 percent of the subnational policy documents in the inventory or referred to in the literature reviewed, were introduced in the state of California in the U.S. San Francisco, in the state of California, was the first city in the U.S. to successfully introduce a regulatory ban on plastic carrier bags in 2007. The city first tried in 2005 to use an economic instrument modeled on the Ireland plastic bag tax example, but under pressure from stakeholders in plastic bag manufacture and sale, the state legislature passed a law in 2006 prohibiting a "city, county or other public agency" in the state from introducing plastic bag levies or taxes. After the passage of this state law, the city pursued a regulatory ban. San Francisco's ban sparked the spread of similar local policies throughout the state, with the cities of Malibu and Palo Alto using the instrument in 2008 and 2009, and Los Angeles County doing the same in 2010 (while adding a fee for paper bags to reduce leakage). By 2014, over 55 city and county plastic bag bans had been enacted across the state of California. After 2013, the prohibition on economic instruments in the 2006 state law ended, such that economic instruments were subsequently also available to local governments throughout the state. By the end of 2015, a total of 139 policies had been introduced across the state, affecting over a third of its population. These were largely regulatory bans, unlike many cities and counties on the eastern coast of the U.S. By one measure, plastic bag consumption in the state of California dropped by 42 percent from 2008 to 2012. Additionally, the state requires municipalities to control discharges of preproduction plastic.

Sources: Taylor, 2019; Karlsson et al., 2018; Taylor and Villas-Boas, 2016; Larsen and Venkova, 2014, in Li and Zhao, 2017; Romer, 2007.

Figure 27. Regulatory Bans or Economic Policies Targeting Plastic Pollution at the Subnational Level Over Time, by GNI



The local governments in these examples were more likely to pair regulatory bans with information instruments, and particularly education and outreach, than the national policies analyzed. While regulatory bans of various forms of plastic bags or other macroplastic pollutants are far and away the most common type of instrument used by local governments in the examples of subnational policies, 39 percent of these (17) were combined with information instruments of various types in the sample analyzed (and 11 of these were instruments for education and outreach). More specifically, of the policies that include a ban, tax or levy on plastic bags in some form (see Appendix IX), just over half of the instruments (19) were combined with information instruments of various types – higher than the percentage found in the national policies analyzed (39 percent). Similarly, the percentage of instruments for a ban, tax or levy on plastic bags in some form that were combined with instruments for education or outreach in the subnational examples was almost 22 percent, significantly higher than the same percentage for the national policies analyzed (13 percent).

Several of the subnational policies provided examples of instruments to provide alternatives to banned plastics. Some policies required retailers to provide alternatives, and in some cases regulated these alternatives as well to reduce leakage (i.e., the increase in the consumption of paper shopping bags).). In one example, an economic instrument was paired with a regulatory ban to address alternatives, in the 2018 New York city ban on expanded polystyrene single service articles. This regulation creates an annual financial hardship waiver renewable upon application, for small stores, food service establishments or mobile food commissaries (defined as having less than US$500,000 in annual revenue and not part of a chain), as well as not-for-profit corporations. The waiver is granted if there is no comparable alternative product not composed of expanded polystyrene that would cost the same or less than the banned product, and that

the purchase of the alternative would create an undue financial hardship. Similarly, the state of California (2014) paired with a plastic bag ban, the requirement to develop a US$2 million public revolving fund to provide loans to create and retain jobs and economic activity within the area of jurisdiction in the manufacture and recycling of plastic reusable grocery bags, to help firms and employees transition to new products needed as a result of the ban.

A spectrum of examples of economic instruments can be found in the subnational policies as well. The economic instruments used in the examples include cash-for-return schemes for plastic bottles (e.g., Oregon, United States, and Saskatchewan, Canada), as well as a number of levies on plastic bags (typically not for government collection but solely to affect consumer behavior). All eight of the examples of the use of plastic bag levies or taxes weere in the United Kingdom or United States, with charges ranging from five to ten cents per bag in the United States, and a minimum of five pence per bag in the United Kingdom. Some researchers have argued that charges this small could be considered a "nudge" (i.e., a subtle prompt to encourage but not compel alternate behaviors), rather than an economic instrument (Rivers et al. 2017). Of note, one unique instrument in San Carlos City (Philippines, 2014), encourages businesses to promote the use of recyclable, reusable and/or biodegradable alternative packaging materials, potentially through stores providing special counters or express lanes (called a "Green Lane") to cater to customers who bring their own bags or use reusable bags.

Finally, a number of regulatory instruments were used to require responsible handling of plastic and particularly plastic waste. For example, in New South Wales, Australia (2005) the policy requires reuse and recycling of plastic packaging based on a "waste action plan" to be developed by firms. A number of examples require local governments within a given jurisdiction to establish plastic waste management infrastructure to meet various goals (e.g., the government in Jilin Province, China (2014)) adopted a policy requiring local government bodies within the province to establish a plastic waste recycling network, and build plastic waste composting stations. Similarly, the government in Baringo County, Kenya (2014) requires any manufacturers, importers, sellers or users of plastic packaging material to establish polythene waste disposal systems, while the local government will construct and establish a waste disposal and dumping site with a section designated for plastics and polythene materials at every sub-location and public institution. The government in Punjab, India (2018) requires establishment of plastic waste management infrastructure at its local bodies, including rural governing councils, and specifies that urban local government bodies shall channel plastic waste to registered recyclers when feasible, or when not shall encourage its use for road construction.

Similar to the trend in national policies, the subnational policies analyzed included only a handful of examples of instruments used to address microplastic pollution. These instruments were regulatory bans on plastic microbeads in products, e.g., in Illinois, United States (2014) personal care products with plastic microbeads were banned; in Ontario, Canada (2015) the manufacture or addition of microbeads to cosmetics, soaps, or similar products was banned; and in Taiwan (2017) the manufacture, import, or sale of cosmetic products containing plastic microbeads. In the examples of the subnational policies in Canada and the United States, these would be subsequently superseded by national policies (the 2016 Microbeads in Toiletries Regulations and the 2015 Microbead-Free Waters Act, respectively).

Conclusions

The sample of 77 subnational policies analyzed is a relatively small percentage (less than 23 percent) of the total number of subnational policies referenced in the literature reviewed, and the results are not considered representative or indicative of any global trends, but rather examples—largely from the United States, Australia, the United Kingdom, and Canada. As with national-level policies, instruments were most commonly used to address plastic bag pollution, typically at the selling and use stages of the life cycle, followed by those addressing macroplastics from land-based sources more generally. Through all of these examples, regulatory bans on various types of plastic pollutants were the preferred tools of local governments, almost three times more commonly used than economic instruments.

The examples highlight efforts to directly address the challenge of finding alternative products to meet demand for those products banned. In one example, the government created a waiver for small firms and operators due to proof of financial hardship as a result of purchasing alternatives to the expanded polystyrene banned. In another example, the government paired a plastic bag ban with a revolving fund to spur investment in the transition to manufacture and recycling of plastic reusable grocery bags. Where taxes or levies were used to address plastic bag pollution, the charges ranged from US$0.05 to 0.10 per bag in the United States, and a minimum of 5 pence per bag in the United Kingdom.

Lastly, the subnational policies analyzed only included a handful of examples targeting microplastic pollution. These were regulatory bans on the manufacture or sale of various cosmetic and personal care products containing plastic microbeads.

Box 2. Technologies to Reduce Marine Plastic Pollution

Review of technology innovations to help reduce plastic pollution. Governments at different levels around the world do not respond to the plastic pollution problem in a vacuum, but rather policies drive innovation in the private sector, and innovation can also influence public policy. To illustrate the fast-moving nature of the innovations occurring alongside the development of public policies, this box summarizes the results of a systematic search for technologies that have been enacted to either: (1) prevent plastics from leaking into waterways, or (2) improve the ability to recapture and collect existing plastic pollution (see Appendix II for methods used).

A total of 39 inventions was found (see Appendix X for a description of each, including the year invented, type of plastic targeted, lifecycle stage of plastic targeted, and country of invention). Of these 39 inventions, 14 aim to prevent plastic pollution from entering waterways. The remaining 25 technologies aim to collect existing plastic pollution from waterways, and include large-scale booms aimed at massive collection efforts, smaller robotics aimed at localized collection, and technology that seeks to track and identify plastic pollution to aid in manual collection. Twenty-seven of the 39 total technologies solely targeted macroplastics while only nine exclusively targeted microplastics. Three technologies targeted both macro- and microplastics.

Technologies aimed at preventing plastic leakage. Of the technologies identified, 14 aim to prevent plastic pollution from entering waterways. Six of these technologies aim to prevent microplastic leakage through graywater disposal, primarily in residential water systems. For example, two laundry balls and a washing machine filter

are designed to trap microfibers generated from washing synthetic fabrics in domestic laundry systems and prevent them from entering wastewater. Similarly, "showerloop" technology filters and reuses greywater in the home; while this technology is primarily designed to reduce water consumption, a secondary benefit is preventing the leakage of microplastics, such as those from cosmetics, into the environment.

Several other innovations target macroplastic leakage. For example, six technologies aim to filter and remove macroplastics from stormwater and wastewater before entering waterways. One invention, Clever-Volume, is a monitoring technology that allows authorities to certify the volume of trash in shipping containers, preventing improper disposal and fraud. Results also included inventions with simple designs, like "Stow it, Don't Throw It," which repurposes tennis ball containers into fishing line recycling bins that are distributed to anglers to prevent leakage of plastic fishing gear.

Technologies aiming to collect plastics from rivers and oceans. The majority of inventions found focus on collecting macroplastics from rivers and oceans. A widely publicized example is The Ocean Cleanup System, a large boom system designed to clean up the Great Pacific Garbage Patch. Initial tests of the prototype were unsuccessful, although the project was considered more success after a recent redesign. Another large device called the Holy Turtle is deployed off the coast of Honduras. This 1,000-foot long floating unit is towed by two marine vessels to capture floating waste, while large vent holes act to protect wildlife. Eighteen other smaller projects include aquatic drones, boats, and buckets aimed at more localized collections of macroplastics from harbors and waterways. These designs range from simple, nondiscerning collection technologies, to more advanced features, including sonar technology and sensors that aim to avoid disturbing wildlife. A related macroplastic collection technique involves the use of a "bubble barrier" rather than traditional nets or filters to guide trash to the edge of rivers or waterways for easy collection. Only two of these technologies boast the ability to passively collect microplastics in addition to macroplastics, although it is unclear how these boats and skimmers will effectively target and collect microplastics. Creators of another invention, the Floating Robot for Eliminating Debris (FRED), are engaged in ongoing efforts to improve the technology to collect plastics down to the size of a few millimeters, but the existing technology does not yet incorporate those improvements.

Rather than directly targeting the collection of macroplastics, one invention facilitates the manual collection of macroplastics with other debris from the ocean. The Malolol I is an unmanned robot that detects marine debris in the open ocean, which a team later collects or satellite tags. Only three inventions focus exclusively on collecting microplastics, rather than macroplastics, from waterways. These include a remotely operated vehicle that uses infrared light to detect, photograph, and remove microplastics from the environment and a magnetic liquid that combines oil and magnetite powder to bind to and remove microplastics.

Limitations on the scope of the review. The search identified numerous attempts to use enzymes, bacteria, or other bioengineering methods to convert plastics to useful materials (e.g., "plastic to fuel") or their raw components and carbon dioxide for benign disposal. Likewise, the search revealed multiple investments in developing alternatives to replace plastic. A comprehensive review of these technologies was not undertaken, but these efforts do appear to be a significant focus for several researchers.

Source: Melvin, E.C., E. Schmaltz, Z. Diana, E. Gunady, D. Rittschof, J. Virdin, J.A. Somarelli, & M.M. Dunphy-Daly. (submitted as a solicited review to Environment International*). Plastic Pollution Solutions: Emerging Technologies to Prevent and Collect Marine Plastic Pollution.*

CHAPTER FOUR: STATE OF THE SCIENCE ON PLASTICS POLICY EFFECTIVENESS

4.1 Overview of What Has Been Measured

Extent to Which the Effects of Plastic Pollution Policies Have Been Measured

Of the 136 articles found in the scientific literature that consider the effectiveness of policy instruments to address plastic pollution, 41 provide either quantitative and/or qualitative observations of outcomes attributed to instruments for only 24 national policies and 36 subnational policies (and one international policy—a regional directive issued by the European Commission). Of these, one-third of the national policies and one-fourth of the subregional policies are included in the Plastics Policy Inventory, or in total 28 percent of the 60 plastics policies with observations of outcomes in the scientific literature, have policy documents in the inventory. For the national policy documents in the inventory, as well as those with references in the literature but for which the documents have not yet been found, at most only 6 to 8 percent of national policies and 11 percent of subnational policies aiming to address plastic pollution have outcomes observed and reported in the scientific literature (though the number and trend is increasing).

In addition, the grey literature reviewed provides quantitative measures for an additional 70 policies to those measured in the scientific literature, 36 of which are policies targeted to plastic bag pollution. Across these policies, the studies in the grey literature reviewed typically provide much less information than the scientific literature, in terms of the research design and methodology of study conducted, for example, the measures of bag consumption before and after the policy instrument was introduced.

Selected Key Studies of Plastic Pollution Policy

A number of the studies are meta-reviews of plastics policy, summarizing a range of policies targeting specific types of plastic pollutants, or geographies, etc. (Table 4).

Table 4. Selected Meta-Reviews of Plastics Policy in the Scientific Literature

Authors	Year	Title	Journal
Taylor and Villas-Boas	2016	Bans vs. Fees: Disposable Carryout Bag Policies and Bag Usage	*Applied Economic Perspectives and Policy*
Martinho et al.	2017	The Portuguese Plastic Carrier Bag Tax: The Effects on Consumers' Behavior	*Waste Management*
Wagner	2017	Reducing Single-Use Plastic Shopping Bags in the USA	*Waste Management*
Xanthos and Walker	2017	International Policies to Reduce Plastic Marine Pollution from Single-Use Plastics (Plastic Bags and Microbeads): A Review	*Marine Pollution Bulletin*
Dauvergne	2018	Why is the Global Governance of Plastic Failing the Oceans?	*Global Environmental Change*

Authors	Year	Title	Journal
Schnurr et al.	2018	Reducing Marine Pollution from Single-Use Plastics (SUPS): A Review	*Marine Pollution Bulletin*
Schuyler et al.	2018	Economic Incentives Reduce Plastic Inputs to the Ocean	*Marine Policy*
Lam et al.	2018	A Comprehensive Analysis of Plastics and Microplastic Legislation Worldwide	*Water Air and Soil Pollution*

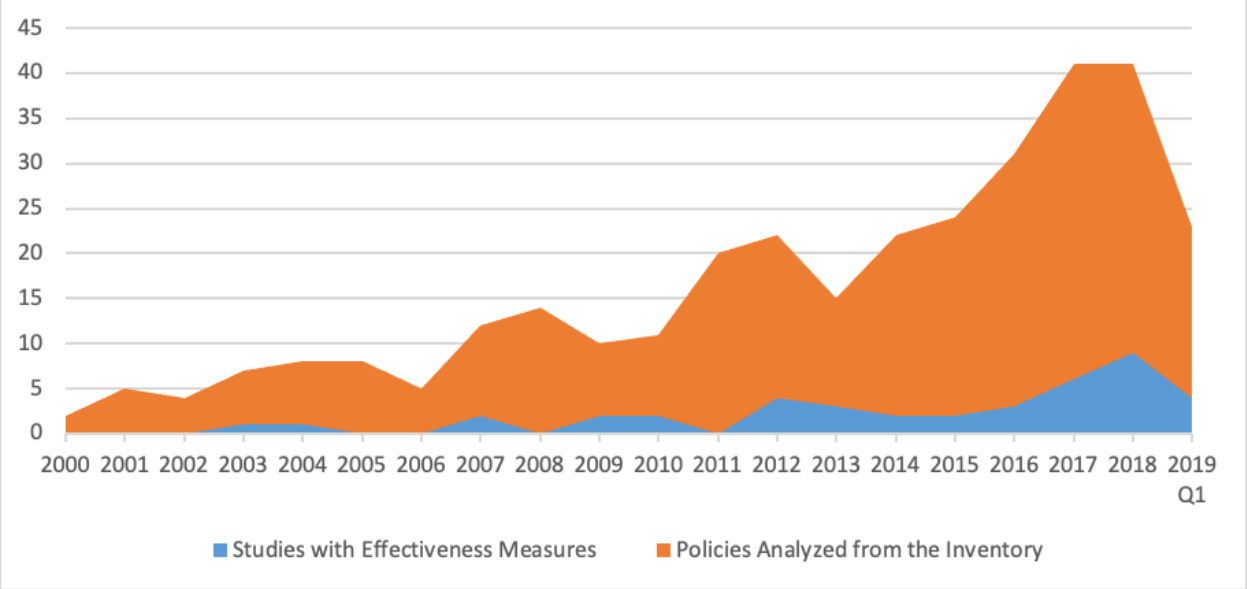
Geographic Coverage of Studies

The geographies where the effectiveness of plastics policy was studied in the scientific literature were almost exclusively limited to North America (40 percent), Europe (28 percent), and East Asia and the Pacific (24 percent). Of the 24 national policies with some observations of outcomes in the scientific literature, almost half were in Europe, and another third were in East Asia and the Pacific. Notably, no national policies in Latin America or South Asia have observed measures of outcomes recorded in the scientific literature.

Time Lag in Studies

Two challenges in studying the effectiveness of policies and their instruments are the time lag between the adoption of a policy and sufficient observations of its delivery to measure effectiveness (UNEP, 2018). A comparison of the publication of studies with effectiveness measures of plastic policy with the policies analyzed in the inventory illustrates this time lag (Fig. 28). For example, for studies with a quantitative measure of outcomes attributed to a policy instrument targeting plastic bag pollution, the average time-period between adoption of the policy and publication of the study is 6.5 years.

Figure 28: Time Lag between Adoption of Plastics Policies and Publication of Studies with Observations of Plastics Policy Effectiveness



Types of Instruments Studied

The vast majority (82 percent) of these studies and the scientific literature on plastics policy effectiveness, is focused on instruments addressing pollution from plastic bags, namely bag bans, levies, or taxes. Perhaps unsurprisingly given the time lag referenced above, no studies have measured the effectiveness of instruments targeted to microplastic pollution (though McDevitt et al. (2017) review the design of the U.S. Microbead-Free Waters Act). Throughout the scientific literature, only three studies reported information on the costs to governments for delivering the instruments, and no reports in the grey literature reviewed do so.

4.2 Observed Effects of Plastic Bag Policies

Of the 60 policies that have quantitative or qualitative measures of effectiveness observed in the literature, 38 use plastic bag bans, levies, or taxes.

Geographies Studied

Of the 23 national bans, taxes, or levies adopted on some form of plastic carrier bags in sub-Saharan African countries that were analyzed in the inventory, only one has been studied in the scientific literature (South Africa), together with one other policy for which the document is not in the inventory (Botswana). For the subnational policies, only five areas were studied outside of Australia, the United Kingdom, and the United States: Buenos Aires, Argentina; Syros, Greece; Tainan City, Taiwan; Toronto, Canada; and Yogyakarta, Indonesia. Of the 38 plastic bag bans, levies, or taxes with quantitative measures reported, only seven (18 percent) are in geographies outside of Australia, Europe, and North America, suggesting a geographic bias in the effectiveness literature on policies to reduce plastic bag pollution.

Box 3. Overview of the Economic Theory behind Plastic Carrier Bag Levies or Taxes

Much of the theory behind environmental taxes comes from Pigou (1920), who suggested that the external (to the polluter) costs of pollution could be internalized (by the polluter) by imposing a tax on the polluter or the pollutant at such a rate that the marginal benefits (to the polluter) from polluting equal the marginal social costs of abatement. However, there is limited knowledge about the (internal or external) costs of plastic bag pollution as well as other environmental and social costs of consumption that are not included in the price that the retailers pay for plastic bags, so it is not possible to set the price for plastic bags at the marginal social cost. Rather, levies or taxes on plastic bags are less precise instruments, trying to mimic the effect of a "true" Pigouvian tax than a simple product tax, explicitly aiming to send a price signal to change consumers' behavior. Hence, the goal is to set the price at a level sufficient to change behavior, i.e., to provide both a financial disincentive and an educational tool. The bag levy or tax instrument aims to influence demand and not supply, and focuses on the later stages in the product life cycle. It does not necessarily conform to the polluter pays principle, as many nonpolluters will pay (since the charge hits all consumers, regardless of their bag disposal choices). However, in many cases, the amount of the levy or tax represents a negligible cost to consumers, leading some researchers to argue that they can be characterized as a policy "nudge" rather than an economic instrument.

Sources: Ayalon et al. (2009); Rivers et al. (2017); Taylor and Villas-Boas (2016); Zen et al. (2013); Dikgang et al. (2012); Convery et al. (2007)

Type of Instruments Studied

Of the 38 plastic bag instruments with quantifiable effects reported in the scientific literature, 22 (58 percent) are economic instruments, far higher than the trend in national policies analyzed in the inventory (where countries were more than twice as likely to use a regulatory ban than an economic instrument to address plastic bag pollution) and likely higher than the trend in subnational policies. Hence, the scientific literature on plastic policy effectiveness would generally appear to be overweighted to economic instruments.

Methods Used to Measure Effects

Of the effectiveness studies for policies to reduce plastic bag pollution, only one employed methods for causal inference typically used for evidence-based policy-making (Taylor and Villas-Boas 2016). Also relying on causal inference, one additional study evaluated the increase in reusable bags (Rivers et al. 2017), and another study the reduction of plastic bottle consumption (Berck et al. 2016) as a result of a policy. This is consistent with other observations that most of the evidence of the effectiveness of plastic bag policy instruments comes from research that is not sufficient to attribute *causal* changes solely to the instrument (Rivers et al. 2017, Jakovcevic et al. 2014). The causal effect of a policy instrument can only be isolated with respect to a well-defined and defensible counterfactual—a group of untreated units that can represent the outcomes that would have occurred to the treated units in the absence of the policy instrument (Ferraro and Hanauer 2014). Isolating the effects of a policy instrument on outcomes, or indicators of outcomes, through construction of a counterfactual is considered more robust than simply comparing measures of outcome indicators before and after the introduction of an instrument, as the latter can be confounded by other factors not measured or observed that may be correlated to the timing of the instrument, decisions made during delivery, or other factors (Vincent 2016).

Short-Term Trends in the Effects Measured

Across the plastic bag policies studied, regardless of whether the instrument used was a regulatory ban or an economic instrument, significant short-term reductions in the consumption of plastic bags were consistently measured (almost all within 24 months of the introduction of the instrument, most within 12 months) (Fig. 28 and Fig. 29). Of course, outcomes have not been uniformly positive (O'Brien and Thondhlana 2019), e.g., the one-year increase in consumption measured in Romania after the 2009 introduction of a levy (Pre-Waste 2011, in Martinho et al. 2017), and recent surveys of shoppers in Maun, Botswana that suggest there was still widespread consumption years after the bag levy was introduced in 2007 (Mogomotsi et al. 2019). The overall trend is consistent with findings by UNEP (2018), that for areas with data some 30 percent reported "dramatic reductions" in single-use plastic bag consumption within the first year after the instrument was introduced (Schnurr et al. 2018), as well as a number of other syntheses at different levels (e.g., Heidbreder et al. 2019, Romer and Tamminen 2014). At the same time, the grey literature reviewed shows similar measures of short-term reductions in the consumption of plastic bags, consistently across geographies and instruments (i.e., regulatory bans or economic instruments).

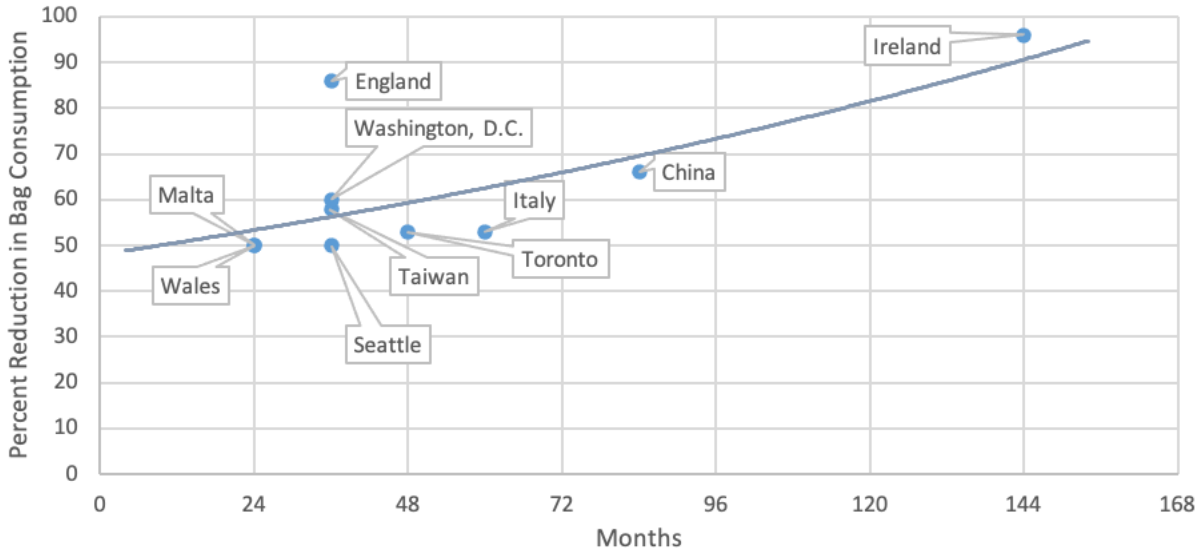
Longer-Term Trends in the Effects Measured

Over the longer-term, sustaining plastic bag consumption reductions can be challenging, as consumers may adjust their behavior in what has been termed the "rebound effect" (Dikgang et al. 2012), such that effectiveness may diminish over time (Ayalon et al. 2009, Martinho et al. 2017, Frater and Lee 2012, Dikgang et al. 2012). For example, in Ireland plastic bag consumption decreased after the instrument introduction in 2002 from 328 bags per person annually to 21 bags per person, but then increased to 31 bags per person as consumers adjusted to the charge. This change led to a policy response that increased the minimum fee charged for plastic bags, and consumption fell back to 21 bags per person (Frater and Lee 2012), and eventually to an estimated 14 bags per person by 2014 (Xanthos and Walker 2017). In addition, several studies suggest that while policy instruments can affect consumption behavior (Wagner 2017, Jakovcevic et al. 2014), these changes are not necessarily permanent and can be reversed with a change in policy. For example, in South Africa, after the levy was introduced in 2002 at a price of 46 rand cents per bag, consumption fell by 90 percent. However, the fee was subsequently reduced, and retailers internalized the levy rather than charging it (or all of it), and prices on average dropped by 46 percent, resulting in a rebound in consumption (Dikgang et al. 2012). Essentially, when the price was set at a lower level, the quantity of bags demanded rebounded, and as people became accustomed to paying for bags and absorbing the charge in their grocery budget, the demand continued to climb.

In Yogyakarta, Indonesia, after the introduction of a plastic bag levy in 2016, consumption was reduced by 30 percent within four months, and a survey of 100 grocery store customers revealed that 75 percent of respondents claimed to use fewer bags than before the levy. However, the levy was subsequently revoked, and a follow-up survey of 100 shoppers found that 84 percent of respondents used plastic bags from the stores, suggesting that behavior was not affected in the long-term (Sobaya et al. 2018). Additionally, almost a decade after China introduced its national plastic bag levy of approximately US$0.04 per bag, anecdotal reports suggested that consumption may have rebounded and shoppers had internalized the relatively low fee, while smaller stores avoided charging it altogether (You 2017). In this case, O'Loughlin (2010) reported that delivery of the instrument has been partial at best, with vast majority of smaller retailers not complying with the rules and providing free plastic bags to customers, such that while consumption from major chain grocery and convenience stores declined, consumption elsewhere had yet to do so. For example, 80 percent of retail stores in rural regions continued to provide free plastic bags, whose use remained prevalent particularly among street vendors and smaller stores (O'Loughlin 2010).

However, for those measures of longer-term effects in the scientific literature, across 10 cases where effects were reported at least 24 months after the instrument was introduced, consumption reductions have remained significant (Fig. 29).

Figure 29. Studies with Policy Effects on Consumption Reported at Least 24 Months after the Policy Instrument Was Introduced



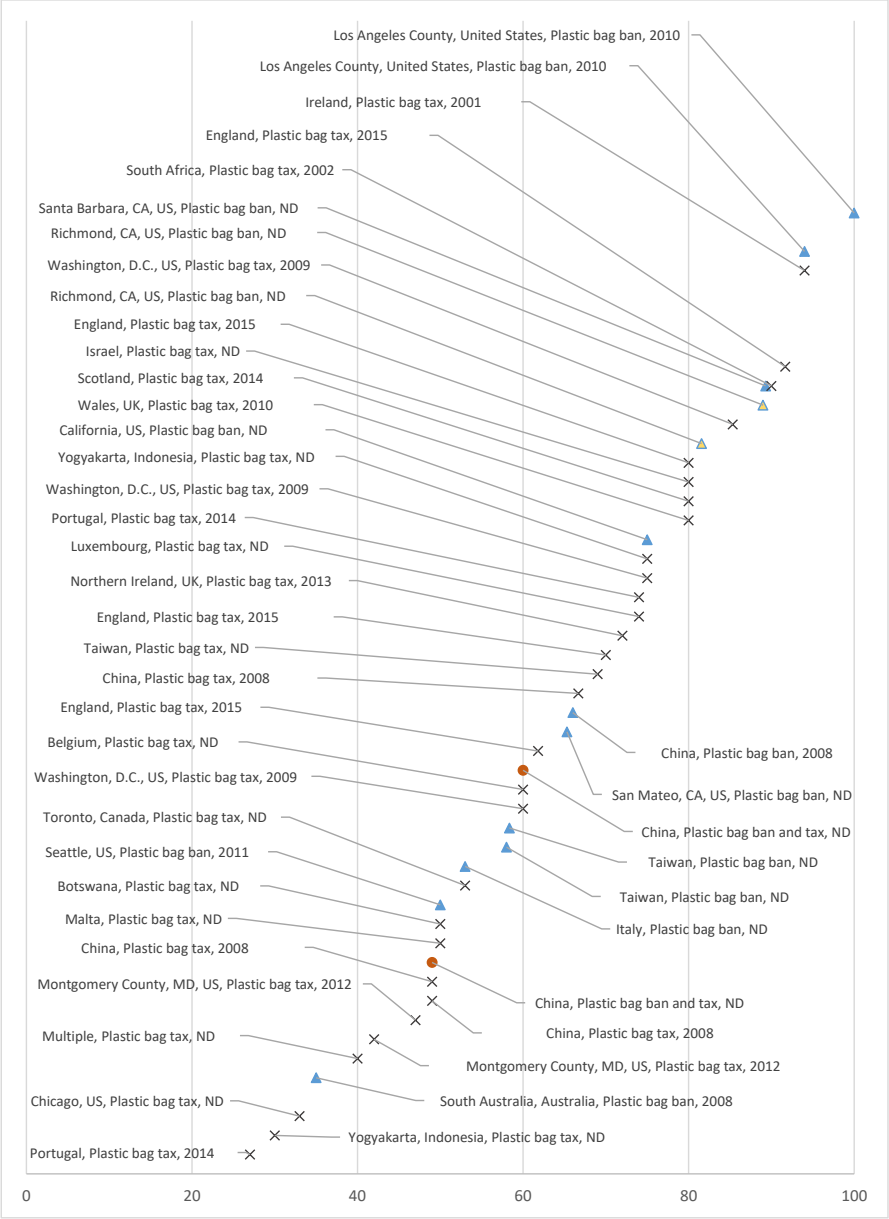
Sources: China: You 2017 in Dauvergne 2018; England: Defra 2018; Ireland: Xanthos and Walker 2017; Italy: Legambiente ONLUS 2017 in Schnurr et al. 2018; Malta: Hermann et al. 2011 in Martinho et al. 2017; Seattle: Hoffman 2016 in Wagner 2017; Taiwan: TEPA 2012 in Liu et al. 2013; Toronto: Rivers et al. 2017; Wales: Welsh Government 2016 in Schnurr et al. 2018; Washington, DC: DoEE 2013 in Rivers et al. 2017.

Throughout the cases studied in Figure 29, relatively few researchers have considered the effects of regulatory bans compared to economic instruments, though both have shown significant and consistent reductions in bag consumption in the scientific literature. One of the more robust comparisons took advantage of the introduction of a single-use plastic bag ban, and a levy on paper bags and reusable plastic bags in nearby towns in California, U.S. (Richmond, San Pablo, and El Cerrito), and looked at the difference in before-after consumption rates in each (Taylor and Villas-Boas 2016). The study found that both policy instruments led to "remarkably similar" reductions in single-use plastic bag consumption. However, while both the ban and the levy led to leakage of demand into consumption of paper bags, the levy included a charge on paper bag use and the sale of relatively inexpensive reusable alternatives, leading to a lower increase in paper bag use and a higher net reduction in disposable bag use (plastic bags plus paper bags) (Taylor and Villas-Boas 2016). In general, some researchers have suggested that both are effective in reducing plastic use, and that bans may be most effective, though they may not be politically feasible in every context or enforceable (Heidbreder et al. 2019), and may lead to a greater increase in the use of disposable alternatives (Taylor and Villas-Boas 2016). However, the cost of monitoring and enforcing compliance underlies the choice of instruments for governments in different contexts and levels, and compliance with regulatory bans may be relatively cheaper to monitor (Taylor and Villas-Boas 2016), which may account for the prevalence of this instrument (see Chapter 3).

Summary of the Effects Measured

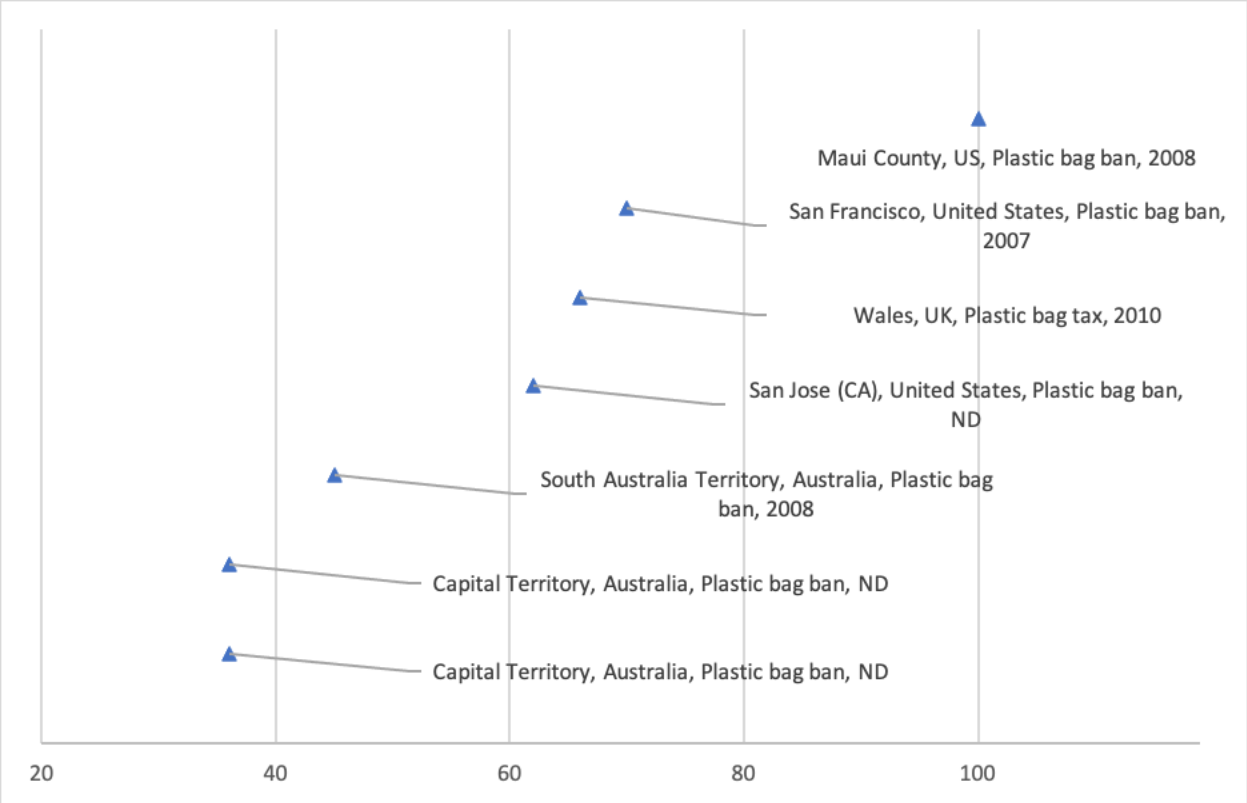
Across all of the quantitative measures of the effect of policy instruments targeting plastic bag pollution, for both the short- and long-term, and both regulatory and economic instruments, the average reduction in the consumption of bags after the instrument's introduction was 64 percent (Fig. 30). Additionally, a number of studies measured the effects in terms of reduced plastic bag litter, also showing significant reductions (Fig. 31).

Figure 30. Percent Reduction in Plastic Bag Consumption Due to Policy Instruments as Reported in the Scientific Literature (Before and after Policy)



Note: X = economic instrument (levy or tax); triangle = regulatory ban; circle = both; no Y axis given as data occurs only along the horizontal axis, and is differentiated vertically solely for illustrative purposes. These data only summarize measures of reduction in use or consumption of the plastic bags targeted by the instruments, and do not include any unintended increases in consumption of other types of disposable bags.

Figure 31. Measures of Effects of Policy Instruments on Plastic Bag Littering in the Scientific Literature (% Reduction in Bags Littered before and after Policy)



Note: No Y axis given as data occurs only along the horizontal axis and is differentiated vertically solely for illustrative purposes.

Unintended Consequences of the Instruments

It has been well-documented that demand for plastic carrier bags can shift (i.e., "leak") into alternatives, such as paper bags or plastic garbage bags—though in some cases less so for economic instruments than for regulatory bans (Heidbreder et al. 2019, Taylor 2019,; Schnurr et al. 2018, Zen et al. 2013). In some cases, consumers may be reusing plastic carrier bags as garbage bags, contributing to an increase in demand for plastic garbage bags if instruments target carrier bags (Taylor 2019). However, even when consumption of plastic carrier bags decreases and paper bag consumption increases, the latter is typically less than the former when taxes or fees are imposed on paper bags, such that net consumption of disposable bags (plastic and paper bags) decreases (Taylor and Villas-Boas 2016). Additionally, a study in California found that when inexpensive reusable bags are also available in stores, the increase in paper bag consumption associated with a plastic bag ban, levy, or tax is much less (Taylor and Villas-Boas 2016).

Additional unintended consequences that have been reported in the scientific literature include the loss of employment tied to manufacturing of plastic bags, for example soon after China's 2008 plastic bag levy Suiping Huaquiang Plastic, a 20,000-employee plastic bag manufacture went out of business (Xanthos and Walker 2017). Another potential consequence of the leakage of demand

into paper bags and plastic garbage bags is potentially even while there is a net decrease in consumption of plastic, there may be a net increase in greenhouse gas emissions associated with plastic production because of increased emissions from plastic garbage bag production (Taylor 2019). At the same time, there are possible unintended consequences that are positive, if there is spill over into other policies—i.e., where the plastic bag policy instrument contributed to greater public support for other policies of similar size and scope (Thomas et al. 2019). In that sense, the plastic bag policy instruments could in some situations serve as a gateway to other regulating other plastic pollutants.

Contributing Factors and Constraints to Policy Effectiveness

Throughout the scientific literature, a number of common factors are cited as contributing to the policy effects measured, as well as constraints to achieving policy goals:

- ***For economic instruments, the amount of the levy or tax.*** While the amount of the levy or tax does not necessarily reflect the social cost of plastic pollution, the aim is to create an economic disincentive sufficient to change behavior (Mogomotsi et al. 2019). The efficacy of economic instruments depends on gauging the correct price per bag, when the policy is introduced (Dikgang et al. 2012), and where the proceeds go. Economic theory predicts that the price elasticity of a cheap good is normally low, and this has been the case with plastic bags (Dikgang et al. 2012). Indeed, the perceived advantages of using plastic carrier bags are probably not inherent to the plastic itself, but rather due to its availability compared to alternatives (Heidbreder et al. 2019). For example, the popularity of plastic carrier bags in the U.S. stems from their light weight and their perceived low cost (Li and Zhao 2017). However, in a number of instances, the amount charged for a plastic bag was not considered to be sufficient to change behavior (Sobaya et al. 2018, Dikgang et al. 2012), and if too small is likely only to affect people who are sensitive to the behavioral reminder—typically those who are on the margin between using reusable or disposable bags (Rivers et al. 2017). At the same time, some authors have suggested that the impact of the charge might be overestimated, because unobserved factors such as changes in social norms are not accounted for when comparing consumption rates before and after the instrument (Heidbreder et al. 2019).
- ***For both regulatory and economic instruments, the availability of inexpensive reusable alternatives.*** The availability of alternatives, e.g., types of reusable bags that stores decide to sell in lieu of plastic carrier bags, have significant impact on policy effectiveness, including leakage of demand into paper bags (O'Brien and Thondhlana 2019, Taylor and Villas-Boas 2016).
- ***Public awareness and acceptance (e.g., through accompanying information instruments).*** A number of studies of plastic bag policy instruments emphasize the importance of education and outreach campaigns, through a combination of information instruments with any ban, tax or levy (Martinho et al. 2017, Zen et al. 2013, Convery et al. 2007). In the case of the oft-cited Ireland plastic bag tax, support was secured from different stakeholders through a public outreach campaign (Convery et al. 2007). At the same time, some research has suggested that information instruments alone are unlikely

to incentivize a change in habitual and frequent behavior, in the absence of regulatory or economic instruments as "negative reinforcers" (Sharp et al. 2010). Nonetheless, several studies have suggested that social pressure is an important variable influencing plastic consumption, and that education and outreach campaigns have strengthened compliance with other plastic policy instruments (Heidbreder et al. 2019). This may be because they activate intrinsic motives of consumers (e.g., to protect the environment), as well as the extrinsic motives activated by an economic instrument for example (e.g., to reduce costs) (Jakovcevic et al. 2014). Essentially, further information on the environmental impact of a potential use can influence environmental motivations and increase consumers' willingness-to-pay for environmental protection (Latinopoulos et al. 2018).

Box 4. Reusable Bag Rewards Programs

While almost all of the economic instruments used to address plastic bag pollution create disincentives, some research has suggested that incentives can be effective as well. For example, monetary rewards programs for use of reusable bags can help activate consumers' intrinsic motives for environmental protection, when awareness of plastic bag pollution is low. These programs can also create peer pressure that influences behavior, even after the reward is available.

Source: Jiang (2016)

- ***Levels of enforcement of compliance.*** In some cases, enforcement of instruments has been insufficient (UNEP 2018), e.g., reportedly in the case of China central government oversight on local enforcement appeared to be weak, particularly on small-scale retailers, combined with low public awareness of the policy (He 2012, O'Loughlin 2010), or in India's 2009 regulatory ban on plastic bags (Gupta and Somanathan 2011, in O'Brien and Thondhlana 2019).

In conclusion, although the scientific literature that reports measures of policy effects from plastic bag bans, levies, or taxes is skewed towards: (1) studies without controls to help determine effects (e.g., "difference-in-difference" studies), (2) economic instruments introduced in wealthier countries, and (3) the short-term effects of the policy, the consistent trend in the data available suggests that these instruments have typically had a significant effect on reduction in plastic bag consumption. They are not necessarily eliminating plastic bag pollution, nor likely to change consumer behavior completely, but they are likely to have a significant impact in reducing consumption (Jory et al. 2019). Some of the key constraints or lessons learned to achieving and maintaining these effects include, among others:

- Setting the fee high enough to affect behavior with economic instruments in a given context, and in some cases adjusting it upwards over time to counteract the "rebound effect" as the policy instrument's effect may diminish over time;
- Focusing on accessible and inexpensive reusable alternatives; and
- Emphasizing public awareness and acceptance of the policy to enhance compliance, through coupling regulatory and economic instruments with information instruments.

4.3 Observed Effects of Other Plastic Policies

Of the 60 policies that have quantitative or qualitative measures of effectiveness observed in the scientific literature, only nine are not targeted to plastic bag pollution and have quantitative measures. Most of these are economic instruments that addressed pollution from plastic beverage containers (e.g., cash for return schemes, taxes), while two focused on fishing gear, one on increased recycling to reduce beach litter, and one on a smoking ban to reduce beach litter. Additionally, the grey literature reviewed includes 34 plastic policies not targeted to plastic bag pollution, which have some measure of outcomes. These however typically have very limited information on outcomes, or the methods used to measure them.

Effects of Instruments Targeted to Plastic Beverage Containers

Several studies in the scientific literature measure the effects of economic instruments that provide cash for return of plastic beverage containers for recycling, as well as studies of 18 cash for return policies in the grey literature. These policies were enacted largely at the national level in Europe, and the subnational level in Australia and the United States. The indicators measured typically included changes in the recycling rate of plastic beverage containers, or in littering (waste mismanagement).

Across the few studies in the scientific literature, the recycling rate measured was on the order of 70 percent in the United States in California and Oregon in 2012, and Hawaii over the period 2006 to 2015 (at a deposit of US$0.05 per plastic bottle), and in the Northern Territory of Australia was 46 percent in 2014 following policy implementation. In the grey literature, measures of the recycling rates attributed to ten subnational cash for return instruments in the United States (including those referenced previously for California, Hawaii, and Oregon) ranged from 51 to 92 percent, with a deposit of US$0.05 to 0.10 per plastic bottle. Similarly, grey literature studies also include seven national cash for return instruments in Europe, with recycling rates measured ranging between 85 to 98 percent, though higher deposits of Euro 10 to 40 cents (CM Consulting and Reloop Platform 2018).

These studies are consistent with meta-reviews suggesting strong evidence that cash for return instruments reduce plastic beverage container pollution, e.g., reporting that in both Australia and the United States areas where local governments had introduced these instruments had a significantly lower proportion of containers in debris surveys than those that had not (Schuyler et al. 2018). In both countries, the mean proportion of containers found in coastal debris surveys in states with a cash for return instrument was approximately 40 percent lower than states without this instrument (Schuyler et al. 2018). One contributing factor was the increased recycling rate in less affluent neighborhoods, which saw greater reductions in pollution than wealthier areas, though rates increased overall as well (Schuyler et al. 2018).

Additionally, in one study an economic disincentive (a tax) was introduced in a grocery chain to reduce pollution from plastic water bottles, with a 2.8 to 5.9 percent reduction in consumption measured in response to a tax of 6.5 to 9.5 percent, and remaining at 2.3 to 3.3 percent lower after the tax is removed. The study noted that this was equivalent to consumption of 143,000 fewer plastic bottles from the grocery chain sampled, while the total sales were over 2.43 million bottles

—suggesting that the instrument was not likely to have significant effects on plastic waste (Berck et al. 2016). One contributing factor cited was potentially an inelastic demand for bottled water, suggesting that a very high tax would be necessary to change consumer behavior for bottled water (Berck et al. 2016).

Lastly, a study of the effect of information instruments on willingness-to-pay for plastic bottles in France showed a decrease in willingness-to-pay as a result of information provided to consumers on the negative environmental effects, and decreased consumption (Orset et al. 2017). This finding reinforced the conclusion of a recent review reporting that recycling behavior was strengthened when education or outreach campaigns accompanied regulatory instruments for recycling (Heidbreder et al. 2019).

Effects of Instruments Targeting Land-Based Source of Plastic Broadly

Studies of regulatory instruments to require responsible handling of plastic waste, notably through recycling, were only found in the case of European instruments. In this case, the instruments introduced in European countries reportedly increased the recycling rate of plastic from 34.7 to 39.5 percent from 2012 to 2014 (Waste + Water Management Australia 2015, in Lam et al. 2018).

4.4 Key Information Gaps on the Effectiveness of Plastics Policy Instruments

As mentioned previously, the scientific literature on the effects of policy instruments to reduce plastic pollution is largely confined to those targeted to plastic carrier bags—comprising almost 82 percent of the instruments studied for which effective measures were reported. The remainder is largely focused on economic instruments to enhance recycling of plastic beverage containers, typically through cash for return instruments.

The majority of these studies are not able to conclusively determine the quantitative effects of the instruments (e.g., as opposed to changing sociocultural norms), due to the absence of controls for comparison. Additionally, the majority of the studies focus on economic instruments introduced in wealthier countries, even though regulatory bans are the most prevalent instrument to address plastic pollution worldwide. Lastly, the vast majority of studies report effects of the policy instruments in the short-term, but very few measure effects over a longer-term.

The reviewed grey literature adds measures of instruments addressing plastic bag pollution and those addressing plastic beverage containers, but the trends of focusing on economic instruments in wealthier countries are the same, and typically far less information on the measures and how they were taken is provided, in order to give anything other than an indication.

Lastly, there were no studies in the scientific literature measuring the effectiveness of instruments aiming to address microplastic pollution (e.g., regulatory bans of microbeads). These findings are consistent with other plastic policy reviews (Xanthos and Walker 2017), which found that there is a research gap on the effectiveness of plastics policy instruments, with little scientific literature on the impact of instruments targeting single-use plastic pollutants, and none on those targeting microbeads.

CHAPTER FIVE: SUMMARY OF POLICY RECOMMENDATIONS FROM THE SCIENTIFIC COMMUNITY

This chapter provides a brief summary of lessons learned and recommendations from the scientific literature to policymakers for instruments to address the plastic pollution problem, except those that are site-specific or local, and focusing on either all or land-based sources of plastic pollution. The literature reviewed includes a total of 244 articles from 2000 until the end of first half 2019, comprised of: (1) the plastics policy effectiveness literature (n = 136 papers); (2) additional papers that primarily give proposals for how to improve current public policy or introduce new policies (n = 41 papers); and (3) recommendations emerging from 67 articles about public policies observed or expected to have an impact on reducing plastic leakage, but were not introduced with the explicit intention of doing so (e.g., solid waste management policies).

A repeated theme among policy recommendations in the scientific literature is that plastic pollution is a global problem that is especially challenging to solve, reflecting the properties of plastic itself: its longevity, toxicity, malleability, and propensity to disintegrate into microplastics (Dauvergne 2018). As such, researchers have emphasized that there is no "silver bullet" or single approach that will effectively resolve this complex environmental and societal challenge, but rather an integrated or "all of the above" approach is needed at multiple levels and across all stages of plastic product life cycles (Garcia et al. 2019, Gallo et al. 2018, Vince and Hardesty 2018, ten Brink et al. 2018). For this reason, common recommendations are categorized across a range of instruments and lifecycle stages, by sources of pollution and types of pollutants: all land-based sources, all macroplastic pollutants, plastic bags specifically, other single-use macroplastic pollutants (e.g., plastic bottles), microplastic pollutants, and then common recommendations to all plastic sources and types.

5.1 Common Recommendations for All Land-Based Sources of Plastic Pollution

While most recommendations focus on all or specific types of macroplastic pollutants and/or on microplastic pollutants from land-based sources, some focus broadly on them all. For example, Xanthos and Walker (2017) recommend that even with limited effectiveness data, the growing global trend of increased regulatory bans and levies/taxes of different types of plastic pollutants should continue and expand (from macro to microplastics).

Cross-Cutting Instruments: Information—Research, Data Collection, Data Reporting or Record Keeping.

Across the problem, the literature emphasizes the need for research, notably to quantify effectiveness of policies, to understand the main sources of plastic pollution, and its effects on human health, the environment and the economy, among others (Gold et al. 2014). For example, monitoring of microplastic beads in wastewater effluent could reveal baseline data of microplastic releases into the aquatic or marine environment, and monitoring could begin in advance of a regulatory instrument (Iverson 2019, Xanthos and Walker 2017).

Cross-Cutting Instruments: Information—Education or Outreach

A focus of multiple policy recommendations throughout the scientific literature is the importance and effectiveness of education or outreach campaigns to consumers about other policy instruments, as support for or compliance of the policy instrument improves where the environmental benefits are better understood (Chukwu 2018, Gallo et al. 2018, Martinho et al. 2017, Zen et al. 2013, Frater and Lee 2012). Particularly with economic instruments that create a tax, educating consumers about the destination of the public revenues (e.g., designate a Nature Fund) can help increase support and acceptability of the instrument, together with information on the environmental impacts (Martinho et al. 2017, Convery et al. 2007). For example, recycling behavior was strengthened when information campaigns were added to the regulatory instrument for recycling, for example, using posters, television screens, flyers, websites, public exhibitions, stakeholder meetings, participation in cleanup activities. (Heidbreder et al. 2019).

Cross-Cutting Instruments: Regulatory—Affirmative, Capture Plastic Post-Leakage

Post-leakage capture and cleanup are recommended across multiple types of plastic pollutants, though financing these efforts are often cited as a challenge for states. Gold et al. (2014) propose product redemption fees and shipping container fees as potential sources of capital for cleanup, with a focus on plastic litter hot spots along coastlines, coral reefs, the seafloor and the deep ocean.

5.2 Recommendations for Land-Based Sources of Macroplastic Pollutants

Instruments for Extended Producer Responsibility: Economic (Cash for Return) Instruments and/or Regulatory Instruments to Develop New or Improve Existing Processes or Products

A common recommendation from researchers for instruments to address the full range of macroplastic pollutants is to regulate or encourage producers to take responsibility for management of the waste created by their products—extended producer responsibility—and aim for high recovery rates and internalizing externalities to "get the prices right" (Iverson 2019, Gallo et al. 2018, Gold et al. 2014, Sachs, 2006). In practice, the transaction costs of internalizing external costs of plastic pollution for individual producers can be substantial, if not prohibitive, resulting in some cases in instruments targeting EPR collectively for producers (Sachs 2006). This is because each individual producer likely has limited capacity, expertise, and workforce to actually carry out EPR-related tasks or projects. In assessing constraints to instruments encouraging EPR in Europe, Leal and Filho et al. (2019) emphasize the importance of creating economic incentives for enterprises to fully engage in the efforts, and recommend to extend them to other types of plastic pollutants beyond plastic packaging, for example, agricultural plastics, textile waste, plastic used in construction, medical and pharmaceutical packaging, bulky plastics, furniture, printer cartridges, textile, and carpets.

Regulatory—Affirmative Instruments: Responsible Handling of Plastic (E.G., Solid Waste Management, Recycling).

The plastic pollution problem is often defined in terms of mis-managed plastic waste (Jambeck et al. 2015), suggesting that across different types of macroplastic pollutants, the disposal, collection and recycling stages of the product lifecycle are fundamental to solving the problem. Essentially, improved solid waste management systems across the world and particularly in areas of high leakage are critical for addressing plastic pollution. In terms of policy instruments explicitly aiming to enhance solid waste management in order to reduce plastic pollution, several are recommended throughout the literature, including: regulatory instruments for recycling (e.g., targets), often delivered at the municipal level (Garcia et al. 2019); and regulatory prohibitions on disposing of recyclable and recoverable plastic waste in landfills (e.g., in Europe) that lead to higher recycling rates (PlasticsEurope 2018).

In the case of the EU, the focus of regional policies has been on increasing the recycling rate of plastics, via regulatory instruments to set recycling targets for member states (Penca 2018, Steensgaard et al. 2017). In addition, a regulatory ban on disposal of plastic in landfills was introduced in many countries throughout the EU (Steensgaard et al. 2017), helping to drive a 64 percent increase in recycling capacity across nine European countries between 2006 to 2014 (Worm et al. 2017). For the plastic that does arrive at landfills, better capping and run-off control methods could help prevent escape of disposed plastic (Harse 2011). In fact, much of the literature on the effect of general waste management policies on plastic pollution focuses on changes to recycling rates among households. In the case of China, recommendations focus on waste sorting as the foundation of recycling, and opportunities such as liquefaction for example (Lin and Nakamura 2019). In some cases, researchers have suggested financial incentives for households to sort the waste at the source, or reduced sanitation fees to incentivize responsible handling of plastic (Chukwu 2018). Throughout this literature, recommendations focus on reducing the cost of source separation and alternative handling of the waste at the household level, reducing households' time burden for material recycling, e.g., by providing curbside recycling services or by locating drop-off recycling centers close enough to households (Saphores and Nixon 2014), and increasing information to the households on the benefits of material recycling. One challenge in marginal pricing of waste disposal for households is the incentive for illegal dumping (Saphores and Nixon 2014).

5.3 Recommendations Specifically for Plastic Bag Pollution

Introduce a Mix of Instruments, With an Emphasis on Education and Outreach

Regulatory bans and economic instruments have shown significant (though varied) outcomes for reduction of plastic bag consumption, and indeed one researcher recommends that the United States adopt a national ban for bags and plastic utensils (Iverson 2019). Additionally, numerous researchers and studies suggest enhanced effects if these regulatory or economic instruments are combined with others: e.g., subsidies for reusable alternatives (Mogomotsi et al. 2019), education campaigns (Sobaya et al. 2018), and clear information or labelling of bag charges (Taylor and Villas-Boas 2016). Positive consequences for the environment may be an important reason to support the policy for a number of stakeholders, suggesting that education and outreach to

emphasize these benefits may help maintain support for the instruments (Jakovcevic et al. 2014). Persistent education campaigns (including curriculum for schools) can also help combat the rebound effect for economic instruments (He 2012, O'Loughlin 2010).

The Charge Introduced with Economic Instruments Should Typically Be Higher

Recommendations and lessons learned emphasize the importance of setting the charge high enough to influence behavior if an economic instrument is used (e.g., the Botswana tax was too low to reduce consumption). In terms of the amount of the charge, the increased price of plastic bags should be large and an obvious increase, rather than in small increments (Dikgang et al. 2012). In the case of China, the price was often too low (or not charged at all), due in part to weak enforcement and direction by the central government (who is recommended to require local police to take more responsibility for enforcement through spot checks and written inspections submitted to a central database, as well as create a hotline for consumers to report violations) (O'Loughlin 2010, He 2012).

Do Not Ignore Shifting of Demand to Disposable Alternatives

Researchers have noted that ignoring the shift or diversion of demand and consumption from the regulated products into disposable alternatives (i.e., "leakage" in economic terms) overstates the outcomes from policy instruments aiming to reduce plastic bag pollution (Taylor 2019). As one option to address this shift, governments are recommended to introduce a charge for disposable alternatives such as paper bags (along with ensuring inexpensive reusable alternatives are available, while considering other potential unintended consequences such as greenhouse gas emissions from increased production of alternatives) (Taylor and Villas-Boas 2016). Similarly, to address demand for reuse of plastic carrier bags as garbage bags, instruments could encourage the production and sale of inexpensive, thin plastic grocery bags that are specifically designed and marketed to be used as trash bags after their use as carryout bags (Taylor, 2019).

5.4 Recommendations Specifically for Other Types of Single-Use Plastic Pollutants (E.G., Plastic Bottles)

Regulatory Bans for Plastic Bags Could Be Expanded to Other Single-Use Plastic Products

Following examples around the world, researchers have recommended that at least in the short-term, regulatory bans could be effective for other single-use plastic pollutants where alternatives can be sourced, particularly plastic packaging (Iverson 2019, Gallo et al. 2018, Walker and Xanthos 2018). For example, Walker and Xanthos (2018) recommend that the Canadian government consider a federal ban of as many single-use plastic products as is practical (e.g., in addition to plastic bags, plastic packaging, cutlery and straws, among others), which they argue would be much more effective than ad hoc bans at the subnational level. Subsequently, the Canadian government announced plans to introduce a complete ban on single-use plastics as early as 2021 (Sweeney et al. 2019).

For Plastic Bottles, Economic Instruments That Provide Cash for Return Have Been Effective

Such instruments have led to increased recycling rates in many countries and cities (Gallo et al. 2018, Schuyler et al. 2018, Berck et al. 2016) and should be replicated (Gallo et al. 2018) according to a number of researchers. In some cases, the effectiveness of these instruments has been hampered by relatively low refunds per beverage container (Saphores and Nixon 2014). In addition, in at least one instance, researchers proposed a mix of economic and information instruments that could be used to address plastic bottle pollution based on the context, including: (1) information instruments for education campaigns concerning the environmental consequences of use and benefits of reusable alternatives; (2) economic instruments that provide incentives (subsidies) for production and use of bottles issued with renewable products; (3) economic instruments that provide incentives (subsidies) for production of biodegradable plastic bottles; and/or (4) economic instruments that provide both incentives (subsidies, cash for return) and disincentives (taxes) to encourage recycling and recyclable plastic bottles (Orset et al. 2017).

5.5 Recommendations for Microplastic Pollutants

Regulatory Bans of Plastic Microbeads in All Types of Cosmetic and Personal Care Products

Such bans are recommended at all levels, even in countries with complete coverage of tertiary wastewater treatment programs (Gallo et al. 2018), including in specific cases such as the Great Lakes in North America (Schroeck 2016). Simply and clearly stated regulatory bans of plastic microbeads in all types of cosmetic and personal care products, together with an efficient enforcement mechanism, are consistently recommended as the best fit for addressing this pollutant, for at least the following reasons: (1) the products are washed down the drain during their anticipated use so information instruments for education or outreach would not likely be possible (i.e., in changing behavior, since all uses will result in the products being washed down the drain) and (2) regulations for responsible handling of waste, extended producer responsibility, etc., would not likely be effective for similar reasons (Doughty and Eriksen 2013). To support such bans, some researchers recommended development of a scientifically informed standard that clearly distinguishes persistent, bioaccumulative, and/or toxic plastic compositions of plastic microbeads (McDevitt et al. 2017).

CHAPTER SIX: ELEMENTS OF AN EFFECTIVE GOVERNMENT RESPONSE

6.1 "All of the Above": Elements of an Effective Response at Each Level of Governance

Plastic pollution is a problem that is global in scale, and for which researchers have emphasized that there is no "silver bullet" or single solution, suggesting rather an "all of the above" approach at multiple levels and across all stages of plastic product life cycles (Garcia et al. 2019, Gallo et al. 2018, Vince and Hardesty 2018, ten Brink et al. 2018). Such an approach would feature a wide range of interlocking solutions that, taken together, could help address the problem (Worm et al. 2017). To support an "all of the above" approach, this chapter highlights some of the findings from the analysis of current public policies around the world (Chapter 3), the state of the science on what is working and what is not from these policies (Chapter 4), and recommendations from the scientific literature for policy-makers (Chapter 5), in order to present some common elements of an effective government response to the problem at different levels. Of course, governments alone will not be able to solve the plastic pollution problem, actions will be required from producers, consumers and researchers to name a few (Worm et al. 2017), but governments do have a major role to play.

6.2 The International Level: A Binding Global Treaty to Reduce Land-Based Sources

To date, the binding international policies explicitly aiming to address the plastic pollution problem focus on maritime sources, specifically from ships (not including abandoned or lost fishing gear)—The International Convention for the Prevention of Pollution from Ships (MARPOL) and the London Convention/Protocol. These treaties have driven both regional and national policy responses, and the general consensus among legal scholars is that they can be considered at least partially effective instruments in driving government responses targeting maritime sources of plastic pollution from ships, platforms, and aircrafts (not including abandoned or lost fishing gear) (Goncalves and Faure 2019). More recently, for example in resolutions agreed at the third UNEA meeting in 2017, the problem has often been defined largely in terms of land-based sources of plastic leaking into the ocean, both macro and microplastics. Haward (2018) has suggested that land-based sources of plastic pollution need similar monitoring and control as the maritime sources under MARPOL. Finally, the 1989 Basel Convention is a binding international policy applicable to the plastic pollution problem, primarily in terms of the transport of plastic waste but also more broadly in its intention for countries to manage waste such as plastic within the country where it is generated or imported in an "environmentally sound" manner (Raubenheimer and McIlgorm 2018).

Across the 28 international policies agreed since the beginning of 2000, none include a global, binding, specific, and measurable target to reduce land-based sources of plastic pollution. Nor is there a binding international policy whose primary goal is to reduce land-based sources of plastic pollution (UNEP 2017, Carlini and Kleine 2018). Rather, the existing policies, both at the global and regional level, typically include instruments to support research and monitoring, and calls for states to develop national action plans. Essentially, the voluntary nature of these 28 policies

limits the extent of plastic pollution reduction that they can achieve (Vince and Hardesty 2017), and typically do not include targets and the level of reporting agreed in binding policies.

For this reason, the assessment of governance strategies for reducing plastic pollution that was presented to the third meeting of UNEA in 2017, noted the lack of globally binding standards to mitigate plastic pollution as a key gap in the international governance of plastics (UNEP 2017, Carlini and Kleine 2018). According to a number of researchers, the solution to fill this gap at the international level could be a binding global treaty to reduce land-based sources (Dauvergne, 2018, Haward 2018, Raubenheimer and McIlgorm 2018, Worm et al. 2017, Vince and Hardesty 2017, Coulter 2010), e.g., what Worm et al. (2017) termed a "Global Convention on Plastic Pollution."

The oceans as a shared resource, where plastic pollution is a transboundary problem and a "common concern of humanity," could provide a rationale and basis for collective action of states through a binding global treaty (Goodwin 2011). Another rationale could be the challenge of ad hoc, bottom-up policies for a global problem (Haward 2018), which has not typically achieved global effectiveness without transnational activism, robust national policies in leading markets, modest costs of compliance to industry and advantages to first movers, among others (Dauvergne 2018).

Researchers have recommended that such a global treaty include at least two key elements, among others: (1) measurable targets for plastic pollution reduction, and (2) robust monitoring, reporting and enforcement mechanisms, building upon standardized plastic pollution databases (Haward 2018, Gold et al. 2014, VanderZwaag and Powers 2008). The targets would of course require negotiation and further analysis, but in one example researchers proposed that targets aim to effectively ban the most prevalent forms of plastic pollution—plastic packaging, plastic carrier bags, plastic microbeads, and emissions of small plastic pellets or nurdles—while targeting a recycling rate of 75 percent for all others (Gold et al. 2014). Regardless of the rate, a key target would be to increase the recycling rate of new and existing plastic products, in part by encouraging design and material innovation (Raubenheimer and McIlgorm 2018). Such a target could also be linked to labelling of plastic products (e.g., declaring ingredients and warning consumers about potentially harmful effects) (Worm et al. 2017), potentially in collaboration with a Plastics Stewardship Council modelled upon the Marine Stewardship Council for wild-caught fish products (Landon-Lane 2018). At the same time, other researchers have focused on a target for regulatory bans, for example of all oil and gas-based plastics (to be phased out over time), which would be simpler and easier to monitor for compliance purposes (Kirk and Popattanachai 2018). Bans could be phased in, beginning with plastics products that contribute the most to pollution and for which alternatives exist, such as plastic carrier bags and straws (Kirk and Popattanachai 2018). Finally, another element raised of a potential treaty would be a global fund for cleanup of plastic pollution, potentially with ocean-linked industries contributing (Landon-Lane 2018, Kirk and Popattanachai 2018), or to support improved waste management in lower-income countries (Haward 2018).

There are a number of precedents for such a treaty, notably the Montreal Protocol, the Stockholm Convention, and the Basel Convention (Raubenheimer and McIlgorm 2017, Haward 2018,

Raubenheimer and McIlgorm 2018, Worm et al. 2017). Worm et al. (2017) suggest that plastics in the environment can be considered as a persistent form of pollution, similar to the persistent organic pollutants regulated by the Stockholm Convention (although the instruments of the treaty would not apply to most plastic materials). The Montreal Protocol, for example, demonstrates an effective regulatory ban of products (ozone-depleting substances) at a large scale (Coulter 2010).

Table 5. Suggested Goals of a Binding Global Plastic Pollution Treaty

Goncalves and Faure (2018)	Worm et al. (2017)
	(i) [Plastic production]: reduce demand and volume of production; require transparency in the use of additives and substances of concern to facilitate recycling and ensure safe chemical management;
(i) address all sources of plastic pollution and the connection between terrestrial, freshwater, coastal and marine ecosystems;	(i) [Plastic material and product design]: support new material development through green engineering and the creation of a marketplace for new materials and appropriate incentives; prohibit excessive packaging to reduce packaging waste and provide a level playing field for marketing via packaging;
(ii) establish guidelines, targets and indicators, helping the goals to become more concrete and more easily evaluated;	(ii) [Waste generation]: provide incentives and support for the shift toward a fully circular economy; ban certain plastic products or applications such as plastic grocery bags, single-use plastic utensils and microbeads in personal care products; educate public about environmental and health risks of particular products and incentivize alternatives; encourage a reuse and sharing economy;
(iii) foreseeing the possibility of reviewing and of compliance mechanisms;	(iii) [waste management]: require producers and consumers to contribute to the cost of recycling or waste management for plastic products; create assistance programs that enable technical experts to support countries in need of waste management system expertise; create a thriving marketplace for recycled content through recycled content requirements for certain materials, government procurement policies, or other standard-setting policies; use landfill bans where appropriate to promote composting and recycling, and to direct hazardous items toward better end-of-life options;
(iv) strengthen technical, scientific and financial resources;	(iv) [litter capture]: use technology and mechanical interventions to capture litter in streams and rivers before it gets to the ocean; promote citizen-based or industry-driven cleanup programs; and
(v) clarify economic impacts—and mainly gains—of the changes involved in adopting the instrument;	(vi) [ocean]: near elimination of plastic waste inputs into global marine environment.
(vi) gather and interpret data and information.	

Of course, the development of such binding global treaties can take decades (Haward 2018, Landon-Lane 2018). Haward (2018) has analogized the process to the 25 years of climate change negotiations from 1990 to the Paris Agreement in 2015, suggesting that international plastic pollution negotiations are now where climate negotiations were in 1992, when the United Nations Framework Convention on Climate Change (UNFCCC) formally recognized the problem and simply encouraged voluntary, undefined support. By this analogy, Haward (2018) suggests that a binding global plastic pollution treaty may not happen until 2040. In the meantime, and in parallel, states may expand and strengthen existing international policies aiming to address plastic pollution (Gold et al. 2014).

6.3 The National and Subnational Levels: A Policy Instrument Selection Matrix

Bodansky (2010) has suggested at best international policy can only contribute about 30 percent of the solution in any given environmental issue. Even with a binding global treaty, most actions will be taken at the national and subnational level to address the plastic pollution problem at the source—which occurs on the land within the borders of states, even if damages can be found in international waters (Goncalves and Faure 2018). Of course, policies will be designed and delivered based on the context, but Table 6 below provides a "Plastics Policy Instrument Selection Matrix" to guide these decisions, built upon the collective experiences of governments to date (Chapter 3), and the state of the science on effectiveness (Chapter 4). The aim of this matrix is to facilitate dialogue with policymakers in a given context (Sterner, 2003), ideally as the basis for modelling the results of policy design based on the choice of different instruments.

Table 6. Plastics Policy Instrument Selection Matrix: Examples from the Policies Analyzed, With Goal of Plastic Pollution Reduction

Type of plastic pollution*	Regulatory – Affirmative				Regulatory – Prohibitive			Economic				Information		
	Develop plans	Develop new or improve existing processes, products	Responsible handling of plastic	Capture plastic post-leakage	Limit plastic	Ban plastic	Prohibit irresponsible handling of plastic	Subsidies	Tax break	Cash for return	Disincentives (fee, tax, levy, duty)	Education or outreach	Labels or placards	Research, data collection, data reporting, or record keeping
Macroplastics	National action plans; Requirements for subnational government agents [21]	Requirements for minimum recycled content of plastic products [1]	Recycling targets for plastic waste; Requirements for handling plastic and disposing of plastic waste [10]	[1]	Standards to reduce the volume of plastic packaging [1]	Ban of plastic packaging or other single-use plastics [38] *Most viable where alternatives exist; and more effective when combined with education or outreach*	[1]	[1]	[0]	Cash for return for plastic beverage containers [2] *Evidence from small sample size in EU and US shows consistent increase in recycling of plastic beverage containers*	Fees for packaging waste to cover costs of management [3]	Information campaigns particularly on the need to improve solid waste management [8]	Labelling of packaging to reduce excessive packaging [6]	Research and data collection on land-based sources; monitoring of plastic waste and policy impact [7]
Plastic bags	Plans for development of alternatives [7] *Focus and development of inexpensive alternatives a key lesson and proposal*	Requirement for reusable bags [5]	Requirements for producers, distributors to collect and recycle plastic bags; or pay a fee for local gov. to establish recycling infrastructure [7]	[0]	[2]	Bans of plastic bags of varying levels of thickness, at varying stages of the life cycle: import, production, selling and use [34] *Consistent reduction in consumption, relatively simple to monitor compliance, but higher leakage into disposable alternatives; may not be politically feasible*	[3]	[0]	[1]	[1]	Taxes or levies charged for plastic bags at the point of sale [17] *Effects depend upon amount charged, combat rebound effect; availability of inexpensive reusable alternatives essential*	Public information campaigns to accompany bans or economic instruments, e.g., on benefits of reusable bags [8] *Effects of bans or economic instruments enhanced by education or outreach, consumer support, increased compliance*	Labelling of plastic bags, including price charged if levy or tax used [10]	Distributors provide annual reports on plastic bag sales [6]

Micro-plastics *Note: no examples yet of instruments to address microplastics from synthetic tire abrasion or clothing*	Plans to develop regulatory instruments for micro-plastics, or to conduct greater research and monitoring [40]	[0]	[0]	[0]	[0]	Bans of plastic microbeads in cosmetic and personal care products, including toothpaste [55] *No effectiveness data available yet, bans occurring largely in Europe and North America to date, however inexpensive alternatives exist*	[0]	Subnational gov.'s have created subsidies for reusable bag manufacturing as an alternative to plastic carrier bag manufacturing lost [0]	[0]	[0]	[0]	[0]	[0]	Research and data collection to inform design of instruments [5]

*Types of plastic pollution are listed in descending order, by types most frequently targeted by instruments in the policies; [% of all national policies targeting a given type of plastic, using this instrument]; Text in italics describes available evidence on effectiveness.

The Plastics Policy Instrument Selection Matrix proposed above does not include all potential or proposed instruments along every stage of the plastic product lifecycle, but rather provides examples of instruments that have been used to date by governments in the policies analyzed, paired with any indications of effectiveness from the scientific literature. Some of the more frequent instruments used have been recycling targets for macroplastic waste in general, regulatory bans for plastic packaging, cash for return schemes for plastic beverage containers, regulatory bans, levies or taxes on plastic carrier bags, and regulatory bans on plastic microbeads in cosmetic and personal care products, among others. The practice of instrument selection reflects the theory that when pollution abatement is technically difficult, e.g., when sources are diffuse such as with many land-based sources, pollution reduction may only be achieved by reducing production or consumption of certain goods (Sterner 2003). The instruments in the matrix are largely and most frequently targeted to the production and selling phase of the lifecycles, reflecting this point. From the different instruments in the matrix, Dauvergne (2018) expresses optimism that national and subnational bans, levies or taxes on plastic bags, and bans on plastic microbeads, can be effective, but expresses more skepticism from efforts to address plastic packaging (e.g., plastic food packaging)—though the European Union and the United Kingdom have each subsequently considered a tax on virgin plastic or plastic packaging that does not contain a minimum amount of recycled material respectively.[18]

18. See: https://www.gov.uk/government/publications/introduction-of-plastic-packaging-tax/plastic-packaging-tax; https://news.bloombergtax.com/daily-tax-report/eu-leaders-looking-to-plastic-waste-tax-to-fill-the-brexit-gap.

CHAPTER SEVEN: SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

7.1 Policy Design: How Governments Have Responded to the Problem

Trends in Policy Responses

On top of policies that are generally applicable and can have a significant effect on plastic pollution but do not explicitly intend to do so (e.g., general solid waste management policies), this study has summarized the results of an analysis of the design of public policy responses to the plastic pollution problem. Key findings (Chapter 3) include the following:

Overall, analysis of the Plastics Policy Inventory shows a clear upward trend in the number of public policy responses to the plastic pollution problem over the last decade, at global, regional and national levels (and expected at the subnational level).

- At the global level, prior to 2000 a number of binding international policies were agreed upon that are applicable to the problem, but only maritime sources of pollution were directly addressed. Since 2000, the 28 international policies that aim to address the problem have typically been nonbinding agreements (forming a growing body of "soft law") and focused largely on land-based sources.
- At the regional level, the upward trend in the number of policies adopted has been similar to the global level (if not slightly leading global policies). These policies are essentially a European phenomenon: almost 62 percent of the regional policies in the inventory were largely developed within Europe (and almost half of these from the Mediterranean). Even when binding upon participating states, these policies have almost always depended upon national legislation, and have frequently been nonbinding regional "action plans" facilitated by UNEP in conjunction with the Regional Seas Programme.
- At the national level, the sample of 147 policy documents in the inventory shows the same upward trend over the last decade, broadly across all regions. Although not a random sample, given the proportion of known national policies included in the sample, this trend can be considered indicative. This increase coincides with the increase in international policy responses over the same time period, beginning with the Honolulu Strategy in 2011 and continuing for example with a series of UNEA resolutions beginning in 2014. While this does not imply causality, it does suggest again an overall trend of increased public policy responses within the last decade, across all levels.
- At the subnational level, the inventory includes only 77 subnational policies as compared to 264 references in the literature reviewed that have not yet been found, that can be considered as examples only and not indicative of global trends. Roughly two-thirds of the 77 policies analyzed and the 264 referenced to policy documents not yet found, were adopted within four countries: the United States, Australia, the United Kingdom, and Canada. This may suggest that these geographies are more likely to be studied by researchers and results published, and that significant numbers of subnational policies around the world, e.g., in East Asia, Latin America and sub-Saharan Africa, have been missed in studies to date.

At the national level, this upward trend in the inventory largely reflects new policies introduced solely to address pollution from plastic bags. After agreement on the Honolulu Strategy, from 2013 to 2018 almost 40 percent of all new national policies introduced to address plastic pollution in the inventory solely targeted plastic bags. Almost twice as many national policies targeting plastic bags in the inventory were passed in the years 2013–2018 (25 total) as during the entire preceding period from 2000–2012 (14 total). This overall trend in the inventory of a growing number of national policies adopted to address plastic pollution, was largely driven by wealthier countries (high- and upper-middle-income countries), though policy responses in lower income countries also showed a modest increasing trend.

At the same time, the definition of the plastic pollution problem has evolved in policies in the inventory, moving at the global level from more general to more complex, focusing on a number of different types of pollutants, rather than just "all" plastics or "macroplastics." After 2000, the growing number of international policies at the global level have defined the problem in terms of land-based sources, and after the 2011 Honolulu Strategy in increasingly more specific terms such as "marine plastic litter and microplastic." Similarly, international policies at the regional level have tended to define the problem in more complex terms, focusing on a number of different types of plastic pollutants.

The analysis of international policies highlights key gaps in the response at this level, namely that there is no global, binding, specific, and measurable target agreed to reduce plastic pollution. Many of the international policies, at both the global and regional level, include instruments to support research and monitoring, and calls for states to develop national action plans. Almost all of the instruments in these policies are plans or recommendations to develop more specific instruments in the future, typically at the national level. For example, at the regional level the action plans facilitated by UNEP in relation to the Regional Seas Programmes were largely plans for future action, without binding commitments by participating states.

While the lack of a binding, global target is a gap in the international response, UNEA's coordinated reporting and review structure provides a clearinghouse of national-level information that could be utilized to increase international cooperation, provide policy guidance and create an explicit flow of information between international and national policy action. Global coordination on targets and implementation will require stronger linkages between international and national policies. In order to facilitate information about plastic pollution, UNEA Resolution 4/6 has created a framework for collecting information on existing activities and actions by governments, regional and global instruments, international organizations, the private sector, NGOs and other relevant contributors to reduce marine plastic litter and microplastics, along with the sources and pathways of plastic and microplastic pollution. Ongoing analysis of this information could help identify policy gaps at both the international and national level, as well as highlight data gaps, accelerate translation of policies between different governments and governmental levels, and identify technical and financial barriers to policy innovation and implementation.

Regional policies in the inventory typically have taken a holistic approach to the problem and focused on leakage across all stages of the life cycle of plastic products, coupled with

forward-looking policy actions such as information instruments or model national legislation. Regional policy instruments, like their global counterparts, depend upon the development and implementation of national legislation. Regional policies, however, were more likely to be binding on the participating countries, and to facilitate the adoption of a wider variety of policy instruments. As a result, regional policies are some of the most comprehensive policy responses to the problem and have more innovative design and mix of policy instruments. For these reasons, regional policies may be leading plastic policy development.

As the number of policies in the inventory has increased and the problem definition evolved, more policies have emerged that are comprehensive and represent an "all of the above" approach. In general, government responses have reportedly been focused on identifying leakage points in the life cycle of different types of plastic products and introducing instruments to reduce or eliminate the source(s) (UNEP 2018). However, in recent years more policies have emerged that aim to address multiple stages of the life cycle of a given type of plastic product more broadly, or in some cases targeting consumer demand driving production. For example, the second UNEA meeting in 2016 adopted a resolution on "marine plastic litter and microplastics" stating that the results from research are sufficient to justify immediate action by states, and suggested a more comprehensive response, referring to all stages of the life cycle of plastic products, and the need for behavior change by consumers. Similarly, the 2013 regional action plan for the Mediterranean provides a model for a comprehensive package of instruments to address pollutants from multiple sources and across all stages of the product life cycle, focusing on both plastic waste management and prevention. In 2019, the EU Directive 904/2019 moved beyond recycling targets to focus on reducing consumption, requiring member states to adopt a mix of instruments in some form that in aggregate, was estimated to cover 86 percent of the single-use plastics found in beach counts of member states. The Directive takes into account feasibility for member states, where alternatives are available more prohibitive instruments are recommended such as a ban, however for products where alternatives are not readily available, affirmative instruments are recommended to ensure responsible handling of waste, all combined with information instruments to help change behavior.

At the national level, examples of comprehensive, "all of the above" responses to land-based sources of pollution (excluding plastic bags) emerging in recent years include Denmark and India in 2016, and Panama, Rwanda, and Tanzania in 2019. In terms of comprehensive national policy responses specifically to pollution from plastic bags, with the exception of the pioneering policy in Ireland in 2001, the most comprehensive policies were all enacted within the last three years, in India (2016), Colombia (2016 and 2017), Panama (2018), Romania (2018), Spain (2018), and Uruguay (2018 and 2019).

Analysis of national policies in the inventory indicates that a number of governments in countries with high levels of mismanaged plastic waste from coastal land-based sources have not yet formulated responses. Of the top 20 coastal countries producing mismanaged plastic waste from land-based sources (Jambeck et al. 2015), seven do not have a national policy in the inventory or even referenced in literature (but not found for analysis in the inventory): Philippines, Thailand, Egypt, Algeria, Brazil, Myanmar, and North Korea. Another four countries have only national policies targeting plastic bags in the inventory or referenced in the literature:

Nigeria, Bangladesh, South Africa, and Morocco. This does not suggest with certainty that no national policies exist in these countries to address land-based sources of plastic pollution. Nor does the presence of a national policy in some countries indicate effectiveness of the government's response to plastic pollution. However, the result that essentially over half of the top 20 countries either do not have a policy or only have a policy targeted to plastic bags, indicates that some of these large polluters may not yet have formulated national policy responses. Similarly, of the top 20 plastic polluting rivers estimated by Lebreton et al. (2017), at least four have some or all of the riparian countries with no national policy in the inventory or referenced in the literature (but not found for analysis in the inventory): the Amazon (Brazil and Ecuador with no policy in the inventory); the Pasig (Philippines), the Irrawaddy (Myanmar), and the Mekong (Cambodia, Laos, Myanmar, and Thailand).

Analysis of the timing of international, regional, and national policies in the inventory and instrument type does not indicate a correlation or connection between actions across different levels of government. Trends in governmental policy response do not suggest a relationship between adoption of a policy instrument at one level and subsequent action at the international, regional, national, or subnational level. This is not to say that policy innovations are not being translated across governmental units, but rather that the analysis did not demonstrate those connections.

Trends in the Instruments Used by Policies in the Inventory

While the most common instrument for international policies was a plan or commitment for participating states to take future action, by far the instrument most frequently used in national policy responses in the inventory was a regulatory ban on plastic at some stage in the life cycle: national governments were three and a half times more likely to use regulatory instruments than economic instruments, and three times more likely to use regulatory instruments than information instruments. Similarly, the subnational examples used regulatory bans far more frequently than economic instruments, at a ratio of roughly two to one for instruments targeting plastic bag pollution, and 23 to 6 for instruments targeting macroplastics more broadly. In terms of packaging instruments within policy, as an indication of the complexity of government responses to the problem, roughly a quarter of the national policies in the inventory that included regulatory and/or economic instruments, also included information instruments to accompany them (though this ratio was slightly higher in Europe and Central Asia, and lower in East Asia and the Pacific and in sub-Saharan Africa).

Maritime sources of plastic pollution were the first addressed in policy, through binding international treaties that have been translated in many cases into national laws. Efforts to address pollution from these sources have benefited from two binding international treaties, MARPOL and the London Convention, that have driven both regional and national policy responses to comply with rules banning plastic pollution from ships (though these do not address pollution from abandoned or lost fishing gear). While these binding international treaties have specific provisions to address key maritime sources of plastic pollution, their effectiveness depends upon states to self-regulate the vessels that they register. The general consensus among legal scholars is that these two international treaties can be considered at least partially effective

in driving government responses (Goncalves and Faure 2019), for example citing the EC Directive 2000/59/EC) requiring enforcement by member states of the commitments in the treaties (Lewis 2001).

Land-based sources of plastic pollution (excluding plastic bags) have largely been addressed by policies at the national or subnational levels, with notable exceptions such as the European Union. Some form of plastic packaging or other single-use plastic product (excluding plastic carrier bags) was banned in at least 25 countries in the inventory, representing a population of almost two billion people in 2018. However, the vast majority of this population was covered by two policies in India and Pakistan, for a total of 1.56 billion. The remaining 23 countries covered by some form of national ban in 2018 covered a population of only 355 million. Across geographies, while EU policies typically include a broad range of instruments (most frequently regulatory affirmative instruments such as recycling requirements), many of the other regions were characterized by regulatory prohibitive instruments such as a ban on plastics of some type, including sub-Saharan Africa, East Asia and the Pacific, Latin America and the Caribbean, and South Asia.

The growth over the last decade in national (and likely subnational) regulations banning some form of plastic carrier bags, is one of the major features of global plastics policy in the inventory. As national policies to address plastic carrier bags have increased, by the end of the first half of 2019, within the sample of policies analyzed national governments had banned, taxed or levied fees on various forms of bags in at least 43 countries around the world, covering a population of 952 million in 2018 if the policies in China and India are excluded, and a total of 3.7 billion if they are included. The East Africa Community's "Polythene Material Control Bill" would add another 22.175 million people to these totals (given that four of its six members already have national policies included in this list). The instrument most commonly used in these policies by far was a regulatory ban, which was more than twice as likely to be used to address pollution from plastic bags than the second most common instrument: economic disincentives. Over half of the policies analyzed with bag bans were in sub-Saharan Africa. Alternatively, the European Union through the two directives to member states in 2015, focused on the introduction by states of a mix of instruments, toward achieving a sustained reduction in the consumption of lightweight plastic carrier bags, defined as annual consumption of a maximum of 40 bags per person by the end of 2025.

Instruments for education and outreach in the inventory were often not paired with national regulatory or economic instruments to reduce plastic bag pollution. Of the 48 national policies in the sample that include a ban, tax, or levy on plastic bags in some form, only 18 also include a supporting information instrument, and only six of these were aimed at education and outreach. Overall, throughout the sample of national policies analyzed in the inventory, governments used instruments for education and outreach in only 15 instances. Within the subnational examples, though not indicative, regulatory bans of some form of plastic bags again were by far the most common type of instruments used by local governments, but just over half of the instruments (19) were combined with information instruments of various types, and 22 percent were combined with instruments for education or outreach, significantly higher than the same percentage for the national policies analyzed (13 percent).

National policies in the inventory that introduced a ban, tax, or levy on some form of plastic bags were largely a phenomenon in low-income and lower-middle-income countries. Of the 43 countries where national governments introduced a ban, tax, or levy on some form of plastic bags in the inventory, 33 were in sub-Saharan Africa, Pacific Island countries or territories, or Latin America and the Caribbean. In this sample, Africa leads the world in national policies to ban, tax, or levy plastic bags. This finding is consistent with Clapp and Swanston (2009), who noted that efforts to combat plastic pollution from bags first occurred in low-income and lower-middle-income countries, driven by bottom-up responses to a visible problem, as well as observations by Taylor and Villas-Boas (2016). Similarly, Ritch et al. (2009) observed that clear links between plastic bag use, flooding, and ensuing public health concerns in some countries (most notably Bangladesh and India), provided an immediate risk leading to policy responses.

On the opposite end of the spectrum from responses to plastic bag pollution, there are relatively few policy responses to microplastic pollution in the inventory, at any level. At the global level, only in 2014 did international policies start to focus on microplastics as part of the larger plastic pollution problem, and subsequently UNEA Resolution 2/11 in 2016 provides more specificity, including a focus on plastic microbeads in products. However, even for products known to be sources of microplastic pollution, there are no binding international commitments for action to reduce production or consumption. At the regional level, 2013 marked the first year a regional policy targeted this aspect of the problem, and though plans for microplastics are less common in these policies, the Northeast Atlantic Plan provides an example of a more detailed response, envisaging the possibility of states reaching voluntary agreement with the industry to phase out the use of plastic microbeads in personal care and cosmetic products. For all of the policies adopted to address the plastic pollution problem during the study period, there were not yet any European Union requirements for member states to introduce instruments specifically to address microplastic pollution.

At the national level, within the inventory only nine national governments had policy responses to microplastic pollution by the end of 2019's first half, and eight of these were adopted within the last five years. National policy responses to microplastic pollution have largely been confined to Europe and North America, comprised largely of high- or upper-middle-income countries. Throughout these initial responses, the problem has largely been defined in terms of plastic microbeads within cosmetic products, as only one instrument in the entire sample is targeted to microplastic pollution from synthetic tire abrasion (in order to conduct research and collect data). Across the 11 policies, the instruments used were either regulatory bans of plastic microbeads or planning requirements. Similar to the trend in national policies, the subnational policies analyzed included only a handful of examples of instruments used to address microplastic pollution.

Despite the dearth of policies found to address microplastic pollution, some researchers are optimistic that the world is "on track to eliminate microbeads from rinse-off products over the next decade," given voluntary actions by industries in advance of policies and the ready availability of inexpensive alternatives (Dauvergne 2018). Alternatively, there is a complete lack of policies found to address microplastic pollution from synthetic tires and textiles.

7.2 Policy Effectiveness: What Has Worked and What Has Not

As described in Chapter 2 and Appendix II, a Plastics Policy Library was created through a search of multiple databases with scientific literature that included screening thousands of articles and finally extracting 136 for the library, together with an ad hoc review of grey literature studies. Key findings from the review of this literature (Chapter 4) include the following:

The scientific literature on plastics policy effectiveness is small and limited, albeit growing. Of the 136 articles reviewed, 41 provide either quantitative and/or qualitative observations of outcomes attributed to instruments for only 24 national policies and 36 subnational policies (and one international policy—a regional directive issued by the European Commission). In terms of coverage of the national policy documents in the inventory, as well as those with references in the literature but for which the documents have not yet been found, at most only 6 to 8 percent of national policies and 11 percent of subnational policies aiming to address plastic pollution have outcomes observed and reported in the scientific literature (though the number and trend is increasing). Of note, not all observations are quantitative measures of outcomes attributed to instruments defined in the policy document, and in many cases, these include qualitative and more general observations of outcomes. In addition, the grey literature reviewed provides quantitative measures for an additional 70 policies to those measured in the scientific literature, 36 of which are policies targeted to plastic bag pollution. Across these policies, the studies in the grey literature reviewed typically provide much less information than the scientific literature, in terms of the type of study conducted, or the measures of bag consumption before and after the policy instrument was introduced.

The vast majority of this literature is focused on the short-term effects of policy instruments aiming to reduce plastic carrier bag pollution, largely economic instruments in high-income countries. Across the policies studied, regardless of whether a regulatory ban or an economic instrument (i.e., a levy or tax) was used, significant reductions in the consumption of plastic bags were consistently measured in the short-term (within 24 months of the introduction of the instrument, and typically within 12 months). The degree to which these instruments achieved consumption reductions varied, and in some cases a lack of enforcement on retailers, or charges fixed too low in economic instruments, led to smaller effects. Essentially, the literature suggests that these instruments may not necessarily be eliminating plastic bag pollution, nor likely to change consumer behavior completely, but they are likely to have a significant impact if enforced.

Over the longer-term, the number of studies of plastic bag policy effectiveness is smaller, but still suggest sustained reductions in consumption. Across 10 cases where effects were reported at least 24 months after the instrument was introduced, consumption reductions have remained significant, at 50 percent or above. Sustaining these effects depends in part on combating the rebound effect when economic instruments are used, whereby consumers internalize the charge and start to increase demand—such that the charge may also need to be increased.

The choice of a regulatory ban or economic instrument to address plastic bags does not appear to be determinant, as both have shown significant and consistent reductions in plastic bag consumption in the scientific literature. Each has benefits and costs for governments. For example, regulatory bans may be more effective in reducing consumption and relatively

cheaper to enforce compliance, though they may not be politically feasible in every context and may lead to greater leakage into the use of disposable alternatives than economic instruments. Regardless of the choice, across both types of instruments, the literature suggests that key factors to effectiveness may include: (1) setting the fee high enough for economic instruments to affect behavior and in some cases adjusting it upwards over time to counteract the rebound effect (notably, where measured in the United States and the United Kingdom, the amount has typically varied between US$0.05 and 0.10 per bag); (2) focusing on provision of inexpensive reusable alternatives; and (3) emphasizing public awareness and acceptance of the policy to enhance compliance, through coupling regulatory and economic instruments with information instruments.

The literature on policies targeting plastic bags consistently documented examples of unintended consequences, where demand for plastic carrier bags shifted into alternatives, such as paper bags or plastic garbage bags—though in some cases less so for economic instruments than for regulatory bans (Heidbreder et al. 2019, Taylor 2019, Schnurr et al. 2018, Zen et al. 2013). However, even when consumption of plastic carrier bags decreased and paper bag consumption increased, the latter was typically less than the former when taxes or fees are imposed on paper bags, such that net consumption of disposable bags (plastic and paper bags) decreased. Some positive unintended consequences have also been noted, such as the increase in public support for regulation (Thomas et al. 2019).

Studies of economic instruments to incentivize increased recycling of plastic beverage containers by providing cash for return of the used containers, have consistently shown significant effects over a small sample size largely in Europe and North America. A handful of policy instruments studied in the scientific literature, as well as studies in the grey literature of 18 policies, have shown significant increases in the recycling rate, associated with introduction of the instrument. The deposits have typically been on the order of US$0.05 to 0.10 per bottle in the United States, and higher in Europe. This synthesis is consistent with other summaries of the literature, e.g., Schuyler et al. (2018) which reported strong evidence that cash for return instruments reduce plastic beverage container pollution.

Beyond studies of the effects of policy instruments on plastic bag pollution and plastic beverage container pollution, only a handful of studies have considered instruments addressing other types of pollutants or sources. Notably, there are no studies of the effects of policy instruments aiming to address microplastic pollution, e.g., regulatory bans of the use of plastic microbeads in cosmetic products (e.g., Schnurr et al. 2018).

This review provides further data to illustrate the significant research gap on the effectiveness of plastic policy instruments. This is consistent with other recent policy reviews, which have highlighted a research gap on effectiveness (e.g., Xanthos and Walker 2017, Schnurr et al. 2018). This gap may in part reflect the time lag between the introduction of policies and the publication of studies with quantitative measures of effectiveness in the scientific literature, which for the articles reviewed in the Plastics Policy Library was on average 6.5 years. The geographies where plastics policy effectiveness was studied in the scientific literature reviewed were almost exclusively limited to North America (40 percent), Europe (28 percent), and East Asia and the

Pacific (24 percent). Notably, no national policies in Latin America or South Asia have observed measures of outcomes recorded in the scientific literature. Additionally, the policy instruments studied have largely been confined to those targeting plastic bag pollution—comprising almost 82 percent of the instruments studied for which effective measures were reported in the scientific literature. The remainder is largely focused on economic instruments to enhance recycling of plastic beverage containers, typically through cash for return instruments. The majority of these studies are not able to conclusively determine the effects of the instruments (e.g., as opposed to changing sociocultural norms), due to the absence of controls for comparison. Additionally, the majority of the studies focus on economic instruments introduced in wealthier countries, even though regulatory bans are the most prevalent instrument to address plastic pollution worldwide. Lastly, the vast majority of studies report effects of the policy instruments in the short-term, but very few measure effects over a longer-term.

7.3 Policy Recommendations: Proposals from the Scientific Literature

A repeated theme among policy recommendations in the scientific literature is that plastic pollution is a complex global problem requiring an integrated or "all of the above" response at multiple levels and across all stages of plastic product life cycles. For this reason, common recommendations are categorized across a range of instruments and life cycle stages, by sources of pollution and types of pollutants: all land-based sources, all macroplastic pollutants, plastic bags specifically, other single-use macroplastic pollutants (e.g., plastic bottles), microplastic pollutants, and then common recommendations to all plastic sources and types.

For responses to all land-based sources of plastic pollution, increased use of information instruments is recommended. Multiple policy recommendations throughout the scientific literature focus on the importance and effectiveness of education or outreach campaigns to consumers about other policy instruments, as public support for these instruments improves where the environmental benefits are better understood. Additionally, across the problem the literature emphasizes the need for public support for research, notably to quantify effectiveness of policies, to understand the main sources of plastic pollution, and its effects on human health, the environment and the economy, among others. Although this information gap need not preclude continued policy responses, for example Xanthos and Walker (2017) recommend that even with limited effectiveness data, the growing global trend of increased regulatory bans and levies/taxes of different types of plastic pollutants continue (from macro to microplastics).

For land-based sources of macroplastic pollution, as defined the disposal, collection, and recycling stages of product life cycles are fundamental to solving the problem—essentially improved solid waste management systems, particularly in lower- and middle-income countries. Several policy instruments are recommended throughout the literature explicitly to enhance solid waste management in order to reduce plastic pollution, including: regulatory instruments for recycling (e.g., targets), often delivered at the municipal level; and regulatory prohibitions on disposing of recyclable and recoverable plastic waste in landfills (e.g., in Europe) that lead to higher recycling rates. Much of the literature on the effect of general waste management policies on plastic pollution focuses on changes to recycling rates among households. In the case of Europe, the focus of regional policies has been on increasing the

recycling rate of an expanding list of plastics via regulatory instruments to set recycling targets for member states. In addition, a regulatory ban on disposal of plastic in landfills has been introduced throughout the EU, helping to drive a 64 percent increase in recycling capacity across nine European countries between 2008 and 2016. For the plastic that does arrive at landfills, better capping and run-off methods could help prevent escape of disposed plastic. In the case of China, recommendations focus on waste sorting as the foundation of recycling, and opportunities such as liquefaction, for example. Sorting often occurs informally in cities throughout the country, and researchers recommend a formal institution to oversee waste sorting for recycling. In other cases, researchers have suggested financial incentives for households to sort the waste at the source, e.g., through reduced sanitation fees. Throughout this literature, recommendations focus on reducing the cost of source separation and alternative handling of the waste, reducing households' time burden for material recycling, e.g., by providing curbside recycling services or by locating drop-off recycling centers close enough to households, and increasing information to the households on the benefits of material recycling and awareness campaigns on existing recycling systems. One challenge in marginal pricing of waste disposal for households, is the incentive for illegal dumping.

For land-based sources of macroplastic pollutants, instruments that extend producer responsibility are also consistently recommended. Instruments used by governments to regulate or encourage producers to take responsibility for management of the waste created by their products, as well as consumers for their purchases, include economic instruments that require producers to provide cash to consumers for return of materials for recycling, as well as regulatory instruments to develop new, or improve existing processes or products. In practice, cash for return instruments have largely been used for plastic beverage containers, though with consistent effects on increased recycling rates—largely measured in Europe and North America.

For instruments targeted specifically to addressing plastic carrier bag pollution, researchers consistently recommend using a mix of instruments, notably for education and outreach to accompany regulatory or economic instruments. Numerous researchers and studies suggest enhanced effects if regulatory or economic instruments are combined with others: e.g., subsidies for reusable alternatives, education campaigns, and clear information or labelling of bag charges. Positive consequences for the environment may be an important reason to support the policy for a number of stakeholders, suggesting that education and outreach to emphasize these benefits may help maintain support for the instruments. Persistent education campaigns (including curriculum for schools) can also help combat the rebound effect for economic instruments.

For regulatory bans of various forms of plastic bags, simplification and reduced monitoring costs may be a benefit where government capacity is limited, but leakage into disposable alternatives is a key challenge. One option recommended to address leakage is to introduce a charge for disposable alternatives such as paper bags (along with ensuring inexpensive reusable alternatives are available).

For economic instruments imposing a charge on various forms of plastic bags, researchers emphasize the importance of setting the charge high enough to influence behavior. In terms of

the amount of the charge, researchers have recommended that to be effective the increased price of plastic bags should be large and an obvious increase, rather than in small increments.

For other single-use macroplastic pollutants, e.g., plastic bottles, some researchers suggest that regulatory bans for plastic carrier bags could be extended to these other products, at least in the short-term. Following examples around the world, researchers have recommended that at least in the short-term, regulatory bans could be effective for other single-use plastic pollutants where alternatives can be sourced, particularly plastic packaging.

For plastic bottles, economic instruments that provide cash for return have been effective in increasing recycling rates and recommended for wider use. Though largely studied in Europe and North America, the results have encouraged researchers to recommend this instrument, though noting that in some cases effectiveness has been hampered by relatively low refunds per beverage container.

For microplastic pollutants, regulatory bans of plastic microbeads in all types of cosmetic and personal care products are recommended at all levels, even in countries with complete coverage of tertiary wastewater treatment programs. This instrument, simply and clearly stated with an efficient enforcement mechanism, is consistently recommended as the best fit, since the products are washed down the drain during their anticipated use and information instruments for education or outreach would not likely be effective alone (i.e., in changing behavior, since all uses will result in the products being washed down the drain), nor regulations for responsible handling of waste, extended producer responsibility, etc.

Finally, across all land-based sources of plastic pollution, scientists have consistently called for a binding global treaty, drawing from precedents such as the Montreal Protocol, the Stockholm Convention, or the Paris Agreement. Across the 28 international policies agreed since the beginning of 2000, none include a global, binding, specific, and measurable target to reduce land-based sources of plastic pollution, limiting the extent of plastic pollution reduction that they can achieve. For this reason, a number of researchers have called for a binding global treaty to reduce land-based sources (e.g., Dauvergne 2018, Haward 2018, Raubenheimer and McIlgorm 2018, Worm et al. 2017, Vince and Hardesty 2017, Coulter, 2010), for example what Worm et al. (2017) termed a "Global Convention on Plastic Pollution."

Researchers have recommended that such a global treaty include at least two key elements, among others: (1) binding and measurable targets for plastic pollution reduction and (2) robust monitoring, reporting, and enforcement mechanisms. The targets would of course require negotiation and further analysis, but in one example researchers proposed that targets aim to effectively ban the most prevalent forms of plastic pollution—plastic packaging, plastic carrier bags, plastic microbeads, and the small plastic pellets or nurdles—while targeting a recycling rate of 75 percent for all others. Regardless the rate, a key target would be to increase the recycled rate of new and existing plastic products, in part by encouraging design and material innovation. Such a target could also be linked to labelling of plastic products (e.g., declaring ingredients and warning consumers about potentially harmful effects), potentially in collaboration with a Plastics Stewardship Council modelled upon the Marine Stewardship Council. Another element raised of

a potential treaty would be a global fund for cleanup of plastic pollution, potentially with ocean-linked industries contributing, or to support improved waste management in lower-income countries.

There are a number of precedents or models for such a treaty, notably the Montreal Protocol, the Stockholm Convention, and the Basel Convention. The Montreal Protocol for example, demonstrates an effective regulatory ban of products (ozone-depleting substances) at a large scale, though not necessarily of products at the scale of plastics production.

Of course, the development of such binding global treaties can take decades, and Haward (2018) has analogized the process to the 25 years of climate change negotiations from 1990 to the Paris Agreement in 2015, suggesting that international plastic pollution negotiations are now where climate negotiations were in 1992, when the United Nations Framework Convention on Climate Change (UNFCCC) formally recognized the problem and simply encouraged voluntary, undefined support. Even with a binding global treaty, most actions will be taken at the national and subnational level to address the plastic pollution problem at the source—which occurs on the land within the borders of states. Action at these levels of course need not wait on a binding global treaty, and the "Plastics Policy Instrument Selection Matrix" proposed in Chapter 6 aims to provide a simple (and evolving) tool to help guide governments in these decisions, built upon the collective experiences of governments to date (Chapter 3), and the state of the science on effectiveness (Chapter 4). The aim of this matrix is to facilitate dialogue with policymakers in a given context, ideally as the basis for modelling the results of policy design based on the choice of different instruments.

7.4 Recommendations for Expanding the Field of Plastics Policy Research

With the caveat that scientists can consistently be relied upon to conduct research that suggests more research, policymakers have requested more information to inform policies and action to address the plastic pollution problem (see for example Resolution 4/6 from the 2019 UNEA meeting). The growing trend in policies introduced (see Chapter 3), together with the time lag and slow response of scientific studies of their effectiveness (see Chapter 4), suggest that this field is still relatively young and much more information is needed on the types of policy instruments that could be used by governments at different levels in varying contexts, and on the effects that these can be expected to have—though scientists have been quick to write that this does not mean there is not sufficient information for robust action and response now. This study aims to contribute two small tools that may assist in this growing field: (1) a global Plastics Policy Inventory to track government responses and help study policy design and (2) a Plastics Policy Library of scientific literature with measures of the effects of these policies.

A Global Plastics Policy Inventory of Government Responses to the Plastic Pollution Problem

As described in Chapter 2 and Appendix II, these additional public policy responses, on top of business-as-usual effects from continuing or enhancing management of solid waste, have been systematically collected and organized into a global Plastics Policy Inventory for analysis. This inventory currently includes 291 policy documents explicitly aiming to address plastic pollution

since 2000, as well as 370 policy documents expected to have an impact on plastic pollution, and 75 non-English policy documents retained for future translation and screening, and finally 442 reference to plastics policy documents from the scientific and grey literature reviewed have been logged, where the actual policy document has yet to be located. The policy documents in the inventory are organized by the year adopted and the area of jurisdiction, from the beginning of 2000 through the first half of 2019, though could be extended and kept as an active and up-to-date inventory and monitoring tool.

The inventory can currently be considered comprehensive only for policies at the international level (containing 97 percent of the total number of known policies, either found or referenced in the literature reviewed), but can be considered indicative for policies at the national level (39 to 47 percent of the total number of known policies). At the subnational level, the inventory currently only provides scattered examples at the subnational level (21 percent of the total number of known policies).

This inventory can serve as a tool that will contribute to Resolution 4/6 adopted at the fourth meeting of UNEA in 2019, requesting UNEP to provide information to inform policies and action, and requesting the "ad hoc open-ended expert group on marine litter and microplastics" created by UNEA Resolution 3/7 in 2018, to take stock of existing activities and actions by governments to "reduce marine plastic litter and microplastics." The inventory offers the potential to become a tool for standardized monitoring of policy responses to the problem, and that could be quickly updated and expanded to track governments' progress. Similarly, it responds to a recommendation in the scientific literature by for "better science and policy inventories, including databases of extant and evolving legislative, regulatory and communication-oriented efforts."

A Plastics Policy Library of Scientific Literature Studying the Effectiveness of Government Responses to the Plastic Pollution Problem

Finally, as a tool that can be updated and expanded, a library of scientific literature about public policies aiming to address plastic pollution was compiled, from searches of the following interdisciplinary or legal research databases: Web of Science, Google Scholar, and HeinOnline (legal literature). From these databases, over 13,000 returns were screened, resulting in a library of 136 articles on plastics pollution policy, as described in Appendix II. All quantitative and qualitative measures of outcomes attributed to a given policy instrument were extracted, including unintended outcomes, and stored in a database linked to the relevant instrument and policy document in the inventory. This library could be maintained in real-time and policy effectiveness measures continuously extracted into a database, to provide a state of the science on the effectiveness of plastics policy instruments.

GLOSSARY

Marine debris is defined by the United States National Oceanic and Atmospheric Administration (NOAA), as "any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes" (Bondaroff et al. 2017).

Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment (from UNEP 1995, in GESAMP 2019).

Microbeads are small polyethylene (plastic) microspheres commonly used as exfoliates in consumer toiletry products such as facial and body cleansers and toothpastes. Manufacturers and consumers in the cosmetics sector benefited from the inexpensive, widely available microbeads as a substitute for natural exfoliating substances beginning in the mid-1990s (Strifling, 2016).

Microplastics comprise a very heterogenous assemblage of particles that vary in size, shape, color, chemical composition, density, and other characteristics (Galgani et al. 2015). They can be subdivided by usage and source as (1) "primary" microplastics, produced either for indirect use as precursors (nurdles or virgin resin pellets) for the production of polymer consumer products, or for direct use, such as in cosmetics, scrubs and abrasives, and 2) "secondary" microplastics, resulting from the break-down of larger plastic material into smaller fragments. Fragmentation is caused by a combination of mechanical forces, e.g., waves and/or photochemical processes triggered by sunlight (Galgani et al. 2015). See Browne (2015) for the various sources of microplastics and the pathways into the oceans.

Nudge policies are policies that attempt to change the "choice architecture" that surrounds a decision, in order to promote a desired outcome (e.g., delivering a reminder to a consumer that there is indeed a choice to be made) (Thaler and Sunstein 2008).

Plastics are defined as synthetic polymers with thermoplastic or thermoset properties (synthesized from hydrocarbon or biomass raw materials), elastomers (e.g., butyl rubber), material fibers, monofilament lines, and coatings (GESAMP 2019).

Policy context contains the general characteristics of a nation or sector which may have a high explanatory potential (e.g., history, physical environment, relevant social, political, economic, and cultural factors) (Bemelmans-Videc et al. 1998), considered here as analogous to "enabling conditions." For example, key contextual factors cited as driving environmental policy decisions have included, among others, geographic location, interests of the group, cost of living, level of economic development, and educational attainment (Li and Zhao 2017).

Policy instruments are defined here as tools by which governments use power in attempting to ensure support and effect social change, in this case to reduce plastic pollution into the ocean. Policy instruments can be classified into three mutually exclusive categories: regulations, economic incentives, or information, as follows:

- Regulatory instruments: measures taken by governmental units to influence people by means of formulated rules and directives which mandate receivers act in accordance with what is ordered in these rules or directives;
- Economic instruments: characterized as involving the handing out or taking away of material resources while the addressees are not obligated to take the measures involved (includes market-based instruments that aim to create economic incentives for behavior change, as well as instruments that aim to create economic disincentives for certain behaviors); and
- Information instruments: attempts at influencing people through the transfer of knowledge, the communication of reasoned argument, and persuasion (Bemelmans-Videc et al. 1998).

Policy instrument effectiveness is the degree of goal-realization due to the use of certain policy instruments (Bemelmans-Videc et al. 1998).

"Pollution of the marine environment" means the introduction by humans, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities (UNCLOS (Article 1(1)(4)).

Public policy is a particular course of action or inaction pursued by governments, individually or collectively (Heidenheimer et al. 1990).

Public policy documents are written statements of policy by one or more governments or organs of government, at the international, national, or local level. They include:

- public policy agreements that articulate policy instruments enacted by one or more governments at some level, such as a treaty, law, or regulation (synonymous with a legal instrument), and
- public policy commitments that articulate policy goals and/or instruments expressed by one or more governments at some level, but not yet enacted or legally binding.

Single-use plastics is an umbrella term for different types of products that are typically used once before being thrown away or recycled. These include, among other items, grocery bags, food packaging, bottles, straws, containers, cups, and cutlery (UNEP and WRI 2018).

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APPENDIX I. BRIEF OVERVIEW OF THE PLASTIC POLLUTION PROBLEM

Global awareness and discourse around the leakage of plastics (i.e., synthetic organic polymers) into the ocean has grown significantly since the total volume was first estimated for 2010 to be on the order of 4.8 to 12.7 million metric tons (Jambeck et al. 2015). Although plastics did not enter into widespread use until the 1950s, by 2015 global annual production had increased to 322 million metric tons, and leakage of these products into the ocean equated to a new "silent spring" (Geyer et al. 2017, Worm et al. 2017). In the absence of a well-designed strategy for the disposal of end-of-life plastics, humans are conducting what has been called "a singular uncontrolled experiment on a global scale, in which billions of metric tons of material will accumulate across all major terrestrial and aquatic ecosystems on the planet" (Geyer et al. 2017). This section provides a brief overview of the growth in global plastic production, the leakage of plastic waste into the environment, and the scale of this plastic pollution in the ocean.

1.1 Growth in Global Plastic Production

Definition of plastics. Plastics is a term derived in 1907 from the Greek word *plastikos* (moldable) to describe an entirely new class of materials: synthetic polymers (Worm et al. 2017). While natural organic polymers such as cellulose or DNA are ubiquitous in nature, only around the beginning of the twentieth century did chemists begin to understand their properties and structure sufficiently to create human-made versions (Worm et al. 2017). In 1907 Leo Baekeland invented the world's first fully synthetic polymer of commercial importance, by mixing two common chemicals, phenol and formaldehyde, and subjecting them to heat and pressure to create a resin called Bakelite (Worm et al. 2017). Since Bakelite began commercial production in 1910 (Worm et al 2017), thousands of different types of plastics have been developed worldwide (PlasticsEurope 2018).

Processes for producing plastics (collectively known as polymerization). Plastics are produced through processes that synthesize polymers from petrochemicals or biomass raw materials, as most plastics are based on the carbon atom (exceptions are those based on silicon) (American Chemistry Council 2019, PlasticsEurope 2019). As a first step for most plastics, hydrocarbon chemicals are separated from natural gas, petroleum, or coal (American Chemistry Council 2019). In the presence of a catalyst, the molecules of these hydrocarbon chemicals are then converted into monomers (i.e., molecules that can be bonded to other identical monomers) such as ethylene, propylene, butane, and others, which are in turn chemically bonded into chains called polymers through a process called polymerization (American Chemistry Council 2019). The polymers created can be visualized as long chains of connected atoms similar to a string of pearls. For some polymers such as polyethylene, the pearls on the string—or repeat units—can be just one carbon atom and two hydrogen atoms. For others, such as nylons, the repeat units can involve 38 or more atoms (American Chemistry Council, 2019). Each different combination of monomers used can result in a plastic of different properties and characteristics, initially in the form of a resin that can subsequently be molded (American Chemistry Council 2019). Likewise, the order of the atoms in the long chains of polymers can be altered to create different characteristics of the plastic, or the plastics can be altered by the inclusion of additives, such as

antioxidants, colorants, foaming agents, plasticizers, lubricants, flame retardants, etc. (American Chemistry Council 2019).

The two main types of plastics resulting from the polymerization process are thermoplastics and thermosets. There are two basic mechanisms for polymerization—addition reactions and condensation reactions—with each producing a different type of plastic. Polymerization based on addition reactions occurs when a special catalyst is added, frequently a peroxide, which causes one monomer to link to the next and that to the next, etc., to create polymers that are long, one-dimensional chains of atoms known as thermoplastics (American Chemistry Council 2019). Thermoplastic resins are meltable because of weak secondary bonding forces in the chain that soften when exposed to heat, while at the same time being able to return to their original condition when cooled back down to room temperature (not unlike ice) (American Chemistry

Box 1. Examples of Common Thermoplastics (Resin Type and Applications/Uses)

Polyethylene (PE), including high-density PE and low-density PE (some of the most common types of PE):

- Packaging (Low-density PE)
- Carryout bags (Low-density PE)
- Film Packaging (Low-density PE)
- Electrical insulation, pipes, tubes (High-density PE)
- Milk jugs and detergent bottles (High-density PE)
- Water bottles (both)

Polyethylene terephthalate (PET):

- Food and beverage packaging
- Textile fibers

- Polystyrene (PS)
- Utensils, plates, disposable cups, plastic tableware
- Food containers and packaging foam (e.g., Styrofoam)
- CDs

Polypropylene (PP):

- Carpet fibers
- Automotive bumpers
- Appliances
- Yogurt containers, drinking straws, and bottle caps

Polyvinyl Chloride (PVC)

- Sheathing for electrical cables
- Floor and wall coverings, siding
- Window frames, shower curtains
- Guttering and plumbing pipes
- Films

Polycarbonate (PC)

- Construction materials, traffic lights
- Lenses, eyeglasses

- Polyamide (PA) and Polyphthalamide (PPA):
- Nylons
- Polyester

Sources: American Chemistry Council, PlasticsEurope (2019), Ilyas et al. (2018), UNEP (2018), Worm et al. (2017), Steensgard et al. (2017).

Council 2019, PlasticsEurope 2019). The vast majority of the world's plastics are thermoplastics, commonly used in food packaging (American Chemistry Council 2019).

The second mechanism for polymerization is condensation polymerization, resulting in resins that solidify (or "set") irreversibly when heated or cured, called thermosets (American Chemistry Council 2019). In this process, catalysts cause all monomers to react with any adjacent monomer, resulting in two and three-dimensional networks of atoms instead of the one-dimensional chains found in thermoplastics (American Chemistry Council 2019). Common thermosets include rubber tires used for trucks and automobiles (American Chemistry Council 2019). More specifically, common thermoset resins and applications include polyurethanes (PURs), such as those used in mattresses, cushions, and insulation; unsaturated polyesters such as those used in boat hulls, furniture, bath tubs, and shower stalls; epoxies such as those used in adhesive glues and coating for electrical devices; and phenol formaldehyde such as those used in electrical appliances, electrical circuit boards and switches, and plywood (American Chemistry Council 2019, PlasticsEurope 2019).

Trends in global plastic production beginning in the twentieth century. Since Baekeland's invention in 1907, global production of plastics has occurred in three distinct phases: (1) slow initial growth from 1910 to 1950; (2) large-scale production and exponential growth from 1950 to 2000, with widespread use outside of the military first occurring in this phase; and (3) linear growth more in lockstep with economic growth from 2000 to 2015 (Geyer et al. 2017, Worm et al. 2017). With the acceleration in production during the second phase, starting in the 1950s, plastic has substantially outpaced any other manufactured material to become the most widely used human-made substance on the planet (Geyer et al. 2017, Worm et al. 2017). In this period, global production (both polymer resins and synthetic fibers) increased from 2 million tons annually in 1950 to 380 million tons in 2015 (407 million tons when additives are included (i.e., global primary plastics production)—a faster growth rate than the global economy (as measured by gross domestic product) (Geyer et al. 2017[19]). The cumulative amount of plastic produced over this period was 7.8 billion tons, half of which was produced since 2002 (Geyer et al. 2017). Asia accounts for just over half of global plastic production (50.1 percent, with China the world's leading producer at 29.4 percent[20]), while the European Union (EU) and North America produce roughly 18 to 19 percent each, followed by the Middle East and Africa (7.1 percent), and South America (4 percent), collectively representing over 97 percent of global production (PlasticsEurope 2018).

Composition of plastic production. In aggregate, 92 percent of all plastic ever made has been produced from the following resins: PE, PP, PVC, PET, PUR, and PS, as well as synthetic fibers (70 percent of which were polyester) (Geyer et al. 2017).[21] Roughly 15 percent of total plastic

19. To estimate global plastic production volumes and composition, Geyer et al. (2017) used data published by the PlasticsEurope Market Research Group on pure polymer (resin) production, and data published by the Fiber Year and Tecnon OrbiChem on fiber production.
20. Until a ban was introduced at the end of 2017, China imported significant volumes of plastic waste for recycling, on the order of seven to nine million tons per year during the period from 2010 through 2016 (Brooks et al. 2018).
21. These production volumes do not include bio-based plastics, made partially or in whole from renewable biological resources. In 2016, some 4.2 million tons of bio-based plastic applications were produced globally, expected to increase to 6.1 million tons annually by 2021 (PlasticsEurope 2019).

production consists of fibers, such as polyester and acrylic (UNEP 2018). Of the non-fiber plastics produced, the single largest type has been PE (36 percent, or roughly 100 million tons of resin annually), largely for packaging (i.e., materials designed for immediate disposal), followed by PP (21 percent) and PVC (12 percent) (PlasticsEurope, 2019; Geyer et al. 2017; Jambeck et al. 2015). In 2015, the single largest application (usage pattern or market sector) of plastic resins produced was the use of PE and to a lesser extent PP and PET for packaging (146 million tons, equivalent to 42 percent of non-fiber plastics), reflecting a global shift from reusable to single-use containers, especially for food and drink, followed by PVC, PUR and others for construction (65 million tons, equivalent to 19 percent of non-fiber plastics) (Geyer et al. 2017). The composition of the global production of primary plastics (resins, fibers and additives) in 2015 was estimated by Geyer et al. (2017) as shown in the table below.

Table 1. Global Primary Plastics Production in 2015, by Use

Use/Market Sector	Volume (Million Tons)	Percentage of the Total
Packaging	146	36
Building and Construction	65	16
Textiles	59	14
Other	47	12
Consumer and Institutional Products	42	10
Transportation	27	7
Electrical/Electronic	18	4
Industrial Machinery	3	1
TOTAL	407	100

Source: Geyer et al. (2017).

Perhaps the two packaging products that have become symbols for the ubiquity of plastics are plastic carryout bags[22] and plastic water bottles. For the former, Rivers et al. (2017) cite Clapp and Swanston (2009) estimates that between 500 billion and 1.5 trillion disposable plastic shopping bags are used annually, and O'Loughlin (2010) reported roughly 1 trillion bags used annually in China alone, while Li and Zhao (2017) report that in the U.S. an estimated 100 billion bags are used annually. Of note, this production requires an estimated 12 million barrels of crude oil in the U.S., while the plastic bag manufacturing industry was the country's third largest (Plastics Indus 2010, Berkeley Municipal Government 2009, in Fromer, 2010), and 37 million barrels in China (O'Loughlin 2010). In terms of plastic water bottles, Orset et al. (2017) cite ELIPSO (2012) that some 179 billion plastic water bottles had been produced in 2010, and report that as of 2017 some 89 billion liters of water were bottled and consumed annually across the globe (with an

22. To produce plastic carryout bags, natural gas and petroleum are processed to form PE resin, which is continually heated, and then shaped and cut to form bags (Fromer 2010).

annual growth rate in global plastic water bottle consumption between 2008 and 2013 of 6.2 percent).

Similarly, every year some 300 billion cigarette packs are produced, containing roughly 6 trillion of cigarettes whose butts may be discarded into the environment (Novotny et al. 2009, 2015, in Wallbank et al. 2017), reportedly at a rate of 75 percent littered, equating to 750,000 to 1 billion kilograms of cellulose acetate filters (Novotny and Slaughter 2014, in Wallbank et al. 2017).

1.2 Leakage of Plastic Waste into the Environment

While sunlight weakens plastic materials, causing them to fragment into particles, none of the mass-produced plastics biodegrade in any meaningful way, but rather remain as waste that must be disposed (Geyer et al. 2017). Annual plastic waste can be expected to roughly track annual plastic resin production, with any differences resulting from the time lag in disposal of durable goods (Jambeck et al. 2015). To give a sense of the scale of this waste, approximately 11 percent of the waste generated by the total population in 192 countries in 2010 was plastic (Jambeck et al. 2015), with global solid waste generation strongly correlated to gross national income per capita (Geyer et al. 2017). Essentially there are three different ways to dispose of plastic waste so that it is not left uncontained in the environment, (i.e., "leaking"): (1) recycling or reprocessing it into secondary material (which delays, rather than avoids, final disposal, and only reduces future waste generation if it displaces primary plastic production); (2) destroying it thermally, which is the only way to permanently eliminate plastic waste (almost always by thermal incineration, with or without energy recovery, though there are emerging technologies such as pyrolysis which extract fuel from plastic waste); or (3) discarding and containing it in managed systems, such as sanitary landfills (Geyer et al. 2017).

Of the 7.8 billion tons of plastic produced between 1950 and 2015, an estimated total of 4.9 billion tons (63 percent) were discarded and are accumulating in landfills or in the natural environment, another 0.8 billion tons (10 percent) were incinerated, and another 0.6 billion tons (8 percent) have been recycled. (Geyer et al. 2017). Since 1960, the share of plastics in municipal solid waste (by mass) increased from less than 1 percent to more than 10 percent by 2005 in middle- and high-income countries with available data (Jambeck et al. 2015). The composition of this waste is not equivalent to the composition of global production given the time lag in use, and in 2015 the composition of the total global waste generated from primary plastics was estimated to be 47 percent from packaging, 6 percent from transportation, 4 percent from building and construction, 4 percent from electrical/electronic, 12 percent from consumer and institutional products, almost 0 percent from industrial machinery, 14 percent from textiles, and 13 percent from other uses (Geyer et al. 2017).

Prior to 1980, plastic recycling and incineration were negligible, but nonfiber plastics has since been subject to significant recycling efforts,[23] with global recycling and incineration rates slowly increasing to account for 18 and 24 percent respectively of global nonfiber plastic waste generated in 2014, while the remainder was discarded (Geyer et al. 2017). As of 2014, the highest recycling

23. End of life textiles (fiber products) do not experience significant recycling rates and are thus incinerated or discarded together with other solid waste (Geyer et al. 2017).

rates were in the EU (30 percent) and China (25 percent), with the U.S. at 9 percent (Geyer et al. 2017).

For practical purposes of monitoring the leakage of plastic waste into the environment, plastics are often categorized by their size, most commonly as either (1) macroplastics (200 micrometers or greater in diameter) or (2) microplastics (Worm et al. 2017). Microplastics are derived either from small plastic particles developed for specific applications (such as beads used as exfoliators in personal care products and abrasives in industrial products), or produced through the breakdown of larger items (e.g., through wear during use, such as rubber particles from tire abrasion) (Zhang et al. 2018, Thompson 2015). Microplastics resulting from breakdown of larger items and plastic fibers are widespread in the ocean and have accumulated in the pelagic zone and marine sediments (Thompson et al. 2004).

Macro and microplastics leak into the environment, and notably to the global ocean, at the following general stages of the life cycle of each product (noting that not all plastic products are the same and not all have the exact same life cycle):

(1) Plastic production

(2) Materials and product design

(3) Waste generation

(4) Waste management

(5) Litter capture

(6) The environment (ocean) (Jambeck et al. 2018, PlasticsEurope, 2018)

The raw material of plastic production (stage one above), (i.e., microplastics such as pellets, spherules, granules, discs, etc.)[24] are a common category of waste that leaks into the environment, particularly from leaky processing plants or during transport (Lechner and Ramler 2015). However, the largest determinant of plastic leakage is the percentage of waste that is mismanaged (Worm et al. 2017), defined by Jambeck et al. (2015) as material that is either littered or inadequately disposed.[25] Packaging plastics have short lifetimes and are usually cheap and disposable, and hence commonly discarded into the environment as part of mismanaged waste (Geyer et al. 2017).

In terms of mismanaged plastic waste, microplastics are a particular case, based on management of wastewater (an important source). Many products containing microplastic beads (made of PE, PP, and PS, among others) are applied to the body, rinsed off and washed down the drain into a wastewater stream, where even in the instance of wastewater treatment, some fraction of beads remain in the final effluent and is released into waterways (McDevitt et al. 2017, Strifling 2016). Many municipal wastewater treatment systems are not designed to capture particles as small as plastic microbeads, even where advanced filtration systems are present (screen openings

24. Resin pellets are raw materials used for the manufacturing of other plastic products (Zhang et al. 2018).
25. Inadequately disposed waste is defined as waste that is not formally managed, and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained (Jambeck et al. 2015).

are often too big to capture the beads) (Strifling 2016). Even where the beads are entrained in biosolids (sewage sludge), land application of these biosolids reintroduces the beads to the terrestrial environment, with the potential to enter aquatic habitats via runoff following a storm or irrigation (McDevitt et al. 2017).

1.3 Plastic Pollution in the Ocean

The plastic waste that leaks into the environment at various stages of the life cycle of different products and uses can enter and persist in marine ecosystems, including the shoreline, seabed, water column, and sea surface (Lebreton et al. 2017). Once in the ocean, the biophysical breakdown of plastics is prolonged, with limited options for removal (Worm et al. 2017), while plastic is moved throughout the oceans by prevailing winds and surface currents (Eriksen et al. 2014). Plastic, together with other marine litter, was first reported in the ocean in the 1960s, as more and more incidents of wildlife entanglement or ingestion of plastic were documented (Ryan 2015). The 1970s saw more extensive surveys of marine litter in the North Atlantic and the Caribbean, while interest in beach litter increased (Ryan 2015). By the 1980s research on litter (often composed of plastics) expanded to the Pacific Ocean, and during this decade international conferences on marine debris began (Ryan 2015). In 1997 a seafaring scientist named Captain Charles Moore discovered and confirmed the existence of the "Great Pacific Garbage Patch" where floating plastic debris converged in a gyre, and in 2010 another similar area had been discovered in the Atlantic Ocean (the "North Atlantic Garbage Patch"), in 2013 and 2014 expeditions confirmed that the vast majority of the debris in these areas is plastic material (much of composed of PET) (Goncalves and Faure 2019, Orset et al. 2017).

A sense of the scale of the amount of plastic entering the ocean was provided in 2015 by Jambeck et al. They estimated that of the global mass of plastic waste, 99.5 million tons was generated in coastal regions (i.e., the population living within 50 kilometers of the coast) in 2010 (Jambeck et al. 2015). Of this amount, 31.9 million metric tons was classified as mismanaged (i.e., material either littered or inadequately disposed), and from this amount some 4.8 to 12.7 million metric tons entered into the ocean in 2010 via inland waterways, wastewater outflows, and transport by wind or tides (Jambeck et al. 2015). This represented an order-of-magnitude greater estimation of the total amount of plastic waste potentially entering the global ocean and has helped define the problem of plastic pollution in the ocean. The authors note that the estimate also did not include plastic inputs into the ocean from marine sources, e.g., losses from fishing activities or at-sea vessels, or inputs from natural disasters (Jambeck et al. 2015).

As reproduced in Table 2 below, the top 20 countries' mismanaged plastic waste accounts for 83% of the estimated total amount of potential plastic waste inputs to the ocean from the coastal population in 2010, with China accounting for an estimated 28 percent alone, and the top five countries accounting for just over half (54.5 percent): China, Indonesia, Philippines, Vietnam, and Sri Lanka (Jambeck et al. 2015). Variation in plastic inputs between countries is driven in the model by differences in coastal population density, plastic consumption and waste management practices (Worm et al. 2017), showing large differences in absolute volumes of plastic waste inputs and waste per capita (essentially little plastic waste is considered as mismanaged in high income countries). Assuming a business-as-usual trend in waste management, the amount of plastic

waste from coastal populations available to enter the ocean was predicted to grow by an order of magnitude between 2010 and 2025 (Jambeck et al. 2015). However, this business-as-usual trend seems less likely if observed decoupling of waste generation with economic growth is considered, as well as stagnation of plastic production and use in Europe at 60 million tons per year in the period from 2005 to 2015, together with waste management improvements in some countries (Worm et al. 2017).

Table 2. Top 20 Coastal Countries Producing Mismanaged Plastic Waste

Country	% of total Mismanaged Plastic Waste	Plastic Marine Debris (MMT/ Year)
China	27.7	1.32–3.53
Indonesia	10.1	0.48–1.29
Philippines	5.9	0.28–0.75
Vietnam	5.8	0.28–0.73
Sri Lanka	5.0	0.24–0.64
Thailand	3.2	0.15–0.41
Egypt	3.0	0.15–0.39
Malaysia	2.9	0.14–0.37
Nigeria	2.7	0.13–0.34
Bangladesh	2.5	0.12–0.31
South Africa	2.0	0.09–0.25
India	1.9	0.09–0.24
Algeria	1.6	0.08–0.21
Turkey	1.5	0.07–0.19
Pakistan	1.5	0.07–0.19
Brazil	1.5	0.07–0.19
Myanmar	1.4	0.07–0.18
Morocco	1.0	0.05–0.12
North Korea	1.0	0.05–0.12
U.S.	0.9	0.04–0.11

*If considered collectively, coastal EU countries (23 total) would rank eighteenth on the list.
Source: Jambeck et al. (2015).

Subsequently, Lebreton et al. (2017) developed a model to estimate the amount of plastic waste transported to the ocean by rivers. The results suggested that in addition to the Jambeck et al. (2015) estimate of potential plastic inputs from coastal populations (4.8 to 12.7 million tons in 2010), another 0.8 to 1.5 million tons of plastic waste reaches the ocean annually from inland areas (i.e., more than 50 kilometers from the coast) via rivers (Lebreton et al. 2017). Of the amount of plastic waste estimated to potentially enter the ocean from coastal populations by

Jambeck et al. (2015), 0.4 to 0.9 million tons were estimated by Lebreton et al. (2017) to occur via river transport, so that the total amount of plastic waste transported by rivers to the ocean each year is potentially 1.2 to 2.4 million tons.

Different rivers transport vastly different amounts of plastic waste to the ocean, depending largely (but not solely) upon nearby population density, levels of urbanization and industrialization within catchment areas, rainfall rates and the presence of artificial barriers such as weirs and dams (Lebreton et al. 2017). On this basis, the model suggested that the majority of plastic waste reaching the ocean via rivers occurred on the Asian continent (86 percent), with three of the top four rivers in China (Yangtze, Xi, and Huangpu) and eight of the top 10 in Asia, as reproduced in Table 3 below (Lebreton et al. 2017). In essence, Asia is the epicenter of the world's marine plastic pollution problem (Garcia 2019), responsible for at least two thirds of mis-managed plastic waste from coastal populations (Jambeck et al. 2015) and 86 percent of the plastic waste reaching the ocean via rivers (Lebreton et al. 2017).

Table 3. Top 20 Plastic Polluting Rivers (Catchments) According to the Lebreton et al. Model (90 Percent of the Total)

1. Yangtze: China	11. Mekong: Thailand, Cambodia, Laos, China, Myanmar, Vietnam
2. Ganges: India, Bangladesh	12. Imo: Nigeria
3. Xi: China	13. Dong: China
4. Huangpu: China	14. Serayu: Indonesia
5. Cross: Nigeria, Cameroon	15. Magdalena: Colombia
6. Brantas: Indonesia	16. Tamsui: Taiwan
7. Amazon: Brazil, Peru, Colombia, Ecuador	17. Zhujiang: China
8. Pasig: Philippines	18. Hanjiang: China
9. Irrawaddy: Myanmar	19. Progo: Indonesia
10. Solo: Indonesia	20. Kwa Ibo: Nigeria

Source: Lebreton et al. (2017).

Once in the ocean, plastic debris may float on the surface, with an estimated total weight of floating plastic worldwide between 93,000 and 267,000 tons, largely comprised of macroplastics (Worm et al. 2017). Eriksen et al. (2014) estimated that 5.25 trillion plastic particles weighing 268,940 tons floated on the ocean surface, the vast majority of which are small fragments. This number is at least an order of magnitude lower than the estimated amount entering the ocean, which should be as high as tens of millions of tons since almost two-thirds of global plastic production results in polymers with a density lower than sea water (Lebreton et al. 2019). One hypothesis for the location of this "missing plastic" at the ocean's surface is that it could have degraded and settled in the deep sea and marine sediments (where concentrations are higher than in the water column), with the deep sea potentially acting as a global sink for microplastic pollution (Worm et al. 2017). Alternatively, plastic inputs to the ocean (e.g., Jambeck et al. 2015, Lebreton et al. 2017) could have been overestimated, or the estimated total weight of floating

plastic debris underestimated (surface trawls are typically combined with visual sightings and global dispersion models) (Lebreton et al. 2019). An effort to propose a mass balance model for estimating plastic debris suggested that over 99 percent of the plastic inputs to the ocean since 1950 had settled below the surface by 2016, with 309,000 tons on the surface for a relatively short period before settling/sinking (Koelmans et al. 2017).

However, Lebreton et al. (2019) developed a new global ocean surface mass balance budget for floating plastic debris, and on this basis predicted that the shoreline is capturing a major part of the "missing plastic," and that only a small fraction of buoyant macroplastics leaking into the ocean eventually escapes the coastal environment and accumulates in offshore waters. Essentially, the authors predict that of the mass of buoyant macroplastic that has entered the ocean since 1950 (an estimated 70 to 189 million metric tons), the majority (two-thirds or 46.7 to 126.4 million metric tons) has not disappeared from the ocean surface as a result of degradation, but is stored by the world's shoreline, where debris is stranded, settled and/or buried, undergoing episodes of capturing and resurfacing (Lebreton et al. 2019). The implications are that floating plastic debris is highly persistent (Lebreton et al. 2019).

Going forward, Lebreton et al. (2019) predict that under a business-as-usual scenario of ocean plastic pollution, the quantities of buoyant macroplastics at the surface and coastline could quadruple by 2050, while a scenario where pollution sources are stopped from 2020 onwards is predicted to reduce the floating and stranded mass of buoyant macroplastics by 59 and 57 percent respectively by 2050 (the mass of microplastics in the ocean and on beaches more than doubles from 2020 levels however, as material left in the environment slowly degrades).

In aggregate, the effects of plastic pollution on marine wildlife are considered to be severe as a result of ingestion and entanglement, and 693 different species have been estimated to be affected by marine debris (Gall and Thompson 2015). Once in the open waters, plastics tend to concentrate toxins, impacting megafauna when ingested (Tanaka et al. 2013), as well as lower–tropic organisms (Bakir et al. 2014) and their predators (Setala et al. 2014, Farrell and Nelson 2013). The problem is persistent, as photodegradation of plastics generally takes much longer in the ocean than on land, because ultraviolet light is absorbed rapidly by water (Andrady 2003).

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APPENDIX II. DETAILED DESCRIPTION OF METHODS USED

2.1 Conceptual Framework Guiding the Analysis

With the research objective to synthesize how governments are responding to the marine plastic pollution problem, these responses were defined as public policies—i.e., particular courses of action or inaction pursued by governments, individually or collectively (Heidenheimer et al. 1990). The synthesis of government responses was guided by the conceptual framework of a basic public policy cycle, described similarly albeit in different terms across a wide range of contexts to include: (1) the design of public policy (where problems are identified and prioritized, and solutions developed); (2) the delivery of public policy instruments (implementation); and (3) evaluation and adaptation (where progress is monitored and adjustments or adaptations made) (Gupta 2010). The public policy cycle provides a basic conceptual framework for analysis of government responses, and within that framework three interlinked concepts can describe aspects of the response: (1) the policy context in which the cycle occurs (e.g., the geographic context, socioeconomic context, etc.); (2) the policy instrument used by the government to effect social change (as designed and delivered); and (3) the policy instrument's effectiveness (the degree to which it achieves its goal, according to monitoring and evaluation) (Bemelmans-Videc et al. 1998). These instruments are the means by which governments attempt to achieve a stated goal (i.e., targeted outcomes), and can be identified from the public policy documents that describe them (i.e., the written statements of policy by one or more governments or organs of government). Hence, the public policy documents form the units of analysis in this study, and the policy instruments they describe are the variables of interest.

By definition, the instruments analyzed are those explicitly aiming to reduce plastic leakage and hence can be characterized as part of governments' response to the problem. At the same time, generally applicable waste management policies are considered fundamental to addressing the problem (Jambeck et al. 2015), even if they are not intending to do so (i.e., were not designed at least partially in response to the problem of plastic leakage). For this reason, such public policies expected to have an impact on the problem but for which intent to do so cannot be confirmed, are considered as part of the baseline or business-as-usual scenario, rather than a government response to the plastic pollution problem. For example, in this context, if

General Waste Management Policies (A) + Dedicated Policy Responses (B) = Total Government Response (C),

then B is only one tool in a government's toolbox. A review of general waste management polices is beyond the scope of this study (though general waste management policies found in the search for plastic policies have been maintained for further analysis), although a global review has been conducted for solid waste (World Bank 2018). A brief summary of this effort is provided in Chapter 3 (Section 3.1) as background (or baseline) to the explicit government responses characterized through the research. Additionally, a review of the literature describing effects

of general waste management policies on plastic leakage was conducted, in order to synthesize the state of the science on the contribution of these policies to solving the problem. This study aims to identify and characterize the additional response from governments (B), in order to help eventually estimate (C). In the final chapter of this report, the available information on the role of generally applicable policies (A) in reducing plastics leakage, is combined with the results of the analysis of policies specifically responding to the plastics problem (B), to form a fuller menu of options for governments.

2.2 Methods

In order to identify and characterize the public policy instruments governments have used to address this problem, synthesize the available information on how effective these instruments have been, and summarize the recommendations of scientists to policymakers, the following steps were followed:

- *Step one*: Construct a noncomprehensive global plastics policy inventory;
- *Step two*: Analyze the content of the policy documents in the inventory, to identify and characterize the instruments;
- *Step three*: Review the literature for measures of the effectiveness of the instruments; and
- *Step four*: Summarize the recommendations for policymakers from the scientific literature.

Step one: Constructing a noncomprehensive global Plastics Policy Inventory. The inventory of public policy documents describing government responses to the marine plastic pollution problem was constructed through several phases of searches, including of: (1) global policy databases as primary sources of data, (2) scientific literature and an ad hoc review of grey literature as secondary sources, and (3) media resources. As a cross-check, a number of experts were consulted to identify any gaps in the first iteration of the inventory.

In the first phase, a team of four researchers searched the following international databases containing public policy documents: ECOLEX, InforMEA, and the UN Ocean Commitments site. Detailed descriptions about them are provided below.

ECOLEX is an information service on environmental law and is operated jointly by the Food and Agriculture Organization of the United Nations (FAO), the International Union for Conservation of Nature (IUCN), and the United Nations Environment Programme (UNEP), which independently have their own legal databases. The database combines information from all three partners to serve as a comprehensive source on global environmental law and information. The three organizations receive information and multilateral, national, and subnational policies from governments, academia, NGOs, companies, and members of the public to collate this database. As a result, some geographies with more resources and capacity may have more representation in this database than others.

InforMEA is the United Nations Information Portal on multilateral environmental agreements facilitated by UNEP and supported by the EU. This database focuses on multilateral agreements and collects information through CoP decisions and resolution, MEA secretariats and other members, partner organizations, news, national reports, and implementation plans. InforMEA hosts annual steering committee meetings. Its stakeholders include 43 international and regional legally binding instruments from 18 secretariats and welcomes observers from other multilateral institutions. The database does include national level environmental policies as well. Available information suggests that InforMEA collects data through annual meetings and established relationships with stakeholders. As such, certain regions may be more represented than others.

The United Nations Ocean Commitments website stores a registry of voluntary commitments made by entities ranging from governments, intergovernmental organizations, civil society organizations, nongovernmental organizations, or corporations, among others, targeted to any or all components of UN SDG 14. The website supports search and filter functions to identify and follow-up on government responses to the plastic pollution problem. Some of these voluntary commitments were implemented through policies, while others were not. Commitments made by governments outside of this conference are not included in the database.

These three sites were selected because they provide users with comprehensive and up-to-date access to primary sources (i.e., policy documents themselves) on the international, regional, and national level, and to a lesser extent on the subnational level. In addition, they provide secondary and tertiary resources that describe policies, including newspaper articles, court decisions, and legal literature). The databases vary in terms of the range of their document libraries, whether or not they employ Boolean search rules and character limits, and the algorithms they employ to determine relevancy based on search queries. The limitations or biases of these databases include that they are not updated frequently enough to feature policies adopted in the year during which the search was conducted (2019), and there is some over representation of certain geographies, particularly English-speaking regions. Another limitation is that they do not typically include formal financial policies (e.g., a finance act) that may affect plastic product imports as those are not considered environmental policies by the database.

Based on scoping of the literature that identified a larger sample for trials in ECOLEX, a consistent set of key words was used for the searches (the databases do not support searches using Boolean combinations of terms), as shown in Box 1 below.

Box 1. Keywords Used to Search for relevant Public Policy Documents

Cigarette waste - Marine debris - Marine litter - Microplastic - Microfiber - Nurdle* - Nylon - Plastic - Polyethylene - Polymethyl methacrylate - Polypropylene - Polystyrene - Polyvinyl chloride - Shopping bag - Styrofoam - Synthetic disposable – Tire/Tyre - Beach clean-up - Coast* clean-up - River clean-up, - Recyclate - Polymer - Bioplastic - Oxodegradable

The results (i.e., public policy documents) of independent searches by each researcher were combined into one list (stored in an Excel database) unless the title or short description provided by the online database clearly indicated that the document was not relevant (e.g., a policy for sterilizing plastic gloves for surgery). Subsequently, duplicates appearing in multiple searches were removed. Each of the remaining documents was given a unique identification number and retained for screening. This list of documents was cross-checked against the nonsearchable Foreign Law Guide database, using the information provided in the database about the legal systems of countries around the world and citations to their legal publications, as well as a list of environmental policies by nation. The result was 682 policy documents for screening.

In the second phase, a library of scientific literature about public policies aiming to address marine plastic pollution was compiled, from searches of the following interdisciplinary or legal research databases: Web of Science, Google Scholar, and HeinOnline (legal literature). The Boolean combinations of terms (i.e., search strings) used for these databases included the terms in Box 1 related to plastic pollution, as well as additional terms related to policy that were identified based on terms associated with or descriptors of public policy and governance interventions that could address leakage of plastics. Hence, the first half of the search string consisted of terms relating to plastic pollution and the second half of terms relating to public policy and governance. Based on initial tests, the search string of terms related to plastic pollution was divided into three smaller strings: (1) more general, (2) less general, and (3) "poly" words, all in combination with the same terms for public policy and governance. These three strings were specified in order to target the most relevant articles among a high number of returns, allowing the most relevant articles to be more easily identified among the returns. For example, the string with "poly" words for plastic pollutants returned a significant number of articles related to the chemistry of plastics, which crowded out articles relating to plastic pollution. The three strings used are as follows:

- *Most general:* ("Marine debris" OR "Marine litter" OR Microplastic OR Microfiber OR Plastic NOT Surge* NOT elast*) AND (Policy OR Govern* OR Institution OR Law OR Regulat* OR Legal OR Intervention OR Infrastructure OR Coastal city OR Mega-city OR Municip* OR Subsidy OR subsidize OR Subsidies OR Ban OR bans OR banned OR Tax OR taxes OR taxed OR Fee OR Fees);
- *Less general:* (Nylon OR "Shopping bag" OR Styrofoam OR "Synthetic disposable" OR Tire OR Tyre OR "Cigarette waste" OR "Beach clean-up" OR "Coast* clean-up" OR "River clean-up") AND (Policy OR Govern* OR Institution OR Law OR Regulat* OR Legal OR Intervention OR Infrastructure OR Coastal city OR Mega-city OR Municip* OR Subsidy OR subsidize OR Subsidies OR Ban OR bans OR banned OR Tax OR taxes OR taxed OR Fee OR Fees); and
- *"Poly" words:* (Polyethylene OR Polymethyl methacrylate OR Polypropylene OR Polystyrene OR Polyvinyl chloride OR Recyclate OR Polymer OR Bioplastic OR Oxodegradable) AND (Policy OR Govern* OR Institution OR Law OR Regulat* OR Legal OR Intervention OR Infrastructure OR Coastal city OR Mega-city OR Municip* OR Subsidy OR subsidize OR Subsidies OR Ban OR bans OR banned OR Tax OR taxes OR taxed OR Fee OR Fees).

The "most general" search string above included two exclusions to further refine for relevant articles—(1) "NOT Surge*" and (2) "NOT elast*"—in order to remove results that address plastic surgery or mechanical engineering papers ("elastic-plastic" response). This exclusion further reduced the number of articles to screen and increased the density of relevant articles reviewed.

Using each of the above three search strings and the two exclusions for the most general string, the results were sorted by relevance, non-English articles and those published before 2000 excluded, and one researcher screened the top articles. As expected the most general string resulted in the highest number of potentially relevant articles to screen from each database, while the string for poly words resulted in the fewest For each search string, the most relevant articles were screened up to a preset number for a cutoff, after which the results were spot-checked at semi-systematic intervals (either 100 or 500 articles further away from the last relevant result). The lack of relevant articles found in these spot checks and the decreasing frequency of relevant articles in the strings indicated that the relevant results were captured through these methods. Returns were screened by first reviewing the title and then the abstract of the article, and articles were included if they met the following criteria:

- evaluated the effects of public policies introduced with the intention of reducing plastic pollution and/or were expected to have an impact on plastic pollution reduction; or
- primarily provided policy recommendations for reducing plastic pollution; or
- provided information to inform the development of policy recommendations.

Scientific surveys of plastic pollution that do not include a direct reference to an existing public policy in the abstract were excluded, unless presenting a comparison both before and after a policy was introduced. Additionally, articles presenting the results of scientific studies to test the efficacy and efficiency of different technologies for recycling or pyrolysis were excluded as outside the scope of this study.

The total number of articles screened and the returns for each search string and database are as follows:

- *Web of Science*: For the most general search string, the first 3,000 articles were screened out of 15,332 returns, and between returns 2,500 and 3,000 only five relevant articles were found, and no relevant articles were found within returns 3,450 and 3,500. For the less general string, the first 2,000 articles were screened out of 3,494 returns, and no relevant articles found after the first 1,000 returns, or within returns 2,450 and 2,500. For the poly words string, the first 1,000 articles were screened out of 37,881 returns, and no relevant articles found after the first 500 returns or within returns 1,450 and 1,500.
- *HeinOnline*: Legal texts were excluded to screen only articles, and based on the limited amount of returns a fewer number were screened. For the most general search string, the first 2,000 articles were screened out of 11,256 returns, and between returns 1,000 and 2,000 only three relevant articles were found, while no relevant articles were found within returns 2,100 and 2,200. For the less general string, the first 1,000 articles were screened out of 21,797 returns, and no relevant articles were found after the first 500 returns, or

within returns 1,100 and 1,200. For the poly words string, the first 600 articles were screened out of 3,802 returns, and no relevant articles after the first 500 returns or within returns 800 and 900.

- *Google Scholar*: The search strings were shortened to address the smaller text box, using either one, two, or three plastic pollution terms plus the string of terms for public policy and governance (altered to utilize the * wildcard on more terms in order to fit to the Google Scholar search box). The resulting shortened strings that were used are as follows: ("PLASTIC WORD") AND (Policy OR Govern* OR Institution OR Law OR Regulat* OR Legal OR Intervention OR Infrastructure OR Coastal city OR Mega-city OR Municip* OR Subsid* OR Ban* OR Tax* OR Fee*); with the following "plastic words" used: for most general – "Marine debris," "Marine litter," (Microplastic OR Microfiber), Plastic; for less general – (Nylon OR "Shopping bag" OR Styrofoam), (Tire OR Tyre), "Cigarette waste," ((Beach OR Coast* OR River) AND clean-up); and for poly words – (Polyethylene OR Polymethyl methacrylate OR Polypropylene), (Polystyrene OR Polyvinyl chloride), (Recyclate OR Polymer), (Bioplastic OR Oxodegradable OR "synthetic disposable"). For the most general search string, the first 500 articles were screened, while the first 300 returns were screened for the less general terms, and the first 130 returns were screened for the poly words. The string with "cigarette waste" only returned 117 results, so all returns were screened. In total, a similar number of articles were screened as to the HeinOnline database: 2,000 for most general, 1,000 for less general, and 550 for poly words. After the first 250 returns for each of the less general terms and the first 100 returns for the poly words, only one relevant article was found in screening of additional returns. Of note, Google Scholar also returned theses and dissertations, which were excluded.

The results from the screening process were stored in a Zotero catalog and tagged based on the type of study, either "review," "single study," or "law review," and the level of intervention, as either "international," "national," or "subnational." The results were organized into four categories of a library on plastic pollution policy, as follows:

- *Plastics policy effectiveness literature*: 136 articles about public policies introduced with the clear intention of reducing plastic pollution (16 of these were grey literature papers returned from Google Scholar);
- *Generally applicable policy*: 67 articles about public policies observed or expected to have an impact on reducing plastic leakage, but were not introduced with the explicit intention of doing so (e.g., solid waste management policies);
- *Plastic policy recommendations*: 41 articles that primarily give proposals of how to improve current public policy or introduce new policies; and
- *Potentially relevant studies*: 71 articles that provide information that could be instructive for the development of public policy recommendations, but do not directly address effectiveness of policies (e.g., those studies that addressed public perception of policies to

reduce plastic pollution, conducted a life cycle analysis, addressed economic impacts of marine pollution, or addressed norm diffusion in policy formation).

In addition, a residual of 65 articles was retained for further review in the future (i.e., a second opinion), where the relevance was unclear according to the inclusion and exclusion rules.

Finally, from the library constructed the category for plastics policy effectiveness literature was reviewed (136 articles) by one researcher and all specific public policies described were logged in a database as plastics policy references, together with the sources, for possible inclusion in the inventory.

In addition to the scientific literature, an ad hoc review of key studies in the grey literature was conducted, by two researchers in order to identify policy documents for potential inclusion in the inventory. Studies published after 1999 were identified based on searches of websites for global organizations conducting research on the marine plastic pollution problem (using a single keyword "plastic"), including:

- the European Commission (directed to the following site: http://ec.europa.eu/environment/waste/plastic_waste.htm, last accessed on June 20, 2019, resulting in review of nine reports, annexes, and staff working documents supporting the European Strategy for Plastics);
- the Food and Agriculture Organization of the United Nations (FAO) (322 returns to a search of the publications page of the FAO website (http://www.fao.org/home/en/) on June 19, 2019, from which non-English documents and newsletters were excluded, and based on a review of titles and abstracts, two reports reviewed);
- the Organisation for Economic Co-operation and Development (OECD) (four returns to the search of the OECD Library Publications site on April 10, 2019, resulting in one report reviewed),
- the United Nations Environment Programme (UNEP), (22 returns to a search of the UNEP website (https://www.unenvironment.org/) on April 10, 2019, from which PowerPoint presentations and infographics were excluded, resulting in a total of eight reports reviewed);
- the United Nations Industrial Development Organization (UNIDO) (72 returns to a search of the UNIDO publications database on June 19, 2019, from which workshop proceedings were excluded and based on a review of titles, one report reviewed);
- the World Bank (82 returns to the search of the publications page on the World Bank website (https://www.worldbank.org/) on June 19, 2019, from which Briefs—rather than reports or working papers—were excluded, and based on a review of titles and abstracts, one report reviewed);
- the International Union for Conservation of Nature (IUCN) (four returns to the search of the IUCN Library system on June 20, 2019, resulting in three reports reviewed);

- the World Economic Forum (three returns to the search of the World Economic Forum website (https://www.weforum.org/) on June 20, 2019, resulting in two reports reviewed);
- the World Resources Institute (WRI) (one return to a search of the publications page of the WRI website (www.wri.org) on June 19, 2019, which was not reviewed); and,
- the World Wildlife Fund (WWF) (860 returns to a search of the WWF website (https://www.worldwildlife.org/) on June 19, 2019, from which the 100 most relevant were screened by title and abstract, and one report reviewed).

The reports identified in the above ad hoc searches were reviewed for references or descriptions of specific public policy documents describing efforts to reduce plastics leakage, and each reference logged in a database as plastics policy references (based on the description or information available in the text, including the underlying sources where given), for possible inclusion in the inventory.

The full log of references to policy documents from the review of the scientific literature and the review of the ad hoc literature, was subsequently reviewed to remove duplicates and references to documents outside of the study period, based on the following rules:

- Policies that were identified from the grey literature without a date that had the same name in the database with a date were assumed to be the same document;
- The newest version of the same policy was added to the database and the outdated version was removed; and
- A grey literature reference to an unnamed policy that had a likely corresponding policy based on country, type of plastic (e.g., plastic bags), and time period in the database were assumed to be duplicates.

On this basis, copies of the policy documents referred to in the literature were located based on the following steps: (1) identify if the reference itself provides a website link to the policy document, (i2) search global databases using the description or name: ECOLEX, InforMEA, FAOLEX, (3) search for the policy document on government websites of the country or municipality with legislation, or through their respective national gazette, (4) search the website of the environmental agency of the government of the country where the policy is referenced, and (5) general Google search by name or description of the policy document.

For those countries estimated to be among the top 50 in mismanaging plastic waste (Jambeck et al. 2015) but where no national policy documents had been found and screened into Tier 1 as plastics pollution policies and where a policy had been referenced in the scientific or grey literature, a more targeted and detailed search was conducted as follows: (1) using Google Search to identify any mention of the policy on a range of media (government websites, press releases, nongovernment organization reports, media); (2) search FAOLEX for the policy document; and (3) search Google based on available description. A total of 12 additional policy documents were added as a result.

The remaining references for which the policy documents could not be found were stored in a separate database to the inventory, with all available metadata included (i.e., level of intervention—international, national, or subnational, description of the policy, geographic area of jurisdiction, and year enacted) as "Policy documents not found." The total number of references to policy documents which could potentially be included in the inventory but for which the policy document has not been found for review is as follows:

- International level: 1
- National level: 175
- Subnational level: 266

In the third phase of searches to construct the global inventory, media feeds were reviewed by using Google's feature to search for news feeds exclusively. In order to broaden returns to include announcements related to policy commitments, the terms "commit*," "pledge," and "aim*" were added to the following search string: Cigarette waste OR Marine debris OR Marine litter OR Microplastic OR Microfiber OR Nurdle* OR Nylon OR Plastic OR Polyethylene OR Polymethyl methacrylate OR Polypropylene OR Polystyrene OR Polyvinyl chloride OR Shopping bag OR Styrofoam OR Synthetic disposable OR Tire OR Tyre OR Cigarette waste OR Beach clean-up OR Coast* clean-up OR River clean-up OR Recyclate OR Polymer OR Bioplastic OR Oxodegradable; Policy OR Govern* OR Institution OR Law OR Regulat* OR Legal OR Intervention OR Infrastructure OR Coastal city OR Mega-city OR Municip* OR Subsid* OR Ban* OR Tax* OR Fee* OR State* OR Declar* OR Target* OR Commit* OR Pledge OR Aim.*

The first 150 to 200 returns (15 to 20 results pages) were reviewed by title and where the title was relevant the entire news feed/article was reviewed, and then searches and reviews repeated just for the following time periods: 2000–2004, 2005–2009, 2010–2015, and 2015 to March 31, 2019. Policies referenced in the news feeds were first compared to the results of the searches of the global database, and if not already found then an individual search in Google was conducted to locate the policy document. If found the document was added to the other results for screening into the inventory, if not then the policy was recorded in a separate list of government commitments not yet enacted. This phase only resulted in six policy documents for screening into the inventory that were not already located via the searches of the global database (first phase described previously in this Appendix).

The results of these three phases of searches—(1) global policy databases as primary sources of data, (2) scientific literature and an ad hoc review of grey literature as secondary sources, and (3) media resources—yielded a total of 976 policy documents for screening into the inventory. Of these 105 policy documents were in languages other than English, but with titles and/or descriptions that indicate they aim to address plastic pollution. Those documents in French or Spanish were translated using Google Translate and then reviewed and corrected by speakers with language proficiency. The subsequent unofficial translations were then added to the body of policy documents for screening, adding 16 French and 14 Spanish policy documents for screening. The remaining 75 non-English policy documents were stored in a separate list within the inventory.

In this screening process, one researcher reviewed the relevant text of each document first (i.e., where the key words were found), and where unclear reviewed the whole document, in order to organize the policy documents into one of four categories in the inventory, as defined below:

(1) *Plastic Pollution Policies* [Tier 1]: Policy documents where the intent of the government is clearly the reduction of plastic leakage into the environment at any point in the plastic life cycle;

(2) *Generally Applicable Policies* [Tier 2]: Policy documents that may have an impact on the quantity or quality of plastic leakage into the environment, but where the intent of these policies as it relates to plastic leakage cannot be inferred from the document itself; and

(3) *Excluded Policies* [Tier 3]: Policy documents where the specific intent and direct impact on plastic leakage at any stage in the life cycle is unclear, ambiguous, or absent, but plastics are peripherally associated with the policy itself.

A final cross-check was conducted through consultation with experts. A first request for feedback was sent to a total of 21 experts identified through partners and existing professional networks, of which nine responded and suggested a total of 33 additional policy documents for screening—of which 14 were screened into the list of plastic pollution policies [Tier 1]. Figure 1 (next page) summarizes the steps completed to construct the Inventory.

Figure 1. Summary of Steps to Construct a Global Plastics Policy Inventory

The result is a first Global Plastics Policy Inventory that includes 291 policy documents explicitly aiming to address plastic pollution since 2000, as well as 370 policy documents expected to have an impact on plastic pollution. The latter were identified in searches because of keywords related to plastic pollution in some way, but is certainly not comprehensive and does not include a larger number of policy documents that may include no mention of any plastic materials or pollutants, but nonetheless may be expected to have an impact on the plastic pollution problem.

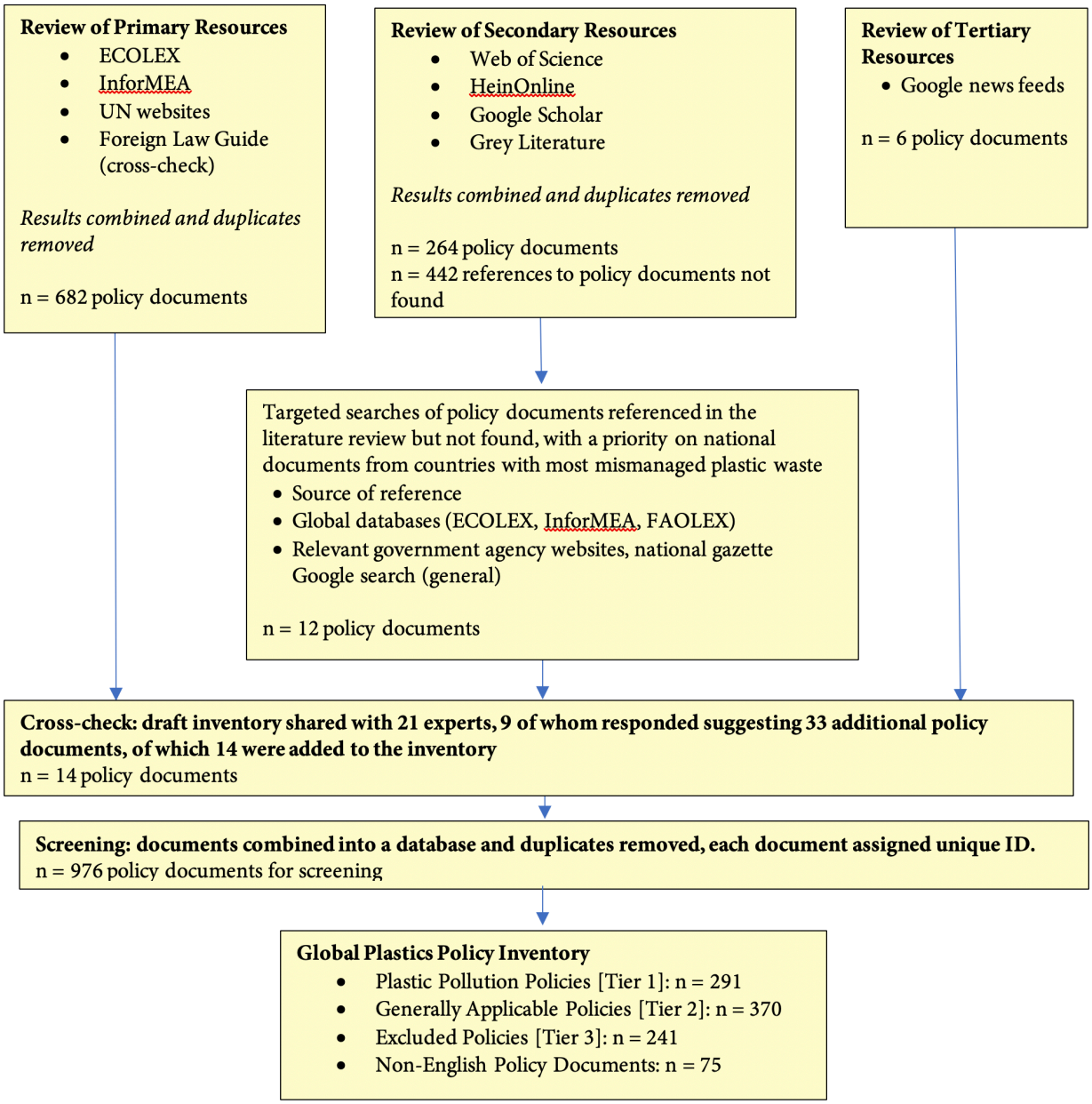
In addition, 75 non-English policy documents have been retained for future translation and screening, to be added to this Inventory. Finally, 442 references to plastics policy documents from the scientific and grey literature reviewed have been logged, where the actual policy document has yet to be located. Of these 442 references, 175 are for national policies, and for 68 of these a range factors contributed to a low confidence that the policies were actually enacted (e.g., spelling errors, duplication to other references, etc.).

Caveats and limitations of the Inventory. The Global Plastics Policy Inventory is certainly not comprehensive, and is limited by a number of constraints, including: (1) language constraints, as searches were conducted in English; (2) subnational policies (e.g., at the municipal level) are not maintained in global databases and those that are studied in the literature may reflect a publication bias; and (3) the searches may simply not have been conducted in enough places or extensively enough to capture all of the public policy responses to the marine plastic pollution problem.

That said, the initial searches and cross-checks conducted to date provide the following levels of confidence in the completeness of the Inventory, based on the following ratios of policy documents in the inventory to the total known/referenced policy documents (i.e., the number of policy documents found in the searches + the number of policy documents referred to in the literature reviewed, but for which the documents were not found): (1) high confidence = 75 percent or higher; (2) medium confidence = 40 to 75 percent; and (3) low confidence = 0 to 40 percent.

- *International – high confidence*: 67 Tier 1 policy documents of the 69 total known/referenced policy documents (i.e. ,67 Tier 1 policy documents, one non-English policy document, and one policy referenced but for which the document was not found), for a total coverage of 97.1 percent;
- *National – medium confidence*: 147 Tier 1 policy documents of the 377 or 309 (i.e., 147 Tier 1 policy documents, 55 non-English policy documents, and 107–175 policies referenced but for which the documents were not found) total known/referenced policy documents (i.e., documents referenced in the literature reviewed but not found, and documents found but not translated into English), for a total coverage of 39.0 or 47.6 percent (in terms of the coverage of countries, there are 116 different countries with at least one policy document in the Inventory, out a total of 143 countries with at least one known/referenced policy document); and

- *Subnational – low confidence*: 77 Tier 1 policy documents of the 362 total known/ referenced policy documents (i.e. 77 Tier 1 policy documents, 19 non-English policy



documents, and 266 policies referenced but for which the documents were not found), for a total coverage of 21.3 percent.

On the basis of the above proposed confidence levels, the inventory of international plastics policy documents could be considered representative of the international agreements made from 2000 to the end of the first half in 2019, including both global and regional agreements. At the national level, the inventory of plastics policy documents could be considered indicative of the diversity and types of government responses, though not necessarily representative given the

English language limitation of the searches. Nonetheless, the subset is large enough and diverse enough to give some indication of how governments are responding at the national level to the marine plastic pollution problem. Finally, the inventory of subnational plastics policy documents should be considered as neither representative nor indicative, but simply a collection of available examples that may serve as a resource for policymakers.

Step two: Content analysis of the plastic pollution policies in the Inventory. Each of the 291 of plastics policy documents in the Inventory was coded using NVIVO qualitative analysis software in order to identify and characterize the policy instrument (the design of the policy response) and the enforcement mechanisms defined to help deliver these instruments, drawing upon the conceptual framework described previously. To guide the analysis a codebook was developed to classify:

(1) The policy instruments comprising the government's response, considered as multidimensional variables, in terms of:

   (a) The type of instrument,

   (b) The type of plastic pollutants targeted by the instrument, and

   (c) The stage of the life cycle of the plastic targeted; and

(2) Any associated enforcement mechanisms defined to help deliver the instruments.

The types of policy instruments were defined as one of three mutually exclusive categories:

(1) Regulatory instruments – measures taken by governmental units to influence people by means of formulated rules and directives which mandate receivers act in accordance with what is order in these rules or directives which can be affirmative (i.e., requiring an action) or prohibitive (i.e., prohibiting an action);

(2) Economic instruments – characterized as involving the handing out or taking away of material resources while the addressees are not obligated to take the measures involved (can be an incentive, such as a subsidy, or a disincentive, such as a tax); and

(3) Information instruments – attempts at influencing people through the transfer of knowledge, the communication of reasoned argument and persuasion (Bemelmans-Videc et al. 1998).

For each of these three types of policy instruments, a number of common and specific instruments used to address plastic leakage were identified as subcategories, e.g., bans on specific products, recycling mandates, taxes on products, etc. These subcategories were tested on a wide range of policy documents, which given the heterogeneity of the data, required revisions and consolidations until a streamlined typology of plastic policy instruments was developed that could fit to the dataset. This typology is given in Section 3.2.

For the type of plastic pollutants, a lack of standardized terms to define different types of plastic pollution (i.e., plastic litter) has been a challenge to local and global monitoring assessments (GESAMP 2019). At the highest level, plastic pollutants can be identified in terms of the source

activities: (1) land-based activities or (2) maritime activities. Additionally, plastic pollutants can be defined in terms of size, though there has been debate in recent years over the definitions of different size classes to use (Ryan 2015), with the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) providing the following classes and definitions:

- Megaplastics: > 1 meter
- Macroplastics: 25 to 1,000 millimeters
- Mesoplastics: 5 to 25 millimeters
- Microplastics: < 5 millimeters
- Nanoplastics: < 1 micrometer (GESAMP 2019)

Unfortunately, policy documents have not uniformly defined the size classes of plastic pollutants targeted according to these standards, and based on initial testing only two size classes were retained for general applicability: macroplastics (implicitly including mega and mesoplastics), and microplastics (implicitly including nanoplastics). Additionally, given the data two specific categories of plastic types within these sizes were defined: plastic bags (macroplastic) and tire abrasion (microplastic). The resulting categories for the types of plastic pollutants were a mix of sources and sizes as follows:

- Macroplastics from land-based activities, excluding plastic bags,
- Plastic bags,
- Microplastics from land-based activities, excluding from tire abrasion,
- Microplastics from tire abrasion,
- All plastic pollutants from maritime activities, and
- All plastics pollutants of any type (general).

For the stage of the life cycle of plastic pollutants, the following generic stages were taken as a starting point and adapted based on the data (e.g., adding a stage for imports to reflect product import bans): (1) plastic production, (2) materials and product design, (3) waste generation, (4) waste management, (5) litter capture, and (6) the environment (ocean) (Jambeck et al. 2018, PlasticsEurope 2018). These are also consistent with the stages identified in Steensgaard et al. (2017). See Table 1 below for the resulting stages identified and used in the analysis.

Table 1. Codebook Used in the Analysis of Plastics Policy Documents

Variable	Dimension	Code	Sub-Code (if any)
Policy Instrument	Type of instrument	Regulatory – affirmative	• Develop new, or improve existing process or product • Plan/commitment • Postleakage plastic capture • Responsible handling of plastic
		Regulatory – prohibitive	• Ban plastic • Irresponsible handling of plastic • Limit plastic
		Economic	• Disincentive (fee, tax, levy, duty) • Cash for return • Subsidy • Tax break
		Information	• Education or outreach • Label or placards • Research, data collection, data reporting or record keeping
	Type of plastic pollutants targeted	Macroplastics from land-based activities, excluding plastic bag	
		Plastic bags	
		Microplastics from land-based activities, excluding tire abrasion	
		Microplastics from tire abrasion	
		Plastic pollutants from maritime activities	
		All plastic pollution	
	Stage of the life cycle of the plastic targeted	Production	
		Import	
		Selling	
		Use	
		Disposal	
		Collection	
		Recycling	
		Reuse	
		All	
Enforcement mechanisms		Enforcement	

In summary, the codebook was developed iteratively over time, based on multiple tests with samples of policy documents in the inventory, among a team of three researchers. As mentioned previously, categories used as codes needed to be broad to accommodate the heterogeneity of policies across different levels in the Inventory, which included a broad range of language used to describe similar concepts, as well as in the amount of language to describe similar instruments. Initial attempts to accommodate this diversity failed to produce a set of codes that could be used across the different policy documents and contexts to produce a standardized and comparable set of results, as reflected in low inter-rater reliability (IRR) scores between the three researchers indicating that the codebook did not provide appropriate codes for the researchers to similarly describe the same dimensions of a policy instrument. The codebook was edited iteratively with IRR tests conducted to demonstrate a change in scores. The resulting final codebook is shown in Table 1 and was considered applicable for all of the policy documents in the Inventory, and on the basis of higher IRR scores also considered robust enough to conduct analyses that could achieve the objectives of the study (see Table 2 below).

For IRR measures two metrics were used: (1) percentage agreement and (2) Cohen's Kappa, a quantitative measure of the magnitude of agreement among coders (Cicchetti and Feinstein 1990, Feinstein and Cicchetti 1990). Cohen's Kappa is a measure of agreement that takes into account the likelihood of the agreement between users occurring by chance. Therefore, percentage agreement can be high, while the value of Cohen's Kappa is low in cases where the likelihood of agreement is high. For the purposes of this analysis, "agreement" referred to the consistent selection (among the analysts) of relatively small amounts of text within the policy documents often longer than 100 pages. The term "coding" referred to the consistent application (among the analysts) of the codebook shown above, by marking sections of the selected test as one or multiple coding options.

The literature on the interpretation of Cohen's Kappa ranks the overall average score among the three analysts as "weak" (McHugh 2012), "moderate" (Viera and Garrett 2005), and "fair to good" (QSR International 2020). The percentage agreement was consistently above 99% in all IRR tests, caused by the fact that typically only very small sections of the policy documents contained information relevant to the plastic pollution issue (the objective of the analysis). Since only this small fraction of the policy documents was typically coded, in the case of small disagreements among analysts (e.g., the inclusion of commas, section headings, or small sections of irrelevant text) the Kappa score would decrease, while the percentage agreement (within just the coded text) would remain essentially unchanged at almost 100%.

Table 2. Inter-Rater Reliability Scores (Cohen's Kappa) of the Researchers

IRR Test	1	2	3	4	Overall Average
Document	5 Documents	3 Documents	1 Document	1 Document	
Document type	All Levels	International	Subnational	Subnational	
Coder 1 & 2 score	0.3	0.8	0.5	0.6	0.55
Coder 1 & 3 score	0.3	0.7	0.6	0.5	0.53
Coder 2 & 3 score	0.7	0.8	0.5	0.6	0.65
Average score	0.43	0.77	0.53	0.57	0.58

Note: Percentage agreement was consistently above 99% for all IRR Tests.

Step three: Review the literature for measures of the effectiveness of the instruments. The scientific and grey literature were reviewed in order to synthesize any measures of outcomes attributed to plastics policy instruments, including unintended outcomes, as well as any contributing factors (i.e., enabling conditions) or constraints to those outcomes. For the scientific literature, the plastics policy effectiveness literature identified in the literature review conducted in step one above, was reviewed in detail (n = 136 papers). All quantitative and qualitative measures of outcomes attributed to a given policy instrument were extracted, including unintended outcomes, and stored in a database linked to the relevant instrument and policy document in the Inventory (and its metadata, as well as the source of the outcome measures), together with any text describing contributing factors to the outcomes observed or predicted. Given that this literature had already been reviewed to identify relevant policy documents, all outcomes could be linked either to a policy document in the Inventory, or a reference to a policy document not yet found. Additionally, the grey literature reviewed in the ad hoc search for plastics policy documents in step one above, was also reviewed in order to extract any measures of outcomes attributed to the instruments described in these policy documents. The combined results from this review provide a state of the science on the effectiveness of plastics policy instruments (considering articles published up to March 31, 2019).

Step four: Summarize the recommendations for policymakers from the scientific literature. An extensive review of the scientific literature on plastics policies was conducted in order to extract and summarize the recommendations for design and delivery of public policy. This review included: (1) the plastics policy effectiveness literature identified in the literature review conducted in step one above (n = 136 papers); (2) the additional papers generated from that review that included articles that primarily give proposals for how to improve current public policy or introduce new policies (n = 41 papers); and (3) recommendations emerging from 67 articles about public policies observed or expected to have an impact on reducing plastic leakage, but were not introduced with the explicit intention of doing so (e.g., solid waste management policies). The recommendations or proposals for public policy to address the marine pollution problem were identified and then summarized to identify similar groups of recommendations and proposals, as well as any key trends.

Methods Used for Review of Technologies in Box 2

Two researchers searched Google for announcements in press releases, key events, or other media that identified technological innovations that have been created to reduce plastic pollution in the ocean. A consistent set of keywords were used (using Boolean combinations of terms) in the search (see below). The search results were reviewed to extract information on new technological inventions that have been created to prevent new or reduce existing marine and riverine plastic pollution. Information on the development and deployment of these technologies, as well as geographic location of invention, was noted and included in this catalogue.

Search Terms	
"Cigarette waste" and "Invent*"	"marine waste" AND "collect" AND "tech"
"Marine debris" and "Tech"	"marine debris" AND "collect" AND "tech"
"Marine debris" and "Invent*"	"marine litter" AND "collect" AND "tech"
"Marine litter" and "Invent*"	"marine waste" AND "collect" AND "invent"
"Microplastic" and "Invent*"	"marine debris" AND "collect" AND "invent"
"Microfiber" and "Invent*"	"marine litter" AND "collect" AND "invent"
"Nurdle*" and "Invent*"	"marine waste" AND "cleanup" AND "invent"
"Nylon" and "Invent*"	"marine debris" AND "cleanup" AND "invent"
"Marine Plastic" and "Invent*"	"marine litter" AND "cleanup" AND "invent"
"Ocean Plastic" AND "Invent"	"marine waste" AND "remove" AND "invent"
"Polyethylene" and "Invent*"	"marine debris" AND "remove" AND "invent"
"Polymethyl methacrylate" and "Invent*"	"marine litter" AND "remove" AND "invent"
"Polypropylene" and "Invent*"	"plastic" AND "remove" AND "waterway"
"Polystyrene" and "Invent*"	"plastic" AND "collect" AND "waterway"
"Polyvinyl chloride" and "Invent*"	"plastic" AND "remove" AND "ocean"
"Shopping bag" and "Invent*"	"plastic" AND "collect" AND "ocean"
"Styrofoam" and "Invent*"	"litter" AND "trap" -cat
"Synthetic disposable" and "Invent*"	"trash" AND "marine" AND "technology"
"Tire" and "Invent*"	"ocean" AND "booms"
"Tyre" and "Invent*"	"river" AND "booms"

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APPENDIX III. SUMMARY OF INTERNATIONAL POLICY INSTRUMENTS AT THE GLOBAL LEVEL

Key Actions or Instruments Recommended for National Governments to Take, By Policy

2002: UNEP/CHW.6/21 Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Note by the Secretariat: Technical guidelines for the identification and environmentally sound management of plastic wastes and for their disposal

- Adopts technical guidelines for sound management of plastic wastes and for their disposal contained in UNEP/CHW.6/21; and invites parties to use the technical guidelines.

2005: UNGA Resolution/60/31 Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments

- Calls upon states to take action to address the issue of lost or abandoned fishing gear and related marine debris, including through the collection of data on gear loss, economic costs to fisheries and other sectors, and the impact on marine ecosystems. Also […] Encourages states to collect data, studies, introduce economic instruments, develop best management practices, develop joint prevention and recovery programs, establishing clearing house mechanism for information exchange on fishing net types (including national inventories), raise awareness.

2011: The Honolulu Strategy – A Global Framework for Prevention and Management of Marine Debris

Strategies recommended to reduce amount and impact of land-based sources of marine debris include:

(i) education and outreach on impacts and need for improved solid waste management;
(ii) market-based instruments to support solid waste mgt;
(iii) employ infrastructure for improving stormwater management and reducing discharge of solid waste into waterways;
(iv) legislation and policies to support solid waste minimization and management;
(v) improve regulatory frameworks regarding stormwater, sewage systems, and debris in tributary waterways;
(vi) build capacity for monitoring and enforcement of compliance;
(vii) conduct regular cleanup efforts, especially hotspots

Strategies recommended to reduce amount and impact of maritime sources of marine debris include:

(i) education and outreach,
(ii) waste minimization and proper waste storage at sea, and disposal at port reception facilities, to minimize ocean dumping;
(iii) legislation and policies to prevent and manage marine debris and implement requirements of MARPOL Annex V;
(iv) build monitoring and enforcement capacity

2011: UNEP/Resolution/10.4 Tenth Meeting of the Conference of the Parties to the Convention on Migratory Species – Marine Debris

- "Encourage parties to identify coastal and oceanic locations where marine debris aggregates"
- "Recommends that Parties develop and implement their own national plans of action … address the negative impacts of marine debris in waters within their jurisdiction"

2012: UNEP/GPA/IGR.3/5 Third Session of the Intergovernmental Review Meeting on the Implementation of the Global Program of Action for the Protection of the Marine Environment from Land-Based Activities – Draft Manila Declaration

- General call to find innovative solutions to marine litter, through full range of instruments (generic), best practices, information - non-specific; recommends the establishment of a global partnership on marine litter
- GPA coordination office should focus its work in 2012-2016 on nutrients, litter and wastewater as three priority source categories

2014: UNEP/CMS/Resolution 11.30 Eleventh Meeting of the Conference of the Parties to the Convention on Migratory Species – Marine Debris

- Invites countries to consider: (i) levies on single-use carrier bags, (ii) deposit refund systems for beverage containers, (iii) obligations to use reusable items at events as appropriate
- Encourages parties to address the issue of abandoned, lost or otherwise discarded fishing gear (ALDFG)
- Encourages parties to include the prevention and management of marine debris in relevant national legislation
- Calls upon parties to incorporate marine debris targets when developing marine debris management strategies

- Encourages parties to establish public awareness campaigns to assist in preventing waste from reaching marine env., and set up management initiatives for removal of debris
- Encourages parties to consider looking at the prevalence of all the types of debris that may have impacts on migratory species, within established monitoring programs. Invites CMS Secretariat to work w UNEP Regional Seas Programme to support standardization of monitoring methods for impacts of debris
- "Encourages the Scientific Council… to promote the prioritization of research into the effects of microplastics on the species ingesting them"
- Encourages parties to use existing monitoring programs to track marine debris that may have an impact on migratory species
- Calls upon parties to incorporate marine debris targets when developing marine debris management strategies, including targets related to impacts on migratory species
- Recommends that parties planning to introduce regulatory or economic measures to reduce the amount of waste entering the env., accompany these with behavioral change campaigns
- Encourages parties to address the issue of ALDFG by following strategies set out in the Code of Conduct for Responsible Fisheries

2014: UNEA/Resolution 1.6 Marine Plastic Debris and Microplastics

- Encourages governments to take action through legislation, enforcement of international agreements, provision of adequate reception facilities for ship-generated wastes, improve waste mgt practices and support beach clean-ups, as well as info, education and awareness programs
- Encourages governments to work with the Global Partnership on Marine Litter to implement Honolulu Strategy
- Emphasizes that further action is needed to address the challenges posed by marine plastic debris and microplastics, by addressing such materials at source, by improving waste management practices and by cleaning up existing debris and litter

2015: UNGA Resolution 70/235. Oceans and the Law of the Sea

- Encourages states to meet the commitment in Future We Want resolution (UNGA); and
    - Urges states to integrate the issue of marine debris into national strategies dealing w waste management, especially in the coastal zone, ports and maritime industries; consider developing integrated waste management infrastructure; develop economic incentives to reduce marine debris; provide an incentive to use port reception

facilities; support measures to prevent, reduce and control pollution from any source, including land-based sources; raise awareness

2016: CBD/COP/DEC/XIII/10 Thirteenth Meeting of the Conference of the Parties to the Convention on Biological Diversity – Addressing impacts of marine debris and anthropogenic underwater noise on marine and coastal biodiversity

- Invites gov.'s to consider EPR as a response to damage or sufficient likelihood of damage to coastal and marine biodiversity from marine debris
- CBD secretariat to facilitate collaboration with Gov.'s and other relevant organizations on the application of measures to prevent and mitigate the impacts of marine debris on coastal and marine biodiversity and habitats
- Voluntary guidance that suggests priority actions to deal w land-based sources of marine debris include: "promote structural economic changes that would reduce the production and consumption of plastics, increase production of environmentally friendlier materials, and support the development of alternative materials, increase recycling and reuse and support an enabling environment for these changes through capacity-building, regulations and standards and cooperation among industry, governments and consumers." Also suggests […] support[ing] "the design of products that are long-lasting and reusable, reparable, re-manufacturable and recyclable with the most effective use of resources." Also suggests […] limit[ing] "superfluous consumption by enabling consumers to make responsible, well-informed decisions and discouraging inappropriate disposable behavior"; [improving] "the waste management systems of countries through sharing of best practices"; [promoting] "reusing and recycling over incineration and landfilling" and "best practices along the whole plastics manufacturing and value chain from production to transport, such as aiming for zero loss"; and identify[ing] "baseline data on the main land-based sources [of marine debris]"
- Voluntary guidance that suggests priority actions to deal w land-based sources of marine debris include: "assess whether different sources of microplastics and different products and processes that include both primary and secondary microplastics are covered by legislation, and strengthen […] the existing legal framework […] so that necessary measures are applied, including through regulatory and/or incentive measures to eliminate the production of microplastics that have adverse impacts on marine biodiversity."

2016: UNEA Resolution 2/11 Marine Plastic Litter and Microplastics

- "While research already undertaken provides sufficient evidence of the need for immediate action, more research is needed on marine plastic debris and microplastics" and urges governments at all levels to support such research

- UNEP to assist states to develop national action plans, recognizing that targeted measures in regions that are the largest sources are especially important for global reduction of marine plastic debris and macroplastics
- Encourages establishment of international monitoring standards for marine plastic debris and microplastics
- Requests UNEP to undertake an assessment of the effectiveness of relevant international, regional and sub-regional governance strategies and approaches to combat marine plastic litter and microplastics.
- Invites states to organize and/or participate in annual campaigns for awareness-raising, prevention and environmentally-sound clean-up of marine litter
- "Encourages the establishment of a harmonized international size definition and terminology and compatible standards and methods for the monitoring and assessment of marine plastic debris and microplastics, as well as … cooperation on cost-effective monitoring"
- Encourages manufacturers to consider impacts of products containing microbeads … and eliminate or reduce the use of primary microplastic particles in products

2016: UNGA A/RES/71/257 Oceans and the Law of the Sea

- Calls upon states to implement UNEA Resolution 2/11 on marine plastics litter and microplastics
- "Encourages states as appropriate, to address marine debris and microplastics in the marine debris and microplastics in the marine environment"

2017: Basel Convention – Work Programme 2018–2019

- "Consider relevant options available under the Convention to further address marine plastic litter and microplastics, taking into account the assessment requested by UNEA in Res. 2/11 … and develop a proposal for further action"

2017: 13th Conference of the Parties to the Basel Convention – BC-13/11: Technical Assistance

- Encourages regional and coordinating centers interested to work under the Basel Convention on the impact of plastic waste, marine plastic litter, microplastics and measures for prevention and environmentally sound management

2017: UNEP CMS Resolution 12.20 – Management of Marine Debris

- Requests CMS Secretariat to engage actively with the Global Partnership for Marine Litter, focus on impacts of marine debris on migratory species, and to work with UNEP Regional Seas Programmes to support standardization and implementation of methods for studies monitoring impacts on different species groups

2017: G20 Action Plan on Marine Litter

Recommended actions include:

- Promote the socio-economic benefits of establishing policies to prevent marine litter
- Promote waste prevention and resource efficiency
- Significantly reduce the use of micro-beads and single-use plastic bags and where appropriate phase them out
- Significantly reduce the loss of plastic pellets during production and transport
- Promote sustainable waste management[—s]upport integrated sustainable waste management including infrastructure (for collection and treatment)
- Promote effective waste water treatment and storm water management
- Raise awareness, promote education & research
- Strengthen the engagement of stakeholders

2018: G7 Ocean Plastics Charter

Participating governments commit to promote:

- "Sustainable design, production and after-use markets" by "working with industry towards 100% reusable, recyclable, or, where viable alternatives do not exist, recoverable, plastics by 2030; … taking into account the full environmental impacts of alternatives, significantly reducing the unnecessary use of single-use plastics; using green public procurement to reduce waste and support secondary plastics markets and alternatives to plastics; … working with industry towards increasing recycled content by at least 50% in plastic products where applicable by 2030; … supporting secondary markets for plastics including using policy measures and developing international incentives, standards or requirements for product stewardship, design and recycled content;…[and] working with industry towards reducing the use of plastic microbeads in rinse-off cosmetic and personal care consumer products, to the extent possible by 2020, and addressing other sources of microplastics."
- "Collection, management and other systems and infrastructure" by "working with industry and other levels of government, to recycle and reuse at least 55% of plastic

packaging by 2030 and recover 100% of all plastics by 2040; … increasing domestic capacity to manage plastics as a resource, prevent their leakage into the marine environment from all sources, and enable their collection, reuse, recycling, recovery and/or environmentally-sound disposal; … encouraging the application of a whole supply chain approach to plastic production toward greater responsibility and prevent unnecessary loss, including in pre-production plastic pellets; … accelerating international action and catalyzing investments to address marine litter in global hot spots and vulnerable areas through public-private funding and capacity development for waste and wastewater management infrastructure, innovative solutions and coastal clean-up; … [and] working with relevant partners, in particular local governments, to advance efforts to reduce marine litter and plastics waste, notably but not exclusively in small island and remote communities, including through raising awareness."

- "Sustainable lifestyles and education" by "strengthening measures, such as market-based instruments, to prevent plastics from entering the oceans, and strengthening standards for labelling to enable consumers to make sustainable decisions on plastics, including packaging; … supporting industry leadership initiatives and fostering knowledge exchange through existing alliances and other mechanisms; … promoting the leadership role of women and youth as promoters of sustainable consumption and production practices; … [and] support platforms for information sharing to foster awareness and education efforts on preventing and reducing plastic waste generation, plastics pollution and eliminating marine litter."
- "Research, innovation and new technologies" by "assessing current plastics consumption and undertaking prospective analysis on the level of plastic consumption by major sector use, while identifying and encouraging the elimination of unnecessary uses; … calling on G7 Ministers of Environment at their forthcoming meeting to advance new initiatives, such as a G7 Plastics Innovation Challenge, to promote research and development of new and more sustainable technologies, design or production methods by the private sector and innovators to address plastics waste in the oceans with a focus on all stages of the production and supply chain;…[and] promoting the research, development and use of technologies to remove plastics and microplastics from waste water and sewage sludge; … guiding the development and appropriate use of new innovative plastic materials and alternatives to ensure they are not harmful to the environment; … harmonizing G7 science-based monitoring methodologies; … [and] collaborating on research on the sources and fate of plastics and their impact on human and marine health."
- "Coastal and shoreline action" by "encouraging campaigns on marine litter in G7 countries with youth and relevant partners to raise public awareness, collect data and remove debris from coasts and shorelines globally; … [and] accelerating implementation of the 2015 G7 Leaders' Action Plan to Combat Marine Litter through the Regional Seas Programmes, initiatives led by RFMOs, where appropriate, and targeted investments for clean-up activities that prove to be environmentally sound in global hotspots and priority areas, in particular on Abandoned, Lost or Otherwise Discarded Fishing Gears (ALDFG) and wastes generated and collected by fishery activities."

2018: UNEA Resolution 3.7 Marine Litter and Microplastics

- "Acknowledging the challenges of addressing marine plastic pollution in the face of increasing production and consumption of plastic in products and packaging [….] Urges all actors to step up actions" to meet SDG14.1; and encourages all member states to prioritize policies and measures to avoid marine litter and microplastics from entering the marine environment. Also encourages states to cooperate to develop standards for monitoring marine litter and microplastics, and to develop action plans for preventing marine litter and the discharge of microplastics; and to include marine litter and microplastics in waste management plans and wastewater treatment where appropriate. Also, "to prioritize, where feasible, cleaning up of the marine environment."
- Asks UNEP to strengthen capacity on this topic and to contribute to Global Partnership on Marine Litter; facilitate establishment and implementation of regional and national action plans to prevent and reduce litter and microplastics in the marine environment, upon request; and requests UNEP to compile voluntary commitments targeting marine litter and microplastics, to provide an overview of their scope in support of UNEA on this issue and to better track progress towards SDG14.1; also decides to convene meetings of an open-ended ad hoc expert group to examine the barriers to and options for combating marine plastic litter and microplastics.
- Asks UNEP to "identify the range of national, regional and international response options, including actions and innovative approaches, and voluntary and legally binding governance strategies and approaches, and to identify the env., social and econ costs and benefits of different response options, and to examine the feasibility and effectiveness of different response options,, […] for consideration by UNEA"

2018: CBD/COP/DEC/14/10 Fourteenth Session of the Conference of the Parties to the Convention on Biological Diversity – Other Matters Related to Marine and Coastal Biodiversity

- Urges governments to increase their efforts with regard to avoiding, minimizing, and mitigating the impacts of marine debris, in particular plastic pollution

2018: Memorandum of Understanding on the Conservation of Migratory Sharks

- Encourages no increase in and minimiz[ing] use of plastics in fishing operations

2019: UNEA Resolution 4.6 Marine Plastic Litter and Microplastics

- "Stressing … importance of environmentally sound waste management, resource efficiency, the 'three Rs' (reduce, reuse, recycle), sustainable materials management, innovation in related technologies, the environmentally sound clean-up of marine plastic

litter, and international cooperation for effectively preventing pollution from marine litter, including plastic litter and microplastics"

- Calls upon states to address the problem of marine litter and macroplastics
- Underlines the urgent need to consider global coordination, cooperation and governance to more effectively implement UNEA resolutions 1/6, 2/11 and 3/7
- Requests UNEP to: convene existing relevant science advisory initiatives; prepare an assessment on sources, pathways, and hazards of litter, including plastic litter and microplastics pollution; recommend indicators to harmonize monitoring, reporting and assessment methodologies; and gather information with a view to informing policies and action; develop guidelines for the use and production of plastics in order to inform consumers, including about standards and labels
- Decides to extend until its 5th session the mandate of the ad hoc open-ended expert group on marine litter and microplastics established in Resolution 3/7, and requests the group to take stock of existing activities and actions by governments, regional and global instruments, international organizations, the private sector, NGOs and other relevant contributors to reduce marine plastic litter and microplastics; and identify technical and financial resources or mechanisms for supporting countries in addressing marine plastic litter and microplastics
- Decides to strengthen coordination and cooperation by establishing a multi-stakeholder platform within UNEP to take immediate action towards the long-term elimination, through a life-cycle approach, of discharges of litter and microplastics into the oceans. This may include the following functions: serving as a forum to share experiences and coordinate action; serve as a repository for assessments of the ways in which land and sea-based sources of marine litter are addressed at the national, regional and international levels, and conceptual and practical guidance materials to help governments; raise global awareness; establish and maintain a database of technical and scientific information related to marine litter

2019: UNEA Resolution 4.7 Environmentally Sound Management of Waste

- Invites states to "reduce microplastics, including in wastewater treatment plants, and encourage producers to use alternatives to microbeads"

2019: UNEA Resolution 4.9 Addressing Single-Use Plastic Products Pollution

- Requests UNEP to support governments upon demand in "the development and implementation of national or regional action plans to address the environmental impact of single-use plastic products", and to facilitate and coordinate technical and policy support to governments on this topic

- Requests UNEP to make available "information on action already taken by Member States to address plastic pollution […] and sharing that information in advance of the 5th session of the Environment Assembly."

2019: BC 14/13 Fourteenth Session of the Conference of the Parties to the Basel Convention – Further Actions to Address Plastic Waste under the Basel Convention

- Encourages governments to "set time-bound targets and adopt adequate measures to ensure that plastic packaging is designed to be reusable and recyclable in a cost-effective manner, the plastic packaging recycling rate by weight is monitored and significantly improved at the global, regional and national levels, and recycled content in plastic products is significantly increased."
- Encourages governments to foster innovation in relation to plastic waste.
- Calls upon parties and others to make further efforts at the domestic level to prevent and minimize the generation of plastic waste, including through increasing the durability, reusability and recyclability of plastic products and furthering the repair, refurbishment and remanufacturing of plastic products, where technically and economically feasible.
- Calls upon parties and others to promote environmentally sound and efficient management of plastic waste, for example, single use plastic and fishing gear, by improving the collection, transport, treatment and recycling of plastic waste, by improving or creating markets for recycled materials made from plastic waste, by improving other means of recovery, by reducing transboundary movement of plastic waste to a minimum, consistent with environmentally sound and efficient management, and by reducing the discharge of plastic waste and microplastics.
- Invites parties and others to submit to the Secretariat, by 1 June 2020, information on the following plastic waste referred to in entry Y48 in Annex II and entry B3011 in Annex IX to the Convention: plastic waste almost exclusively consisting of one cured resin or condensation product, including but not limited to FEP, PFA, MFA, PVF, PVDF; and requests Secretariat to compile information referred to for consideration by the CoP at its 15th meeting and make available on convention website by 1 September 2020.

APPENDIX IV. SUMMARY OF INTERNATIONAL POLICY INSTRUMENTS AT THE REGIONAL LEVEL

Africa

I. All (or Multiple) Plastics

Commitments for Participating Governments or Member States

2016: East African Community Polythene Materials Control Bill

- Use, sale, manufacturing and importation of polythene is regulated in all the East African Community Partner States … the Council may, in consultation with the Partner States establish a list of polythene materials necessary to be used in exceptional cases in the Community
- Any person who wishes to use, sell, manufacture or import any polythene material not specified in the Schedule shall apply for a written authorization from the relevant authority
- Any activity aiming at controlling the polythene waste pollution or any person investing in biodegradable packaging materials may (a) receive support from the East African Community Development Fund or (b) receive support from the government or a Partner State in form of subsidies, grants or tax regimes as such Partner State may determine.

II. Plastic Carry-Out Bags

Commitments for Participating Governments or Member States

2016: East African Community Polythene Materials Control Bill

- For the avoidance of all doubt, the elimination of polythene bags shall be complete in all the Partner States within one year from the coming into force of this Act.

Antarctica

I. All (or Multiple) Plastics

Commitments for Participating Governments

2015: Commission for the Conservation of Antarctic Living Marine Resources Conservation Measure 26-01 (2018) General Environmental Protection during Fishing

- Any packaging bands, once removed from packages, shall be cut into approximately 30 cm sections, so that they do not form a continuous loop and at the earliest opportunity burned in the on-board incinerator.
- Any plastic residue shall be stored on board the vessel until reaching port and in no case discarded at sea.

East Asia and the Pacific

I. Maritime Sources

Commitments for Participating Governments

2018: Pacific Regional Action Plan Marine Litter 2018–2025

- To develop and then apply draft cross compliance MARPOL provisions for Pacific Island Cruise Company access license.

Key Trends or Instruments Recommended for Participating Governments

2008: The Coordinating Body on the Seas of East Asia (COBSEA) Regional Action Plan on Marine Litter (RAP-MALI)

The COBSEA Secretariat will:

(i) Legal and economic instruments: Encourage and assist countries to develop and adopt legal and economic instruments to assist the management and prevention of marine litter from sea-based sources.

(ii) MARPOL Annex V: Encourage and assist countries in the region that are not party to MARPOL Annex V to become party, and assist countries with on-ground implementation of Annex V.

(iii) Port waste reception review: Consider undertaking a regional review of the adequacy of port waste reception facilities and publish a Regional Directory of such, similar to that published jointly by Australia and New Zealand.

(iv) Port waste reception fees: Seek to encourage countries in the region to adopt a coordinated regional approach to port waste reception facilities, based on a "General Fee" cost recovery basis.

(v) Training and capacity building: Seek to provide technical training and capacity building to staff from national governments, port authorities and the shipping industry on the prevention and reduction of marine litter from sea-based sources, through regional workshops and training courses.

(vi) FAO Code of Conduct: Encourage and assist the regional fishing industry to better implement/comply with the FAO Code of Conduct for Responsible Fisheries as it relates to LAFG.

(vii) Gear marking: Encourage and assist countries to develop national legislation that requires all fishing gear to be identified/marked.

(viii) Gear registers: Encourage and assist countries to establish national registers of fishing gear types (especially net types) used by their domestic fishing fleets.

(ix) Waste gear buy-back: Encourage and assist countries to establish waste fishing gear buy-back schemes such as that implemented successfully in Republic of Korea.

2008: Northwest Pacific Action Plan – Regional Action Plan on Marine Litter

- Apply sectoral guidelines on sea-based sources marine litter.

2018: Pacific Regional Action Plan Marine Litter 2018–2025

- Conduct national training on litigation, enforcement, compliance, monitoring, and prosecution of illegal discharges from vessels.
- Evaluate options to identify lost fishing gear in order to allocate clean-up costs.
- Convene a regional workshop to consider options to reduce the amount of abandoned and lost fishing gear, such as through tagging of fishing gear.

II. All (or Multiple) Plastic Pollutants

Commitments for Participating Governments

2016: Cleaner Pacific 2025: Pacific Regional Waste and Pollution Management Strategy 2016–2025

- Pacific Island Countries and Territories (PICTs), supported by SPREP and partners, shall implement waste, chemicals, and pollutants (WCP) prevention and reduction programmes. Programmes should target waste streams such as single-use plastic bags, Styrofoam containers, tyres and products containing hazardous substances.
- PICTs, supported by SPREP and partners, shall develop and enforce national policies, strategies, plans and legislation and strengthen institutional arrangements to support and promote best practice WCP management.
- PICTs, supported by SPREP and partners, shall implement WCP prevention and reduction programmes. Programmes should target waste streams such as single-use plastic bags, Styrofoam containers, tyres and products containing hazardous substances.
- PICTs, supported by SPREP and partners, will expand user-pays WCP collection services.

2018: Pacific Regional Action Plan Marine Litter 2018–2025

- Implement marine litter and microplastics data collection app for the Pacific.
- Support the development of a global legal framework to address marine litter and microplastics.
- Develop a regional framework to address marine litter and microplastics possibly through scope of Noumea Convention.

- Develop model legislation to ban single use plastics, Styrofoam and plastic packaging, based on Marshall Islands and Vanuatu examples.
- Apply model legislation to ban single use plastics, Styrofoam and plastic packaging, based on Marshall Islands and Vanuatu examples.
- Demonstrate and make available recyclable and biodegradable options – preferably biodegradable with short term subsidies if needed for local businesses to make the transition.
- Implement solid waste management initiatives and actions as outlined in the Cleaner Pacific 2025 moving from a linear economy to a circular economy of Reuse, Reduce, Recycle and Return. Applying Resource Recovery Schemes and Extended Producer Responsibility schemes (CP2025-6.1 & 6.4).
- Support PICTs expand user-pay waste collection services (CP2025-8.1 to 8.4) 6.4 Identify and disseminate market information for recyclables, and appropriate transboundary disposal facilities for hazardous waste (CP2025-9.3).
- Develop a regional model communication, awareness and education action plan and implement in countries (CP202512.1).
- Develop and implement "Clean schools" and "Clean Campus" programmes to encourage adoption of waste reduction and recycling best practices in schools and educational institutions (CP2025-6.7).
- Implement marine litter and microplastics data collection app for the Pacific.
- Support community-based cleanup activities to raise awareness of marine litter.

Key Trends or Instruments Recommended for Participating Governments

2008: Northwest Pacific Action Plan – Regional Action Plan on Marine Litter

- Implement marine litter monitoring using NOWPAP guidelines.
- Maintenance of marine litter database.
- Maintain and update data and information based on national inputs by member states and RACs.
- Compilation of data from national monitoring programmes.

Europe and Central Asia

I. Maritime Sources

Commitments for Participating Governments or Member States

2009: Council Regulation (EC) No 43/2009

In the Eastern, Western and Central Pacific Ocean tuna-fishing vessels shall be prohibited from disposing of salt bags or any other type of plastic rubbish at sea

2013: Regional Plan for the Marine Litter Management in the Mediterranean

- The Contracting Parties shall also take the necessary steps to provide ships using their ports with updated information relevant to the obligation arising from Annex V of MARPOL Convention5 and from their legislation applicable in the field.
- Apply by 2017 the necessary measures to prevent any marine littering from dredging activities in accordance with the relevant guidelines adopted in the framework of Dumping Protocol of the Barcelona Convention.
- The Contracting Parties shall take the necessary measures by 2020 to close the existing illegal dump sites in the geographical area of the Regional Plan.
- The Contracting parties shall sanction illegal dumping in accordance with national legislation including littering on the beach, illegal sewage disposal in the coastal zone and rivers in the area of the application of the Regional Plan in accordance with national legislation.

2019: Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment

- Member States shall ensure that extended producer responsibility schemes are established for fishing gear containing plastic placed on the market of the Member State, in accordance with Articles 8 and 8a of Directive 2008/98/EC.
- Member States that have marine waters as defined in point 1 of Article 3 of Directive 2008/56/EC shall set a national minimum annual collection rate of waste fishing gear containing plastic for recycling.
- Member States shall monitor fishing gear containing plastic placed on the market of the Member State as well as waste fishing gear containing plastic collected and shall report to the Commission in accordance with Article 13(1) of this Directive with a view to the establishment of binding quantitative Union collection targets.
- Member States shall ensure that the producers of fishing gear containing plastic cover the costs of the separate collection of waste fishing gear containing plastic that has been delivered to adequate port reception facilities in accordance with Directive (EU) 2019/883

or to other equivalent collection systems that fall outside the scope of that Directive and the costs of its subsequent transport and treatment.

Key Trends or Instruments Recommended for Participating Governments or Member States

2009: Council Regulation (EC) No 1224/2009

- A Community fishing vessel shall have the equipment on board to retrieve lost gear.
- The master of a Community fishing vessel that has lost gear or part of it shall attempt to retrieve it as soon as possible.
- If the lost gear cannot be retrieved, the master of the vessel shall inform the competent authority of its flag Member State, which shall then inform the competent authority of the coastal Member State, within 24 hours of the following: (a) the external identification number and the name of the fishing vessel; (b) the type of lost gear; (c) the time when the gear was lost; (d) the position where the gear was lost; (e) the measures undertaken to retrieve the gear.

2012: UNEP Med Decision IG.20/10 – 17th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols - Adoption of the Strategic Framework for Marine Litter Management

- Assess lost and abandoned fishing gear and identify and implement counter measures against biological damage

2013: Regional Plan for the Marine Litter Management in the Mediterranean

- In accordance with Article 14 of the Prevention and Emergency Protocol explore and implement to the extent possible by 2017, ways and means to charge reasonable cost for the use of port reception facilities or when applicable, apply No-Special-Fee system.
- [Explore and implement to the extent possible] [Apply as appropriate] by 2017 the "Fishing for Litter" system, in consultation with the competent international and regional organizations, to facilitate clean up of the floating litter and the seabed from marine litter caught incidentally and/or generated by fishing vessels in their regular activities including derelict fishing gears.
- [Explore and implement to the extent possible] [Apply as appropriate] by 2017 "Gear marking to indicate ownership" concept and 'reduced ghost catches through the use of environmental neutral upon degradation of nets, pots and traps concept', in consultation with the competent international and regional organizations in the fishing sector.

2014: Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Commission Marine Litter Regional Action Plan

- Ensure regional coordination on the implementation of EU Directive 2000/59/EC in relation to MARPOL Annex V ship generated waste
- Identify best practice in relation to inspections for MARPOL Annex V ship generated waste, including better management of reporting data, taking into consideration the Paris MOU1 on port state control
- Seek the dialogue with the Paris MOU to take the risk of illegal waste discharges into consideration for the prioritization of port state control inspections. Incentives for responsible behavior/disincentives for littering
- Identify the options to address key waste items from the fishing industry and aquaculture, which could contribute to marine litter, including deposit schemes, voluntary agreements and extended producer responsibility
- Investigate the prevalence and impact of dolly rope (synthetic fibre). Engage with competent authorities (such as National Authorities, EU, North East Atlantic Fisheries Commission, etc.) and the fishing industry in order to work together to reduce the waste generated by dolly rope on a (sub) regional basis.
- Analyse penalties and fines issued by Contracting Parties for waste disposal offences at sea to highlight the differences, trends, problem areas and issues to relevant organisations, such as the North Sea Network of Investigators and Prosecutors
- Engage in a dialogue with industry aimed at highlighting the top marine litter problem items based on OSPAR beach monitoring surveys and/or other evidence on impacts. Ensuring effective implementation and enforcement of MARPOL Annex V in relation to both fishing and shipping waste. Investigating markets for plastic waste from the fishing and shipping industry

2016: Decision IG.22/4 of the 19th Meeting of the Contracting Parties to the Barcelona Convention

- Necessary actions are taken to ratify and implement, with high priority, the MARPOL Convention and its six annexes, to ensure their transposition into national law, placing special emphasis on revised Annex V..and Annex VI…as amended
- [Strategy aims that] all Mediterranean coastal states have ensured, with high priority, the existence of a national legal framework (regulations) as a basis for prosecuting discharge offenders for infringements of the MARPOL Convention or of any national legal framework implementing it.

II. Macroplastics

Commitments for Participating Governments or Member States

2004: Directive 2004/12/EC of the European Parliament and of the Council amending Directive 94/62/EC on packaging and packaging waste

- Member States shall ensure that, in addition to the measures to prevent the formation of packaging waste taken in accordance with Article 9, other preventive measures are implemented. Such other measures may consist of national programmes, projects to introduce producer responsibility to minimise the environmental impact of packaging or similar actions adopted, if appropriate in consultation with economic operators, and designed to bring together and take advantage of the many initiatives taken within Member States as regards prevention.
- In order to comply with the objectives of this Directive, Member States shall take the necessary measures to attain the following targets covering the whole of their territory:
    - no later than 30 June 2001 between 50 % as a minimum and 65 % as a maximum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery;
    - no later than 31 December 2008 60 % as a minimum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery;
    - no later than 30 June 2001 between 25 % as a minimum and 45 % as a maximum by weight of the totality of packaging materials contained in packaging waste will be recycled with a minimum of 15 % by weight for each packaging material;
    - no later than 31 December 2008 between 55 % as a minimum and 80 % as a maximum by weight of packaging waste will be recycled;
    - no later than 31 December 2008 the following minimum recycling targets for materials contained in packaging waste will be attained: (i) 60 % by weight for glass; (ii) 60 % by weight for paper and board; (iii) 50 % by weight for metals; (iv) 22,5 % by weight for plastics, counting exclusively material that is recycled back into plastics;

2013: UNEP MED IG.21/9 Decision IG.21/7 - Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol

- By the year 2019 implement adequate waste reducing/reusing/recycling measures in order to reduce the fraction of plastic packaging waste that goes to landfill or incineration without energy recovery.

2016: UNEP MED IG.22/28 Athens Declaration

- Commit to take the necessary measures to ensure the effective implementation of the National Action Plans in accordance with the LBS Protocol of the Barcelona Convention and the related Regional Plans to progressively eliminate pollution reaching the Mediterranean sea with a particular focus on marine litter as an emerging issue of regional and global concern and with the goal of achieving its significant reduction by 2024 in synergy with relevant initiatives at global and regional levels,

2016: Decision IG.22/1 of the 19th Meeting of the Contracting Parties to the Barcelona Convention

- [Mid-Term Strategy aims at supporting training programs and education programs on marine pollution monitoring and prevention]

2019: Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment

- Member States shall take the necessary measures to achieve an ambitious and sustained reduction in the consumption of the single-use plastic products listed in Part A of the Annex, in line with the overall objectives of the Union's waste policy, in particular waste prevention, leading to a substantial reversal of increasing consumption trends. Those measures shall achieve a measurable quantitative reduction in the consumption of the single-use plastic products listed in Part A of the Annex on the territory of the Member State by 2026 compared to 2022. By 3 July 2021, Member States shall prepare a description of the measures which they have adopted pursuant to the first subparagraph, notify the description to the Commission and make it publicly available.
- In order to comply with the first subparagraph of this paragraph, each Member State shall monitor the single-use plastic products listed in Part A of the Annex placed on the market and the reduction measures taken and shall report on progress made to the Commission
- Member States shall prohibit the placing on the market of the single-use plastic products listed in Part B of the Annex and of products made from oxo-degradable plastic
- With regard to beverage bottles listed in Part F of the Annex, each Member State shall ensure that: (a) from 2025, beverage bottles listed in Part F of the Annex which are manufactured from polyethylene terephthalate as the major component ('PET bottles') contain at least 25 % recycled plastic, calculated as an average for all PET bottles placed on the market on the territory of that Member State; and (b) from 2030, beverage bottles listed in Part F of the Annex contain at least 30 % recycled plastic, calculated as an average for all such beverage bottles placed on the market on the territory of that Member State.

- Member States shall ensure that each single-use plastic product listed in Part D of the Annex placed on the market bears a conspicuous, clearly legible and indelible marking on its packaging or on the product itself informing consumers of the following:
    - appropriate waste management options for the product or waste disposal means to be avoided for that product, in line with the waste hierarchy; and
    - the presence of plastics in the product and the resulting negative impact of littering or other inappropriate means of waste disposal of the product on the environment.
- Member States shall take the necessary measures to ensure the separate collection for recycling: (a) by 2025, of an amount of waste single-use plastic products listed in Part F of the Annex equal to 77 % of such singleuse plastic products placed on the market in a given year by weight; (b) by 2029, of an amount of waste single-use plastic products listed in Part F of the Annex equal to 90 % of such singleuse plastic products placed on the market in a given year by weight. Single-use plastic products listed in Part F of the Annex placed on the market in a Member State may be deemed to be equal to the amount of waste generated from such products, including as litter, in the same year in that Member State.
- Member States shall take measures to inform consumers and to incentivise responsible consumer behaviour, in order to reduce litter from products covered by this Directive, and shall take measures to inform consumers of the single-use plastic products listed in Part G of the Annex and users of fishing gear containing plastic about the following:
    - the availability of re-usable alternatives, re-use systems and waste management options for those single-use plastic products and for fishing gear containing plastic as well as best practices in sound waste management carried out in accordance with Article 13 of Directive 2008/98/EC;
    - the impact of littering and other inappropriate waste disposal of those single-use plastic products and of fishing gear containing plastic on the environment, in particular on the marine environment; and
    - the impact of inappropriate means of waste disposal of those single-use plastic products on the sewer network.
- Information systems and reporting 1. Member States shall, for each calendar year, report to the Commission the following:
    - data on single-use plastic products listed in Part A of the Annex that have been placed on the market of the Member State each year, to demonstrate the consumption reduction in accordance with Article 4(1);
    - information on the measures taken by the Member State for the purposes of Article 4(1);
    - data on single-use plastic products listed in Part F of the Annex that have been

separately collected in the Member State each year, to demonstrate the attainment of the separate collection targets in accordance with Article 9(1);

- data on fishing gear containing plastic placed on the market and on waste fishing gear collected in the Member State each year;
- information on recycled content in beverage bottles listed in Part F of the Annex to demonstrate the attainment of the targets laid down in Article 6(5); and
- data on the post-consumption waste of single-use plastic products listed in Section III of Part E of the Annex that has been collected in accordance with Article 8(3).

Key Trends or Instruments Recommended for Participating Governments or Member States

2004: Directive 2004/12/EC of the European Parliament and of the Council amending Directive 94/62/EC on packaging and packaging waste

- The Commission shall help to promote prevention by encouraging the development of suitable European standards, in accordance with Article 10. The standards shall aim to minimise the environmental impact of packaging in accordance with Articles 9 and 10. The Commission shall, as appropriate, present proposals for measures to strengthen and complement the enforcement of the essential requirements and to ensure that new packaging is put on the market only if the producer has taken all necessary measures to minimise its environmental impact without compromising the essential functions of the packaging.'

2015: Closing the Loop – An EU Action Plan for the Circular Economy

- The Commission is proposing, in the revised legislative proposals on waste, a more ambitious target for the recycling of plastic packaging.

2016: Decision IG.22/20 of the 19th Meeting of the Contracting Parties to the Barcelona Convention

- [The Secretariat will] undertake a state of play analysis of existing data information systems on marine litter and develop user requirements for a marine litter databank.
- [The Secretariat will] share best practices on waste management including prevention and landfill bans [of wastes such as plastic].
- [The Secretariat will] prepare country fact sheets on marine litter and…training capacity building on relevant guidelines.
- [The Secretariat will implement] pilot projects on marine litter [reduction and prevention].

- [The Secretariat will] organize training and support programme to promote entrepreneurship…to implement innovative solutions … [to prevent marine litter].

2019: Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the Reduction of the Impact of Certain Plastic Products on the Environment

- The measures may include national consumption reduction targets, measures ensuring that re-usable alternatives to the single-use plastic products listed in Part A of the Annex are made available at the point of sale to the final consumer, economic instruments such as instruments ensuring that those single-use plastic products are not provided free of charge at the point of sale to the final consumer and agreements as referred to in Article 17(3).
- By 3 January 2021, the Commission shall adopt an implementing act laying down the methodology for the calculation and verification of the ambitious and sustained reduction in the consumption of the single-use plastic products listed in Part A of the Annex.
- The harmonised marking specifications shall be established by the Commission in accordance with paragraph 2.
- In order to achieve that objective, Member States may inter alia: (a) establish deposit-refund schemes; (b) establish separate collection targets for relevant extended producer responsibility schemes. The Commission shall facilitate the exchange of information and sharing of best practices among Member States on the appropriate measures to meet the targets laid down in paragraph 1, inter alia, on deposit-refund schemes. By 3 July 2020, the Commission shall adopt an implementing act laying down the methodology for the calculation and verification of the separate collection targets laid down in paragraph 1 of this Article.

III. Microplastics

Key Trends or Instruments Recommended for Participating Governments or Member States

2013: UNEP MED IG.21/9 Decision IG.21/7 - Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol

- Establish procedures and manufacturing methodologies together with plastic industry, in order to minimize the decomposition characteristics of plastic, to reduce microplastic.

2014: Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Commission Marine Litter Regional Action Plan

- Evaluate all products and processes that include primary micro plastics and act, if appropriate, to reduce their impact on the marine environment.

- Engage with all appropriate sectors (manufacturing, retail etc.) to explore the possibility of a voluntary agreement to phase out the use of micro plastics as a component in personal care and cosmetic products. Should a voluntary agreement prove not to be sufficient, prepare a proposal for OSPAR to call on the EU to introduce appropriate measures to achieve a 100% phasing out of micro plastics in personal care and cosmetic products.
- Elimination, change or adaptation of the products for environmental benefits. Evaluate all products and processes that include primary micro plastics and act, if appropriate, to reduce their impact on the marine environment.
- Engage with all appropriate sectors (manufacturing, retail etc.) to explore the possibility of a voluntary agreement to phase out the use of micro plastics as a component in personal care and cosmetic products. Should a voluntary agreement prove not to be sufficient, prepare a proposal for OSPAR to call on the EU to introduce appropriate measures to achieve a 100% phasing out of micro plastics in personal care and cosmetic products.

2016: UNEP Med Decision IG.22/28 – Implementing the Marine Litter Regional Plan in the Mediterranean (Fishing for Litter Guidelines, Assessment Report, Baselines Values, and Reduction Targets)

- Strongly encourages the Contracting Parties to take the necessary measures to implement the Regional Plan in a timely manner considering as appropriate measures related to microplastic; and submit a report on measures taken by 2017 for the considerations of COP 20.

IV. All (or Multiples) Plastics

Commitments for Participating Governments or Member States

2013: UNEP MED IG.21/9 Decision IG.21/7 – Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol

- Apply by the year 2020 the cost effective measures to prevent any marine littering from dredging activities taking into account the relevant guidelines adopted in the framework of Dumping Protocol of the Barcelona Convention.
- The Contracting Parties shall take the necessary measures by the year 2020 to close to the extent possible the existing illegal dump sites on land in the area of the application of the Regional Plan.
- The Contracting Parties shall take enforcement measures to combat dumping in accordance with national and regional legislation including littering on the beach, illegal sewage disposal in the sea, the coastal zone and rivers in the area of the application of the Regional Plan.

- By the year 2017 explore and implement to the extent possible prevention measures related to:
    - Extended Producer Responsibility strategy by making the producers, manufacturer brand owners and first importers responsible for the entire life-cycle of the product with measures prioritizing the hierarchy of waste management in order to encourage companies to design products with long durability for reuse, recycling and materials reduction in weight and toxicity;
    - Sustainable Procurement Policies contributing to the promotion of the consumption of recycled plastic-made products;
    - Establishment of voluntary agreements with retailers and supermarkets to set an objective of reduction of plastic bags consumption as well as selling dry food or cleaning products in bulk and refill special and reusable containers;
    - Fiscal and economic instruments to promote the reduction of plastic bag consumption;
    - Establishment of Deposits, Return and Restoration System for expandable polystyrene boxes in the fishing sector;
    - Establishment of Deposits, Return and Restoration System for beverage packaging prioritizing when possible their recycling and reuse; and
    - Establish procedures and manufacturing methodologies together with plastic industry, in order to minimize the decomposition characteristics of plastic, to reduce microplastic.
- By the year 2025 at latest, to base urban solid waste management on reduction at source, separate collection, recycling, composting of the organic fraction and environmentally sound disposal (SAP-MED4).
- Take necessary measures to establish by year 2020 [2025] adequate urban sewer, wastewater treatment plants, and waste management systems to prevent run-off and riverine inputs of litter.
- The Contracting Parties shall remove existent accumulated litter, subject to EIA procedure, [in a regular manner] [at least annually], in particular from specially protected areas and SPAMIs and litter impacting endangered species listed in Annexes II and III of the SPA and Biodiversity Protocol. To this aim the Contracting Parties undertake to [Explore and implement to the extent possible] [Apply as appropriate] the following measures by [2017] [2019]:
    - Identify in collaboration with relevant stakeholders[’] accumulations/hotspots of marine litter and implement compulsory national programmes on their regular removal and sound disposal;
    - Implement National Marine Litter Cleanup Campaigns on a regular basis;

- Participate in International Coastal Cleanup Campaigns and Programmes;
- Apply as appropriate Adopt-a-Beach or similar practices and enhance public participation role with regard to marine litter management;
- Apply Fishing for Litter practices, in consultation with the competent international and regional organizations and in partnership with fishermen and ensure adequate collection, sorting, and environmentally sound disposal of the fished litter; and
- Charge reasonable costs for the use of port reception facilities or, when applicable apply No-Special-Fee system, in consultation with competent international and regional organizations, when using port reception facilities for implementing the measures provided for in Article 10.

- For the purpose of this Regional Plan and in compliance with the monitoring obligations under Article 12 of the Barcelona Convention and Article 8 of the LBS Protocol, the Contracting Parties shall design by the year 2017 National Monitoring Programme on Marine Litter.
- The Contracting Parties shall assess in the framework of ecosystem approach the state of marine litter, the impact of marine litter on the marine and coastal environment and human health as well as the socioeconomic aspects of marine litter management based on common agreed methodologies, national monitoring programmes and surveys.
- The Contracting Parties agree to cooperate, with support from the Secretariat, with competent international and regional organizations and relevant scientific institutions, on marine litter issues that due to their complexity require further research.

2015: EU Directive 2015/720 Regarding Regulation and Consumption of Light-Weight Plastic Bags (Amending 94/62/EC)

- and recycling[: …] In order to comply with the objectives of this Directive, Member States shall take the necessary measures to attain the following targets covering the whole of their territory: […] no later than 31 December 2008 the following minimum recycling targets for materials contained in packaging waste will be attained: […] 22,5 % by weight for plastics, counting exclusively material that is recycled back into plastics.

2019: Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the Reduction of the Impact of Certain Plastic Products on the Environment

- Member States shall take measures to inform consumers and to incentivise responsible consumer behaviour, in order to reduce litter from products covered by this Directive, and shall take measures to inform consumers of the single-use plastic products listed in Part G of the Annex and users of fishing gear containing plastic about the following:

- the availability of re-usable alternatives, re-use systems and waste management options for those single-use plastic products and for fishing gear containing plastic as well as best practices in sound waste management carried out in accordance with Article 13 of Directive 2008/98/EC;
- the impact of littering and other inappropriate waste disposal of those single-use plastic products and of fishing gear containing plastic on the environment, in particular on the marine environment.

Key Trends or Instruments Recommended for Participating Governments or Member States

2013: UNEP MED IG.21/9 Decision IG.21/7 – Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol

- The Contracting Parties undertake to explore and implement to the extent possible the following measures by the year 2019:
  - Identify in collaboration with relevant stakeholders accumulations/hotspots of marine litter and implement national programmes on their regular removal and sound disposal;
  - Implement National Marine Litter Cleanup Campaigns on a regular basis;
  - Participate in International Coastal Cleanup Campaigns and Programmes;
  - Apply as appropriate Adopt-a-Beach or similar practices and enhance public participation role with regard to marine litter management;
  - Apply Fishing for Litter in an environmentally sound manner, based on agreed guidelines and best practice, in consultation with the competent international and regional organizations and in partnership with fishermen and ensure adequate collection, sorting, recycling and/or environmentally sound disposal of the fished litter; and
  - Charge reasonable costs for the use of port reception facilities or, when applicable apply No-Special-Fee system, in consultation with competent international and regional organizations, when using port reception facilities for implementing the measures provided for in Article 10.
- The Secretariat shall: (a) Prepare the Regional Marine Litter Monitoring Programme, as part of the integrated regional monitoring programme; (b) Establish in the year 2016 the Regional Data Bank on Marine Litter which should be compatible with other regional or overarching databases and (c) Establish by the year 2014 Expert Group on Regional Marine Litter Monitoring Programme, in the framework of the Ecosystem Approach implementation.
- To this aim, the Secretariat shall update by 2014 the existing LBS National Action Plan guidelines. 2. The LBS National Action Plan shall include:

- Development and implementation of appropriate policy, legal instruments and institutional arrangements, including adequate solid waste and sewer system management plans, which shall incorporate marine litter prevention and reduction measures;
- Monitoring and assessment programmes for marine litter;
- National and local measures to prevent and reduce generation of marine litter;
- Programmes of removal and environmentally sound disposal of existing marine litter; and
- Awareness and education programmes.

- The Secretariat shall prepare the Assessment of the state of marine litter in the Mediterranean every six years using results of the national monitoring programmes and applied measures

2014: Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Commission Marine Litter Regional Action Plan

- Highlight those waste prevention and management practices that impact significantly on marine litter.
- Develop sustainable and cost-effective solutions to reduce and prevent sewage and storm water related waste entering the marine environment, including micro particles.
- Reduce the consumption of single use plastic bags and their presence in the marine environment, supported by the development of quantifiable (sub) regional targets, where appropriate, and assist in the development of relevant EU initiatives.
- Encourage international environmental certification schemes to include the management and prevention of marine litter in their lists of criteria.
- Strengthen the existing OSPAR Recommendation 2010/19 on the reduction of marine litter through implementation of fishing for litter initiatives, including by reviewing the option that any vessel involved in the scheme can land non-operational waste at participating harbours in OSPAR countries.
- Establish an exchange platform on experiences on good cleaning practices in beaches, riverbanks, pelagic and surface sea areas, ports and inland waterways.
- Develop sub regional or regional maps of hotspots of floating litter, based on mapping of circulation of floating masses of marine litter, and identification of hotspots of accumulation on coastal areas and the role of prevailing currents and winds.
- Reduction of abandoned, lost and otherwise discarded fishing gear (ALDFG).

- Identify hot spot areas through mapping of snagging sites or historic dumping grounds working with other initiatives, research programmes and with fishing organisations.
- Develop a risk assessment for identifying where accumulations of ghost nets pose a threat to the environment and should be removed.
- Develop marine litter assessment sheets to assist Contracting Parties in developing material for education programmes, including those for professional seafarers and fishermen.
- Establish a database on good practice examples of marine litter measures and initiatives and share this database with other Regional Seas Conventions in order to make action more visible to the public.

2015: Regional Action Plan for Marine Litter in the Baltic Sea

- RECOMMENDS ALSO to a) finalize, by mid-2016, common indicators and associated definition of Good Environmental Status (GES) related to marine litter for regional application in the years to follow; b) identify, by 2016 the way forward to establish coordinated monitoring programmes for the common marine litter indicators including data collection for regular assessment of the state of marine litter in the Baltic Sea area;

2016: Decision IG.22/1 of the 19th Meeting of the Contracting Parties to the Barcelona Convention

- [Mid-Term Strategy aims at] strengthening and implementation of marine pollution prevention and control legislation and policies at national level.
- [Mid-Term Strategy includes that for member states] national pollution and litter monitoring programs updated to include the relevant pollution and litter Imap indicators; inventories of pollutant loads regularly updated, reported and assessed; and marine pollution assessment tools developed for key pollutants and sectors.

2019: The Nordic Ministerial Declaration on the Call for a Global Agreement to Combat Marine Plastic Litter and Microplastics

- Call for the development of a global agreement to more effectively and comprehensively deal with the issue of marine plastic litter and microplastics on a global level in an integrated manner.

V. Plastic Carry-Out Bags

Commitments for Participating Governments or Member States

2015: Directive 94/62/EC on Packaging and Packaging Waste

- Member States shall take measures to achieve a sustained reduction in the consumption of lightweight plastic carrier bags on their territory.
- The measures taken by Member States shall include either or both of the following:
  - the adoption of measures ensuring that the annual consumption level does not exceed 90 lightweight plastic carrier bags per person by 31 December 2019 and 40 lightweight plastic carrier bags per person by 31 December 2025, or equivalent targets set in weight. Very lightweight plastic carrier bags may be excluded from national consumption objectives;
  - the adoption of instruments ensuring that, by 31 December 2018, lightweight plastic carrier bags are not provided free of charge at the point of sale of goods or products, unless equally effective instruments are implemented. Very lightweight plastic carrier bags may be excluded from those measures. From 27 May 2018 Member States shall report on the annual consumption of lightweight plastic carrier bags when providing data on packaging and packaging waste to the Commission in accordance with Article 12.
- The Commission and the Member States shall, at least during the first year following the 27 November 2016, actively encourage public information and awareness campaigns concerning the adverse environmental impact of the excessive consumption of lightweight plastic carrier bags.
- 18 months after the adoption of that implementing act, at the latest, Member States shall ensure that biodegradable and compostable plastic carrier bags are labelled in accordance with the specifications provided for in that implementing act. Specific measures for biodegradable and compostable plastic carrier bags. By 27 May 2017, the Commission shall adopt an implementing act laying down the specifications Union-wide recognition of biodegradable and compostable of labels or marks to ensure plastic carrier bags and to provide consumers with the correct information about the composting properties of such bags.

2015: EU Directive 2015/720 Regarding Regulation and Consumption of Light-Weight Plastic Bags (Amending 94/62/EC)

- Member States shall take measures to achieve a sustained reduction in the consumption of lightweight plastic carrier bags on their territory. Those measures may include the use of national reduction targets, maintaining or introducing economic instruments as well as marketing restrictions in derogation from Article 18, provided that these restrictions are proportionate and non-discriminatory. Such measures may vary depending on

the environmental impact of lightweight plastic carrier bags when they are recovered or disposed of, their composting properties, durability or specific intended use. The measures taken by Member States shall include either or both of the following:

  - the adoption of measures ensuring that the annual consumption level does not exceed 90 lightweight plastic carrier bags per person by 31 December 2019 and 40 lightweight plastic carrier bags per person by 31 December 2025, or equivalent targets set in weight. Very lightweight plastic carrier bags may be excluded from national consumption objectives;
  - the adoption of instruments ensuring that, by 31 December 2018, lightweight plastic carrier bags are not provided free of charge at the point of sale of goods or products, unless equally effective instruments are implemented. Very lightweight plastic carrier bags may be excluded from those measures.

- From 27 May 2018 Member States shall report on the annual consumption of lightweight plastic carrier bags when providing data on packaging and packaging waste to the Commission in accordance with Article 12.
- The Commission and the Member States shall, at least during the first year following the 27 November 2016, actively encourage public information and awareness campaigns concerning the adverse environmental impact of the excessive consumption of lightweight plastic carrier bags.
- Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 27 November 2016. They shall immediately inform the Commission thereof.

Key Trends or Instruments Recommended for Participating Governments or Member States

2015: Directive 94/62/EC on Packaging and Packaging Waste

- Those measures may include the use of national reduction targets, maintaining or introducing economic instruments as well as marketing restrictions in derogation from Article 18, provided that these restrictions are proportionate and non-discriminatory.
- By 27 November 2021, the Commission shall present a report to the European Parliament and to the Council, assessing the effectiveness of measures in Article 4(1a) at Union level, in combating littering, changing consumer behaviour and promoting waste prevention. By 27 May 2017, the Commission shall present a report to the European Parliament and to the Council, examining the impact of the use of oxo-degradable plastic carrier bags on the environment and present a legislative proposal, if appropriate. By 27 May 2017, the Commission shall assess the life cycle impacts of different possibilities to reduce the consumption of very lightweight plastic carrier bags, and present a legislative proposal.

2015: EU Directive 2015/720 Regarding Regulation and Consumption of Light-Weight Plastic Bags (Amending 94/62/EC)

- By 27 November 2021, the Commission shall present a report to the European Parliament and to the Council, assessing the effectiveness of measures in Article 4(1a) at Union level, in combating littering, changing consumer behaviour and promoting waste prevention. By 27 May 2017, the Commission shall present a report to the European Parliament and to the Council, examining the impact of the use of oxo-degradable plastic carrier bags on the environment and present a legislative proposal, if appropriate. By 27 May 2017, the Commission shall assess the life cycle impacts of different possibilities to reduce the consumption of very lightweight plastic carrier bags, and present a legislative proposal, if appropriate.

2016: Decision IG.22/20 of the 19th Meeting of the Contracting Parties to the Barcelona Convention

- [The Secretariat will] assess and promote the use of relevant instruments and incentives to reduce the single use of plastic bags.

Latin America and the Caribbean

I. Maritime Sources

Key Trends or Instruments Recommended for Participating Governments

2007: Plan of Action for the Protection of the Marine Environment and Coastal Areas in the South Pacific – Regional Programme for the Integrated Management of Marine Litter

- Eradicate the discharge of persistent litter from vessels

2014: Regional Action Plan on Marine Litter Management (RAPMaLi) for the Wider Caribbean Region

- Improve port reception facilities to effectively manage ship-generated waste. A survey of the adequacy of existing Port Reception Facilities of all the countries in the WCR is necessary to identify priority areas for improvement.

II. All (or Multiple) Plastics

Key Trends or Instruments Recommended for Participating Governments

2007: Plan of Action for the Protection of the Marine Environment and Coastal Areas in the South Pacific – Regional Programme for the Integrated Management of Marine Litter

- Minimize the disposal of fishing gear in coasts and at sea.

- Increase the coverage of garbage collection systems in coastal municipalities and to ensure the appropriated disposal of persistent materials to prevent their release into the environment.
- Establish the volumes of production, patterns of distribution and accumulation, and impacts of marine litter in the region.

2014: Regional Action Plan on Marine Litter Management (RAPMaLi) for the Wider Caribbean Region

Actions recommended for Governments include:

- Evaluate existing legislation, regulations and enforcement practices that deal with marine litter and strengthen or enact new legislation/regulations as appropriate.
- Establish and/or enhance government sponsored "litter wardens or patrols" in coordination/collaboration with municipal police/security forces and establish the infrastructure for compliance.
- Ensure that debris and ecosystem health issues are integrated into emergency management plans and procedures. Large amounts of debris can enter the ocean through the effects of natural disasters (e.g., volcanic eruptions, tsunamis, storm surges, flooding and hurricanes).
- Establish a clearinghouse of information on effective strategies and practices for enforcement of waste management practices.
- Establish the infrastructure for compliance with existing marine litter management legislation at the national and community levels.
- Establish a Caribbean Marine Litter Regional Working Group to co-ordinate and advise on appropriate actions for marine litter management.
- Provide training for judiciary/magistrates/enforcement officers and sensitisation of politicians on marine litter issues.
- Design and implement a strategy to develop national marine litter monitoring pilot projects in the WCR, including standardised methods for data collection and reporting within the framework of UNEP Regional Seas Global Marine Litter Monitoring guidelines.
- Develop a regional, web-based database as a clearinghouse for marine litter information and research.
- Review and disseminate research on the identification, removal and disposal of marine litter information to enable more effective recovery efforts and disposal of marine litter.
- Develop and implement community-based public education campaigns for marine litter prevention, including specialised marine litter prevention programmes for key user-groups and stakeholders.

- Research Best Management Practices in the hotel, restaurant and the marine transport industries for waste management and strengthen the collaboration with the tourism sector for sharing of best practices and lessons learnt.
- Develop and promote activities for national/regional waste minimisation. For effective waste minimisation, reuse and recycling programmes need to be developed and/or expanded to handle generated waste materials (plastics, glass, metal and other materials).

Middle East

I. All (or Multiple) Plastics

Commitments for Participating Governments

2005: The Protocol Concerning the Protection of the Environment from Land-Based Activities in in the Red Sea and Gulf of Aden

- Therefore, the Contracting Parties, commit themselves as follows: Taking all appropriate action to ensure elimination, to the greatest extent possible, of the solid wastes and litter reaching the marine and coastal environment by prevention or reduction of solid waste generation and by introduction of enhancements to waste treatment, including methods of collection and recycling and final disposal thereof.
- Therefore, the Contracting Parties, commit themselves as follows: Cooperating with each other, and with international organizations, on exchange of information relevant to the practices and experiences relating to solid waste management, recycling, reuse, and cleaner production processes.

Key Trends or Instruments Recommended for Participating Governments

2018: Regional Action Plan for the Sustainable Management of Marine Litter in the Red Sea and Gulf of Aden

Awareness and Education: Raise government and public awareness of the impact of marine litter to the marine environment, economy and human health through the implementation of education and awareness programs and literature.

Legal and Institutional Framework: The objective of this component is: To review and, if necessary, improve the legal basis for preventing litter entering the marine environment.

[Also] proposes actions to encourage private companies to take voluntary initiatives to address the issue of marine litter independent of government laws and regulations.

Research and Monitoring: The objective for this component is: Undertake research to determine the source, density and composition of marine litter in each PERSGA member country.

Capacity Building and Training: The objective for this component is: Identify capacity limitations and training needed to implement actions.

South Asia

I. All (or Multiple) Plastics

Key Trends or Instruments Recommended for Participating Governments

2018: Summary of the Regional Marine Litter Action Plan for the South Asian Seas Region

- [Strategy recommends] establishment and revamping of the institutional structure/ system [including] … establish dedicated marine litter institution in countries lacking such institutions; develop marine litter policies, plans and strategies; enhance interagency cooperation among the relevant institutions for effective management of the marine litter [among others].
- [Strategy recommends] establishment of new legal framework [including to] … ensure that all SAS member countries have legal framework in place for sustainable management of marine litter.
- [Strategy recommends to] review and establish regional institutional mechanisms for enforcement of the marine litter related MEAS [including to] align national and subnational laws and regulations to the existing marine litter related MEAs; identify and establish [an] institutional mechanism for the enforcement of marine litter related MEAs; and develop a mechanism to monitor and report the progress on marine litter MEAs to the secretaries of the respective MEAs [among others].
- [Strategy recommends to] develop programs and plan for management of waste to reduce the marine litter at source..[including to] encourage direct development structure and tools at the river mouths at points of entry into the sea; prepare plans to implement identified source reduction activities for the short term, medium and long term interventions; […[…] develop a program and plan for product modification and improvement to reduce marine litter.
- [Strategy recommends to] introduce new economic and market instruments for influencing consumers to reduce the amount of marine litter.
- [Strategy recommends] research and innovation shall be undertaken to determine the total quantity of marine litter coming into the coastal areas through all sources and to prepare guidelines for best management of marine litter.

APPENDIX V. SUMMARY OF INSTRUMENTS IN NATIONAL LAWS OR REGULATIONS26

Africa

I. Instruments Targeting Maritime Sources of Plastic Pollution

2007, Nigeria: International Convention for the Prevention of Pollution from Ships, 1973 and 1978 Protocol (Ratification and Enforcement) Act

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: The disposal into the sea of all plastics, 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, is prohibited [outside Special Areas]. [Within Special Areas], the disposal into the sea of all plastics is prohibited.
- [*Information: Research, data collection, data reporting or record keeping*]: [Garbage to be managed according to Annex V of MARPOL 73/78, and defined to include plastics].

II. Instruments Targeting Macroplastic Pollutants

2001, Mauritius: Environment Protection (Polyethylene Terephthalate (PET) bottle Permit) Regulations 2001

- [*Regulatory – Prohibitive: Limit plastic*]: No responsible person shall bottle or cause to be bottled any beverage in a PET bottle unless he is in possession of a permit.
- [*Information: Research, data collection, data reporting or record keeping*]: The responsible person shall submit to the Department an annual return in respect of the number of PET bottles produced, collected, recycled and exported.

2004, Benin: Inter-Ministerial Decree setting the Methods of Recovery and Repayment for Products with Ecotaxes and Fines

- [*Economic: Disincentive*]: [Creates] a category of taxes called "ecotaxes" on acts or activities, sources of pollution … [including] … disposable plastic packaging. Any [person] who carries out sales or purchases of [disposable plastic packaging] shall be subject to the payment of the ecotax. The amount of the ecotax is fixed … as follows: 1% of the value … incorporated into the purchase invoice and collected [monthly].

26. Summarizes National laws and regulations, not including public policies that describe plans for future laws or regulations.

2004, Benin: Inter-Ministerial Decree determining Ecotaxes and Fines for Pollution of the Environment

- [*Economic: Disincentive*]: The collection … of environmental taxes and fines for the pollution caused by … disposable plastic packaging [is authorized] …. The proceeds … are housed in a special account … on behalf of the National Fund for the Environment.

2004, Tanzania: The Environmental Management Act 2004

- [*Regulatory – Affirmative: Plan, commitment*]: Each local government authority shall … determine appropriate methods for sorting, storage or disposal of waste. In [this] determination …, local government authorities shall ensure that the solid waste is classified and appropriately stored depending on whether it is organic waste, plastics, glass or metals.
- [*Regulatory – Affirmative: Plan, commitment*]: The Minister may, on approval of the Minister responsible for finance, further prescribe the following incentives and financial measures for the protection of the environment: … product charges, such as charges on plastic or bottle packaging that are used to discourage disposal of or encourage recycling.

2010, Zimbabwe: Plastic Packaging and Plastic Bottles Regulation 2010

- [*Regulatory – Prohibition: Ban plastic*]: The manufacture for use within Zimbabwe, commercial distribution or importation of plastic packaging with a wall thickness of less than thirty micrometers is prohibited; Unless it can be provided that they are: (1) Plastic bread packaging and clingy film used as plastic barrier packaging of a wall thickness of between twenty-five micrometers and thirty micrometers; or (2) biodegradable plastic packaging.

2011, Togo: Decree setting the Procedures for Management of Bags and Packaging in Togo

- [*Regulatory – Affirmative: Responsible handling of plastics*]: The following are authorized for production, importation, marketing, use, collection and recycling: - biodegradable plastic bags and packaging - sacks/vFA for medical and pharmaceutical purposes - bags used in agricultural activities; - non-toxic food bags. Permitted plastic bags and packaging shall be made from materials which make them suitable for recycling or their processing compatible with the requirements of public health and the environment.
- [*Regulatory – Affirmative: Responsible handling of plastics; plan, commitment*]: Any [person who produces, markets or uses] biodegradable or non-biodegradable plastic bags and packaging [in professional activities] is obliged to proceed with the recovery of [the resulting] wastes, for the purpose of recycling them or to eliminate them. [Such persons] are required to establish a system [for] the recovery of bags and packaging, their collection

and orientation towards … reutilization, recovery or elimination. Disposal of bags and … packaging are subject to the prior delivery of a certificate of environmental compliance from the Minister of the Environment, before any installation [of a system for collection of the waste]] […] Any public or private establishment which uses [more than 5 kilograms per day of] bags or packaging, must register with the [responsible government agency] and to communicate [to the agency] semi-annually the waste treatment methods [used] … bags and packaging can only be stored, stocked or processed in installations or equipment approved by the Minister for the Environment.

- [*Regulatory – Prohibitive: Limit plastic*]: It is forbidden for any user to burn, bury or throw bags and biodegradable or nonbiodegradable packaging in places that are not intended for dumpsites authorized by the municipal services and the environment department.
- [*Information: Research, data collection, data reporting or record keeping*]: Any producer of bags or … packaging is obliged to affix its label on these and to regularly communicate the quantities produced and their physicochemical characteristics to the [government].

2012, Mauritania: Decree No. 2012-157 of 21 June 2012 Prohibiting the Manufacture, Importation, Marketing and Use of Flexible Plastic Bags and Bags

- [*Regulatory – Prohibition: Ban plastic*]: It is forbidden [to] import, manufacture, market[,] and use […] bags and flexible plastic bags for packaging.

2012, Seychelles: Environment Protection Act

- [*Regulatory – Prohibition: Ban plastic*]: The manufacture, trade and commercial distribution of domestically produced and imported plastic bags below 30 microns, for use within the Republic of Seychelles, are hereby restricted. A tolerance of 20 percent variation in the measurement of the minimum thickness of the plastic film, used in the manufacture of the plastic bag, [is permitted], where such variation is subsequent to the normal variation occurring in the normal course of production.

2012, Cameroon: Joint Ministerial Order Relating to the Manufacture, Import, and Sale of Non-Biodegradable Packages

- [*Regulatory – Prohibition: Ban plastics*]: The manufacture, import, possession and free sale or distribution of non-biodegradable plastic packaging at low density not exceeding 60 microns shall be prohibited.
- [*Regulatory – Affirmative: Responsible handling of plastics; Plan, commitment*]: The production, import, holding and marketing of non-biodegradable plastic packaging of more than 60 microns and the granules used in their manufacture are subject to the obtaining of an environmental permit […] to ensure the traceability of its

recovery, recycling and/or destruction in an environmentally sound manner […] Any manufacturer, importer or distributor of authorized non-biodegradable packaging shall be responsible for the management of its waste. Any manufacturer importing or distributing non-biodegradable packaging shall draw up and implement a waste management plan and the related monitoring mechanism [and report quarterly to the administration on the plan's implementation]. [The plan will include]: areas where applicants for environmental permits or their partners are required to ensure the sorting, collection, transport, final disposal or recovery of non-biodegradable packaging waste;; […and] the circuits, frequency, schedules and methods and methods of collecting their waste […] Any manufacturer, importer or distributor of non-biodegradable packaging shall set up a deposit system to facilitate the recovery of said packaging for recycling, recovery or final disposal.

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: It is strictly forbidden to burn plastics in the open, to throw them in the nature or to proceed to their burial.

2013, Democratic Republic of the Congo: Inter-Ministerial Decree Prohibiting the Manufacture, Import, and Marketing of Non-Biodegradable Packaging

- [*Regulatory – Prohibitive: Ban plastic*]: The manufacture, import and marketing of non-biodegradable packaging is prohibited throughout the country. Any economic operator in the industrial sector involved in the use of [biodegradable] packaging materials biodegradable is required … to participate in the management of the [resulting] waste.

2013, Seychelles: Environment Protection (Beverage Containers and Labels)

- [*Regulatory – Prohibition: Ban plastics*]: The import, manufacture, trade and commercial distribution of polyvinyl chloride (PVC) labels shall be prohibited for the purpose of labeling beverage containers for use within the Republic of Seychelles.
- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: All beverage containers imported, manufactured, distributed, traded in or used shall be made of PET or glass
- [*Information: Labels or placards*]: All beverage containers imported, manufactured, distributed, traded in or use shall be […] labeled by paper or PET film. All PET beverage containers shall have the standard symbol for PET moulded at the bottom or side wall of the container and the symbol of PET shall be clearly indicated on any label used.

2014, Burkina Faso: Law N ° 017-2014 /AN on the Prohibition of the Production, Import, Marketing and Distribution of Non-Biodegradable Plastic Packaging and Plastic Bags

- [*Regulatory – Prohibition: Ban plastic*]: Any production, import, marketing and distribution of non-biodegradable plastic packaging and bags on the national territory [is prohibited]. Also prohibited: any abandonment of packaging or plastic bags in the natural

environment, public roads or in places other than landfills provided for by competent public authorities; any spill or release of plastic packaging and bags into Streets and other public places, in urban and rural areas, in infrastructures sanitation networks, on trees, in rivers and lakes and on their surroundings; any deposit of solid or liquid products packaged in packaging and plastic bags on the public domain, including inland waters; any immersion of solid or liquid products packaged in packaging and plastic bags in inland waters, dams and rivers; any rejection or abandonment in internal waters of packs and sachets plastics…[Exemptions subject to a special authorization by the relevant Government agency]: plastic packaging and plastic bags intended directly for sanitary activities, scientific and experimental research or for the purpose of security and national security.…The production, import, marketing and distribution of biodegradable plastic packaging and bags are only allowed after approval by the competent departments of the ministries responsible for the environment and sustainable development, industry, trade and crafts.

2016, Djibouti: Arrêté N° 2016-284/PRE du 20/04/2016 portant interdiction d'importation et de commercialisation des sacs plastiques non biodégradables, non produits en République de Djibouti

- [*Regulatory – Prohibition: Ban plastic*]: The import and marketing of non-biodegradable plastic bags and packaging not produced in the national territory, are strictly prohibited.

2017, Seychelles: Environment Protection (Restriction on Importation, Distribution and Sale of Plastic Utensils and Polystyrene Boxes) Regulations 2017

- [*Regulation – Prohibition: Ban plastics*]: Manufacturing, importation, distribution … of plastic utensils and Polystyrene boxes for use within the Republic of Seychelles is hereby prohibited.

2019, Tanzania: The Environmental Management (Prohibition of Plastic Carrier Bags) Regulations, 2019

- [*Regulatory – Prohibition: Ban plastic*]: No person shall sell or offer for sale beverages or other commodities wrapped in plastics unless the nature of such commodities require[s] wrappings by plastics. No licensing authority shall … register or issue a license or permit to any person intending to import, export, manufacture or sell plastic carrier bags that have been prohibited by these Regulations. [Exemptions]: Plastic or plastic packaging for medical services or industrial products or construction industry or agricultural sector or food processing or sanitary and waste management.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Any person who imports, exports, manufactures, sells, stores, distributes, supplies, passes and uses plastic packaging exempted under these Regulations shall ensure that [it is] managed and disposed of in

accordance with the [Solid Waste Management] Regulations and the [Hazardous Waste Control and Management] Regulations. Any person who imports, manufactures, supplies or sells commodities wrapped in plastics shall ensure that the plastic wrappings are managed or disposed of in accordance with the [Solid Waste Management] Regulations.

- [*Regulatory – Affirmative: Responsible handling of plastics*]: Any manufacturer or supplier of products contained in plastic bottles shall set-up, operate or participate in a take-back system in collecting their respective waste plastic bottles for recycling purposes, provided that no additional price is chargeable for that service.

2019, Rwanda: Law N° […] **[…] of […] Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polyethylene Bags and Single-Use Plastic Items**

- [*Economic: Disincentive*]: Imported consumer goods packaged in polythene bags or single-use plastic items are subject to an environmental levy in accordance with relevant laws
- [*Regulatory – Prohibition: Ban plastic*]: The manufacturing, use, importation or sale of polythene bags and single-use plastic items are prohibited […] [Except for] […]home compostable plastic items or woven polypropylene … subject to prior authorization from the competent authority.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Every authorized manufacturer, wholesaler or retailer of polythene bags or single use plastic items must put in place the mechanisms to collect and segregate used polythene bags or single use plastic items and hand them over to the recycling plants.

III. Instruments Specifically Targeting Leakage of Plastic Carry-Out Bags

2002, South Africa: Plastic Bags - Regulations under Section 24 (D) of the Environmental Conservation Act (No. R. 543 of 2002)

- [*Regulatory – Prohibition: Plastic ban*]: The manufacture, trade and commercial distribution of plastic bags, made of plastic film, for use within the Republic of South Africa, with a wall thickness of less than 80 micrometres is hereby prohibited […] [P]lastic bags, made of plastic film, with a wall thickness of between 30 and 80 micrometres may be manufactured, traded and commercially distributed, […] provided they do not, unless required by law, have printing, painting or marks of any kind. … bread bags, made of plastic film, with a wall thickness of between 25 and 80 micrometres may be manufactured, traded and commercially distributed, … if they do not, unless required by law, have printing, painting or marks of any kind. [Exemptions]: shrinklene and flimsy bread bags made of plastic film.

2003, South Africa: Plastic Carrier Bags and Plastic Flat Bags (No. R. 625 of 2003)

- [*Regulatory – Prohibition: Plastic ban*]: The manufacture, trade and commercial distribution of domestically produced and imported plastic carrier bags and plastic flat bags, for use within the Republic of South Africa, other than those which comply with paragraphs 4 and 5 of the Compulsory Specification, is hereby prohibited.

2007, Ethiopia: Solid Waste Management Proclamation no. 513/2007

- [*Regulatory – Prohibition: Plastic ban*]: It is prohibited to plastic manufacture or importation of any biodegradable bags with a grant permit for the non-wall thickness of 0.03 millimeters and less than 0.03 millimeters.
- [*Information: Labels or placards*]: [All plastic bags must be labeled as to whether it they are biodegradable or not] […] it shall be unlawful to put on the market any plastic bag that is not labeled to how whether it is biodegradable or not.

2008, Kenya: Kenya Gazette Supplement – The Finance Act, 2008

- [*Regulatory – Prohibition: Ban plastic*]: The Commissioner may license a person to manufacture plastic bags of not less than- (a) 10 microns, if satisfied that such bags are for export; or (b) 20 microns, if satisfied that such bags are for industrial use….
- [*Economic: Disincentive*]: Plastic shopping bags shall be charged excise duty at the rate of 50% of their excisable value.

2010, Uganda: Government of Uganda. 2010. The Finance (Permitted Plastic Bags and Other Plastics for Exceptional Use), Regulations 2010

- [*Regulatory – Prohibition: Ban plastic*]: The importation, local manufacture, sale or use of sacks and bags of polymers of ethene and polyethene is prohibited. [The responsible Minister] shall … establish a list of sacks and bags of polymers of ethylene, polyethylene and other plastics necessary for use in exceptional cases. … In this section a reference to polyethene means a synthetic plastic material made up of numerous simple chemicals called ethene used for packaging.

2010, Gabon: Arrêté n°1489/MECIT du 16 Juin 2010 Portant Interdiction d'Importation et de Commercialisation de Sachets Plastiques Non Recyclables en République Gabonaise

- [*Regulatory – Prohibition: Ban plastic*]: Non-recyclable plastic bags present on the national territory must be … removed from the production cycle or points of sale […].

2011, Republic of Congo: Décret n° 2011-485 Réglementant la Production, l'Importation, la Commercialisation et l'Utilisation des Sacs, Sachets et Films en Plastique

- [*Regulatory – Prohibition: Ban plastic*]: Production, import, marketing and the use of plastic bags for the sale of food, water and any other drink, are prohibited in the Republic of Congo. Production, import, marketing and use of plastic bags, bags and films called oxo-biodegradable are also prohibited. [Exceptions include, requiring special authorization from the Minister responsible for trade]: plastic bags, sachets and films intended for medical use; - plastic bags, sachets and films intended for agricultural activities; - plastic bags used for garbage collection; - plastic films used in the building and public works; - plastic films for packaging or packaging hygienic products inside production units, especially handkerchiefs of paper, napkins and toilet paper.

2011, Togo: Décret n° 2011-003-PR du 05 Janvier 2011 Fixant les Modalités de Gestion des Sachets et Emballages au Togo

- [*Regulatory – Prohibitive: Ban plastic*]: the production, import, distribution and marketing of non-biodegradable plastic bags and packaging is prohibited.

2013, Cote d'Ivoire: Decret n°2013-327 Portant Interdiction de la Production, de l'Importation, de la Commercialisation, de la Détention et de l'Utilisation des Sachets Plastiques

- [*Regulatory – Prohibitive: Ban plastic*]: Are prohibited: All production, import and sale of plastic bags on the national territory; any form of use of plastic bags; any possession of plastic bags; any spill, discard of plastic bags in streets and other public places, in urban and rural areas, in sanitation and drainage network infrastructures, in water courses and water bodies and their surroundings; any discard of plastic bags on the public domain, including the public maritime domain; any immersion of solid or liquid products packaged in plastic bags in maritime, lagoon, river and lake waters under national jurisdiction; any discard or abandonment in sea, lagoon, fluvial and lacustrine waters of plastic bags.

2014, Mali: Law 2014-024 Prohibiting the Production, Import, and Sale of Non-Biodegradable Plastic Bags in Mali

- [*Regulatory – Prohibition: Ban plastics*]: This law prohibits, […] the production, import and marketing of nonbiodegradable plastic bags in the Republic of Mali.

2014, Seychelles: Customs Management (Prohibited and Restricted Goods) Regulations, 2014 (S.I. 43 of 2014)

- [*Regulatory – Prohibition: Limit plastic*]: Sacks and bags (including cones) of polymers of ethylene; polybags of the type used in primary industries and of other plastics. Vest type plastic bags made of less than 30 microns.

2015, The Gambia: Ban on Plastic Bags Order, 2015

- [*Regulatory – Prohibitive: Ban plastics*]: A person who (a) manufactures or imports; (b) uses; or (c) sells, plastic bags in The Gambia, commits an offence.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Existing stock management: (1) … any plastic manufacturing plants shall be redirected to plastic recycling plants. (2) All confiscated plastic bags and plastic wastes shall be sent to such plants to produce trash bags for waste collection.

2015, Mauritius: Environment Protection (Banning of Plastic Bags) Regulations 2015

- [*Regulatory – Prohibitive: Ban plastic*]: Subject to paragraph (2), no person shall import, manufacture, sell or supply a plastic bag.

2015, Morocco: Loi n°77-15 Portant Interdiction de la Fabrication, de l'Importation, de l'Exportation, de la Commercialisation et de l'Utilisation de Sacs en Matières Plastiques

- [*Regulatory – Prohibitive: Ban plastic*]: manufacturing is prohibited [of] bags of plastics, […] as well as their import, export, their retention with a view to sale, their implementation sale, sale or distribution, even for free. [Exemptions]: plastic bags for industrial or agricultural use, Isothermal plastic bags, bags made of plastic freezing or deep-freezing plastics and those used for the collection of waste […] The plastic bags [exempted from the prohibition] can only be used for the purposes for which they are intended. They must, according to their destination or their category, [have] a mark or print according to the terms and conditions laid down by regulation.

2015, Somalia: Digreeto madaxweyne # JSL / M / XERM / 249-3178 / 042015

- [*Regulatory – Prohibitive: Ban plastic*]: The President: […] Decides: Prohibition of importing and trading of different types of Bags such as Plastic Bags, Container Bags, Corporate Bags and Stores in Commercial Advertising.

2017, Benin: Law No. 2017-39 of 26 December 2017 Prohibiting the Production, Importation, Exploitation, Marketing, Possession, Distribution and Use of Nonbiodegradable Plastic Bags in the Republic of Benin

- [*Regulatory – Prohibitive: Ban plastic*]: The operations of production, import, export, marketing, distribution, possession and use of non-biodegradable bags are prohibited in the Republic of Benin. [A]lso prohibited, the discard, the throwing out of plastic bags in the streets, the public roads, the surroundings of the houses and other public places, in urban and rural environment, in the infrastructures of the sewerage networks, in the courses and water bodies, the sea and their surroundings, overboard vehicles. … The production, import, export, marketing and distribution of biodegradable bags are authorized after approval by the [responsible Government agency]. Notwithstanding the [previous] provisions, the use of bags entering directly into the packaging of manufactured products is permitted. [Exemptions: production for] use in health, medical, military, war, scientific and experimental research or for public health measures, National security and safety … subject to special authorization issued by the Minister of the Environment.
- [*Regulatory – Affirmative: Responsible handling of plastics*]: The management and recycling of authorized plastic bags are specified by [the responsible government agency]. Producers and importers of biodegradable plastic bags have a system for the collection and recycling of waste from these bags.

2017, Kenya: Notice No. 2356 of 2017 on Plastic Bags

2017, Kenya: The Environmental Management and Co-Ordination Act (Gazette Notice No. 2356)

- [*Regulatory – Prohibition: Ban plastic*]: [the responsible Government agent has] banned the use, manufacture and importation of all plastic bags used for commercial and household packaging defined as follows: (a) Carrier bag constructed with handles, and with or without gussets; (b) Flat bag constructed without handles, and with or without gussets.

2017, Madagascar: Décret n° 2017-010 du 03 Janvier 2017 portant Interdiction de la Production, de l'Importation, de la Commercialisation, de la Constitution de Stock et de l'Utilisation des Sachets et des Sacs en Plastique sur le Territoire National

- [*Regulatory – Prohibitive: Ban plastic*]: Import, production for the local market, marketing, distribution, creation and the use of the plastic bags and bags […] with a thickness less than or equal to 50 microns, whatever the density, size, shape and manufacturing … are prohibited on the national territory. [Exemptions]: plastic packaging incorporated into imported finished products or local products, bags made of plastic packaging for pharmaceutical products and plastic bags and bags used for sampling for analysis at the research laboratory or the medical laboratory. The name or

distinctive emblem of the laboratory or pharmacy must appear on these bags and plastic bags.

- [*Information: Labels or placards*]: The identity of the producer and the thickness in micron must appear on all plastic bags with a thickness greater than 50 microns circulating on the national territory. The words "to be reused to preserve our environment" must also appear on these products. For plastic bags over 50 microns thick imported, the identity of the distributor Madagascar must be mentioned.

2017, Seychelles: Environment Protection (Restriction on manufacturing, importation, distribution and sale of Plastic Bags) Regulations 2017 (S.I. No. 37 of 2017)

- [*Regulatory – Prohibition: Ban plastic*]: The manufacturing, importation, distribution and sale of plastic bags, for use within the Republic of Seychelles, which does not fall into the category of exempted plastic bag as specified in the First Schedule are hereby prohibited. The [responsible Government agency] may issue import permits for- (a) exempted plastic bags; or (b) biodegradable bags.

2018, Lesotho: Customs & Excise Tariff – Schedule 1 Part 3

- [*Economic: Disincentive*]: Any rate of environmental levy specified in this Section in respect of any goods shall apply to any such goods which are manufactured in the Republic or imported into the Republic [includes] articles for the conveyance or packing of goods, of plastics; stoppers, caps, lids and other closures, or plastics … sacks and bags (including cones): … carrier bags, with a thickness of 24 microns or more; Flat bags, with a thickness of 24 microns or more (excluding immediate packing, zip-lock bags and household bags including refuse bags and refuse bin liners); Of other plastics: Carrier bags, of other thermoplastic materials, with a thickness of 24 microns or more; Flat bags, of other thermoplastic materials, with a thickness of 24 microns or more (excluding immediate packings, zip-lock bags and household bags including refuse bags and refuse bin liners)

2018, Zambia: LUSAKA, 3rd December 2018 – Issuance of Statutory Instrument No. 65 on Extended Producer Responsibility Regulations

- [*Regulatory – Prohibition: Ban plastic*]: Banning of plastics carrier bags and flat bags that are below 30 microns in thickness. This ban applies to manufacturing, trading and commercial distribution of packaging materials. [Exemptions]: plastic carrier bags or plastic flat bags that conform to the National Standard (ZS719) on Plastic Carrier and Flat Bags developed by the Zambia Bureau of Standards.

- [*Information: Education*]: Display of a Notice to customers regarding the ban on the manufacture, trade and commercial distribution of domestically produced and imported plastic carrier and flat bags that do not meet the prescribed standard mentioned above.

2019, Nigeria: Plastic Bags (Prohibition) Bill

- [*Regulatory – Prohibition: Ban plastics]*: The use, manufacturing, importation or sale of plastic bag is prohibited. A retailer shall offer a paper bag to the customer at a point of sale.

2019, Tanzania: The Environmental Management (Prohibition of Plastic Carrier Bags) Regulations, 2019

- [*Regulatory – Prohibitive: Ban plastics*]: All plastic carrier bags, regardless of their thickness are prohibited from being imported, exported, manufactured, sold, stored, supplied and used in Mainland Tanzania.
- [*Information: Education*]: Local Government Authorities shall- conduct public education and awareness programs on the importance of the prohibition of plastic carrier bags use as well as their effects on human health and the environment.

IV. Instruments Targeting Microplastic Pollutants

2010, Zimbabwe: Plastic Packaging and Plastic Bottles Regulation 2010 (S.I. No. 98 of 2010)

- [*Regulatory – Affirmative: Plan, commitment*]: The agency shall require from time to time, every responsible person to set plastic waste prevention targets and to notify the Agency of such targets;; […] the plastic waste prevention targets shall provide for any of the following as may be appropriate: the disposal of plastic waste by the responsible person in designated receptacles or sites, or the design of plastics containing few pollutants, are recyclable and durable when put to their intended use, or the use of biodegradable products, or the creation of the mode of distribution and return systems, and reduce residual plastic waste to a minimum.

East Asia and the Pacific

I. Instruments Targeting Leakage of All (or Multiple) Types of Plastics

2002, Australia: Antarctic Treaty (Environment Protection) (Waste Management) Regulations 1994

- [*Regulatory – Affirmative: Responsible handling of waste*]: Waste that must be removed. The generator [of waste] must, as soon as practicable, remove any of the following types of waste: (e) poly-vinyl chloride, polyurethane foam, polystyrene foam, rubber…; (f) other

plastic waste that is not low density polyethylene containers; (g) solid residue resulting from incineration of an article.

2006, Samoa: Plastic Bag Prohibition on Importation Regulations 2006

- [*Regulatory – Prohibition: Ban plastic*]: The importation into Samoa of plastic products is prohibited unless: (a) the person importing the plastic products is the holder of a licence to import those plastic products …; and (b) where [the conditions specified by the] licence are complied with. When considering an application for a licence, the CEO or authorised officer may take into consideration: (a) the need to phase out non-biodegradable plastics products to protect the environment; and (b) the technology and alternative products available that can be used instead of non-biodegradable plastic products; and (c) whether the plastic product complies with the minimum standards of biodegradability; and (d) whether the imported item is necessary for the applicant's products or business; and (e) compliance by the applicant of any previous licences issued under these Regulations; and (f) any other relevant matter.
- [*Information: Labels or placards*]: It is a condition of a licence to import plastic products that the person importing the plastic products keep accurate records of the importation and use or other disposal of the plastic products….

II. Instruments Targeting Maritime Sources of Plastic Pollution

2001, Solomon Islands: Shipping (Marine Pollution) Regulations 2011 (L.N. No. 66 of 2011)

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: discharge of garbage which shall be allowed from all vessels, if it is made as far as practicable from the nearest land, but in all cases is prohibited if the distance from the nearest land is less than - (i) 25 nautical miles for dunnage, lining and packing materials which will float; and (ii) 12 nautical miles for food wastes and all other garbage including paper products, rags, glass, metal, bottles, crockery and similar refuse.
- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: [discharge of] synthetic fishing nets, plastic garbage bags and incinerator ash from plastic products which may contain toxic or heavy metal residues, from a ship outside any Special Area is prohibited … [and] from a ship within any Special Area is prohibited.

2005, Singapore: Prevention of Pollution of the Sea (Garbage) Regulations (No. S 363 of 1999)

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: The disposal of any plastics, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ash from plastic products which may contain toxic or heavy metal residues, from a ship outside [or within] any Special Area is prohibited.

2008, Samoa: Marine Pollution Prevention Act 2008

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: no pollutant or harmful substance may be discharged from a vessel, platform or place on land into Samoan waters, or from a Samoan vessel into any waters ["pollutant and harmful substance" includes plastics, synthetic ropes and synthetic fishing nets]. [Exceptions include if] the discharge: (a) was necessary for the purposes of securing the safety of a vessel or the saving of life at sea (provided that the discharge was necessary and reasonable in the circumstances); or (b) resulted from damage to a vessel or its equipment …; or (c) was for a purpose of—(i) training government officers or other persons who are tasked with functions relating to pollution control as approved by the Chief Executive Officer; or (ii) combating specific pollution incidents in order to minimise the damage from pollution, as permitted by a discharge permit issued under section 13.

2013, Fiji: Maritime Transport Decree 2013 (No. 20 of 2013)

- [*Regulatory – Prohibitive: Ban plastic*]: The discharge of plastics, dunnage, lining, and packaging materials within Fiji waters from any ship is prohibited.

III. Instruments Targeting Macroplastic Pollutants

2005, China: Rules on Restrictions of Excessive Product Packaging

- [*Information: Labels or placards*]: Plastic shall be labeled with recycling identification code of the plastic material.

2005, China: Provisions of the People's Republic of China on the Prevention and Control of Vessel Pollution of the Inland Water Environment

- [*Regulatory – Prohibition: Ban plastic*]: No one may use any disposable foaming plastic tableware that cannot be degraded.

2005, Palau: Senate Bill No. 7-94 Establishing a Recycling Program for the Republic of Palau, Establishing a Beverage Container Deposit Fee, Creating a Recycling Fund; and for Other Related Purposes

- [*Economic: Cash for return*]: There is hereby established a recycling program in the Republic of Palau. The purpose and aim of the Recycling Program is to create a self-supported, safe and efficient system of disposal of beverage containers throughout Palau… There is hereby established a revolving fund within the National Treasury that shall be known as the "Recycling Fund," to be maintained by the Ministry of Finance … . All revenue received from deposit fees received pursuant to this Act, … shall be deposited into the Recycling Fund. [After expenses] the Ministry may also use the money to: Fund

administrative, audit, and compliance activities associated with collection and payment of the deposits and handling fees of the deposit beverage container fee and deposit program; … conduct recycling education and demonstration projects; and … promote recyclable market development activities …. Deposit fee: A beverage distributor shall pay to the Ministry a deposit beverage container fee on each deposit beverage container manufactured in or imported to the Republic. The fee shall be imposed only once on the same beverage container. The fee shall be $0.10 per beverage container …. Deposit beverage refund: Using the monies in the Recycling Fund, the Minister shall purchase beverage containers for $0.05 per container. Beverage containers may only be purchased through redemption centers …. The Minister shall sell beverage containers for recycling at market prices …. Redemption centers: to facilitate the return of empty beverage containers, the Ministry shall establish one or more redemption centers at which empty beverage containers may be returned and payment received. Any person may operate a redemption center subject to the approval of the Minister …. Using the money in the Recycling Fund, the Minister may provide compensation not to exceed $0.025 per container to the redemption centers for their services.

2006, Korea: Decree No. 202 Establishing Rules on the Standards of product Packaging Materials and Products

- [*Regulatory – Prohibition: Limit plastic*]: When packaging products, Manufacturers and Such should reduce unnecessary packaging by cutting down on the amount of packaging materials and the number of times the product is packaged. The standards of gradual reduction of plastic packaging materials, which Manufacturers and Such of the products provided in Paragraph 3 of Article 7 of the Decree should abide by, are provided in Table 3 in Addendum.
- [*Regulatory – Prohibition: Limit plastic, Ban plastic]:* Manufacturers and Such should not laminate or shrink-wrap with PVC or use coated packaging materials (including the labels on product containers). However, PVC shrink-wrapped packaging materials may be used for the following products, if not using PVC shrink-wrap materials for these products could lead to packaging materials failing to fulfill their functions: [Petroleum products, drugs, animal-based and plant-based oil, chemical products and pesticides, products needing refrigeration].

2007, Fiji: Environmental Management (Waste Disposal and Recycling) Regulations 2007

- [*Regulatory – Affirmative: Responsible handling of plastic*]: It is a condition of every plastic bottle permit that: (a) the permit holder will adequately train staff in the environmentally sound handling of plastic bottles; (b) the name and distinguishing marks on bottles set out in the application for the permit will not be changed without the written consent of the [responsible Government agent]; (c) the premises to be used will be kept safe and clear of debris; (d) the permit holder will, separately or jointly with other holders of plastic

bottle permits, maintain one or more plastic bottle collection centres for collection of used plastic bottles from consumers or retailers. Before issuing a plastic bottle permit, the [responsible Government agent] must be satisfied: (a) that the premises are suitable for the importing and/or manufacture of plastic bottles; (b) that the facility operates, directly or in conjunction with another facility, a system for collection and recycling of bottles.

- [*Information: Research, data collection, data reporting or record keeping*]: in order to improve collection and recycling [of plastic bottles] … [the responsible Government department must monitor returns and annually compile and publish data received about plastic bottles].

2010, Tuvalu: OZONE DEPLETING SUBSTANCES REGULATIONS 2010

- [*Regulatory – Affirmative: Plan, commitment*]: No one is allowed to manufacture any of the prohibited controlled goods, including….any plastic foam or any goods that contain plastic foam which have been manufactured using a controlled substance

2011, Australia: Waste reduction and recycling act 2011

- [*Economic: Cash for return*]: The main [objectives] of this [provision is] to: (a) increase the recovery and recycling of empty beverage containers; (b) reduce the number of empty beverage containers that are littered or disposed of to landfill; (c) ensure the manufacturers of beverage products meet their product stewardship responsibility in relation to their beverage products; (d) provide opportunities for social enterprise, and benefits for community organisations, by…making funds available through the payment of refund amounts for empty beverage containers; and creating opportunities for employment in activities related to collecting, sorting and processing containers for recycling; and (e) complement existing collection and recycling activities for recyclable waste. …..[These objectives will be] achieved by providing for a container refund scheme (the scheme) that: (a) encourages consumers to collect empty beverage containers for recycling by providing for refund amounts to be paid for the containers; (b) encourages waste management service providers to ensure empty beverage containers collected through general waste services are recycled by providing for recovery amounts to be paid for containers sent for recycling; and (c) recognizes the role of the manufacturers of beverage products in generating waste in the form of empty containers by requiring the manufacturers to— (i) contribute to the cost of refund amounts paid for the containers and the cost of administering the scheme; and (ii) ensure containers for their beverage products are made of materials that are suitable for recycling.

2013, Tonga: Waste Management (Plastic Levy) Regulations 2013

- [*Information: Research, data collection, data reporting or record keeping*]: An importer shall keep in a permanent form a full and true record of the number of plastic bags, in stock before the commencement of business on the 4 July 2013 [and retain for 2 years]

2016, Republic of the Marshall Islands: Styrofoam and Plastic Products Prohibition Act 2016

- [*Regulatory – Prohibitive: Ban plastic*]: It shall be unlawful for a person to import, manufacture, sell or distribute Styrofoam cups and plates, disposable plastic cups and plates, and plastic shopping bags.

2016, Tonga: Environment Management (Litter and Waste Control) Regulations 2016

- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: [It is an] offence to burn noxious waste…For the purposes of this regulation "noxious waste" includes waste — which contains plastics, rubber, polystyrene foam, waste oil which emits smoke or fumes

2017, Palau: Plastic Bag Use Reduction Act (RPPL No. l0-14)

- [*Information: Education or outreach*]: The [Government] shall undertake a public education campaign to increase awareness of the destructive effects of plastic use and inform the public of practical ways to reduce dependence on plastics. The educational program shall be funded by the Recycling Program…
- [*Information: Education or outreach*]: There is hereby established a revolving fund within the National Treasury that shall be known as the "Recycling Fund," to be maintained by the Ministry of Finance, separate and apart from other funds of the National Treasury. …All revenue received from deposit fees received pursuant to this chapter, or the sale of beverage containers under the provisions of this chapter, appropriations by the Palau legislature, any grants, donations and contributions to the Recycling Program, and any interest or income earned on the money in the Recycling Fund shall be deposited into the Recycling Fund. …the Recycling Fund shall be first applied to the expenses attributable to the administration of the Recycling Program, then to the payments required under § 1605 of this chapter, then to a reserve to cover anticipated and unanticipated future expenses of the program. The Ministry may also use the money to: (1) Fund administrative, audit, and compliance activities associated with collection and payment of the deposits and handling fees of the deposit beverage container fee and deposit program; (2) Conduct recycling education, plastics education programs consistent with 11 PNC § 2103, and demonstration projects; and (3) Promote recyclable market development activities.
- [*Information: Education or outreach*]: The Minister shall provide for the teaching of a plastics education program consistent with the policies and directives of Chapter 21 of

Title 11 of the Palau National Code. The plastics education program shall be incorporated into the curriculum for all grade levels.

2018, Palau: Responsible Tourism Education Act of 2018 (RPPL No. 1-30)

- [*Regulatory – Affirmative*]: Develop new, or improve existing process or product]: All tour operators licensed…shall provide their customers with a reusable alternative to disposable plastic or polystyrene food containers, cups, water bottles, and drinking straws, whether through the provision of a reusable water dispenser, reusable [food] containers, reusable dishes, reusable individual water containers and straws, or other means.

2018, Palau: Executive Order No. 417 to establish a "Zero Disposable Plastic" Policy

- [*Regulatory – Prohibitive: Ban plastic*]: All government offices and agencies shall immediately stop the practice of providing disposable plastic and polystyrene beverage containers to employees and guests. This includes, but is not limited to, disposable plastic water bottles and polystyrene cups. ln order to implement the Policy, each office in the Executive Branch shall purchase water dispensers, which shall be regularly maintained and made available for staff and visitors to access. Disposable plastic and polystyrene bottles and cups should not be provided; instead, guests should be provided with reusable drink ware, and employees should be encouraged to bring their own reusable containers. Similarly, when providing meals of any sort, plastic and polystyrene dishes should not be used; instead, reusable dishes should be provided whenever feasible.

2019, Tuvalu: Waste Management (Prohibition on the Importation of Single-Use Plastic)

- [*Regulatory – Prohibition: Ban plastic*]: A person must not import, manufacture, sell or distribute any or all of the following single-use plastic: (a) shopping bag that is wholly or predominantly made of or lined with plastic or plastic blend, and designed to be given out to consumers; but does not include a long-life synthetic fabric multi-use shopping bag or a plastic bag that is, or forms an integral part of, the packaging in which goods are sealed or contained before sale; (b) plastic water bottles less than 1.5 litres and plastic beverage bottles less than 1.5 litres; (c) plastic water pouches and plastic bags used to produce ice blocks, (d) straws which are made in whole or in part of plastic or a plastic blend and designed for one-time use, but does not include straws which are attached to packaging, (e) single-use plastic polystyrene plates, cups and take-away container, including cups and plates with a plastic coating or lining, (f) single-use plastic cutlery, (g) plastic sheet or cling film glad wrap used for food wrapping, (h) plastic sheet used for spreading dining table, and (i) plastic flags.

IV. Instruments Specifically Targeting Leakage of Plastic Carry-Out Bags

2006, Samoa: Plastic Bag Prohibition on Importation Regulations 2006

- [*Information: Labels or placards*]: It is a condition of a licence to import biodegradable plastic bags that each bag has labelled on it the licence number and the name of the authorised supplier. It is a condition of a licence to import plastic products that will be used to produce biodegradable plastic bags, that each bag produced has labelled on it the licence number and the name of the authorised supplier.

2007, China: Administrative Measures for the Paid Use of Plastic Bags at Commodity Retailing Places

- [*Regulatory – Affirmative: Responsible handling of plastic*]: Commodity retailing places shall purchase plastic bags from the legally established plastic bag manufacturers, wholesalers or importers, ask for the relevant certificate, and set up machine accounts for the purchase and sales of plastic bags for future reference.
- [*Economic: Disincentive*]: Commodity retailing places shall sell plastic bags at a marked price according to law. A commodity retailing place may determine the price of plastic bags independently, but any of the following behaviors shall be prohibited: selling plastic bags at a price lower than the cost; selling plastic bags to consumers in violation of the marked price by discounting or other way; or providing free plastic bags to consumers either directly or in any disguised form.
- [*Information: Labels or placards*]: A commodity retailing place may determine the price of plastic bags independently, but any of the following behaviors shall be prohibited: selling plastic bags without marking a price thereon or without marking the required information or in the required way;

2008, Cook Islands: Environment (Atiu and Takutea) Regulations 2008

- [*Regulatory – Prohibitive: Ban plastic*]: It shall be unlawful for any person to bring onto the Island any non-biodegradable plastic shopping bags…whether for personal or business purposes

2011, Australia: Waste reduction and recycling act 2011

- [*Regulatory – Prohibition: Ban plastic*]: The [objectives] of this [provision] are to: (a) reduce plastic pollution by reducing the number of plastic bags that become waste and enter the environment as litter; and (b) encourage retailers and consumers to reduce the overall use of carry bags by considering whether it is necessary on every occasion to use a bag to carry goods; and use alternative shopping bags. A banned plastic shopping bag is a carry bag with handles: (a) made, in whole or part, of plastic (whether or not the plastic

is degradable) that has a thickness of less than the thickness prescribed by regulation; or if a thickness has not been prescribed by regulation—35 microns; or (b) prescribed by regulation to be a banned plastic shopping bag.

2012, Vietnam: Circular No. 159/2012/TT-BTC amending and supplementing Circular No. 152/2011/TT-BTC of 11 November 2011 guiding the Government's Decree No. 67/2011/ND-CP of 8 August 2011, detailing and guiding a number of articles of the Law on Environmental Protection Tax

- [*Economic: Disincentive*]: For multi-layer plastic bags produced or processed from HDPE, LDPE, LLDPE or other plastic membranes (PP, PA, …) or of other materials such as aluminum, paper, etc., environmental protection tax shall be determined by the percentage ((Yr) of HDPE, LDPE or LLDPE amount in such multi-layer plastic bags. Based on the amount of HDPE. LDPE or LLDPE permitted for use in the production or processing of multi-layer plastic bags, multi-layer plastic bag producers or importers shall make declarations and take responsibility for their declarations.

2013, Tonga: Waste Management (Plastic Levy) Regulations 2013

- [*Economic: Disincentive*]: There shall be charged, levied and paid a levy (which shall be known as a plastic levy in respect of plastic bag supplies at the point of importation). An importer shall be accountable for and liable to pay the levy. The amount of the levy shall be 10 percent of the customs value of each plastic bag upon importation.

2017, Fiji: Environmental Levy (Budget Amendment) Act 2017 (No. 36 of 2017)

- [*Economic – Disincentive*]: An Environment and Climate Adaptation Levy shall be charged on plastic bags distributed by businesses prescribed by regulations…[in the amount of] $0.10c per plastic bag…The [levy] on plastic bags is payable by the person to whom a plastic bag is provided. The levy imposed… shall: (a) not be subject to the Value Added Tax imposed under the Value Added Tax Act 1991; and (b) be clearly and separately shown on a tax invoice, invoice or receipt issued for the purchase of any goods.

2017, Fiji: Environment and Climate Adaptation Levy (Plastic Bags) Regulations 2017 (L.N. No. 61 of 2017)

- [*Economic: Disincentive*]: The Environment and Climate Adaptation Levy charged on plastic bags must be collected by a cashier at the point at which a plastic bag is provided by the business to a consumer.
- [*Information: Labels or placards*]: A business must display a notice informing consumers of the Environment and Climate Adaptation Levy charged on plastic bags,…[and] the notice must be clearly legible and displayed in a conspicuous place.

2017, Palau: Plastic Bag Use Reduction Act (RPPL No. l0-14)

- [*Regulatory – Prohibitive: Ban plastics*]: One year following the effective date of this Act, no individual or business may import plastic products prohibited for distribution by Section 2102 [plastic bags].Two years following the effective date of this chapter, Retail establishments may not provide plastic bags that are not biodegradable or compostable to their customers at the point of sale or prior to exit for the purpose of transporting groceries, food products, and other merchandise…Retail establishments that sell reusable bags to consumers shall price Reusable bags at no greater than twenty-five percent (25%) above the At cost value.

2018, New Zealand: Waste Minimisation (Plastic Shopping Bags) Regulations 2018

- [*Regulatory – Prohibitive: Ban plastic*]: Retailers must not sell plastic shopping bags. A retailer must not sell plastic shopping bags for the purpose of distributing goods sold by the retailer in New Zealand.

2019, Samoa: Public notice plastic prohibition (ban) 2019

- [*Regulatory – Prohibitive: Ban plastic*]: As such, the public is hereby advised that the Waste (Plastic Bag) Regulation 2018 prohibits the import, manufacture, export, sale and distribution of plastic shopping bags, packing bags and straws effective from the 30 January 2019. Plastic shopping bags under the regulation means a bag made in whole or partly of thin plastic film and contains starch (such as biodegradable bags) or full petroleum, or additive used as shopping bags and packing bags. Packing bags means packing bags used for re-packing and storage of products. Exemptions:…plastic bag used exclusively to pack or repack frozen goods sold at retailers such as meat, frozen ice cream, ice cubes, locally produced chips, locally produced kekesaina, ava, local biscuits, repacked coffee, tea, sugar, flour and cocoa.

V. Instruments Targeting Microplastic Pollutants

2017, New Zealand: Waste Minimisation (Microbeads) Regulations 2017

- [*Regulatory – Prohibition: Ban plastic*]: A person must not sell a prohibited wash-off product in New Zealand. A prohibited wash-off product means a wash-off product that contains microbeads for 1 or more of the following purposes: (i) exfoliation of all or part of a person's body: (ii) cleaning of all or part of a person's body: (iii) abrasive cleaning of any area, surface, or thing: (iv) visual appearance of the product; but (b) does not include a medical device or medicine.

Europe and Central Asia

I. Instruments Targeting Leakage of All (or multiple) Types of Plastics

2004, Malta: CHAPTER 473 - ECO-CONTRIBUTION ACT

- [*Economic: Disincentive*]: There shall be charged and levied by the competent authority, on account of the Government, an eco-contribution at the rates shown in the Third Column of the First Schedule payable on products described in the First and Second Columns of the said Schedule, which are placed on the market, and in the Fourth Column of the Second Schedule payable on services described in the First, Second and Third Columns of the said Schedule [subsequently amended in multiple acts]
- [*Economic: Tax break*]: In cases of recovery of waste from products on which eco-contribution is paid in terms of this Act, the producers of those products may, in accordance with regulations made under articles 12 and 13, be granted a credit of the contribution paid thereon, or part thereof, against eco-contributions which may fall due in future.

2007, United Kingdom: The Producer Responsibility Obligations (Packaging Waste) Regulations 2007

- [*Regulatory – Affirmative: Plan, commitment; Responsible handling of plastic*] A person who is a producer in respect of a year….[has producer responsibility obligations and] must— (a) be registered as provided in [these Regulations], and… (c) furnish a certificate of compliance in respect of his recovery and recycling obligations in accordance with regulation 21..; and (d) if his main activity is that of seller, provide information to consumers of the goods sold by him about: the return, collection and recovery systems available to them; their role in contributing to the reuse, recovery and recycling of packaging and packaging waste; the meaning of related markings on packaging that he places on the market and that relates to his recovery and recycling obligations; and the chapter dealing with the management of packaging and packaging waste in any strategy prepared under [the national waste strategy)].

2012, United Kingdom: The Producer Responsibility Obligations (Packaging Waste) (Amendment) Regulations 2012

- [*Regulatory – Affirmative: Responsible handling of plastic*]: [Includes general waste recovery targets, and also recycling targets for plastic waste range from 32% in 2012 to 57% in 2017]

2014, Austria: Ordinance on the Prevention and Recovery of Packaging Waste and Specific Waste Products (Packaging Ordinance of 2014)

- [*Regulatory – Affirmative: Plan, commitment*]: manufacturers, importers, packers and distributors shall be obliged — unless this is disproportionate… — to input the packaging taken back and accumulated in the company's operation into a state-of-the-art recycling plant demonstrably reaching for each packaging material in total the following minimum percentages by mass related to the sum total of transport and sales packaging (after eliminating foreign substances, substances and packaging not subject to this Ordinance): Plastics: 40%.
- [*Regulatory – Affirmative: Plan, commitment*]: Manufacturers, importers, packers, distributors, major waste generation points and importers for own use or collection and recovery systems commissioned by them shall be obliged to input the following minimum percentages by mass of the respective packaging materials placed on the market in the federal territory of Austria into a state-of-the-art recycling plant in each calendar year starting 2007: Plastics 22.5%

2015, Macedonia: Law for Packaging and Packaging Waste Management

- [*Economic: Disincentive*]: The producer who releases on the market in [Macedonia] packaged goods that due to usage create packaging waste, as well as the producer who as an end user imports in [Macedonia] packaged goods that due to usage create packaging waste shall be obliged to pay compensation for managing packaging waste (hereinafter: compensation). The compensation…shall amount to: Type of material - Plastic Subtype of material: amount 20.000 den/ton
- [*Regulatory – Affirmative: Plan, commitment*]: [In Macedonia], the following amounts of packaging and packaging waste need to be collected and processed in the following time period: by the end of year 2018 22.5% plastic, considering only the recyclable materials in the plastic.

2015, Netherlands: Marine Strategy for the Dutch part of the North Sea 2012-2020

- [*Information: Education or outreach*]: Actions to put the litter problem on the agenda of stakeholders include: Including the litter/plastic soup theme in the successive levels of learning (with the Institute for Curriculum Development) and promoting the topic among teaching and education professionals….Improving and intensifying education about litter and waste separation as well as focusing education also on behavioural change by means of an education measure together with NGOs and other organisations focused on education.

2017, United Kingdom: Producer Responsibility Obligations (Packaging Waste) (Miscellaneous Amendments) Regulations 2017 (S.I. No. 1221 of 2017)

- [*Regulatory – Affirmative: Responsible handling of plastic*]: [Sets recycling targets for plastic at 53% to 57% from 2018 to 2020, respectively]

II. Instruments Targeting Maritime Sources of Plastic Pollution

2004, Malta: Merchant Shipping (Prevention of Pollution by Garbage) Regulations

- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: The disposal of all plastics from a ship into the sea outside special areas is prohibited. The disposal from a ship into the sea outside special areas, of garbage other than plastics is prohibited except where it is made as far as practicable from the nearest land and: (a) in the case of dunnage, lining and packing materials which will float, not less than twenty-five miles from the nearest land; or in the case of food wastes and all other garbage including paper products, rags, glass, metal, bottles, crockery and similar refuse, not less than twelve miles or, if such wastes and other garbage have been ground or comminuted to the required standard, not less than three miles from the nearest land.

2008, United Kingdom: Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008 (S.I. No. 3257 of 2008)

- [*Regulatory – Prohibitive: Irresponsible handling of plastics*]: The disposal into the sea of any plastics from a ship to which this regulation applies is prohibited. Where plastics are mixed with garbage of one or more kinds referred to in regulation 27, 28 or 29, the disposal of that mixed garbage into the sea from such a ship is prohibited.
- [*Information: Research, data collection, data reporting or record keeping*]: Every ship to which this regulation applies must keep on board a garbage record book [garbage discharge or incineration must be entered into the record book], and in the event of a disposal, an escape, or an accidental loss, an entry must be made recording the circumstances of, and the reasons for, the disposal, escape or accidental loss.
- [*Information: Labels or placards*]: A ship to which the regulation applies must display placards which notify the crew and any passengers of the requirements for the disposal of garbage contained in regulations 26 to 28 and 30.

2012, Ireland: Sea Pollution (Prevention of Pollution by Garbage from Ships) Regulations 2012 (S.I. No. 372 of 2012)

- [*Regulatory – Prohibitive: Irresponsible handling of plastics*]: The discharge of all garbage into the sea is prohibited, except as provided otherwise than in section 11 of the Act and Regulations 5, 6, and 7. Except as provided in section 11 of the Act, discharge into the sea

of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, plastic garbage bags and incinerator ashes from plastic products is prohibited.

III. Instruments Targeting Macroplastic Pollutants

2001, Ireland: Waste Management (Farm Plastics) Regulations, 2001 (S.I. No. 341 of 2001)

- [*Economic: Cash for return*]: A producer of farm plastics shall operate a deposit and refund scheme in relation to farm plastics which are imported or manufactured by the producer and supplied by the producer to persons within the State and for this purpose: (a) a producer shall require each purchaser of such farm plastics to pay to the producer a refundable deposit of money in relation to such farm plastics supplied by the producer to the purchaser, (b) the amount of a refundable deposit shall be calculated at a rate equivalent to £200 prior to 1st January 2002 and €254 thereafter per tonne of such farm plastics so supplied, (c) a producer shall, upon the return by any person of such farm plastics to the producer, repay to that person an amount which is equal to the deposit, or proportion of the deposit, paid to the producer in respect of the farm plastics so returned. A producer shall submit [annually] to each local authority in whose functional area he has supplied farm plastics for sale, … a certificate from an independent auditor, … in relation to the operation of a deposit and refund scheme by that producer in respect of the preceding financial year.

2004, Bulgaria: Ordinance on Packaging and Packaging Waste

- [*Regulatory – Affirmative: Responsible handling of plastic*]: The plastic pallets and cases according to Art. 6, paragraph 7, item 2, must meet the following requirements: 1. to be produced in controlled process of recycling, at which the materials, subject to recycling, originate only from other plastic cases or pallets and the input of external materials is minimum, inasmuch as the recycling is technically feasible, without exceeding 20 percent of the weight of the produced pallet or case; 2. at the process of production and distribution not to be deliberately input lead, cadmium, mercury or hexavalent chromium, and their presence in the packaging is due to occasional factors, which are not connected with the process of production and distribution; 3. the exceeding of the utmost admissible concentration is result only of the input of recycled materials. The recycling of the plastic pallets and cases, unfit for following use according this paragraph, shall be implemented so, that 1. the material, subject to recycling, to originate from plastic cases or pallets from the same closed and controlled system for reuse and distribution; 2. the input of external materials to be minimum, as far as the recycling is technically feasible, in any cases not exceeding 20 percent of the weight of the obtained product.

2005, Latvia: Natural Resource Tax Law

- [*Economic: Disincentive*]: A taxpayer shall be a person who: in [Latvia] in public catering and retail trade sells disposable tableware and accessories which are manufactured from plastic (polymers), paper, cardboard, composite materials thereof (laminates) with polymer or metal components and metal foil (hereinafter – disposable tableware and accessories)

2007, Ireland: Waste Management (Packaging) Regulations, 2007 (S.I. No. 798 of 2007)

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: A major producer who is an importer of packaged products or is a packer/filler shall take such steps as are necessary to ensure that in any quarterly period, the aggregate weight of packaging waste which is accepted or, as appropriate, collected by that major producer for the purposes of recovery— (a) is not less than 60% of the aggregate weight of packaging material and packaging imported or packed/filled and supplied by that major producer in the preceding quarterly period, and (b) that a minimum 55% of the aggregate weight of packaging material and packaging imported or packed/filled and supplied by that major producer in the preceding quarterly period is recovered by way of recycling, and, where appropriate, (c) that a minimum— …22.5% by weight for plastics, and as appropriate, supplied by that major producer in the preceding quarterly period is recovered by way of recycling.

2007, Malta: Waste Management (Activity Registration) Regulations (L.N. 106 of 2007)

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Manufacture of finished goods from waste: (1) The manufacture of finished goods from any of the following kinds of waste [specifies plastic]. (2) The storage of any such waste [is exempted according to] sub-paragraph (1) above if: (a) the waste is stored at the place of manufacture; and (b) the total amount of any particular kind of waste stored at that place at any time does not exceed 1,000 tonnes. (3) For amounts of waste less than 1 tonne does not require registration.
- [*Regulatory – Prohibitive: Ban plastic*]: [Limits the amount plastic waste for storage for reuse or recovery at any place, and duration of storage to a maximum of 12 months]

2008, Switzerland: Ordinance on Beverage Containers

- [*Regulatory – Affirmative: Responsible handling of plastic*]: Dealers, manufacturers and importers who supply beverages in non-refillable PET or metal containers to consumers and who do not ensure the disposal of all containers they supply through financial contributions to a private organization, must: a. take back such non-refillable containers

at all points of sale during all opening hours; b. pass such non-refillable containers on for recycling at their own expense

- [*Information: Labels or placards*]: Dealers, manufacturers and importers who supply beverages in non-refillable PET or metal containers to consumers and who do not ensure the disposal of all containers they supply through financial contributions to a private organisation, must:..c. indicate clearly in easily visible places at the points of sale that they accept the return of these types of non-refillable containers.
- [*Information: Labels or placards*]: Dealers, manufacturers and importers who supply beverages to consumers must: a. mark refillable containers as such; this does not apply to restaurant businesses; b. indicate the amount of the deposit charged on deposit-bearing beverage containers; c. on non-refillable PVC containers indicate the name and address of a company in Switzerland that is obliged to take them back.
- [*Economic: Cash for return*]: Dealers, manufacturers and importers who supply beverages in non-refillable PVC containers to consumers must charge a deposit. They must take back non-refillable PVC containers of all the products they stock, refund the deposit and at their own expense pass the containers on for recycling. Exempted from these obligations are holders of restaurant businesses who ensure that non-refillable PVC containers are collected. The deposit shall be not less than CHF 0.30 for any non-refillable PVC container.
- [*Regulatory – Affirmative: Plan, commitments*]: The recycling level for beverage containers made from…PET…shall be a minimum of 75%… The recycling rate of any packaging material is the percentage proportion of the containers recycled during a calendar year compared with the total weight of non-refillable containers of the material supplied for use in Switzerland.
- [*Economic: Cash for return*]: If the target is not achieved, [the responsible Government agency] may require that dealers, manufacturers and importers: charge a minimum deposit on non-refillable containers of the material concerned; accept the return of such containers and refund the deposit.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: If the target is not achieved, [the responsible Government agency] may require that dealers, manufacturers and importers: pass returned containers on for recycling at their own expense

2011, Malta: Waste Regulations, 2011 (L.N. 184 of 2011)

- [*Regulatory – Affirmative: Plan, commitment*]: Re-use, Recycling and recovery targets…by 2020: …the preparing for re-use and the recycling of …plastic.. from households, shall be increased to a minimum of overall 50 % by weight

- [*Regulatory – Affirmative: Develop new or improve existing process or product*]: local councils shall … set up separate collection (which includes comingled collection) for at least the following:… plastic, in order to promote high quality recycling.

2011, Montenegro: Waste Management Law

- [*Regulatory – Affirmative: Responsible handling of plastic*]: At least 50% of the total weight of collected waste materials such as…plastics…from households and other sources is prepared for reuse and recycling.…The waste [names plastic as one type] is collected separately, if practicable in the technical and economic terms and justified from the standpoint of environmental protection, so as not to be mixed with other waste or other material having different properties. … The manner in which separate collection and the collection of municipal waste for treatment is performed shall be regulated by the competent local self-government bodies.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: *Packaging* waste shall be collected separately from other wastes. Commercial packaging waste shall be delivered to a business enterprise or entrepreneur performing the activity of collecting, processing and/or removal of such waste … Municipal waste containers shall be delivered to the locations that are designed for this type of waste within the separate collection of municipal waste or in locations that are planned for the collection of such waste by the distributor. The manufacturer and importer of packaging and packed products shall be included in the organized system of acquisition, collection and treatment of packaging waste. Manufacturers and importers of packaging shall bear the costs of the organized system for acquisition, collection and treatment of packaging waste. A company or entrepreneur who collects waste packaging shall take measures to ensure that annually, including energy processing, at least 60% of the total weight of packaging placed on the market is collected. A company or entrepreneur who handles waste packaging shall take security measures to recycle at least 55% of the total weight of packaging which is placed on the market so as to achieve at least the following ratio for recycling individual components: … 22.5% of weight of plastics, where this applies only to material that is re-recycled into plastics.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Reuse and recycling of … plastic waste … in the percentages referred to in Article 14 of this Law [i.e., at least 50% of the total weight collected of waste materials such as … plastics … from households and other sources] shall be achieved by 2020.

2011, Spain: Law 22/2011, of July 28 on Contaminated Waste and Soil

- [*Regulatory – Affirmative: Plan, commitment*]: The environmental authorities in their respective field of competence shall take measures to promote high quality recycling and, to this end, a separate collection of waste, including used oils, shall be established,

when technically, economically and environmentally feasible and adequate, to meet the necessary quality criteria for the corresponding recycling sectors. Before 2015, a separate collection must be established for at least the following materials: … plastic. Existing separate collection systems may be adapted to separate collection of the materials referred to in the preceding paragraph. More than one material may be collected in the same fraction provided its adequate subsequent separation is guaranteed if this does not imply a loss of the quality of the materials obtained or an increase in cost.

- [*Regulatory – Affirmative: Responsible handling of plastic*]: In order to meet the objectives of this Law and to move towards a recycling society with a high level of resource efficiency, the Government and the competent authorities shall adopt the necessary measures through the management plans and programs of waste to ensure that the following objectives are achieved and, where appropriate, those established: a) Before 2020, the amount of household and commercial waste destined for the preparation for reuse and recycling for paper, metal, glass, plastic, bio-waste or other recyclable fractions must, as a whole, reach at least 50 % in weight.

2013, Latvia: Cabinet Regulation No. 184 of 2013 on Separate Waste Collection, Preparation for Re-use, Recycling and Material Recovery

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: A local government in co-operation with waste managers … shall establish a system for separate collection of … waste containing plastic. Separately collected waste and waste sorted in sorting facilities that is transferred to recycling or to perform another recovery activity in which no significant reduction of the mass of waste takes place, shall be considered to be waste prepared for re-use, recycled or otherwise recovered. Waste managers who prepare municipal waste for re-use and who recycle it shall, by 2020, ensure the preparation of waste for re-use, recycling thereof or material recovery (with the exception of energy recovery and waste recycling into materials intended for use as fuel) in the amount of 50% (by weight) of the amount of municipal waste produced in a calendar year. Achievement of this objective shall be determined as a percentage ratio between the weight of municipal waste prepared for re-use, recycled or subjected to material recovery in a calendar year, and the weight of municipal waste produced.

2014, Estonia: Packaging Excise Duty Act

- [*Economic: Disincentive*]: Excise duty on the packaging of imported goods shall be paid by the person by whom or on whose behalf the goods are declared for the customs procedure. Excise duty on the packaging of imported goods shall be paid by the person by whom or on whose behalf the goods are declared for the customs procedure of release for free circulation within the meaning of the Community Customs Code. Excise duty on the packaging of goods packaged in Estonia shall be paid by the person who places the

packaged goods on the market for the first time in Estonia or makes the packaged goods accessible for distribution or use.

2014, Netherlands: Packaging Management Decree

- [*Regulatory – Affirmative: Responsible handling of plastic*]: manufacturers and importers shall jointly ensure that for each calendar year at least a quantity, determined in terms of weight by ministerial regulation, of plastic packaging waste produced from households, is recycled. The manufacturer or importer shall ensure that in each calendar year, of the total quantity of packaging either placed on the market in the Netherlands or imported and disposed of by it, during that calendar year, at least 75 per cent by weight is utilised, and at least 70 per cent by weight is recycled. The manufacturer or importer shall ensure that in each calendar year, of the total quantity of packaging either placed on the market in the Netherlands by it or imported and disposed of by it, during that calendar year: a. of plastic packaging, at least the following weight percentage is recycled: [45% by weight in 2015 to 51% by 2021].

2015, United Kingdom: The Single Use Carrier Bags Charges (England) Order 2015

- [*Information: Research, data collection, data reporting or record keeping*]: Before 5th October 2015, the Secretary of State must: (a) complete a review of industry standards for the biodegradability of lightweight plastic material; and [provide a report to Parliament of] the conclusions of the review, in particular whether it appears … that there exists an industry standard appropriate for the purposes of an exclusion from the obligations specified in Part 2 on grounds of biodegradability; and (ii) if so, how that exclusion would be implemented.

2016, Denmark: Statutory Order on Deposits on and the Collection etc. of Packaging for Certain Beverages

- [*Economic: cash for return*]: Any person who markets beverages in packaging in Denmark shall collect deposits for the packaging when placing them on the market… The deposits laid down in accordance with recommendations from the sector organisations for producers of beer and soft drinks shall constitute (including VAT) the following …: 1) Plastic packaging not exceeding 99cl, DKK 1.50 2) Refillable glass packaging exceeding 50cl, DKK 3.00 3) Other packaging not exceeding 99cl, DKK 1.00 4) Packaging exceeding 99cl, DKK 3.00.
- [*Economic: cash for return*]: Any person who has marketed packaging containing beverages in Denmark shall accept the packaging and pay the relevant deposit to the person who has returned the packaging, if the following conditions have been met…: 1) Refillable packaging: Refillable packaging shall be accepted if it corresponds to the marketed types of packaging or can be sorted into crates and trays together with

the marketed types of packaging. 2) One-way packaging: Stores shall accept one-way packaging if this packaging is made of the same material as the marketed one-way packaging. Others who market beverages in one-way packaging shall accept the one-way packaging items they have marketed. 2) The obligation to accept one-way packaging and pay deposits for empty one-way packaging shall not apply to providers and intermediaries. 3) Stores shall accept all types of one-way packaging and pay deposits for this packaging if the store has installed a central control unit. 4) A condition for paying deposits on a one-way packaging item …, shall be that 1) the one-way packaging item has been registered with Dansk Retursystem A/S, …, and 2) the one-way packaging item complies with the requirements for marking, … 5) A condition for paying deposits on one-way packaging which is returned to the stores' reverse vending machines and which complies with the conditions in subsection 4) shall be that the packaging can be identified electronically, including by scanning the EAN barcode.

- [*Economic: Cash for return*]: Providers who market refillable packaging covered by this Statutory Order shall ensure that the refillable packaging is part of the deposit and return system in which the packaging is collected in appropriate crates and trays at the party to whom the provider has marketed the packaging with a view to re-using the packaging. At least 98% of the marketed refillable packaging shall be collected for re-use … Dansk Retursystem A/S shall ensure that collected empty one-way packaging is recycled.
- [*Economic: Cash for return*]: Any person who markets beverages in packaging in Denmark shall collect deposits for the packaging when placing them on the market … The deposits laid down in accordance with recommendations from the sector organisations for producers of beer and soft drinks shall constitute (including VAT) the following … Plastic packaging not exceeding 99cl, DKK 1.50.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Providers who accept refillable packaging shall ensure that the packaging is recycled when the packaging can no longer be re-used.
- [*Information: labels or placards*]: Any person who … may request to receive packaging which has been detained or confiscated, may request Dansk Retursystem A/S to legalise the packaging by marking it with a self-adhesive legalisation deposit label …. [The person shall order and purchase the deposit labels from Dansk Retursystem A/S].

2017, Ireland: Waste Management (Farm Plastics) (Amendment) Regulations 2017 (S.I. No. 396 of 2017)

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: These Regulations amend the Waste Management (Farm Plastics) Regulations 2001 and are designed to assist in the improved recovery of waste farm plastics. … the definition of farm plastics will be expanded to include two further materials (i.e., netting and bale twine).

2018, Uzbekistan: About Measures to Further Improve the System of Household Waste Management

- [*Regulatory – Prohibition: Ban plastic*]: the following will be prohibited: free delivery of polymer film bundles, including the cost of goods sold in [Uzbekistan], as well as their sale at a lower cost (excluding packages that are integral parts and goods); Production of polymer film packages less than 40 microns in [Uzbekistan] (packages made of polymer film for export, no handles and integral part of goods, sold for commercial rolls, as well as bio-filtered polymeric materials except); Packages of polymer film [in Uzbekistan] packages imported by physical persons for transportation and packing of goods and personal belongings, as well as in transit except for the goods being transported.

IV. Instruments specifically Targeting Leakage of Plastic Carry-Out Bags

2001, Ireland: Waste Management (Amendment) Act, 2001 (No. 36 of 2001)

- [*Economic: Disincentive*]: The Minister may, with the consent of the Government, make regulations providing that there shall be chargeable, leviable and payable a levy … in respect of the supply to customers, at the point of sale to them of the goods or products to be placed in the bags, or otherwise of plastic bags in or at a specified class or classes of supermarket, service station or other sales outlet. The amount of the levy shall … not exceed an amount of 15p, or, in the case of levy payable on or after 1 January 2002, 19 cents, for each plastic bag supplied to a customer. The levy shall be payable by the person who carries on the business of selling goods or products in or at the supermarket, service station or sales outlet concerned or, if two or more persons each carry on such a business in or at the particular premises, whichever of them causes to be made the particular supply of plastic bags concerned.

2001, Ireland: Waste Management (Environmental Levy) (Plastic Bag) Regulations, 2001 (S.I. No. 605 of 2001)

- [*Economic: Disincentive*]: The following classes of plastic bags are excepted from the [levy[: (a) plastic bags solely used to contain (i) fresh fish and fresh fish products, (ii) fresh meat and fresh meat products, or (iii) fresh poultry and fresh poultry products provided that such bags are not greater in dimension than 225mm in width (exclusive of any gussets), by 345mm in depth (inclusive of any gussets), by 450mm in length, (inclusive of any handles); (b) plastic bags solely used to contain the products referred to in paragraph (a) where such products are contained in packaging, (including a bag), provided that such plastic bags are not greater in dimension than the dimensions referred to in paragraph (a); (c) plastic bags solely used to contain(i) fruit, nuts or vegetables, (ii) confectionery, (iii) dairy products, (iv) cooked food, whether cold or hot, or (v) ice provided that such products are not otherwise contained in packaging and where such bags are not greater in dimension than the dimensions referred to in paragraph (a); (d) plastic bags used

to contain goods or products sold: (i) (ii) on board a ship or aircraft used for carrying passengers for reward, or in an area of a port or airport to which intending passengers are denied access unless in possession of a valid ticket or boarding card, for the purposes of carrying the goods on board the ship or aircraft referred to in subparagraph (i); (e) plastic bags designed for re-use, which are used to contain goods or products and which are sold to customers for a sum of not less than 70 cent each.

- [*Information: Research, data collection, data reporting or record keeping*]: An accountable person shall keep in a permanent from a full and true record of: [the number of bags in stock before March 4, 2002, specifying those excepted from regulation, and the number of bags under regulation that are purchased or acquired subsequently in each accounting period, as well as the number supplied by customers].

2004, Malta: Chapter 473 – Eco-Contribution Act

- [*Economic: Disincentive*]: A producer of plastic bags described in the First and Second Columns of the First Schedule who is liable for the payment of an eco-contribution at the rate shown in the Third Column of the said Schedule shall be obliged to comply with the obligations in accordance with the provisions of the said Fourth Schedule.

2011, Ireland: Environment (Miscellaneous Provisions) Act 2011 (No. 20 of 2011)

2011, Spain: Law 22/2011, of July 28 on Contaminated Waste and Soil

- [*Regulatory – Affirmative: Plan, commitment*]: Public administrations shall take the necessary measures to promote the most sustainable systems for the prevention, reduction and management of waste from commercial single-use non-biodegradable plastic bags and their alternatives, including actions corresponding to the status of the administration as consumer, through public purchases …. By regulation, the calendar for the replacement of single-use commercial bags of non-biodegradable plastic will be established, as well as the formulas provided for compliance with said calendar.
- [*Information: Research, data collection, data reporting or record keeping*]: A working group will be created within the specialized Coordination Commission for the study of proposals on the prevention and management of waste from commercial single-use non-biodegradable plastic bags. Said working group will analyze the information available both at the international level, as well as at the state and regional level, in matters of standardization and life cycle analysis, among other aspects related to the purpose of this provision.

2015, Macedonia: Law for Packaging and Packaging Waste Management

- [*Regulatory – Prohibition: Ban plastic*]: It is prohibited to release on the market bags for transport of goods made of ethylene polymers, poly (vinyl chloride) and/or other plastic materials. As an exception to paragraph (1) of this Article it is allowed to release on the market biodegradable bags made of the appropriately precribed standards for biodegradability. The standards for biodegradability referred to in paragraph (2) of this Article that are supposed to be met by the bags for transport of goods, the manner of release and use of biodegradable bags for transport of goods on the market shall be prescribed by the minister heading the state administration body responsible for activities in the environmental field.
- [*Economic: Disincentive*]: The compensation amount of the bags used for transport of goods shall be: 1) 1 den/1 kg weight of the bags used for transport of goods. … [to be paid by]: 1) a domestic legal entity and /or natural person producing bags used for transport of goods from ethylene polymers, poly (vinyl chloride) and or other plastic masses regardless whether they contain appropriate additives and/or are biodegradable, and 2) a legal entity and /or natural person importing bags used for transport of goods from ethylene polymers, poly (vinyl chloride) and /or other plastic masses.

2015, United Kingdom: The Single Use Carrier Bags Charges (England) Order 2015

- [*Economic: Disincentive*]: A seller must charge a minimum of 5 pence (including any VAT) for each SUCB supplied in a reporting year—(a) at the place in England where the goods are sold, for the purpose of enabling the goods to be taken away; or (b) for the purpose of enabling the goods to be delivered to persons in England.
- [*Information: Research, data collection, data recording or record keeping*]: A seller must keep a record in relation to a reporting year if required to charge in that year in accordance with article 3 … [that includes]: … (a) the number of SUCBs supplied by the seller during the reporting year; (b) in relation to those bags—(i) the gross proceeds of the charge; (ii) the amount of any VAT received by way of the gross proceeds of the charge; (iii) the amount of any reasonable costs; (iv) the apportionment between any different kinds of reasonable costs; (v) the net proceeds of the charge; (vi) the uses to which the net proceeds of the charge have been put. … In this paragraph, "reasonable costs" means costs reasonably incurred completing transactions, communicating information, obtaining expert advice or carrying on similar activities to enable the seller to comply with this Order.

2016, Finland: Framework Agreement to Reduce the Consumption of Lightweight Plastic Carrier Bags (Plastic Carrier Bag Agreement)

- [*Information: Research, data collection, data reporting or record keeping*]: The Ministry: undertakes to evaluate after 3 years from the date when the agreement was concluded

the effectiveness of the measures … in terms of reducing the consumption of lightweight plastic carrier bags and preventing littering. … By the end of 2016, the Ministry and the Federation will specify the methods to be applied in monitoring the achievement of the objectives and reporting on it …. [A] management group [will] follow and promote the realisation of the objectives of the agreement by: estimating the level of consumption of lightweight plastic carrier bags per person in the beginning of the contract period; monitoring the reported numbers of lightweight carrier bags consumed on an annual basis; verifying the correctness of the reported information on the numbers of lightweight carrier bags consumed.

- [*Regulatory – Affirmative: Plan, commitment*]: Should the evaluation show that the measures taken have not been effective, the Ministry …will consider other potential means to reduce the consumption of lightweight plastic carrier bags.

2017, Malta: Waste Management (Packaging and Packaging Waste) Regulations, S.L. 549.43

- [*Regulatory – Affirmative: Plan, commitment*]: The competent authority shall take such measures in order to … achieve a sustained reduction in the consumption of lightweight plastic carrier bags within the territory of Malta, through the adoption of either or both of the following: … measures ensuring that the annual consumption level does not exceed 90 lightweight plastic carrier bags per person by 31 December 2019 and 40 lightweight plastic carrier bags per person by 31 December 2025, or equivalent targets set in weight. Measures and instruments to be adopted may include the use of national reduction targets, economic instruments and marketing restrictions in derogation from regulation 11 of these Regulations, provided that these restrictions are proportionate and non-discriminatory. Measures may vary depending on the environmental impact of lightweight plastic carrier bags when they are recovered or disposed of, their composting properties, durability or specific intended use. Very lightweight plastic carrier bags may be excluded from these measures.
- [*Economic: Disincentive*]: The competent authority shall take such measures in order to … achieve a sustained reduction in the consumption of lightweight plastic carrier bags within the territory of Malta, through the adoption of either or both of the following: … instruments ensuring that by 31 December 2018, lightweight plastic carrier bags are not provided free of charge at the point of sale of goods or products, unless equally effective instruments are implemented.
- [*Information: Education*]: The competent authority shall take such measures in order to … conduct information campaigns for users or consumers and producers of packaging on: … the adverse environmental impact of the excessive consumption of lightweight plastic carrier bags.

2018, Romania: Law No 87/2018 Amending and Supplementing Law No 249/2015 Regarding the Management of Packaging and Packaging Waste

- [*Regulatory – Prohibitive: Ban plastic*]: It shall be forbidden to place lightweight and very lightweight plastic carrier bags with a handle on the national market.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Economic operators marketing plastic carrier bags shall be obliged to market only plastic carrier bags meeting the essential requirements regarding the reusable nature of packaging materials, provided for in Point 2 of Annex 2, so that they are suitable for multiple reuse, with the exception of very lightweight plastic carrier bags.
- [*Economic: Cash for return*]: Economic operators marketing products packaged in reusable primary packaging shall be obliged to receive the reusable packaging in exchange for new one or to reimburse the consumer the value of the deposit, upon their request.
- [*Information: Research, data collection, data reporting or record keeping*]: As of 27 May 2018, the statements and reports on packaging and packaging waste management sent to the European Commission by the Ministry of Environment, … shall also include data regarding the annual consumption of lightweight plastic carrier bags.
- [*Information: Labels or placards*]: Economic operators placing biodegradable and compostable plastic carrier bags on the national market shall be responsible for labelling this sales packaging in accordance with the [the specified regulations].

2018, Spain: Royal Decree No. 293/2018 – Reducing the consumption of plastic bags and creating the Registry of Producers

- [*Regulatory – Prohibitive: Ban plastic; Economic: Disincentive*]: The measures adopted to reduce the consumption of plastic bags, depending on of its effective date, are the following: 1. As of July 1, 2018: a) Free delivery to consumers of plastic bags at the points of sale of goods or products is prohibited, except for very light plastic bags and plastic bags with a thickness equal to or greater than 50 microns with a percentage equal to or greater than 70% recycled plastic. b) In the case of the exception for plastic bags with a thickness equal to or greater than 50 microns provided in the previous section, merchants must have documentation provided by the manufacturer attesting said percentage. c) Merchants will charge an amount, for each plastic bag they provide to the consumer. To determine the price of plastic bags, traders may take as reference the guide prices set out in Annex I. d) Likewise, the merchants will inform the consumers of the established prices, exposing them to the public in a visible place and including a reference to the fulfillment of the requirements contained in the previous sections.
- [*Regulatory – Prohibitive: Ban plastic*]: As of January 1, 2020: a) Delivery to consumers, at points of sale of goods or products, of fragmented plastic bags is prohibited. b) Plastic bags with a thickness equal to or greater than 50 microns shall contain a minimum percentage of 50% recycled plastic.

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: As of January 1, 2021, the delivery of light and very light plastic bags to the consumer at the points of sale of goods or products is prohibited, except if they are made of compostable plastic. Merchants may also opt for other packaging formats to replace plastic bags.
- [*Information: Labels or placards*]: Within eighteen months after the adoption of the European regulations provided for in Article 8 bis of Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994, on packaging and packaging waste, to establish the specifications of the labels or brands that allow the recognition of compostable plastic bags throughout the European Union, compostable plastic bags that are placed on the national territory market must be marked in accordance with the Community regulations that are approved.
- [*Information: Education or outreach*]: The Ministry of Agriculture and Fisheries, Food and Environment and the autonomous communities, as competent authorities, will conduct public information campaigns on the measures adopted in this royal decree as well as awareness campaigns on the negative consequences for the environment of the excessive consumption of all types of plastic bags and the effects of their abandonment, and will promote the application of the principle of waste hierarchy. These campaigns will contain information on the container in which the plastic, compostable and non-compostable bags should be deposited, once they become waste. Local entities and merchants may also carry out information and awareness campaigns in accordance with the campaigns of the competent authorities. Campaigns carried out by the competent authorities may be subject to financing by the extended collective responsibility systems within the framework of the financing agreements that these systems have with the autonomous communities or, where appropriate, local entities.
- [*Information: Research, data collection, data reporting or record keeping*]: The manufacturers of plastic bags shall collect the information contained in section two of Annex II, corresponding to the bags they have placed on the national market in each calendar year. This information will be sent to the Ministry of Agriculture and Fisheries, Food and Environment before March 31 of the following year to which it is referred, for the purpose of preparing the information on plastic bags that must be provided to the European Commission in accordance with current regulations, and that will be published annually. The information provided by the bag manufacturers will be accessible to the competent authorities for the purposes of inspection and control.

V. Instruments Targeting Microplastic Pollutants

2017, United Kingdom: Environmental Protection (Microbeads) (England) Regulations 2017 (S.I. No. 1312 of 2017)

- [*Regulatory – Prohibitive: Ban plastic*]: A person who supplies, or offers to supply, any rinse-off personal care product containing microbeads is guilty of an offence …. A person guilty of an offence is liable on summary conviction to a fine.

- [*Regulatory – Prohibitive: Ban plastic*]: A person who, in the manufacture of any rinse-off personal care product, uses microbeads as an ingredient of that product is guilty of an offence.

2018, France: Article 124 of the law of 8 August 2016 for the recovery of biodiversity, nature and landscapes

- [*Regulatory – Prohibitive: Ban plastic*]: As of January 1, 2020, the setting in the market for household sticks for sticks whose plastic stem is prohibited.
- [*Regulatory – Prohibitive: Ban plastic*]: The placing on the market of rinsed cosmetic products for exfoliation or cleaning purposes involving solid plastic particles, with the exception of particles of natural origin which are unlikely to subsist in the media, to propogate chemical or biological active principles or to affect animal trophic chains.

Latin America and the Caribbean

I. Instruments Targeting Leakage of All (or Multiple) Types of Plastics

2008, St. Lucia: Environmental Protection Levy Act

- [*Economic: Disincentive*]: There shall be charged, levied and collected on goods imported into Saint Lucia a levy to be known as the environmental protection levy at a rate specified in the Schedule. Description of goods [includes]: (a) goods in containers made of plastic …—1.5% of the c.i.f. value. (b) empty containers made of plastic …—1.5% of the c.i.f. value.

II. Instruments Targeting Macroplastic Pollutants

2010, Peru: Modify articles of Supreme Decree No. 009-2009-MINAM Eco-Efficiency Measures for the Public Sector

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Public Sector Entities must use plastics, paper, cardboard with a percentage of recycled material. Said percentage shall be determined by the Ministry of Environment through Ministerial Resolution, within a term not exceeding thirty (30) calendar days counted from the effective date of this Supreme Decree … Public sector entities must buy and use biodegradable plastic bags.

2012, Haiti: Prohibition of Food Packaging and Disposable Polystyrene Dishes

- [*Regulatory – Prohibitive: Ban plastic*]: The import of [food packaging and disposable and polystyrene dishes as well as plastic containers in particular] will be formally banned throughout the country.

2015, Guyana: Environmental Protection (Expanded Polystyrene Ban) Regulations, 2015 (No. 8 of 2015)

- [*Regulatory – Prohibitive: Ban plastic*]: The importation, manufacture, sale or offer for sale of expanded polystyrene products in Guyana is hereby prohibited …. No Food Service Establishment shall sell or provide food for consumption, either on or off the said Establishment's premises, in expanded polystyrene food service products. The provisions … shall not apply to prepackaged food … in polystyrene containers that have been filled and sealed prior to receipt by the Food Service Establishment.

2017, St. Lucia: Environmental Health (Expanded Polystyrene Ban) Regulations 2017

- [*Regulatory – Prohibitive: Ban plastic*]: a person shall not - (a) import, (b) manufacture, or (c) sell, expanded polystyrene food service products. Prohibition on use: a person shall not - (a) use, or (b) serve, provide or sell food in, expanded polystyrene food service products.

2018, Uruguay: Sustainable Use of Plastic Bags

- [*Regulatory – Prohibitive: Ban plastic*]: The delivery to any title, in plastic wrappings, of newspapers, magazines, invoices, receipts and other similar objects is prohibited. The regulations may establish duly founded exceptions.

2018, Jamaica: The Trade (Plastic Packaging Materials Prohibition) Order, 2018

- [*Regulatory – Prohibitive: Ban plastic*]: No person shall import or distribute any single use plastic in commercial quantities. [This paragraph] shall not apply … (b) to single use plastics used to maintain public health and for compliance with food safety standards, including packaging used by wholesalers and retailers to distribute raw meat, eggs, flour, sugar, rice or baked goods; (c) to single use plastics imported or distributed by the Ministry responsible for health for use in the practice of medicine or dentistry, in veterinary practice , or in any other medical field in respect of which the Ministry responsible for health imports or distributes single use plastics; (d) to single use plastic bags used to package personal effects, and contained in the luggage of a person travelling into or out of Jamaica; (e) to drinking straws for use by persons with disabilities and imported or distributed by a recognized body representing persons with disabilities; and (f) until the 1st day of January, 2021, to drinking straws made wholly or in part of polyethylene or polypropylene, manufactured for single use, and attached to, or forming part of, the packaging of juice boxes or drink pouches.

2019, Dominica: Budget Address 2018 – 2019: From Survival, to Sustainability and Success: A Resilient Dominica

- [*Regulatory – Prohibitive: Ban plastics*]: Effective 1st January 2019, a number of items considered to be inimical to the environment will be banned. These will include the following: • plastic straws, • plastic plates, • plastic forks • plastic knives • Styrofoam cups • Styrofoam containers.

2019, Panama: Regulating the Reduction and Progressive Replacement of Single-Use Plastics in 2021

- [*Regulatory – Prohibitive: Ban plastic*]: As of January 1, 2021, State institutions are prohibited from purchasing for institutional consumption, the following single-use plastic products: 1. Plastic ear swabs; 2. Plastic covers for laundry clothes; 3. Disposable plastic utensils; 4. Disposable plastic revolvers; 5. Plastic balloons; 6. Disposable plastic containers; 7. Plastic reeds; 8. Disposable plastic caps for glasses and 9. Disposable plastic packaging for products.
- [*Regulatory – Prohibitive: Ban plastic*]: As of January 1, 2021, the use and commercialization of the following disposable plastic products is generally prohibited: 1. Plastic ear swabs; 2. Plastic covers for laundry clothes; 3. Disposable plastic utensils; 4. Disposable plastic revolvers; 5. Plastic balloons; 6. Disposable plastic containers; 7. Plastic reeds; 8. Disposable plastic caps for glasses and 9. Disposable plastic packaging for products. The articles contemplated in numerals 3, 6, 8 and 9, whose use and commercialization are prohibited as of July 1, 2022, are exempted.
- [*Economic: Tax break*]: The tax incentives will have the specific objective of granting tax benefits that encourage and favor the use of sustainable and biodegradable alternatives over single-use plastic in national commerce and industry. Income Tax (lSR) will be deductible for the expenses incurred for the execution of the effective replacement of single-use plastics by the subjects described in Article 3, as well as any other expenditure intended to improve practices and business policies focused on environmental prevention. Companies specializing in the conversion and industrial processing of solid waste and biodegradable materials and industrial recycling, composting and waste-related plants will be exempt from paying the following taxes: 1. Income Tax (lSR); 2. Dividend Tax or participation fee distributed among partners or shareholders National and international; 3. Transfer Tax of Personal Property and Services (lTBMS). For the purposes of this article, the corresponding request to the General Directorate of Revenue.
- [*Regulatory – Affirmative: Plan, commitment*]: The following measures are established to reduce the use of single-use plastic items. Natural persons, individuals, must: 1. Adopt a personal or family policy to reduce single-use plastics. 2. Gradually eliminate the acquisition of [single-use] packaging and plastic products… 3. Preferably acquire products whose packaging can be reused.

- [*Regulatory – Affirmative: Plan, commitment*]: The legal persons referred to in Article 3 and the natural persons that trade, must: 1. Develop an internal policy for the reduction of single-use plastics and a transition plan that includes aspects of corporate social responsibility. 2. Gradually dispose of single-use plastic containers and products. 3. Invest in reusable packaging and new product distribution systems.
- [*Regulator – Affirmative: Plan, commitment; Develop new, or improve existing process or product*]: Progressive Replacement of Single-Use Plastics. Progressive replacement of single-use plastic items with products manufactured with reusable, recyclable, biodegradable or compostable materials is established. Replacement by plastic options labeled as degradable plastic is prohibited. The Demand and Consumption Control will aim at the progressive replacement of single-use plastic items with products manufactured with reusable, recyclable or biodegradable materials and will be aimed primarily at the following items: 1. Plastic ear swabs; 2. Plastic covers for laundry clothes; 3. Disposable plastic utensils; 4. Disposable plastic revolvers; 5. Plastic balloons; 6. Disposable plastic containers; 7. Plastic reeds; 8. Disposable plastic caps for glasses and 9. Disposable plastic packaging for products. The replacement of single-use plastics by options labeled as degradable plastic.
- [*Regulatory – Affirmative: Plan, commitment*]: The Panama Canal Authority will issue its own internal policy for the Reduction and Replacement of single-use plastics within its operations in accordance with what is feasible and convenient for the operation of the Canal and water security. The Executive Branch, through the Ministry of Environment, will develop, prepare and update the Strategic Plan, which will be issued through a regulatory Executive Decree of this Law. The Strategic Plan will establish the specific objectives for the fulfillment of the general purpose of this Law regarding actions necessary to achieve the progressive replacement of single-use plastic materials within the established deadlines. The Ministry of Environment must: 1. Establish indicators and monitor the progress of the goals set for the reduction of single-use plastic. 2. Accountability to citizens about progress in this regard.
- [*Regulatory – Affirmative: Plan, commitment; Information: Education or outreach*]: The Ministry of Environment, the Ministry of Health and the Ministry of Education will have the obligation to develop and support national awareness campaigns on the consequences of single-use plastic and on the available sustainable alternatives. These campaigns should include at least how to reduce the use of single-use plastic in everyday life and how to dispose of it responsibly; the impacts of poor waste management on public health; and explain the difference between biodegradable, oxy-biodegradable or degradable plastics, as well as the negative impact of the last two on our ecosystem due to contamination by microplastics.
- [*Information: Labels or placards*]: Any reusable, recyclable, biodegradable or compostable replacement material must have the proper documentation that certifies the state, time and conditions of decomposition established.

- [*Information: Education or outreach*]: Natural persons, individuals, must: Promote a culture of awareness, education and communication about Environmental impacts of the use of single-use plastics. Promote the consumption of alternatives with less impact or reuse and recycling.
- [*Information: Education or outreach*]: The legal persons referred to in Article 3 and the natural persons that trade, must: Promote awareness, education and communication programs, both internal as external, on the impacts of the use of single-use plastics, which favor the consumption of alternatives with less impact or reuse and recycling.
- [*Information: Research, data collection, data reporting or record keeping*]: The legal persons referred to in Article 3 and the natural persons that trade, must: Carry out assessments on their progress in reducing plastics and the residual generation.

III. Instruments Specifically Targeting Leakage of Plastic Carry-Out Bags

2015, Paraguay: Promotion of the Reduction of the Use of Polyethylene Plastic

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Owners of supermarkets, self-services, warehouses and shops in general, should gradually replace the use of single-use polyethylene bags, with reusable ones or made with alternative biodegradable non-contaminating and reusable materials, in the following terms:1.- 12 (twelve) months, for those who carry out the economic activity of retail sale in markets, supermarkets and shops with a predominance of food products and beverages. 2.- 24 (twenty-four) months, for all the owners of establishments that sell wholesale products, and that are not included in the previous numeral. These deadlines will be counted from the publication of this Law. The deadlines and percentages of replacement will be determined by the Application Authority, taking into account the needs of adequate technology of the national industry dedicated to the manufacture of the product to be replaced.
- [*Economic: Disincentive*]: Owners of supermarkets, self-services, warehouses and shops in general, may charge for each single-use bag delivered for the transport of products requested by the consumer, in order to encourage the decrease in consumption. The value of the bags will be determined by the Application Authority, via regulation.

2016, Antigua and Barbuda: Antigua Plastic Bag Ban

- [*Regulatory – Prohibitive: Ban plastic*]: The importation, distribution, sale and use of shopping plastic bags is prohibited absolutely after the 30th June 2016.

2016, Colombia: Regulation of the rational use of plastic bags and adopting other provisions

- [*Regulatory – Prohibitive: Ban plastic*]: It is prohibited to: a) Abandon, remove or bury uncontrollably, plastic bags or fractions of same, in the national territory; b) Accumulate

used open air bags; c) Distribute expendable bags at payment points as of December 30, 2016 Article 13.

- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: The duties of consumers are as follows: a) Do not require additional plastic bags to those required for the transport of purchased goods. b) Reuse plastic bags received from distributors. c) Follow the instructions provided by the plastic bag distributors on the handling of the plastic bags.
- [*Regulatory – Prohibitive: Limit plastic*]: Existing distributors must comply with the following goals: a) As of December 31, 2017, reduce by 10% the number of plastic bags distributed at the payment points, measured in terms of the PRB indicator (%) referred to in Table 2 of Article 10 of this resolution. For the fulfillment of this goal, expendable plastic bags will be included. b) In subsequent years, they must guarantee minimum annual reductions of 5% of the PRB (%) until they reach a minimum of 60% reduction with respect to the base year. 3. New distributors must comply with the following goals: Start reducing the number of bags distributed at the points of payment, measured in terms of the PRB indicator (%), taking into account the year in which operations began and the baseline year.
- [*Economic: Disincentive*]: Alternative to the presentation of the Program of Rational Use of Plastic Bags. Distributors who meet the following conditions will not be required to submit the Rational Use of Plastic Bags Program: a) Charge the minimum plastic bags at market prices explicitly to consumers. b) Comply with the provisions of literals a, b, c, numeral 1 of article 10 of this resolution.
- [*Regulatory – Affirmative: Plan, commitment*]: The distributors of plastic bags, must formulate, present, implement and keep updated the Program of Rational Use of Plastic Bags, for the follow-up of the goals. Distributors of plastic bags other than those referred to in the scope of this resolution will be subject to strategies aimed at the rational use of plastic bags in a second phase of implementation, as determined by the Ministry of Environment and Sustainable Development within a term of 12 months counted from the effective date of this resolution.
- [*Information: labels or placards*]: In plastic bags, incorporate information that guides the consumer about its use, including at least: a) An environmental message related to the rational use of bags in a minimum size of 10% of the area of one of its faces. b) The carrying capacity of the bag expressed in kilograms visibly. c) The caliber of the bag expressed in thousandths of an inch or in microns [4]. d) Recommendations for the reuse of the bag.
- [*Information: Research, data collection, data reporting or record keeping*]: The distributors of plastic bags must submit an annual report on their compliance. [These] reports shall contain at least the achievements of the Rational Use of Plastic Bags Program, measured in terms of the Indicators [number of bags distributed at the payment points in the base year (number of bags/year; total weight of bags distributed/year); annual percentage of variation of the number of bags distributed at the payment points (in number and

weight); percentage reduction of distributed bags compared to the base year (in number and weight)], which demonstrates the fulfillment of the goals and the description of the strategies developed for their implementation.

- [*Information: Labels or placards*]: All distributors must comply with the following goals: 1. As of December 30, 2016: a) Deliver at the payment points plastic bags that meet: a) dimensions whose area is equal to or greater than 30 cm x 30 cm, b) caliber equal to or greater than 0.9 thousandths of an inch or that the caliber of the bag is sufficient to meet the load capacity indicated on the bag. b) Plastic bags must include an environmental message related to the rational use of bags in a minimum size of 10% of the area of one of their faces. c) Include visible information on the carrying capacity of the bag expressed in kilograms. d) Make available to the consumer at least one alternative for the transport of goods such as reusable bags, market carts, baskets, backpacks, etc.

2016, Paraguay: Decree Regulating the Promotion of the Reduction of the Use of Polyethylene Plastic

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Supermarkets, self-services, warehouses and shops in general, before March 31, 2017, must have for sale in the areas destined to the collection of merchandise (each cash register) with sufficient offer of reusable bags (cloth, resistant plastic, etc.) and bags made with biodegradable materials (paper, biodegradable plastic, etc.), in addition to the single-use polyethylene bags that may continue to be used taking into account the replacement schedule to be defined in the Plan in accordance with Article 2 of this decree. The subjects obliged by Law No. 5414/2015 must also display in the areas destined to the collection of merchandise (each cash register), posters with information that promotes public awareness about the environmentally sound use of non-renewable natural resources (plastics), in the form, characteristics and deadlines that the Ministry of Industry and Commerce establishes via regulations.
- [*Regulatory – Affirmative: Plan, commitment*]: The Ministry of Environment will elaborate the quality criteria environmental that biodegradable plastic bags must meet, and will communicate them to the Ministry of Industry and Commerce so that they are considered in the Plan to be approved in accordance with the provisions of Article 2 of this decree.

2017, Colombia: Consumption tax on plastic bags

- [*Economic: Disincentive*]: Requirements for the application of the differential rates of the national consumption tax on plastic bags that offer environmental solutions … plastic bags that offer environmental solutions will have differential rates of 0%, 25%, 50% or 75% of the full value of the rate, provided when the following requirements are met:

  1. Biodegradability: Biodegradable plastic bag in a percentage equal to or greater than

thirty percent (30%) as indicated in standards NTC-5991-2014, ASTM D6400-04, UNE-EN-ISO 13432: 2000-11, DIN V54900-2. In any case, the plastic bag must not contain substances of interest in its composition such as Zinc (Zn), Copper (Cu), Nickel (Ni), Cadmium (Cd), Lead (Pb), Mercury (Hg), Chrome (Cr), Arsenic (As) and Cobalt (Co).

2. Percentage of recycled material in the composition of the bag: The plastic bag must contain at least forty percent (40%) of post-consumer or post-industrial recycled material, which shall be demonstrated in accordance with the provisions of the technical sheet that establishes the Ministry of Environment and Sustainable Development for this purpose.
3. Reuse: Plastic bag that, by means of dynamic load test, demonstrates that it is reusable with the maximum indicated load, in accordance with the UNE 53942-2009 standard.

The differential rates referred to in this article will be applied according to the provisions of the following:

(i) [Greatest environmental impact generated by the plastic bag]: the plastic bag meets the requirement provided in numeral 2 or numeral 3: 75% of full rate;
(ii) [second greatest environmental impact generated by the plastic bag]: The plastic bag meets the requirement set forth in numeral 1, or simultaneously meets the requirements set forth in numerals 2 and 3: 50% of full rate;
(iii) [second to least environmental impact generated by the plastic bag]: The plastic bag simultaneously meets the requirements set forth in numerals 1 and 2, or simultaneously meets the requirements set forth in numerals 1 and 3: 25% of full rate;
(iv) [lowest environmental impact generated by the plastic bag]: the plastic bag simultaneously meets the requirements set forth in numerals 1, 2 and 3: 0% of full rate.

- [*Economic: Tax break*]: Biodegradable plastic bags do not cause the national consumption tax on plastic bags [if they] meet any of the following conditions:1. For biodegradability in environmental conditions and compostability: The plastic bag must comply with all the requirements contained in any of the following standards: NTC-5991-2014 (Colombia Technical Standard), ASTM D6400- 04, UNE-EN-ISO 13432: 2000-11 or DIN V54900-2. 2. For biodegradability in sanitary landfills: The plastic bag must be biodegradable in a percentage equal to or greater than fifty percent (50%), for a period of 365 days in an accelerated degradation test simulating conditions of a sanitary landfill carried out in accordance with ASTM D7475-11 and ecotoxicity tests, according to standards D5951-96 (2002) and D6954-04. Paragraph 1. In any case, plastic bags must not contain substances of interest in their composition such as Zinc (Zn), Copper (Cu), Nickel (Ni), Cadmium (Cd), Lead (Pb), Mercury (Hg), Chrome (Cr), Arsenic (As) and Cobalt (Co). Reusable plastic bags do not cause the national excise tax on plastic bags [if they] meet all of the following technical and mechanical characteristics: 1. Have a minimum useful life equivalent to one hundred twenty-five (125) uses without requiring transformation processes, in a minimum transport distance of fifty (50) meters with the maximum bearing capacity announced in the bag, according to the Municipal Code 195.01, July,

2013 (LA, CAL., MUN. CODE § 195.01 (J) (2013)), Los Angeles, California, United States. 2. It can be cleaned or disinfected without deforming or losing its characteristics.

- [*Information: Labels or placards*]: The plastic bags covered by this article must incorporate at least the following information: Name of the manufacturer or importer; Country of origin; Standard(s) technique(s) that meets the plastic bag in its preparation; The following legend: "The delivery of this plastic bag has a differential rate to the national tax on the consumption of plastic bags." [For biodegradable plastic bags and reusable plastic bags, the same requirements hold except for the legend, which shall be]: "The delivery of this plastic bag does not cause the national tax on the consumption of plastic bags."

2018, Panama: Law that adopts measures to promote the use of reusable bags in commercial establishments

- [*Regulatory – Prohibitive: Ban plastic*]: The use of polyethylene bags in supermarkets, self-service checkout, warehouses or shops in general for the transport of products or merchandise is prohibited.
- [*Regulatory – Affirmative: Develop new, or improve existing processes or products*]: The establishments provided for in this Law shall proceed to the progressive replacement of polyethylene bags, within the following deadlines: 1. Eighteen months, counted from the promulgation of this Law, to supermarkets, pharmacies and retailers. 2. Twenty-four months, counted from the promulgation of this Law, to Warehouses and wholesalers. This Law shall not apply when, for aseptic reasons, polyethylene bags must be used to contain processed or pre-processed wet food or supplies and the use of a substitute compatible with minimizing environmental impact is not feasible.
- [*Regulatory-Affirmative: Develop new, or improve existing processes or products; Economic: Disincentive*]: Merchants/traders may choose whether or not to collect reusable bags. In the event that they decide to charge consumers for them, the Authority for Consumer Protection and Defense of Competition will control that they are charged at controlled cost. For this purpose, they must remit to the Authority, at the beginning of each year, the declared cost of these.
- [*Information: Education or outreach*]: The Ministry of Environment will have the following responsibilities: 1. Develop dissemination and national awareness campaigns on the rational use of non-degradable and non-biodegradable material, as well as the environmental benefits of using reusable bags or friendly materials with the environment.

2018, Uruguay: Sustainable use of plastic bags

- [*Regulatory – Prohibitive: Ban plastic*]: The manufacture, import, distribution, sale and delivery, under any title, or plastic bags that are not compostable or biodegradable shall be prohibited.

- [*Regulatory – Affirmative: Plan, commitment; Economic: Disincentive*]: The Executive Branch is empowered to establish the obligation of collection, the setting of a minimum price and the mode of invoicing of the plastic bags authorized by this law.
- [*Regulatory – Affirmative: Plan, commitment; Develop new, or improve existing process or product; Information: Education or outreach*]:The holders of the points of sale or delivery where plastic bags are supplied will be obliged … to: A) Promote and participate in dissemination and awareness campaigns to the population about the responsible and rational use of plastic bags and their impact on the care of the environment. B) Include in the plastic bags that provide the form of identification, the logo or inscription that defines the regulations. C) Have a system for receiving waste from plastic bags available to the consumer. D) Manage the devices for receiving plastic bags in an environmentally appropriate manner and in accordance with the regulations. E) Offer reusable bags for sale. F) Develop actions aimed at minimizing the use of plastic bags.
- [*Regulatory – affirmative: Plan, commitment*]: The Ministry of Housing, Land Management and Environment shall prepare a plan for the immediate availability of plastic bags authorized by law at the points of sale and delivery. The plan must contemplate the participation of actors linked to the production and consumption chain of plastic bags.
- [*Regulatory – affirmative: Plan, commitment; Develop new, or improve existing process or product*]: (Conversion plan) - Commit to the Ministry of Industry, Energy and Mining in coordination with the Ministry of Housing, Land Management and Environment, the development of a program to facilitate the conversion of the national plastic bag industry, in accordance with what is established in the regulations of this law, as well as the promotion of technological solutions and development of new products and markets aimed at minimizing the environmental impacts derived from the use of non-biodegradable plastic bags.

2019, Uruguay: Law No. 19655 – Measures for the Prevention and Mitigation of the Environmental Impact Derived from the use of Plastic Bags

- [*Regulatory – Prohibitive: Ban plastic*]: For the purposes of the provisions of Law No. 19,655, of August 17, 2018, all plastic bags used to contain and transport products and goods that are delivered to a consumer in any scope fall within the scope of this regulation. point of sale or delivery, except for the exclusions expressly provided by law. [Exemptions are as follows]: plastic bags designed to be reused on several occasions and that comply with the following characteristics: a) "Gossip" type plastic bags, which accept various uses and are made with woven plastic material or plastic cloth, such as the "TNT"; b) Plastic bags with a thickness equal to or greater than 100 (one hundred) micrometers, which are manufactured in the country with recovered materials or recycled of national origin and that in accordance with this decree are subject to the obligation of charging a minimum price (the required percentage of recovered or recycled materials of national

origin for this purpose will be: i. during the first year of validity of this regulation, a percentage equal to or greater than 70% (seventy percent); ii. subsequently, a percentage equal to 100% (one hundred percent) of said materials); c) Those that for security reasons must comply with specific international regulations, such as those established by the International Civil Aviation Organization (ICAO). d) Those in direct contact with food for human or animal consumption, with the exception of those used for the primary containment of fruits and vegetables; e) The so-called polyethylene roll bags, which have a thickness less than or equal to 15 (fifteen) micrometers, which are rectangular, without handles and with a sealed bottom, exclusively as soon as they were used for the primary containment of fruits and vegetables; f) The plastic bags that are necessary to use to contain or transport fish or meat, are excluded [i.e.] … those that are used in direct contact with said foods and provided they are transparent. [Plastic bags that do not meet the requirements established in this regulation and the biodegradability criteria or compostability, are prohibited]. Authorized plastic bags may only be distributed, sold or delivered to any title in the national territory, when the manufacturer or importer has obtained the certificate of conformity issued by the Technological Laboratory of Uruguay (LATU). The LATU will keep the National Directorate of the Environment informed of all the pending applications, certifications granted, and other actions carried out in application of these regulations. [This] certification …will be required by the Ministry of Economy and Finance, through the National Customs Directorate, to enable the importation of plastic bags as appropriate. Likewise, they will be required for the commercialization in square of the corresponding plastic bags of national manufacture.

- [*Information: Labels or placards*]: The authorized plastic bags, as well as the reusable ones referred to in paragraph "b" of Article 2 of this Decree, may only be marketed, distributed, sold and delivered with at least the following identification data: a) business name of the manufacturer or importer; b) country of manufacture; c) lot number; and, d) date of manufacture. This text must be printed in a visible place of the bag itself, in Spanish language and appear with clear, indelible and easily readable by the consumer characters.
- [*Economic: Disincentive*]: The authorized plastic bags and the reusable ones made of recycled material, cannot be delivered to the final consumers for free. The minimum price at which the plastic bags must be charged will be UI 0.82 (eighty-two hundredths of the Indexed Unit), which will be set annually according to the value of the Indexed Unit of the first business day of the year corresponding to the effective sale or delivery to the consumer. To these prices the Value Added Tax (VAT) must be added. The subjects reached by the obligation to collect the plastic bags must discriminate on the corresponding invoice, the detail of the plastic bags delivered, indicating their quantity and the unit price thereof.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: (Plastic bag reception system). Points of sale delivery where plastic bags are supplied to the consumer, must have a system for receiving used plastic bags or to be disposed of by consumers, and must manage them through facilities or operators that have the corresponding environmental authorizations.

Middle East and North Africa

I. Instruments Targeting Maritime Sources of Plastic Pollution

2005, Brunei Darussalam: Prevention of Pollution of the Sea Order, 2005

- [*Regulatory – Prohibitive: Ban plastic*]: Prohibition of discharge of refuse, garbage, waste, effluents, plastics and dangerous pollutants from ships … Subject to subsection (2) and any regulation made under subsection (5), if any disposal or discharge of refuse, garbage, waste matter, trade effluent, plastics or marine pollutant in packaged form occurs from any ship into Brunei Darussalam waters, the master, the owner and the agent of the ship shall each be guilty of an offence
- [*Economic: Disincentive*]: Recovery of costs for removing refuse, garbage, waste, plastics, effluents and dangerous pollutants discharged from ships: If any refuse, garbage, waste matter, plastics, marine pollutant in packaged form or trade effluent is discharged from any ship into Brunei Darussalam waters or into any part of the sea or waters outside Brunei Darussalam waters and [it] subsequently drifts or flows into Brunei Darussalam waters, the owner of the ship shall be liable to pay for the costs of any measure reasonably taken by the Director or the appointed authority after the discharge for the purpose of removing it and for preventing or reducing any damage caused in Brunei Darussalam by contamination resulting from the discharge.

2008, Brunei Darussalam: Prevention of Pollution of the Sea (Garbage) Regulations, 2008

- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: Outside of special areas the disposal into the sea of all plastics, 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, is prohibited; Within the Mediterranean Sea area, the Baltic Sea area, the Black Sea area, the Red Sea area, the Gulfs area, the North Sea area, the Antarctic area and the Wider Caribbean Region, including the Gulf of Mexico and the Caribbean Sea, disposal into the sea of the following is prohibited - all plastics, 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.

II. Instruments Targeting Macroplastic Pollutants

2016, Saudi Arabia: Technical Regulation No. (MA-156-16- 03-03) on the biodegradable plastic products in the local markets

- [*Information: Labels or placards*]: Logos of degradable plastics, prepared to be fixed and displayed in the market, shall be written in Arabic or in both English and Arabic in a clear and difficult to remove manner. Each piece shall contain …. Manufacturer's name and the trademark or any of them.

North America

I. Instruments Targeting Macroplastic Pollutants

2003, Canada: Antarctic Environmental Protection Regulations (SOR/2003-363)

- [*Regulatory – Affirmative: Responsible handling of plastic*]: Before the expiry of a permit, the permit holder must remove from the Antarctic the following wastes if they are generated by the permit holder: (e) polyvinyl chloride (PVC), polyurethane foam, polystyrene foam, rubber, electronic scrap, lubricating oils, treated wood or wood products and other products that contain additives that could produce harmful emissions if incinerated; (f) all other plastic wastes, except low density polyethylene containers (such as bags for storing wastes) if those containers are incinerated in accordance with section 40.

2006, United States: Marine Debris Research, Prevention and Reduction Act, 2006

- [*Information: Research, data collection, data reporting or record keeping*]: There is established an Interagency Marine Debris Coordinating Committee to coordinate a comprehensive program of marine debris research and activities among Federal agencies, in cooperation and coordination with non-governmental organizations, industry, universities, and research institutions, States, Indian tribes, and other nations, as appropriate … the Interagency Committee, shall complete and submit to [Congress] a report that: (i) identifies sources of marine debris; (ii) the ecological and economic impact of marine debris; (iii) alternatives for reducing, mitigating, preventing, and controlling the harmful effects of marine debris; (iv) the social and economic costs and benefits of such alternatives; and (v) recommendations to reduce marine debris both domestically and internationally. The report shall provide strategies and recommendations on: (i) establishing priority areas for action to address leading problems relating to marine debris; (ii) developing strategies and approaches to prevent, reduce, remove, and dispose of marine debris, including through private-public partnerships; (iii) establishing effective and coordinated education and outreach activities … Not later than 3 years after the date of the enactment of this Act, and biennially thereafter, the Interagency Committee shall submit to the [Congress] a report that evaluates United States and international progress in meeting the purpose of this Act. The report shall include: (A) the status of implementation of any recommendations and strategies of the Interagency Committee and analysis of their effectiveness; (B) a summary of the marine debris inventory to be maintained by the National Oceanic and Atmospheric Administration; (C) a review of the National Oceanic and Atmospheric Administration program authorized by section 3, including projects funded and accomplishments relating to reduction and prevention of marine debris; (D) a review of Coast Guard programs and accomplishments relating to marine debris removal, including enforcement and compliance with MARPOL requirements; and (E) estimated Federal and non-Federal funding provided for marine debris and recommendations for priority funding needs.

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: the Interagency Committee, shall complete and submit to [Congress] a report that—[identifies] … (iii) alternatives for reducing, mitigating, preventing, and controlling the harmful effects of marine debris; (iv) the social and economic costs and benefits of such alternatives.
- [*Information: Research, data collection, data reporting or record keeping*]: The Administrator shall, in consultation with relevant Federal agencies, undertake marine debris mapping, identification, impact assessment, prevention, and removal efforts, with a focus on marine debris posing a threat to living marine resources and navigation safety, including: (A) the establishment of a process, building on existing information sources maintained by Federal agencies …, for cataloguing and maintaining an inventory of marine debris and its impacts found in [US EEZ] and [US] navigable waters, including location, material, size, age, and origin, and impacts on habitat, living marine resources, human health, and navigation safety; (B) measures to identify the origin, location, and projected movement of marine debris within United States navigable waters, the United States exclusive economic zone, and the high seas, including the use of oceanographic, atmospheric, satellite, and remote sensing data; and (C) development and implementation of strategies, methods, priorities, and a plan for preventing and removing marine debris from United States navigable waters and within the United States exclusive economic zone, including development of local or regional protocols for removal of derelict fishing gear and other marine debris.
- [*Information: Research, data collection, data reporting or record keeping*]: The Administrator, in coordination with the Interagency Committee, shall: (1) maintain a Federal information clearinghouse on marine debris that will be available to researchers and other interested persons to improve marine debris source identification, data sharing, and monitoring efforts through collaborative research and open sharing of data; and (2) take the necessary steps to ensure the confidentiality of such information (especially proprietary information), for any information required by the Administrator to be submitted by the fishing industry under this section.

2012, United States: Marine Debris Research, Prevention and Reduction Act, 2006 and Amendments 2012

- [*Information: Research, data collection, data reporting or record keeping*]: The Administrator, acting through the Program and subject to the availability of appropriations, shall—identify, determine sources of, assess, prevent, reduce, and remove marine debris, with a focus on marine debris posing a threat to living marine resources and navigation safety; … undertake outreach and education activities for the public and other stakeholders on sources of marine debris, threats associated with marine debris, and approaches to identifying, determining sources of, assessing, preventing, reducing, and removing marine debris and its adverse impacts on the United States economy, the

marine environment, and navigation safety, including outreach and education activities through public-private initiatives.

- [*Regulatory – Affirmative: Plan, commitment*]: The Administrator, […] shall— […][…] undertake efforts to reduce the adverse impacts of lost and discarded fishing gear on living marine resources and navigation safety.

II. Instruments Targeting Maritime Sources of Plastic Pollution

2000, United States: Act to Prevent Pollution from Ships (33 U.S.C.)

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: Not later than December 31, 2000, all surface ships owned or operated by the Department of the Navy, and not later than December 31, 2008, all submersibles owned or operated by the Department of the Navy, [may not discharge plastic or floating garbage].
- [*Regulatory – Affirmative: Plan, commitment*]: Except when necessary for the purpose of securing the safety of the ship, the health of the ship's personnel, or saving life at sea, it shall be a violation of this Act for a ship referred to in subsection (b)(1)(A) of this section that is owned or operated by the Department of the Navy: (A) With regard to a submersible, to discharge buoyant garbage or plastic. (B) With regard to a surface ship, to discharge plastic contaminated by food during the last 3 days before the ship enters port. (C) With regard to a surface ship, to discharge plastic, except plastic that is contaminated by food, during the last 20 days before the ship enters port.

2003, Canada: Antarctic Protection Act

- [*Regulatory – Prohibitive: Ban plastic*]: No Canadian vessel shall, while in the Antarctic, discharge into the sea any garbage, plastic or other product or substance that is harmful to the marine environment.

2006, United States: Marine Debris Research, Prevention and Reduction Act, 2006

- [*Information: Research, data collection, data reporting or record keeping*]: The Administrator shall improve efforts to reduce adverse impacts of lost and discarded fishing gear on living marine resources and navigation safety, including – research and development of alternatives to gear posing threats to the marine environment.
- [*Information: Research, data collection, data reporting or record keeping*]: The Administrator, in coordination with the Interagency Committee, shall—(1) maintain a Federal information clearinghouse on marine debris that will be available to researchers and other interested persons to improve marine debris source identification, data sharing, and monitoring efforts through collaborative research and open sharing of data.

- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: The Commandant of the Coast Guard, in consultation with the Interagency Committee, shall—take actions to reduce violations of and improve implementation of MARPOL Annex V and the Act to Prevent Pollution from Ships (33 U.S.C. 1901 et seq.) with respect to the discard of plastics and other garbage from vessels.
- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: The Commandant of the Coast Guard, in consultation with the Interagency Committee, shall—take actions to improve compliance with requirements under MARPOL Annex V and section 6 of the Act to Prevent Pollution from Ships (33 U.S.C. 1905) that all United States ports and terminals maintain and monitor the adequacy of receptacles for the disposal of plastics and other garbage, including through promoting voluntary government-industry partnerships.
- [*Regulatory – Affirmative: Plan, commitment*]: take actions to improve international cooperation to reduce marine debris.
- [*Regulatory – Affirmative: Plan, commitment*]: establish a voluntary reporting program for commercial vessel operators and recreational boaters to report incidents of damage to vessels and disruption of navigation caused by marine debris, and observed violations of laws and regulations relating to the disposal of plastics and other marine debris.
- [*Information: Education or outreach*]: The Administrator shall undertake outreach and education of the public and other stakeholders, such as the fishing industry, fishing gear manufacturers, and other marine-dependent industries, and the plastic and waste management industries, on sources of marine debris, threats associated with marine debris and approaches to identify, determine sources of, assess, reduce, and prevent marine debris and its adverse impacts on the marine environment and navigational safety, including outreach and education activities through public-private initiatives.

2012, Canada: Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)

- [*Information: Labels or placards*]: Every vessel of 12 m or more in length overall must display placards that notify the crew and passengers of the garbage discharge requirements.
- [*Regulatory – Prohibition: Ban plastic*]: Garbage may be discharged from a vessel in Section II waters or a Canadian vessel in waters that are not waters under Canadian jurisdiction if (a) in the case of dunnage, lining material or packing material that does not contain plastics and can float, the discharge is made as far as feasible from the nearest land and in any case at least 25 nautical miles from the nearest land; (b) in the case of garbage other than plastics or garbage that is referred to in paragraph (a), the discharge is made as far as feasible from the nearest land and in any case at least 12 nautical miles from the nearest land.

2016, United States: International Fisheries Regulations – Subpart G – Antarctic Marine Living Resources (50 CFR Ch. III)

- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: The operator of a harvesting vessel may not dump overboard, jettison or otherwise discard any article or substance that may interfere with other fishing vessels or gear, or that may catch fish or cause damage to any marine resource … These articles and substances include, but are not limited to, fishing gear, net scraps, bale straps, plastic bags, oil drums, petroleum containers, oil, toxic chemicals or any manmade items retrieved in a harvesting vessel's gear.

III. Instruments Targeting Microplastic Pollutants

2015, United States: Microbead-Free Waters Act of 2015

- [*Regulatory – Prohibitive: Ban plastic*]: The manufacture or the introduction or the delivery for introduction into interstate commerce of a rinse-off cosmetic that contains intentionally-added plastic microbeads. (A) the term 'plastic microbead' means any plastic particle that is less than five millimeters in size and is intended to be used to exfoliate or cleans the human body or any part thereof, and (B) the term 'rinse-off cosmetic' includes toothpaste.

2016, Canada: Microbeads in Toiletries Regulations

- [*Regulatory – Prohibitive: Ban plastic*]: A person must not manufacture or import or sell any toiletries that contain microbeads.

South Asia

I. Instruments Targeting Macroplastic Pollutants

2006, Sri Lanka: Order No. 1466/5, under the National Environmental Act, No. 47 of 1980

- [*Regulatory – Prohibition: Ban plastic*]: Prohibit - The manufacture of polythene or any polythene product of twenty microns or below in thickness for in country use; and the sale or use of polythene or any polythene product which is 20 microns or below in thickness. For the purposes of this Order "Polythene" means any solid products, bags, material or contrivances manufactured using all forms of polyethylene, polypropylene, polystyrene, poly vinyl chloride, polyethylene terephthalate or any other similar raw material used for the purpose of carrying, packing, wrapping or packaging.

2013, Pakistan: Prohibition of Non-Degradable Plastic Products (Manufacturing, Sale and Usage) Regulations 2013

- [*Regulatory – Prohibitive: Ban plastics*]: No person shall import, manufacture, stockpile, trade, supply, distribute, sell or use any scheduled plastic product which is non-degradable. The scheduled plastic products must be oxo-biodegradable and the pro-degradant used must be approved by the Agency or any other department or agency and in such manner as prescribed.
- [*Information: Labels or placards*]: No pro-degradant additive shall be sold, distributed or imported by any company or manufacturer of scheduled plastic product without registration with the Agency. In order to obtain the registration of pro-degradant additive from the Agency, the applicant shall submit the following documents as a minimum, namely: … [includes certificate of membership of Oxo-biodegradable Plastics Association]. All prominently scheduled plastic products made with oxo- biodegradable plastic and all packaging in which such products are offered for sale, shall be marked " Oxo-biodegradable" and shall bear the identifying mark or logo of the supplier of the pro-degradant additive …. Oxo biodegradable carry bags and containers made of virgin plastic shall be in a natural shade or white and containers used for purposes other than storing and packaging foodstuffs shall be manufactured using pigments and colorants as per ISO 787/1-1982.

2014, Pakistan: Sindh Environmental Protection Act, 2014 (No. VIII of 2014)

- [*Regulatory – Prohibitive: Ban plastic*]: No person shall import, manufacture, stockpile, trade, supply, distribute or sell any scheduled plastic product which is non-degradable. The scheduled plastic products must be oxo-biodegradable and the pro-degradant used must be approved by the Agency or any other department or agency and in such manner as prescribed.

2016, India: Plastic Waste Management Rules, 2016

- [*Regulatory – Prohibitive: Ban plastic*]: plastic sheet or like, which is not an integral part of multilayered packaging and cover made of plastic sheet used for packaging, wrapping the commodity shall not be less than fifty microns in thickness except where the thickness of such plastic sheets impair the functionality of the product. Retailers or street vendors shall not sell or provide commodities to consumer in carry bags or plastic sheet or multilayered packaging, which are not manufactured and labelled or marked, as per prescribed under these rules.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Plastic waste, which can be recycled, shall be channelized to registered plastic waste recycler, and recycling of plastic shall conform to the [India Standard] Guidelines for Recycling of Plastics … Every local body shall be responsible for development and setting up of infrastructure for segregation,

collection, storage, transportation, processing and disposal of the plastic waste either on its own or by engaging agencies or producers. The local body shall be responsible for setting up, operationalisation and co-ordination of the waste management system and for performing the associated functions, namely:- Ensuring segregation, collection, storage, transportation, processing and disposal of plastic waste; ensuring that no damage is caused to the environment during this process; ensuring channelization of recyclable plastic waste fraction to recyclers; ensuring processing and disposal on non-recyclable fraction of plastic waste in accordance with the guidelines issued by the Central Pollution Control Board; creating awareness among all stakeholders about their responsibilities; engaging civil societies or groups working with waste pickers; and ensuring that open burning of plastic waste does not take place. The local body for setting up of system for plastic waste management shall seek assistance of producers and such system shall be set up within one year from the date of final publication of these rules in the Official Gazette of India … Responsibility of Gram Panchayat.- Every gram panchayat either on its own or by engaging an agency shall set up, operationalise and co-ordinate for waste management in the rural area under their control and for performing the associated functions, namely,- ensuring segregation, collection, storage, transportation, plastic waste and channelization of recyclable plastic waste fraction to recyclers having valid registration; ensuring that no damage is caused to the environment during this process; creating awareness among all stakeholders about their responsibilities; and ensuring that open burning of plastic waste does not take place. All waste generators shall pay such user fee or charge as may be specified in the by-laws of the local bodies for plastic waste management such as waste collection or operation of the facility thereof, etc.;

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: local bodies shall encourage the use of plastic waste (preferably the plastic waste which cannot be further recycled) for road construction as per Indian Road Congress guidelines or energy recovery or waste to oil etc. The standards and pollution control norms specified by the prescribed authority for these technologies shall be complied with.
- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: Responsibility of waste generator. - The waste generator shall.(a) take steps to minimize generation of plastic waste and segregate plastic waste at source in accordance with the Solid Waste Management Rules, 2000 or as amended from time to time. (b) not litter the plastic waste and ensure segregated storage of waste at source and handover segregated waste to urban local body or gram panchayat or agencies appointed by them or registered waste pickers', registered recyclers or waste collection agencies.
- [*Regulatory – Prohibition: Irresponsible handling of plastic*]: Carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff; plastic sheet or like, which is not an integral part of multilayered packaging and cover made of plastic sheet used for packaging, wrapping the commodity shall not be less than fifty microns in thickness except where the thickness of such plastic sheets impair the functionality of the product.

- [*Information: Research, data collection, data reporting or record keeping*]: Every person engaged in recycling or processing of plastic waste shall prepare and submit an annual report …to the local body concerned… [which shall in turn] prepare and submit an annual report …to the [the responsible Government agents].
- [*Regulatory – Affirmative: Plan, commitment*]: The producers, within a period of six months from the date of publication of these rules, shall work out modalities for waste collection system based on Extended Producers Responsibility and involving State Urban Development Departments, either individually or collectively, through their own distribution channel or through the local body concerned. Primary responsibility for collection of used multi-layered plastic sachet or pouches or packaging is of Producers, Importers and Brand Owners who introduce the products in the market. They need to establish a system for collecting back the plastic waste generated due to their products. This plan of collection to be submitted to the State Pollution Control Boards while applying for Consent to Establish or Operate or Renewal. The Brand Owners whose consent has been renewed before the notification of these rules shall submit such plan within one year from the date of notification of these rules and implement with two years thereafter. manufacture and use of non- recyclable multilayered plastic if any should be phased out in two years' time. The producer, within a period of three months from the date of final publication of these rules in the Official Gazette shall apply to the Pollution Control Board or the Pollution Control Committee, as the case may be, of the States or the Union Territories administration concerned, for grant of registration. No producer shall … manufacture or use any plastic or multilayered packaging for packaging of commodities without registration from the concerned State Pollution Control Board or the Pollution Control Committees. Every producer shall maintain a record of details of the person engaged in supply of plastic used as raw material to manufacture carry bags or plastic sheet or like or cover made of plastic sheet or multilayered packaging.
- [*Information: Labels or placards*]: Each recycled carry bag shall bear a label or a mark "recycled" as shown below and shall conform to the Indian Standard: IS 14534: 1998 titled as "Guidelines for Recycling of Plastics."

2017, Sri Lanka: Order No. 2034/37

- [*Regulatory – Prohibitive: Ban plastic*]: [By this decree is prohibited]: (i) the manufacture of polythene or any polythene product of twenty (20) microns or below in thickness for in country use ; or (ii) the sale, offer for sale, offer free of charge, exhibition or use of polythene or any polythene product which is twenty (20) microns or below in thickness within the country : Provided that polythene or any polythene product of twenty (20) microns or below in thickness may be permitted to be used with the prior written approval of the Authority for the purposes specified in the Schedule hereto.

- [*Regulatory – Prohibitive: Ban plastic*]: [By this decree is prohibited]: the use of all forms of polyethylene, polypropylene, polyethylene products or polypropylene products as decoration in political, social, religious, national, cultural or any other event or occasion.

2017, Sri Lanka: Order No. 2034/24, under the National Environmental Act, No. 47 of 1980

- [*Regulatory – Prohibitive: Ban plastic*]: [Prohibited] – the manufacture of food wrappers from polythene as a raw material for in country use; and the sale, offer for sale, offer free of charge, exhibition or use of food wrappers manufactured from polythene as a raw material within the country.

II. Instruments Specifically Targeting Leakage of Plastic Carry-Out Bags

2003, India: Notification of the Ministry of Environment and Forests: Matheran and Surrounding Region as an Eco-Sensitive Zone

- [*Regulatory – Prohibition: Ban plastic*]: Carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff'; … carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness; … No person shall use plastic bags within Matheran Municipal Council area. The use of plastics, laminates and tetra-packs within the Eco-sensitive Zone shall be regulated by the Monitoring Committee.

2016, India: Plastic Waste Management Rules, 2016

- [*Regulatory Prohibitive: Ban plastic*]: carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness
- [*Economic: Disincentive*]: Explicit pricing of carry bags. - The shopkeepers and street vendors willing to provide plastic carry bags for dispensing any commodity shall register with local body. The local body … shall make provisions for such registration on payment of plastic waste management fee of minimum rupees forty-eight thousand @ rupees four thousand per month. The concerned local body may prescribe higher plastic waste management fee, depending upon the sale capacity. The registered shop keepers shall display at prominent place that plastic carry bags are given on payment. Only the registered shopkeepers or street vendors shall be eligible to provide plastic carry bags for dispensing the commodities. The local body shall utilize the amount paid by the customers for the carry bags exclusively for the sustainability of the waste management system within their jurisdictions.

2017, Sri Lanka: Order No. 2034/35, under the National Environmental Act, No. 47 of 1980

- [*Regulatory – Prohibitive: Ban plastic*]: [Prohibited] – the manufacture of any bag of high density polyethylene as a raw material for in country use; and sale, offer for sale, offer free of charge, exhibition or use of any bag manufactured from high density polyethylene as a raw material within the country …. Exempted items: garbage bags of the following dimensions or above: length – 600 mm, width – 260 mm, height – 900 mm; textile bag of following dimension or above: length – 400 mm, height – 500 mm.

APPENDIX VI. SUMMARY OF INSTRUMENTS IN SUBNATIONAL LAWS OR REGULATIONS

Africa

I. Instruments Targeting Macroplastic Pollutants

2010, N'Djamena, Chad: Arrêté Portant Interdiction de la Vete d'Eau Minérale Dans les Emballages en Plastique "Leyda" Dans la Ville de N'Djaména

- [*Regulatory – Prohibitive: Ban plastic*]: The sale of mineral water in plastic packaging "leyda," is formally prohibited in the city of N'Djamena.

2014, Baringo County, Kenya: Baringo County Polythene Materials Control and Management Act

- [*Regulatory – Prohibitive: Ban plastic*]: No person may manufacture, import into, sell or use, within Baringo County, any plastic or polythene packaging material not specified in the list referred to in Section 6 of this Act.
- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: No person may litter or otherwise dispose of any plastic or polythene material other than in accordance with the provisions of this Act.
- [*Regulatory – Affirmative: Plan, commitment*]: Every person wishing to manufacture, import, sell or use, in Baringo County, any plastic or polythene packaging material shall first establish and put in place a plastics and polythene waste disposal management system …. [This] plastic and polythene waste management system … shall ensure that the waste is not hazardous and will not constitute a danger and or nuisance to the environment, human or animal life in the County.
- [*Regulatory – Affirmative: Plan, commitment*]: Any person wishing to manufacture, import, sell or use any polythene material specified in the list under Section 8 of this Act shall apply in writing to the [responsible Government agent] for authority to [do so] within Baringo County
- [*Regulatory – Affirmative: Responsible handling of plastic*}: The County Government of Baringo shall construct and establish in every sub-location and public institution in the County, a waste disposal and dumping site at which there shall be a designated section for plastics and polythene materials … Every private business undertaking, educational, health institution or religious organisation in its place of worship, shall establish and operate a waste disposal system that shall have a distinct plastic and polythene materials waste sections into which shall be collected plastic and or polythene material waste from business, institution or place of worship. It shall be the responsibility of [these institutions] to ensure that the waste collected is regularly deposited in the County dump site as may be prescribed … Every public transport operator carrying passengers shall

have in the vehicle or vessel, a container in which shall be deposited all and any waste and litter including plastic and polythene materials waste created in the vehicle and or vessel. … Every household in the County shall maintain a plastic and polythene litter or waste bin into which it shall collect and from which it shall dump all plastic and polythene materials waste into the appropriate sub-location County waste dump.

2015, Nairobi, Kenya: Nairobi City County Solid Waste Management Act (No. 5 of 2015)

- [*Regulatory – Affirmative: Responsible handling of plastic*]: Any person who deposits solid waste in any other manner other than in the litter bin, liner bag or other container … shall be guilty of an offence. Every generator of solid wastes shall separate or cause to be separated the waste into various categories including - … plastics … The segregated waste referred to [above]shall be respectively contained separately in the approved containers … prior to collection or other handling as appropriate. Every generator shall ensure appropriate collection and transportation of the different wastes separated.
- [*Information: Labels or placards*]: Litter bins, liner bags and other solid waste bags shall be coded in order to facilitate waste segregation [includes a designation specific for plastics and paper waste].

II. Instruments Specifically or Primarily Targeting Leakage of Plastic Carry-Out Bags

2015, Nairobi, Kenya: Nairobi City County Solid Waste Management Act (No. 5 of 2015)

- [*Regulatory – Prohibitive: Ban plastic*]: No person may manufacture, have in his or her possession, offer for sale or distribution in any manner within the county any carry bags form virgin plastic of thickness of less than 30 micron and of a size not less than "8x 12" and of a colour other than the specified colour of the Kenyan Standard …. A person may manufacture carry bags of a size, thickness and colour specified by this Act or any other law from recycled plastic materials but such materials must be locally recycled.

East Asia and the Pacific

I. Instruments Targeting Macroplastic Pollutants

2005, New South Wales, Australia: Protection of the Environment Operations (Waste) Regulation 2005

- [*Regulatory – Affirmative: Responsible handling of plastic*]: A person to whom this Part applies must ensure: (a) that the waste materials used in the person's packaging are recovered in accordance with the targets set by the EPA …, and (b) that after being recovered those materials are: (i) re-used or recycled by the person, or (ii) if that is not practicable, re-used or recycled within Australia, or (iii) if that is not practicable, re-used or recycled overseas, and (c) that consumers are given adequate information to enable

them to deal with the materials used in the person's packaging once they are no longer needed by the consumer, including information on where to take the materials and how to re-use or recycle them.

- [*Regulatory – Affirmative: Plan, commitment*]: A person to whom this Part applies must prepare a "waste action plan" … and submit the plan to the EPA within one month after the commencement of this clause. A waste action plan is to set out: (a) a "baseline" of data setting out the person's current performance in respect of the use, recovery, re-use and recycling of the materials used in the person's packaging, and (b) how the person will ensure compliance with clause 46K, including: (i) targets for the recovery of the waste materials used in the person's packaging, and (ii) time frames, proposed actions and performance indicators for achieving those targets.
- [*Information: Research, data collection, data reporting or record keeping*]: A person to whom this Part applies must keep records that set out the following: (a) the amount of each material used in the person's packaging, (b) the arrangements that are in place to ensure that those materials are recovered, including details of any agreement with a third party for the recovery of those materials, (c) the amounts of each material that is recovered and how any recovered material is used.

2011, Muntinlupa, Philippines: Ordinance 10-109 of the City Government of Muntinlupa

- [*Regulatory – Prohibitive: Ban plastic*]: Business establishments and/or individuals are prohibited from: … Selling and providing Styrofoam/styrophor as container; and … Disposing plastic waste … No business establishment shall use Styrofoam/styrophor and other similar container for food, produce and other products.
- [*Information: Research, data collection, data reporting or record keeping*]: Before the implementation of this Ordinance, the Environment Sanitation Center (ESC) is mandated to conduct the study on the feasibility of providing alternative receptacles for the disposition and marketing of products so as not to affect the flow of trade and commerce in the City.
- [*Information: Education or outreach*]: Upon approval of this Ordinance, the City shall conduct training and seminars for information dissemination, public education and communication campaigns using quad media [print, radio, television, and internet] and such campaign shall encourage the participation of other government offices in Muntinlupa and private sectors, including NGOs and Pos, academe, environmental groups in promoting alternative biodegradable packaging materials.
- [*Regulatory – Affirmative: Plan, commitment*]: The ESC is … mandated to provide a program wherein livelihood projects shall be implemented for the manufacture and distribution of eco-friendly receptacles made of water lilies and other environmentally friendly materials in replacement of plastic containers and bags. The livelihood projects

must be coordinated … to help the association of women organization residents of Muntinlupa … earn additional income.

2014, Jilin Province, China: Provisions on the Prohibition of the Sale and Use of Disposable Non-Degradable Plastic Bags and Plastic Tableware in Jilin Province (Order No. 244 of the Jilin Provincial People's Government)

- [*Regulatory – Affirmative: Responsible handling of plastic*]: people's Governments at various levels shall gradually establish a … plastic waste recycling network, enhance the recycling of plastics waste; build bio-composting stations, plastic waste composting

2014, San Carlos City, Philippines: Ordinance No. 14-53

- [*Regulatory – Prohibitive: Ban plastic*]: Business establishments, restaurants, fast food outlets, food kiosks, catering services and the like shall not utilize, sell or provide Styrofoam or expanded polystyrene foam as containers for food and beverages.
- [*Information: Education or outreach*]: Upon approval of this Ordinance, the City … shall conduct massive information, education and communication campaigns using quad media (print, radio, television and internet) and shall include the promotion of alternative biodegradable packaging materials.

2017, City of Darebin, Victoria, Australia: 2018 Banned balloons, disposable food containers and cups at events on council property

- [*Information: Education or outreach*]: Council implements a communication and education campaign that encourages the community and traders across the municipality to eliminate single use [plastic] items.
- [*Regulatory – Affirmative: Plan, commitment; Regulatory – Prohibitive: Ban plastic]*: Officers develop a policy and action plan, with the aim of eliminating the use of single-use plastic bags, all plastic glasses, straws, cutlery, food boxes and coffee cups at Council events. In addition, the policy and action plan should to be actioned by 31 December 2017. The policy should consider the elimination of single use items used at all Council run events, including but not limited to organised or formal sports and recreational events, markets conducted on Council land, buildings and or roads managed by Council.

2019, Taiwan: Parties Subject to and Means for Disposable Tableware Use Restrictions

- [*Regulatory – Prohibitive: Ban plastic*]: [The following premises may not provide disposable tableware made of plastic, defined as] … tableware provided for catering consumers for one-time use, which is designed and produced as disposable items and

which objectively cannot be cleaned and provided to consumers for repeated use: … Public entities; Government entities; Public schools; Public medical institutions; Private schools; Department stores and shopping centers; Hypermarkets; Supermarkets; Chain convenience stores; Chain fast food restaurants; Eating and drinking establishments with storefronts … However, this provision shall not apply to catering stores (vendors) in public or private markets or night markets. …. Restaurants and other catering enterprises in public entities and private schools, catering enterprises department stores and shopping centers, catering enterprises in hypermarkets, catering enterprises in supermarkets, chain convenience stores, chain fast food restaurants, and eating and drinking establishments with storefronts may not provide cooked or prepared food, beverages, or seasoning in plastic cups, bowls, plates, dishes, or food boxes, or plastic food plates inside food boxes to consumers for use … The following plastic products are [exempted]: (1) Lids, cup stands, and sealing film on paper cups. (2) Bowl lids. (3) Food packaged in sealing film and placed on racks as products for display and purchase …. Disposable tableware made of the following materials is [exempted]: 1. Disposable tableware with primary materials based on paper, wood chips, sugarcane, common reeds, hemp, rice straw, straw, rice hulls, and other plant fiber and made with plastic coating, adhesive plastic film, or other physical methods with which plastic substances can be separated, provided that the weight of the plastic contents is lower than ten percent of the overall weight of the disposable tableware minus the weight of the lid. 2. Disposable tableware made from completely biodegradable materials. … [Exemptions for disposable tableware restriction are issued by the local competent authorities on a provisional basis] … to ensure food sanitation and safety and to prevent spread of diseases … [under conditions of] … regional drought or outbreak of contagious diseases, or [where premises cannot clean the tableware due to failure of cleaning equipment or other reasons].

II. Instruments Specifically or Primarily Targeting Leakage of Plastic Carry-Out Bags

2008, South Australia, Australia: South Australia Plastic Shopping Bags (Waste Avoidance) Regulations 2008

- [*Information: Labels and placards*]: A retailer to whom that section applies must display, in a prominent position at each point of sale in the retailer's premises, a notice that (a) … is not less than 95mm in height and 150mm in width; and (b) includes the following statement in legible letters: The [South Australia] Government is banning the supply of lightweight checkout style plastic shopping bags from 4 May 2009. Alternative shopping bags are available from this retail outlet.

2010, Canberra, Australia: Plastic Shopping Bags Ban Act 2010

- [*Regulatory – Prohibitive: Ban plastic*]: A retailer commits an offence if (a) the retailer supplies a plastic shopping bag to a customer of the retailer; and (b) the plastic shopping bag is supplied for the customer to carry goods bought, or to be bought, from the retailer.

2011, American Samoa: An Act prohibiting Supplying of Plastic Bags to Consumers

- [*Regulatory – Prohibitive: Ban plastic*]: No wholesale or retail establishment located or doing business in the Territory of American Samoa shall, directly or indirectly, give, provide, or make available plastic shopping bags to customers or consumers.

2011, Muntinlupa, Philippines: ORDINANCE 10-109 OF THE CITY GOVERNMENT OF MUNTINLUPA

- [*Regulatory – Prohibitive: Ban plastic*]: Business establishments and/or individuals are prohibited from: … Selling and providing plastic bags to consumers as secondary packaging material on wet goods; … No business establishment shall utilize plastic bags as packaging materials on dry goods….No business establishment dealing on wet goods shall use plastic bags as primary packaging material …. No business establishment shall offer or sell plastic to be used as secondary packaging material or as primary packaging material or primary packaging material on dry goods.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Plastic bag discarded or other similar plastic waste material must be cleaned and dried prior to submission to their respective barangays for proper collection and disposal.

2011, Northern Territory, Australia: Environment Protection (Beverage Containers and Plastic Bags) Act

- [*Regulatory – Prohibitive: Ban plastic*]: [During the phase out period]: A retailer commits an offence if, during the phase out period, the retailer: makes a prohibited plastic bag available to a customer for carrying goods purchased, or to be purchased, from the retailer; … is not able to provide an alternative bag to the customer on the customer's request … [After the phase out period]: A retailer must not, on or after the prohibition day, make a prohibited plastic bag available to a customer for carrying goods purchased, or to be purchased, from the retailer. … A person commits an offence if the person: (a) is a manufacturer or distributor of plastic bags; and (b) sells, supplies or otherwise provides prohibited plastic bags to another person ….
- [*Information: Labels and placards*]: A retailer commits an offence if, during the phase out period, the retailer: …. and does not display a notice in the premises in accordance with the requirements prescribed by regulation.
- [*Information: Education or outreach*]: Manufacturers and distributors must not represent prohibited plastic bags [that the bags] are not prohibited plastic bags.
- [*Information: Research, data collection, data reporting or record keeping*]: The Minister must, as soon as practicable after the second anniversary of the prohibition day, appoint a person to prepare a report on: (a) the effect on the community of [the ban]; and (b) the extent to which this [ban] has been effective in restricting the supply of prohibited plastic

bags … The Minister must table a copy of the report in the Legislative Assembly within 6 sitting days after receiving it.

2013, Tasmania, Australia: Plastic Shopping Bags Ban Act 2013

- [*Regulatory – Prohibitive: Ban plastic*]: A retailer must not provide to a person a plastic shopping bag for the purpose of enabling goods sold, or to be sold, by the retailer, to be carried from the retailer's premises.
- [*Information: Education or outreach*]: A retailer must not give to a person information, about the composition of a plastic shopping bag, that the retailer knows, or ought reasonably be expected to know, is false or misleading.
- [*Information: Research, data collection, data reporting or record keeping*]: The Director, by notice in writing to a retailer, may require the retailer to provide to the Director, within a period specified in the notice, evidence, of the kind specified in the notice, as to whether a bag that is, or that was, on the retailer's premises is a biodegradable bag.

2014, Jilin Province, China: Provisions on the Prohibition of the Sale and Use of Disposable Non-Degradable Plastic Bags and Plastic Tableware in Jilin Province (Order No. 244 of the Jilin Provincial People's Government)

- [*Regulatory – Prohibitive: Ban plastic*]: within the administrative region of this province … production and sales … [of non-degradable] plastic shopping bags, plastic cutlery [is prohibited] … Prohibited merchandise sales, business services provided to consumers in non-biodegradable plastic shopping bags and plastic cutlery.
- [*Information: Research, data collection, data reporting or record keeping*]: Operator shall establish the relevant purchase and sale of plastic products account, detailed records of purchases, sales and offers, contents, date, and number of channels.
- [*Information: Education or outreach*]: people's Governments at various levels shall organize … education activities [about the ban]

2014, San Carlos City, Philippines: Ordinance No. 14-53

- [*Regulatory – Prohibitive: Ban plastic*]: Business establishments, fastfood outlets, market vendors, food kiosks, sari-sari stores, ambulant vendors, and the like are prohibited from using plastic cellophanes and sando bags as packaging materials for customers. Stores and other retail establishments are mandated to use any alternative legally compliant packaging material for customers, …in lieu of single-use plastic cellophanes and sando bags.

- [*Economic: Incentive; Regulatory – Affirmative: Plan, commitment*]: The use of recyclable, reusable and/or biodegradable alternative packaging materials should be encouraged and promoted …. All business establishments are encouraged to adopt the "Bring Your Own Bag" Program … and to formulate appropriate incentives to consumers, which may include: Green Lane - stores may provide special counters or express lanes to be called as Green Lane to cater customers who bring their own bags or use of reusable bags.

2015, Hong Kong: Cap. 603 Product Eco-responsibility Ordinance

- [*Economic: Cash for return, Disincentive; Regulatory – Affirmative: Responsible handling of plastic]* The purposes of this Ordinance are— (a) to minimize the environmental impact of various types of products, which may include plastic shopping bags, vehicle tyres, electrical and electronic equipment, packaging materials, beverage containers and rechargeable batteries; and (b) to that end, to introduce producer responsibility schemes, schemes based on the "polluter pays" principle, or other measures, which may require manufacturers, importers, wholesalers, retailers, consumers or any other parties to share the responsibility for the reduction in the use, or the recovery, recycling or proper disposal, of those products. Such schemes or measures may include (but are not limited to) the following—(a) a product take-back scheme under which a manufacturer, importer, wholesaler or retailer is required to collect certain products for proper waste management; (b) a deposit-refund scheme under which a consumer is required to pay a deposit to be refunded on the return of certain products to a specified collection point; (c) the imposition of a recycling levy or fee to finance the proper waste management of certain products … (d) the imposition of an environmental levy or a charge to discourage the use of certain products

2017, Valencia, Philippines: Plastic Bags Regulation, City Ordinance No. 25-2017 Ordinance

- [*Regulatory – Prohibitive: Ban plastic*]: Distribution of plastic bags with thickness lower than 15 microns is prohibited …. Prohibition of market stall owners to directly distribute/ use plastic bags.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Consumers Incentives For Using "Reusable Bags" and /or Redemption of Used Plastic Bags will be awarded by Stores: Point System Scheme - Consumers practicing the use of reusable plastic bags will be given additional points by stores implementing the point system scheme. Green Lane - All stores shall provide special counters or express lane to cater customers using reusable bags.
- [*Regulatory – Affirmative: Plan, commitment*]: Stores Should Provide the following "Reusable Bags" to consumers for a minimum fee. Reusable Shopping Bag - for shopping and buying groceries applicable for shopping malls. Take-out Bag - for carrying out foods applicable for fast food chains; Agora Bag - for carrying wet and dry market products;

Medicine Bag - Appropriate to carry small quantity medicines and applicable for drugstore and pharmacy … All stores and shopping malls are directed to implement their own Waste Markets in their respective areas.

2018, Queensland, Australia: Australia (Queensland) 2018 SUP bags <30 µm banned from July 1, 2018

- [*Regulatory – Prohibitive: Ban plastic*]: A retailer must not give a banned plastic shopping bag to a person to use to carry goods the retailer sells from the retailer's premises. … This section applies whether or not a price is charged for the banned plastic shopping bag.
- [*Information: Education or outreach*]: A person must not give information that the person knows is false or misleading to another person about— (a) the composition of a banned plastic shopping bag; or (b) whether or not a plastic bag is a banned plastic shopping bag.
- [*Information: Research, data collection, data reporting or record keeping*]: The Minister must ensure a review of the operation of this part starts as soon as practicable, but no more than 3 months, after 1 July 2020. The review must include a review of: (a) the effect of this part on the community and retailers; and (b) the level of retailers' knowledge and understanding about the prohibition on giving banned plastic shopping bags to persons; and (c) the effectiveness of this part in reducing the quantity of banned plastic shopping bags— (i) used; and (ii) that becomes waste and is littered or disposed of to landfill …. The Minister must table the report in the Legislative Assembly within 12 sitting days after receiving the report.

2018, Western Australia, Australia: Environmental Protection (Plastic Bags) Regulations 2018

- [*Regulatory – Prohibitive: Ban plastic*]: A retailer must not supply a prescribed plastic bag to a person for the person to carry goods sold by the retailer.
- [*Information: Education or outreach*]: A person who supplies or manufactures prescribed plastic bags must not give any information that the person knows is false or misleading to another person about — (a) the composition of a prescribed plastic bag; or (b) whether or not a plastic bag is a prescribed plastic bag.

2019, Victoria, Australia: Environment Protection Amendment Bill 2019

- [*Regulatory – Prohibitive: Ban plastic*]: A retailer must not sell or provide a banned plastic bag to a person to carry or transport goods sold or provided by the retailer from the retail premises.
- [*Information: Education or outreach*]: A retailer or wholesaler, or a manufacturer of plastic bags, must not, whether by act or omission, provide to any other person information that the retailer, wholesaler or manufacturer knows, or should reasonably know, is false or

misleading about: (a) the composition of a banned plastic bag; or (b) whether or not a bag is a banned plastic bag; or (c) whether or not a bag is an exempt plastic bag.

III. Instruments Targeting Microplastic Pollutants

2017, Taiwan: Restrictions on the Manufacture, Import, and Sale of Personal Care and Cosmetics Products Containing Plastic Microbeads

- [*Regulatory – Prohibitive: Ban plastic*]: Apart from those enterprises already manufacturing or importing the following cosmetic and personal care products containing plastic microbeads as of August 23, 2016, manufacturers, importers, and vendors may not manufacture, import, or sell such products: A. Cosmetics used for washing hair, cosmetics used for bathing, cosmetics used for face-washing, and soap as defined in relevant provisions of the Statute for Control of Cosmetic Hygiene, B. Facial scrub, C. Toothpaste.

IV. Instruments Targeting Maritime Sources of Plastic Pollution

2003, Northern Territory, Australia: Marine Pollution Regulations

- [*Regulatory – Affirmative: Plan, commitment*]: A ship with a gross tonnage more than 400 must carry and comply with a garbage management plan … [with] written procedures for collecting, storing, processing and disposing of garbage (including the use of equipment on board).
- [*Information: Research, data collection, data reporting and record keeping*]: Garbage management and records Ships to display placards: Every ship of 12 m or more in length must display not less than one placard at the garbage disposal point on the vessel or other appropriate place or places to inform the crew and passengers of the MARPOL requirements relating to disposal of garbage.

2017, Taiwan: Regulations for Fishing Vessels Conducting Squid Jigging Fishery

- [*Regulatory – Prohibitive: Irresponsible handling of plastic*]: To prevent harming marine living species, any fishing vessel shall not dispose any type of plastic trash or discharge any oil on the sea.

Europe and Central Asia

I. Instruments Targeting Macroplastic Pollutants

2007, Northern Ireland: Producer Responsibility Obligations (Packaging Waste) Regulations (Northern Ireland) 2007 (S.R. No. 198 of 2007)

- [*Information: Education or outreach*]: A person who is a producer…has producer responsibility obligations …, that is to say he must— … be registered … and … furnish a certificate of compliance in respect of his recovery and recycling obligations … and … if his main activity is that of seller, provide information to consumers of the goods sold by him about: (i) the return, collection and recovery systems available to them; (ii) their role in contributing to the reuse, recovery and recycling of packaging and packaging waste; (iii) the meaning of related markings on packaging that he places on the market and that relates to his recovery and recycling obligations; and (iv) the chapter dealing with the management of packaging and packaging waste in any strategy prepared under Article 18 of [the national waste strategy], … [sets recycling targets for plastic].

2017, Northern Ireland: The Producer Responsibility Obligations (Packaging Waste) (Amendment) Regulations (Northern Ireland) 2017

- [*Regulatory – Affirmative: Plan, commitment*]: [Sets recycling targets for plastic, increasing from 49% in 2016 to 57% in 2020].

II. Instruments Specifically or Primarily Targeting Leakage of Plastic Carry-Out Bags

2010, Wales: The Single Use Carrier Bags Charge (Wales) Regulations 2010

- [*Economic: Disincentive*]: A seller must charge for every single use carrier bag supplied new—(a) at the place in Wales where the goods are sold, for the purpose of enabling the goods to be taken away; (b) for the purpose of enabling the goods to be delivered to persons in Wales … The amount that a seller must charge is such amount as ensures that the consideration paid by a customer for each single use carrier bag is not less than 5 pence.
- [*Information: Research, data collection, data reporting or record keeping*]: [For a period of 3 years] A seller must keep a record of the [following] information … for every reporting year: the number of single use carrier bags supplied which attract the charge; the amount received by way of consideration for single use carrier bags which attract the charge; the amount received by way of the charge; the net proceeds of the charge; (a breakdown of how the amount which represents the difference between the amount received by way of the charge and the net proceeds of the charge has been arrived at, including—(i) the apportionment between any chargeable VAT and reasonable costs; (ii) the apportionment between different heads of reasonable costs; the uses to which the net proceeds of the charge have been put.

2013, Northern Ireland: Single-Use Carrier Bags Charge Regulations (Northern Ireland) 2013 (S.R. No. 4 of 2013)

- [*Economic: Disincentive*]: a seller shall charge a customer at least 5 pence for every single use carrier bag supplied new for the purpose of enabling goods purchased to be taken away or delivered.
- [*Information: Research, data collection, data reporting or record keeping*]: A seller shall keep a record of the [following] information … for every reporting year: (a) the number of single use carrier bags supplied to customers which attract the requirement to charge; (b) the total proceeds received for single use carrier bags supplied to customers which attract the requirement to charge; (c) the amount received by way of the 5 pence element of the charge; (d) any amount of chargeable VAT in respect of the 5 pence element of the charge; (e) the net proceeds of the charge.

2014, Scotland: The Single-Use Carrier Bags Charge (Scotland) Regulations 2014

- [*Economic: Disincentive*]: A supplier must charge for a single use carrier bag supplied new—(a) at the place where goods are supplied, for the purpose of enabling the goods to be taken away; or (b) for the purpose of enabling the goods to be delivered to any person. The amount that a supplier must charge for a single use carrier bag is the amount that will ensure that the consideration paid by the person supplied with the bag is, for each such bag, not less than 5 pence.
- [*Information: Research, data collection, data reporting and record keeping*]: A supplier must keep a record of the information specified in [the following sentence] for every reporting year in which the supplier supplies a single use carrier bag in respect of which there is a requirement to charge … The specified information is: the number of single use carrier bags in respect of which there is a requirement to charge … that are supplied by the supplier; the consideration paid to the supplier for such bags; … and the net proceeds raised by the charge.

2017, England: The Environmental Protection (Microbeads) (England) Regulations 2017

- [*Regulatory – Prohibitive: Ban plastic*]: A person who, in the manufacture of any rinse-off personal care product, uses microbeads as an ingredient of that product is guilty of an offence. A person who supplies, or offers to supply, any rinse-off personal care product containing microbeads is guilty of an offence.

2018, Wales: Environmental Protection (Microbeads) (Wales) Regulations 2018 (S.I. No. 760 (W. 151) of 2018)

- [*Regulatory – Prohibitive: Ban plastic*]: A person who, in the manufacture of any rinse-off personal care product, uses microbeads as an ingredient of that product is guilty of an offence. A person who supplies, or offers to supply, any rinse-off personal care product containing microbeads is guilty of an offence.

2018, Scotland: The Environmental Protection (Microbeads) (Scotland) Regulations 2018

- [*Regulatory – Prohibitive: Ban plastic*]: A person who supplies, offers to supply or has in possession for supply any rinse-off personal care product containing microbeads commits an offence.

Latin America and the Caribbean

I. Instruments Specifically or Primarily Targeting Leakage of Plastic Carry-Out Bags

2018, Rio di Janeiro, Brazil: Law No. 8006 of June 25, 2018

- [*Economic: Disincentive; Information: Labels or placards*]: The commercial companies and businessmen referred to in Article 966 of the Civil Code, holders of commercial establishments located in the State of Rio de Janeiro, are prohibited from distributing (free of charge or charging) disposable plastic bags or bags, made up of polyethylenes, polypropylenes and / or similar, and must replace them within 18 (eighteen) months from date of publication of this Law, by reusable / returnable bags … The reusable / returnable plastic bags and / or bags mentioned in the caption of this article should have a resistance of at least 4 (four), 7 (seven) or 10 (ten) kilos and be made with more than 51% (fifty and one per cent) of material from renewable sources, and should be made in green - for recyclable waste - and gray - for other tailings, to assist the consumer in separating waste and to facilitate identification for their waste collection. Trash …. The reusable / returnable plastic bags and / or bags, as mentioned in the caput of this article, may be distributed upon maximum charge of their cost price.
- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Recyclable bags should be used for the packaging and transportation of products and general merchandise that meet the needs of customers, and can be made with materials from renewable energy sources, such as bioplastic produced from sugar cane, corn plantations, among others.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: The commercial companies and businessmen referred to in art. 966 of the Civil Code, holders of commercial establishments located in the State of Rio de Janeiro will promote the collection and replacement of bags, which are not entirely recyclable, used in those establishments for the

packaging and delivery of products and goods to customers, according to the provisions of Article 2 of this law and against compensation.

North America

I. Instruments Targeting Leakage of All (or Multiple) Types of Plastics

2016, California, United States: Water Code - Division 7: Water Quality - Chapter 5: Enforcement and Implementation (secs. 13300 - 13308)

- [*Regulatory – Affirmative: Plan, commitment*]: The state board and the regional boards shall implement a program to control discharges of preproduction plastic from point and nonpoint sources. The state board shall determine the appropriate regulatory methods to address the discharges from these point and nonpoint sources … The program control measures shall, at a minimum, include waste discharge, monitoring, and reporting requirements that target plastic manufacturing, handling, and transportation facilities … The program shall, at a minimum, require plastic manufacturing, handling, and transportation facilities to implement best management practices to control discharges of preproduction plastics. At a minimum, the state board shall require the following best management practices in all permits issued under the national pollutant discharge elimination system (NPDES) program that regulate plastic manufacturing, handling, or transportation facilities: (1) Appropriate containment systems shall be installed at all onsite storm drain discharge locations that are down-gradient of areas where preproduction plastic is present or transferred. A facility shall install a containment system that is defined as a device or series of devices that traps all particles retained by a one millimeter mesh screen and has a design treatment capacity of not less than the peak flowrate resulting from a one-year, one-hour storm in each of the down-gradient drainage areas…[or when not technically feasible, the facility shall propose for approval] alternative storm drain control measures that are designed to achieve the same performance as a one millimeter mesh screen. At all points of preproduction plastic transfer, measures shall be taken to prevent discharge, including, but not limited to, sealed containers durable enough so as not to rupture under typical loading and unloading activities. At all points of preproduction plastic storage, preproduction plastic shall be stored in sealed containers that are durable enough so as not to rupture under typical loading and unloading activities. At all points of storage and transfer of preproduction plastic, capture devices shall be in place under all transfer valves and devices used in loading, unloading, or other transfer of preproduction plastic. A facility shall make available to its employees a vacuum or vacuum type system, for quick cleanup of fugitive preproduction plastic.

II. Instruments Targeting Macroplastic Pollutants

2003, Saskatchewan, Canada: Litter Control Designation Regulations (R.R.S. c. L-22 Reg. 5)

- [*Economic: Cash for return*]: The environmental handling charge imposed by section 14.82 of the Act: … with respect to plastic bottles, is 6¢ per bottle; … The refundable deposit imposed by section 14.82 of the Act: … with respect to plastic bottles, is: (i) 10¢ per bottle with a volume of: (A) 300 millilitres or less; or (B) less than one litre but more than 300 millilitres.

2007, California, United States: AB-258 Water quality: plastic discharges

- [*Regulatory – Affirmative: Responsible handling of plastic*]: The state board and the regional boards shall implement a program to control discharges of preproduction plastic from point and nonpoint sources. The state board shall determine the appropriate regulatory methods to address the discharges from these point and nonpoint sources …. The program control measures shall, at a minimum, include waste discharge, monitoring, and reporting requirements that target plastic manufacturing, handling, and transportation facilities …. The program shall, at a minimum, require plastic manufacturing, handling, and transportation facilities to implement best management practices to control discharges of preproduction plastics. A facility that handles preproduction plastic shall comply with either subdivision (e) or the criteria established pursuant to subdivision (f). (e) At a minimum, the state board shall require the following best management practices in all permits issued under the national pollutant discharge elimination system (NPDES) program that regulate plastic manufacturing, handling, or transportation facilities: (1) Appropriate containment systems shall be installed at all onsite storm drain discharge locations that are down-gradient of areas where preproduction plastic is present or transferred. A facility shall install a containment system that is defined as a device or series of devices that traps all particles retained by a one millimeter mesh screen and has a design treatment capacity of not less than the peak flowrate resulting from a one-year, one-hour storm in each of the down-gradient drainage areas. When the installation of a containment system is not appropriate because one or more of a facility's down-gradient drainage areas is not discharged through a stormwater conveyance system, or when the regional board determines that a one millimeter or similar mesh screen is not appropriate at one or more down-gradient discharge locations, the regulated facility shall identify and propose for approval by the regional board technically feasible alternative storm drain control measures that are designed to achieve the same performance as a one millimeter mesh screen. (2) At all points of preproduction plastic transfer, measures shall be taken to prevent discharge, including, but not limited to, sealed containers durable enough so as not to rupture under typical loading and unloading activities. (3) At all points of preproduction plastic storage, preproduction plastic shall be stored in sealed containers that are durable enough so as not to rupture under typical loading and unloading activities. (4) At all points of storage and transfer of preproduction plastic, capture devices shall be in place under all transfer valves and devices used in loading, unloading, or other transfer of preproduction plastic. (5) A facility shall make available to its employees a vacuum or vacuum type system, for quick cleanup of fugitive preproduction plastic.

2008, Manitoba, Canada: Packaging and Printed Paper Stewardship Regulation (Man. Reg. 195/2008)

- [*Regulatory – Prohibitive: Ban plastic*]: No person shall supply designated material for consumption unless: (a) the steward of the designated material operates or subscribes to a packaging and printed paper stewardship program; or (b) the person operates or subscribes to a packaging and printed paper stewardship program … No person shall in the course of business use in Manitoba designated material obtained in a supply transaction outside of Manitoba unless the person operates or subscribes to a packaging and printed paper stewardship program … No person shall supply designated material for consumption in a retail sale in Manitoba unless the person makes available to the consumer point of sale information under a packaging and printed paper stewardship program.
- [*Economic: Disincentive*]: a person must not, in the course of supplying or in relation to a supply of designated material for consumption, (a) charge the material's recipient a fee or other monetary amount (i) for or in connection with the post-supply collection, transportation, storage, processing and disposal of the designated material, or (ii) for otherwise recycling the designated material, that is in addition to or separate from the usual or stated price for the printed paper or the goods that were supplied in the designated material; or (b) charge the material's recipient a fee or other monetary amount under a waste reduction and prevention program that is not a packaging and printed paper stewardship program approved under this regulation.
- [*Regulatory – Affirmative: Plan, commitment*]: A plan for a packaging and printed paper stewardship program must include provision for (a) the establishment and administration of a waste reduction and prevention program for packaging and printed paper with waste reduction and prevention targets as set out in the plan; (b) the appropriate management of waste packaging and printed paper …; (c) a province-wide, convenient collection system for waste packaging and printed paper without user fees at the point of collection; (d) a system for the payment of expenditures incurred in the collection, transportation, storage, processing and disposal of waste packaging and printed paper in connection with the waste reduction and prevention program; (e) the orderly collection of revenues from subscribers to the program in balance with expenditures for the program; (f) the establishment and administration of education programs for the purpose of the waste reduction and prevention program; (g) the establishment and administration of a point of sale information program for the purpose of the waste reduction and prevention program; (h) the payment of salaries and other costs of government for the administration and enforcement of this regulation and of the Act as it relates to packaging and printed paper; and (i) ongoing consultations about the stewardship program with persons who the operator considers the stewardship program may affect, including members of the public ….

2009, Washington, D.C., United States: Anacostia River Clean Up and Protection Act of 2009

- [*Regulatory – Affirmative: Post-leakage plastic capture; Information: Education or outreach, Research, data collection, data reporting or record keeping*]: The Fund shall be used solely for the purposes of cleaning and protecting the Anacostia River and other impaired waterways. Funds shall be used for the following projects in the following order of priority: a public education campaign …; the pilot program [to adopt a section of the river for purposes of removing bottles and other trash]; providing reusable carryout bags to ..residents; purchasing and installing equipment … designed to minimize trash pollution that enters waterways through storm drains; creating youth-oriented … education campaigns; monitoring and recording pollution indices; preserving or enhancing water quality and fishery or wildlife habitat; promoting conservation programs; purchasing and installing signs and equipment designed to minimize trash pollution [e.g., recycling containers]; restoring or enhancing wetlands and green infrastructure; funding community cleanup events; funding a circuit rider program with neighboring jurisdictions … to focus cleanup efforts … upstream; supporting vocational and job training experiences in environmental professions; maintaining a public website; and paying for administration of this program.

2011, New Brunswick, Canada: Beverage Containers Act (RSNB 2011, c 121)

- [*Regulatory – Prohibitive: Ban plastic*]: No distributor shall sell a beverage in beverage containers connected by plastic rings or other connecting devices prohibited by the regulations.

2013, Washington, D.C., United States: B20-0573 - Sustainable DC Omnibus Act of 2013

- [*Regulatory – Prohibitive: Ban plastic*]: Food service businesses shall not sell or provide food … in expanded polystyrene food service products. [Exemptions]: prepackaged soup or other food that a food service business sells or otherwise provides to its customers in expanded polystyrene containers that have been filled and sealed prior to receipt by the food service business.

2017, Portland, Oregon: Chapter 17.103 Prohibition and Restrictions on Single-Use Plastic

- [*Regulatory – Prohibitive: Ban plastic*]: As of October 1, 2019, all Retail Food and Beverage Establishments and Cafeterias, where beverages may be consumed at Dine-in areas, shall provide Plastic Serviceware only after Customer request …. As of October 1, 2019, all Retail Food and Beverage Establishments and Cafeterias, where Customers order Fast Food, take-out or delivery, shall provide Plastic Serviceware to Customers only after asking if the Customer needs Plastic Serviceware and the Customer responds affirmatively. For Electronic Ordering, the Retail Food and Beverage Establishments are

responsible for coordinating with any outside ordering service to prompt the Customer to select Plastic Serviceware.

2017, Oregon, United States: Oregon Revised Statute 459A.700-740

- [*Economic: Cash for return*]: Except as provided in subsections (2) and (3) of this section, every beverage container sold or offered for sale in this state shall have a refund value of not less than five cents. (2)(a) Every beverage container sold or offered for sale in this state shall have a refund value of not less than 10 cents, beginning on the later of: (A) Eight months after the Oregon Liquor Control Commission determines that, in each of the two previous calendar years, the number of beverage containers returned for the refund value specified in this section was less than 80 percent of the total number of beverage containers that were sold in this state; or (B) January 1 of the calendar year following the determination by the commission described in subparagraph (A) of this paragraph. (b) The commission may not make a determination under this subsection before January 1, 2016. (c) In making a determination under this subsection, the commission may not include the beverage containers and beverages described in ORS 459A.702 (2)(b) before January 1, 2021. (3) Every beverage container certified as provided in ORS 459A.725, sold or offered for sale in this state, shall have a refund value of not less than two cents. … Any manufacturer, distributor or importer that fails to pay to a dealer or redemption center the refund value of beverage containers and to collect beverage containers as required by ORS 459A.710 (3) is liable to the dealer or redemption center for treble the unpaid refund value and treble the collection costs incurred by the dealer or redemption center for any beverage containers that were not collected as required.
- [*Regulatory – Prohibitive: Ban plastic*]: No person shall sell or offer for sale at retail in this state metal beverage containers connected to each other by a separate holding device constructed of plastic rings or other material which will not decompose by photo-biodegradation, chemical degradation, or biodegradation within 120 days of disposal.

2018, California, United States: Assembly Bill No. 1884, CHAPTER 576

- [*Regulatory – Prohibitive: Ban plastic*]: A full-service restaurant shall not provide a single-use plastic straw to a consumer unless requested by the consumer.

2018, Malibu, California, United States: ORDINANCE NO. 432

- [*Regulatory – Prohibitive: Ban plastic*]: No restaurant, including fast food restaurants, beverage provider, or vendor shall use, provide, distribute, or sell plastic beverage straws, plastic stirrers, or plastic cutlery. … No person shall distribute plastic beverage straws, plastic stirrers, or plastic cutlery at any city facility or any city-sponsored event.

- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Nothing in this section precludes restaurants, including fast food restaurants, beverage providers, or vendors from using or making non-plastic alternatives, such as those made from paper, sugar cane, or bamboo, available to customers […] Non-plastic alternative straws, stirrers, or cutlery shall only be provided upon request by the customer.

2018, New York, New York, United States: Restrictions on the sale or use of certain expanded polystyrene items

- [*Regulatory – Prohibitive: Ban plastic*]: If expanded polystyrene single service articles are not designated as a recyclable material pursuant to subdivision b of this section, then …, no food service establishment, mobile food commissary, or store shall possess, sell, or offer for use single service articles that consist of expanded polystyrene including, but not limited to, providing food in single service articles that consist of expanded polystyrene. [Exemptions]: expanded polystyrene containers used for prepackaged food that have been filled and sealed prior to receipt by the food service establishment, mobile food commissary, or store; or expanded polystyrene containers used to store raw meat, pork, fish, seafood or poultry sold from a butcher case or similar retail appliance.
- [*Information: Research, data collection, data reporting or recording*]: the commissioner shall determine, …, whether expanded polystyrene single service articles can be recycled at the designated recycling processing facility at the South Brooklyn Marine Terminal in a manner that is environmentally effective, economically feasible, and safe for employees. … If the commissioner determines that expanded polystyrene single service articles can be recycled in such manner, the commissioner shall adopt and implement rules designating expanded polystyrene single service articles and, as appropriate, other expanded polystyrene products, as a recyclable material and require the source separation of such expanded.
- [*Information: Education or outreach*]: the department shall provide outreach and education as follows: (1) if expanded polystyrene single service articles are not designated as a recyclable material pursuant to subdivision b of this section, the department, … shall conduct outreach and education to food service establishments, mobile food commissaries, and stores to inform them of the provisions of this section and provide assistance with identifying replacement material, and such outreach and education shall be offered in multiple languages; and (2) if expanded polystyrene single service articles are designated as a recyclable material pursuant to subdivision b of this section, the department shall provide instruction and materials for residential building owners, net lessees or persons in charge of such buildings, and their employees and residents, for the purpose of improving compliance with such new recycling designation.
- [*Economic: Subsidy*]: Any not-for-profit corporation, regardless of its income, and any food service establishment, mobile food commissary, or store that had a gross income under five hundred thousand dollars per location on their annual income tax filing for

the most recent tax year and is not part of a chain food service establishment or a chain store may request from the commissioner of small business services, in a manner and form established by such commissioner, a financial hardship waiver of the requirements of this section [for twelve months, renewable upon application]. Such waiver request may apply to one or more single service articles possessed, sold, or offered for use by any such not-for-profit corporation, food service establishment, mobile food commissary, or store. [Such a waiver shall be granted if]: (1) that there is no comparable alternative product not composed of expanded polystyrene that would cost the same as or less than the single service article composed of expanded polystyrene, and (2) that the purchase or use of an alternative product not composed of expanded polystyrene would create an undue financial hardship.

2019, Berkeley, California, United States: Ordinance No 7, 639-N.S. - Chapter 11.64

- [*Regulatory – Prohibitive: Ban plastic*]: The City of Berkeley shall not purchase any Disposable Foodware that does not comply with the Disposable Foodware Standards in Section 11.64.070, nor shall any City-sponsored event utilize non-compliant Disposable Foodware.
- [*Regulatory – Prohibitive: Limit plastic*]: Accessory Disposable Foodware items shall be provided only upon request by the customer or at self-serve stations, except that for safety reasons … Disposable Cups for delivery by a Prepared Food Vendor or a Takeout Food Delivery Service may include lids, spill plugs and sleeves without request. Prepared Food Vendors and Takeout Food Delivery Services must provide options for customers to affirmatively request Accessory Disposable Foodware Items separate from orders for food and beverages across all ordering/point of sale platforms, including but not limited to web, smart phone and other digital platforms, telephone and in-person. C. Prepared Food Vendors that customarily offer straws are encouraged to maintain a small supply of plastic-type straws which meet the Disposable Foodware Standards set forth in Section 11.64.070, which may be provided to customers upon specific request for a "plastic" straw. D. Prepared Food Vendors offering condiments are encouraged to use dispensers rather than pre-packaged disposable condiment packets.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: Effective January 1, 2020: A. Takeout Food shall only be served in Disposable Foodware that conforms to the Disposable Foodware Standards … B. Accessory Disposable Foodware Items shall conform with the Disposable Foodware Standards…. C. Takeout Food Delivery Services shall only deliver Takeout Food from a Prepared Food Vendor that is served in Disposable Foodware and with Accessory Disposable Foodware Items, if any, that conform to the Disposable Foodware Standards… D. Prepared Food Vendors shall charge customers twenty five cents ($0.25) for every Disposable Cup provided…Effective July 1, 2020: A. Prepared Food served for consumption on the premises of a Prepared Food Vendor shall only be served using Reusable Foodware, except that disposable paper food wrappers, sleeves and bags; foil wrappers; paper napkins; straws and paper tray and plate-liners shall

be allowed for dining on the premises, so long as they meet the Disposable Foodware Standards ….

III. Instruments Specifically or Primarily Targeting Leakage of Plastic Carry-Out Bags

2007, San Francisco, United States: San Francisco Environment Code - Chapter 17: Plastic Bag Reduction Ordinance

- [*Information: Education or outreach*]: The Department's responsibilities for implementing this Chapter include conducting outreach to stores, providing multi-lingual information to educate store employees and customers, and making available lists of vendors who sell Recyclable Paper, Compostable Plastic, or Reusable Bags.

2008, Maui, United Sates: A Bill for an Ordinance Establishing A New Chapter 20.18, Maui County Code, Pertaining to Plastic Bag Reduction

- [*Regulatory – Prohibition: Ban plastic*]: Businesses are prohibited from providing plastic bags to their customers at the point of sale for the purpose of transporting groceries or other goods …. Nothing in this chapter shall preclude a business from making reusable bags or recyclable paper bags available for sale or without charge to customers at the point of sale for the purpose of transporting groceries or other goods …. shopping malls, shops, marketing start up should ban the sale and is not degradable plastic shopping bags, plastic utensils for inspection, building management system, strengthen publicity on the operators.
- [*Information: Research, data collection, data reporting or record keeping*]: On or before September 1 of each year, the director shall submit to the council a report assessing the estimated increase in the number of business customers using recyclable paper bags or reusable bags.

2009, Washington, DC, United States: Anacostia River Clean Up and Protection Act of 2009

- [*Regulatory – Affirmative: Develop new, or improve existing process or product; Information: Labels or placards*]: Disposable carryout bags made of plastic shall: be 100% recyclable; be made of high-density polyethylene film marked with the SPI resin identification code 2 or low-density polyethylene film marked with the SPI resin identification code 4; and display the phrase "Please Recycle this Bag" or a substantially similar phrase, in a highly visible manner on the bag exterior.
- [*Economic: Disincentive; Information: Labels or placards*]: A customer making a purchase from a retail establishment shall pay at the time of purchase a fee of $.05 for each disposable carryout bag. A retail establishment shall not advertise or hold out or state to the public or to a customer directly or indirectly that the reimbursement of the fee or any part thereof to be collected by the retail establishment will be assumed or absorbed by

the retail establishment or otherwise refunded to the customer. All retail establishments shall indicate on the consumer transaction receipt the number of disposable carryout bags provided and the total amount of fee charged.

2010, Thompson, Manitoba, Canada: By-Law Number 1839-2010

- [*Regulatory – Prohibitive: Ban plastic*]: No person shall sell or provide single-use plastic bags free of charge or allow single-use plastic bags to be sold or provided free of charge …. No person employed by or acting on behalf of a person carrying on a retail business shall sell or provide single-use plastic bags free of charge or allow single-use plastic bags to be sold or provided free of charge. … No retail business shall deny the use of any reusable container by a customer for the transport of purchased items.
- [*Regulatory – Affirmative: Develop new, or improve existing process or product*]: Nothing in this by-law shall preclude owners of retail businesses from making alternatives to single-use plastic bags, such as reusable containers and bags, available for sale or free of charge to customers….

2010, Los Angeles, California, United States: An ordinance amending Title 12 - Environmental Protection of the Los Angeles County Code, Relating to Regulating the Use of Plastic Carryout Bags and Recyclable Paper Carryout Bags and Promoting the Use of Reusable Bags within the County Unincorporated Area

- [*Regulatory – Prohibitive: Ban plastic*]: No store shall provide to any customer a plastic carryout bag … This prohibition applies to bags provided for the purpose of carrying away and does not apply to produce bags or product bags … All stores must provide reusable bags to customers, either for sale or at no charge.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: All stores shall provide or make available to a customer only recyclable paper carryout bags or reusable bags for the purpose of carrying away goods or other materials from the point of sale, subject to the terms of this Chapter. Nothing in this Chapter prohibits customers from using bags of any type that they bring to the store themselves or from carrying away goods that are not placed in a bag, in lieu of using bags provided by the store.
- [*Information: Education or outreach*]: Each store is strongly encouraged to educate its staff to promote reusable bags and to post signs encouraging customers to use reusable bags.

2011, Leaf Rapids, Manitoba, Canada: By-Law No. 462 – Being a By-Law of the Town of Leaf Rapids for the Establishment of Single Use Plastic Shopping Bags

- [*Regulatory – Prohibitive: Ban plastic*]: THAT retailers in the Town of Leaf Rapids will not be permitted to give away or sell plastic shopping bags that are intended for single use.

2011, Seattle, Washington, United States: An Ordinance Relating to the City of Seattle's Solid Waste System, Regulating the Distribution of Single-Use Plastic and Biodegradable Carryout Bags and Requiring Retail Establishments to Collect a Pass-through Charge from Customers Requesting Recyclable Paper Carryout Bags

- [*Regulatory – Prohibitive: Ban plastic*]: No retail establishment in the City shall provide a single-use plastic carryout bag to any customer.
- [*Regulatory – Affirmative: Develop new, or existing process or product*]: To further promote the use of reusable shopping bags and reduce the quantity of single-use carryout bags entering the City's waste stream, the Director of Seattle Public Utilities is authorized to make reusable carryout bags available to the public at low cost or free-of-charge, targeting such programs to reach low-income households to the greatest degree possible.
- [*Information: Research, data collection, data reporting or record keeping*]: The Director of Seattle Public Utilities shall evaluate: (a) the financial impact to retail establishments of implementing this ordinance, (b) the effectiveness of this ordinance in reducing the number of single-use carryout bags used in the City, (c) the effectiveness of this ordinance compared to other jurisdictions' efforts to reduce use of singleuse carryout bags, and (d) the waste- and litter- reduction benefits of the City's program. The evaluation shall be presented in reports to the City Council [by January 1, 2013 and July 1, 2016] that recommend any changes in the ban, pass-through charges, or other provisions that are needed to improve effectiveness.

2012, Boulder, Colorado, United States: ORDINANCE NO. 7870 AN ORDINANCE ESTABLISHING A NEW CHAPTER 6-15, "DISPOSABLE BAG FEE," B.R.C. 1981, AND SETTING FORTH RELATED DETAILS

- [*Economic: Disincentive*]: For each Disposable Bag provided to a customer, Food Stores shall collect from customers, and customers shall pay, at the time of purchase, a Disposable Bag Fee of $0.10. Food Stores shall record the number of Disposable Bags provided and the total amount of Disposable Bag Fees charged on the customer transaction receipt. A Food Store shall not refund to the customer any part of the Disposable Bag Fee, nor shall the Food Store advertise or state to customers that any part of the Disposable Bag Fee will be refunded to the customer. A Food Store shall not exempt any customer from any part of the Disposable Bag Fee for any reason except as stated in section 6-15-7, "Exemptions."
- [*Information: Labels or placards*]: Every Food Store subject to the collection of the Disposable Bag Fee shall display a sign in a location outside or inside of the business, viewable by customers, alerting customers to the city of Boulder's Disposable Bag Fee.
- [*Information: Research, data collection, data reporting or record keeping*]: Each Food Store licensed pursuant to the provisions of this chapter shall maintain accurate and complete records [for a period of three years] of the Disposable Bag Fees collected, the number of

Disposable Bags provided to customers, the form and recipients of any notice required pursuant to this chapter, and any underlying records, including any books, accounts, invoices, or other records necessary to verify the accuracy and completeness of such records.

2012, Maryland County, Maryland, United States: Article XIV. Carryout Bag Tax

- [*Economic: Disincentive*]: A tax in the amount of ~ cents is levied and imposed on each customer for each carryout bag that ~ retail establishment provides to the customer.… Each retail establishment that provides ~ carryout bag to ~ customer must collect the amount of the tax imposed under subsection ill when the customer makes any payment for goods in person, through the Internet, by telephone, by facsimile, or by any other means. The retail establishment must hold the taxes required to be collected under this Section in trust for the County until remitted as required…Each retail establishment may retain 1 cent from each 5-cent tax that the retail establishment collects to cover the administrative expense of collecting and remitting the tax to the County. A retail establishment must indicate on the customer's transaction receipt the number of carryout bags that the retail establishment provided to the customer and the total amount of tax levied under this Section.
- [*Information: Research, data collection, data reporting or record keeping*]: on or before the 25th day of each month, each retail establishment must remit the full amount of the tax collected for all carryout bags provided…during the previous month, less the amount retained under Section 52-102 1.fl … A retail establishment is only required to remit the taxes to the Director when the cumulative taxes collected under Section 52-102(a) since the previous remittance, if any, exceed $100 …. Each remittance must be accompanied by a full report of all transactions that involve bags subject to the tax.

2012, Kaua'I County, United States: A Bill for an Ordinance Establishing a New Article 19, Chapter 22, Kaua'I County Code 1987, Relating to Plastic Bag Reduction

- [*Regulatory – Prohibitive: Ban plastic*]: All retail establishments shall provide only the following as checkout bags to customers: recyclable paper bags, biodegradable bags and/or reusable bags. Nothing in this ordinance shall preclude any retail establishment from offering checkout bags for sale to customers.

2013, Austin, Texas, United States: Austin TX Code of Ordinances - Carryout Bags

- [*Regulatory – Prohibitive: Ban plastic*]: Beginning March 1, 2013, no person may provide single-use carryout bags at any City facility, City-sponsored event, or any event held on City property. Beginning March 1, 2013, a business establishment within the City limits may not provide single-use carryout bags to its customers or to any person.

- [*Information: Labels or placards*]: Beginning March 1, 2013, a business establishment within the City limits must provide prominently displayed signage advising customers of the benefit of reducing, reusing and recycling and of the need to use reusable carryout bags. The language and placement of signs under this Section shall be as prescribed by rule.
- [*Regulatory – Affirmative: Plan, commitment*]: A business establishment within the City limits may provide or sell reusable carryout bags to its customer person. A person may provide or sell reusable carryout bags at any City facility, City-sponsored event, or held on City property.
- [*Information: Education or outreach*]: Beginning on the effective date of this ordinance, the City will engage in a public education campaign to inform business establishments and citizens of the requirements regarding carryout bags.

2013, Hawaii County, United States: AN ORDINANCE AMENDING CHAPTER 14, HAWAII COUNTY CODE 1983 2005 EDITION, AS AMENDED) BY ADDING A NEW ARTICLE RELATING TO PLASTIC BAG REDUCTION

- [*Regulatory – Prohibitive: Ban plastic*]: Businesses shall not provide plastic checkout bags to their customers …. Exemptions. a) Organizations classified under Section 501 (c) of the United States Internal Revenue Code and non - incorporated community booster organizations are exempt from the provisions of this article …. Businesses may make plastic checkout bags available for purchase for one calendar year after the effective date of this ordinance.

2014, California, United States: SB-270 Solid Waste: Single-Use Carryout Bags

- [*Regulatory – Prohibitive: Ban plastic*]: On and after July 1, 2015, a store, … may sell or distribute a reusable grocery bag to a customer at the point of sale only if the reusable bag is made by a producer certified pursuant to this article to meet all of the following requirements: (1) Has a handle and is designed for at least 125 uses, as provided in this article. (2) Has a volume capacity of at least 15 liters. (3) Is machine washable or made from a material that can be cleaned and disinfected. (4) Has printed on the bag, or on a tag attached to the bag that is not intended to be removed, and in a manner visible to the consumer, all of the following information: (A) The name of the manufacturer. (B) The country where the bag was manufactured. (C) A statement that the bag is a reusable bag and designed for at least 125 uses. (D) If the bag is eligible for recycling in the state, instructions to return the bag to the store for recycling or to another appropriate recycling location. If recyclable in the state, the bag shall include the chasing arrows recycling symbol or the term "recyclable," consistent with the Federal Trade Commission guidelines use of that term, as updated …. In addition to the requirements in subdivision (a), a reusable grocery bag made from plastic film shall meet all of the following

requirements: (A) On and after January 1, 2016, it shall be made from a minimum of 20 percent postconsumer recycled material. (B) On and after January 1, 2020, it shall be made from a minimum of 40 percent postconsumer recycled material. (C) It shall be recyclable in this state, and accepted for return at stores subject to the at-store recycling program (Chapter 5.1 (commencing with Section 42250)) for recycling. (D) It shall have, in addition to the information required to be printed on the bag or on a tag, pursuant to paragraph (4) of subdivision (a), a statement that the bag is made partly or wholly from postconsumer recycled material and stating the postconsumer recycled material content percentage, as applicable. (E) It shall be capable of carrying 22 pounds over a distance of 175 feet for a minimum of 125 uses and be at least 2.25 mils thick, measured according to the American Society of Testing and Materials (ASTM) Standard D6988-13 … Except as provided [above] on and after July 1, 2015, a store, … shall not provide a single-use carryout bag to a customer at the point of sale. On and after July 1, 2015, a store, … shall not sell or distribute a reusable grocery bag at the point of sale except [if it] meets the requirements [above]. On and after July 1, 2015, a store, … that makes reusable grocery bags available for purchase pursuant to [above] shall not sell the reusable grocery bag for less than ten cents ($0.10) in order to ensure that the cost of providing a reusable grocery bag is not subsidized by a customer who does not require that bag …. On and after July 1, 2015, a store, … may distribute a compostable bag at the point of sale, if the compostable bag is provided to the consumer at the cost specified pursuant to paragraph (2), the compostable bag, at a minimum, meets the American Society for Testing and Materials (ASTM) International Standard Specification for Compostable Plastics D6400, as updated, and in the jurisdiction where the compostable bag is sold and in the jurisdiction where the store is located, both of the following requirements are met: A majority of the residential households in the jurisdiction have access to curbside collection of foodwaste for composting. The governing authority for the jurisdiction has voted to allow stores in the jurisdiction to sell to consumers at the point of sale a compostable bag at a cost not less than the actual cost of the bag, which the Legislature hereby finds to be not less than ten cents ($0.10) per bag.

- [*Regulatory – Affirmative: Plan, commitment*]: On and after July 1, 2015, a producer of reusable grocery bags made from plastic film shall not sell or distribute a reusable grocery bag in this state unless the producer is certified by a third-party certification entity pursuant to Section 42282. A producer shall provide proof of certification to the department demonstrating that the reusable grocery bags produced by the producer comply with the provisions of this article.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: retail establishment not specifically required to comply with the requirements of this chapter is encouraged to reduce its distribution of single-use plastic carryout bags.
- [*Regulatory – Affirmative: Plan, commitment*]: the sum of two million dollars ($2,000,000) is hereby appropriated from the Recycling Market Development Revolving Loan Subaccount in the Integrated Waste Management Account to the department for the purposes of providing loans for the creation and retention of jobs and economic activity

in this state for the manufacture and recycling of plastic reusable grocery bags that use recycled content, including postconsumer recycled material. (b) The department may expend, if there are applicants eligible for funding from the Recycling Market Development Revolving Loan Subaccount, the funds appropriated pursuant to this section to provide loans for both of the following: (1) Development and conversion of machinery and facilities for the manufacture of single-use plastic bags into machinery and facilities for the manufacturer of durable reusable grocery bags that, at a minimum, meet the requirements of Section 42281. (2) Development of equipment for the manufacture of reusable grocery bags, that, at a minimum, meet the requirements of Section 42281.

- [*Information: Labels or placards*]: On and after July 1, 2015, a store, … may sell or distribute a reusable grocery bag to a customer at the point of sale only if the reusable bag is made by a producer certified pursuant to this article to meet all of the following requirements: (1) Has a handle and is designed for at least 125 uses, as provided in this article. (2) Has a volume capacity of at least 15 liters. (3) Is machine washable or made from a material that can be cleaned and disinfected. (4) Has printed on the bag, or on a tag attached to the bag that is not intended to be removed, and in a manner visible to the consumer, all of the following information: (A) The name of the manufacturer. (B) The country where the bag was manufactured. (C) A statement that the bag is a reusable bag and designed for at least 125 uses. (D) If the bag is eligible for recycling in the state, instructions to return the bag to the store for recycling or to another appropriate recycling location. If recyclable in the state, the bag shall include the chasing arrows recycling symbol or the term "recyclable," consistent with the Federal Trade Commission guidelines use of that term, as updated.

2015, Chicago, United States: Checkout Bag Tax (2737)

- [*Economic: Disincentive*]: The Checkout Bag Tax is imposed on the retail sale or use of checkout bags in Chicago. Tax Base: Tax is imposed at $0.07 per checkout bag sold or used in the City. Exemptions, Deductions and Credits: A. This tax shall not apply to the extent it would violate the United States Constitution or the Const State of Illinois. B. This tax shall not apply to the retail sale or use of checkout bags that are used to carry items [purchased] to the Supplemental Nutritional Assistance Program or a similar governmental food assistance program C. It shall be presumed that checkout bags sold or used by wholesalers and stores are subject to t under this chapter until the contrary is established. The burden of proving that such checkout bag hereunder shall be upon the person so claiming.

2016, Montreal, Canada: By-Law Prohibiting the Distribution of Certain Shopping Bags in Retail Stores

- [*Regulatory – Prohibitive: Ban plastic*]: It is prohibited to offer clients in retail stores, against payment or free of charge, traditional plastic shopping bags less than 50 microns

thick, as well as oxo-degradable, oxo-fragmentable or biodegradable plastic bags, regardless of their thickness.

2017, Boston, United States: An Ordinance Regarding the Reduction of Plastic Bags in Boston

- [*Economic: Disincentive*]: A retail establishment that provides any type of checkout bag shall sell them for no less than five cents ($0.05) per bag. All moneys collected pursuant to this ordinance shall be retained by the retail establishment.
- [*Regulatory – Affirmative: Responsible handling of plastic*]: If any retail establishment provides a checkout bag to customers, the bag shall comply with the requirements of being a Reusable Bag, a Recyclable Paper Bag, or a Compostable Plastic Bag.
- [*Information: Research, data collection, data reporting or record keeping*]: Any charge for a checkout bag shall be separately stated on a receipt provided to the customer at the time of sale and shall be identified as the "checkout bag charge" thereon.

2017, Honolulu, Hawaii, United States: A Bill for an Ordinance Relating to the Use of Bags Provided to Customers

- [*Regulatory – Prohibitive: Ban plastic*]: Except as provided in subsections (b) and (c), businesses shall be prohibited from providing plastic checkout bags and non-recyclable paper bags to their customers at the point of sale for the purpose of transporting groceries or other merchandise …. After January 1. 2020, compostable plastic bags shall no longer be provided at the point of sale for the purpose of transporting groceries or other merchandise.
- [*Economic: Disincentive; Regulatory – Affirmative: Responsible handling of plastic*]: Businesses may provide, at the point of sale, reusable bags, compostable plastic bags, or recyclable paper bags to customers for the purpose of transporting groceries or other merchandise … provided that they charge the customer a minimum of 15 cents per bag.

2017, Portland, Oregon, United States: Chapter 17.103 Prohibition and Restrictions on Single-Use Plastic

- [*Regulatory – Prohibitive: Ban plastics*]: the following shall provide only recycled paper bags or reusable bags as checkout bags to customers: 1. Grocery stores; or 2. Retail establishments or food providers with greater than 10,000 square feet in specific store size. As of October 1, 2013, all retail establishments and food providers shall provide only recycled paper bags or reusable bags as checkout bags to customers.

IV. Instruments Targeting Microplastic Pollutants

2014, Illinois, United States: Public Act 098-0638 on Microbeads

- [*Regulatory – Prohibitive: Ban plastic*]: Effective December 31, 2018, no person shall accept for sale a personal care product, except for an over the counter drug, that contains synthetic plastic microbeads as defined in this Section …. Effective December 31, 2019, no person shall accept for sale an over the counter drug that contains synthetic plastic microbeads as defined in this Section.

2015, Ontario, Canada: Bill 75 Microbead Elimination and Monitoring Act (2015)

- [Regulatory – Prohibitive: Ban plastic]: No person shall manufacture microbeads or add microbeads to cosmetics, soaps or similar products.

South Asia

I. Instruments Targeting Leakage of All (or Multiple) Types of Plastics

2016, Karnatka, India: Circular Sub:Ban of Plastics & Penalty Impose in Bruhath Bengaluru Mahangara Palike

- [*Regulatory – Prohibitive: Ban plastic*]: No person including shopkeeper, vendor, wholesaler, retailer, trader, hawker or salesmen shall use plastic carry bags, plastic banners, plastic buntings, flex, plastic flags, plastic plates, plastic cups, plastic spoons, cling films and plastic sheets used for spreading on dining table irrespective of thickness including the above items made of thermocol and plastic which use plastic microbeads. Further, no industry or person shall manufacture, supply store, transport, sale and/or distribute [the items listed in the previous sentence]. [Exemptions]:..plastic carry bags manufactured exclusively for export purpose against any export orders in a plastic industry located in Special Economic Zone and Export Oriented Units; … plastic bags which constitute or form an integral part of packaging in which goods are sealed prior to use at manufacturing/processing units; … plastic bags and sheets used in Forestry and Horticulture nurseries against the orders from the Govt. Departments or from the firms concerned; … plastic used for packaging of milk and milk products (dairy products).

2018, Punjab, India: Plastic Waste (Management and Handling) Rules, 2011

- [*Regulatory – Affirmative: Responsible handling of plastic*]: Every local body shall be responsible for development and setting up of infrastructure for segregation, collection, storage, transportation, processing and disposal of the plastic waste either on its own or by engaging agencies or producers … such system shall be set up within one year from the date of final publication of these rules in the Official Gazette of India…Responsibility of Gram Panchayat. – Every gram panchayat either on its own or by engaging an agency

shall set up, perationalize and co-ordinate for waste management in the rural area under their control and for performing the associated functions, namely, - a) ensuring segregation, collection, storage, transportation, plastic waste and channelization of recyclable plastic waste fraction to recyclers having valid registration; ensuring that no damage is caused to the environment during this process; b) creating awareness among all stakeholders about their responsibilities.

- [*Regulatory – Affirmative: Responsible handling of plastic*]: [waste producers shall] ensure segregated storage of waste at source and handover segregated waste to urban local body or gram panchayat or agencies appointed by them or registered waste pickers', registered recyclers or waste collection agencies; … All institutional generators of plastic waste, shall … handover segregated wastes to authorized waste processing or disposal facilities or deposition centres either on its own or through the authorized waste collection agency;
- [*Regulatory – Affirmative: Responsible handling*]: The local body shall be responsible for setting up, operationalisation and co-ordination of the waste management system and for performing the associated functions, namely: … Ensuring segregation, collection, storage, transportation, processing and disposal of plastic waste; (b) ensuring that no damage is caused to the environment during this process; (c) ensuring channelization of recyclable plastic waste fraction to recyclers; (d) ensuring processing and disposal on non-recyclable fraction of plastic waste in accordance with the guidelines issued by the Central Pollution Control Board; (e) creating awareness among all stake holders about their responsibilities; (f) engaging civil societies or groups working with waste pickers; and (g) ensuring that open burning of plastic waste does not take place.
- [*Regulatory – Affirmative: Plan, commitment*]: Recycling of plastic waste shall conform to the [standards for recycling plastics] … The manufacturer shall not sell or provide or arrange plastic to be used as raw material to a producer, not having valid registration from the concerned State Pollution Control Boards or Pollution Control Committee;…Plastic material, in any form including Vinyl Acetate - Maleic Acid - Vinyl Chloride Copolymer, shall not be used in any package for packaging gutkha, pan masala and tobacco in all forms.
- [*Regulatory – Affirmative: Plan, commitment*]: The plastic waste management by the urban local bodies in their respective jurisdiction shall be as under: a. Plastic waste, which can be recycled, shall be channelized to registered plastic waste recycler and recycling of plastic shall conform to the [guidelines for recycling plastics]; b. Local bodies shall encourage the use of plastic waste (preferably the plastic waste which cannot be further recycled) for road construction as per Indian Road Congress guidelines or energy recovery or waste to oil etc. The standards and pollution control norms specified by the prescribed authority for these technologies shall be complied with; c. Thermo set plastic waste shall be processed and disposed of as per the guidelines issued from time to time by the Central Pollution Control Board … The producers, … shall work out modalities for waste collection system based on Extended Producers Responsibility and involving State

Urban Development Departments, either individually or collectively, through their own distribution channel or through the local body concerned.

- [*Information: Research, data collection, data recording and reporting*]: Every person engaged in recycling or processing of plastic waste shall prepare and submit an annual report… to the local body concerned under intimation to the concerned State Pollution Control Board or Pollution Control Committee [who will in turn submit an annual report to the CPCB, who will submit a report to the Central Government] … Every producer shall maintain a record of details of the person engaged in supply of plastic used as raw material to manufacture carry bags or plastic sheet or like or cover made of plastic sheet or multi-layered packaging.

II. Instruments Targeting Macroplastic Pollutants

2002, Tamil Nadu, India: Tamil Nadu Plastic Articles (Prohibition of Sale, Storage, Transport and Use) Act, 2002

- [*Regulatory – Prohibitive: Ban plastic*]: No person shall sell, store, transport or use any non-reusable carry bag, cup, tumbler or plate made of, or containing, plastic and such other article as may be notified by the non-government in this behalf … No person shall sell, store, distribute or transport any magazine or periodical packed in plastic wrapper. … [This does not apply] to the sale, transport or storing of the plastic articles [referred above] for sale or use outside the State of Tamil Nadu …. No owner or person in charge of any food establishment shall use of permit the use of any plastic article in such food establishment…. For the purpose of this section, "plastic article" means any non-reusable carry bag, cup, tumbler, plate, spoon, fork, knife, straw, box, string, cord, sheet, mat or other article made of, or containing, plastic and such other article as may be notified by the government.

2016, Punjab, India: The Punjab Plastic Carry Bags (Manufacture, Usage and Disposal) Control (Amendment) Act, 2016

- [*Regulatory – Prohibitive: Ban plastic*]: the State Government, may by notification in the Official Gazette, completely prohibit to manufacture, stock, distribute, recycle, sale or use of plastic carry bags and containers made of virgin or recycled plastic and plastic items having one time use such as disposable plastic cups, tumblers, spoons, forks and straws.

2016, Sikkim, India: Notification No. 25/Home/2016

- [*Regulatory – Prohibitive: Ban plastic*]: In order to reduce creation of garbage in the form of used drinking water plastic bottles, it is notified that the packaged drinking water bottles may not be used during any government meetings or functions. As an alternative,

it is suggested and encouraged to all the departments to use filtered water or water from large reusable water dispensers or to use reusable water bottles in government functions.

2016, Sikkim, India: Notification No.26/Home/2016

- [*Regulatory – Prohibitive: Ban plastic*]: A huge quantity of municipal waste is created in the form of used Styrofoam and other dispensable products … Therefore, the government is pleased to ban the sale and use of disposable items, such as cups, plates, spoons, containers etc. made from Styrofoam throughout the State with immediate effect.

2018, Punjab, India: Plastic Waste (Management and Handling) Rules, 2011

- [*Regulatory – Prohibitive: Ban plastic*]: Retailers or street vendors shall not sell or provide commodities to consumer in carry bags or plastic sheet or multi-layered packaging, which are not manufactured and labelled or marked, as per prescribed under these rules; … Plastic sheet or like, which is not an integral part of multi-layered packaging and cover made of plastic sheet used for packaging, wrapping the commodity shall not be less than fifty microns in thickness except where the thickness of such plastic sheets impair the functionality of the product;
- [*Regulatory – Affirmative: Plan, commitment*]: Every person responsible for organising an event in open space, which involves service of food stuff in plastic or multi-layered packaging shall segregate and manage the waste generated during such events in accordance with the Municipal Solid Waste (Management and Handling) Rules,
- [*Information: Labels or placards*]: Retailers or street vendors shall not sell or provide commodities to consumer in carry bags or plastic sheet or multi-layered packaging, which are not manufactured and labelled or marked, as per prescribed under these rules…. Every retailers or street vendors selling or providing commodities in, plastic carry bags or multi-layered packaging or plastic sheets or like or covers made of plastic sheets which are not manufactured or labelled or marked in accordance with these rules shall be liable to pay such fines as specified under the bye-laws of the local bodies.

III. Instruments Specifically or Primarily Targeting Leakage of Plastic Carry-Out Bags

2018, Punjab, India: Plastic Waste (Management and Handling) Rules, 2011

- [*Regulatory – Prohibitive: Ban plastic; Information: Labels or placards; Regulatory – Affirmative: Plan, commitment*]: Carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff'; … Carry bag made of virgin or recycled plastic, shall not be less than fifty microns in thickness; … Sachets using plastic material shall not be used for storing, packing or selling gutkha, tobacco and pan masala; … Retailers or street vendors

shall not sell or provide commodities to consumer in carry bags or plastic sheet or multi-layered packaging, which are not manufactured and labelled or marked, as per prescribed under these rules;

- [*Economic: Disincentive*]: Beginning October 1, 2012, no Store shall provide a Recyclable Paper Bag or Reusable Bag to a customer at the point of sale, unless the Store charges the customer a Checkout Bag Charge of at least ten cents ($0.10) per bag. (2) Beginning October 1, 2013, no Store, including a Food Establishment, shall provide a Compostable Plastic Bag to a customer at the point of sale, unless the Store charges the customer a Checkout Bag Charge of at least ten cents ($0.10) per bag. (3) No Food Establishment shall be required to charge its customers a Checkout Bag Charge for a bag provided for a customer's left-over food from sit-down restaurant dining …. After January 2013, and not later than January 2014, the Controller shall perform an assessment and review of the economic impacts on businesses, both large and small, of the 10 cent Checkout Bag Charge …. The amount charged pursuant to subsection (a) shall be separately stated on the receipt provided to the customer at the time of sale and shall be identified as a the Checkout Bag Charge. Any other transaction fee charged by the Store in relation to providing a Checkout Bag shall be identified separately from the Checkout Bag Charge …. Exemptions: where providing a Checkout Bag to a customer as part of a transaction paid for in whole or in part through the Special Supplemental Food Program for Women, Infants, and Children … A Store shall not charge the Checkout Bag Charge … for a Reusable Bag which meets the requirements of this Chapter and which is distributed to a customer without charge during a limited duration promotional event, not to exceed 12 days per year …. Any owner or operator of a Store may petition the Director of the Department of the Environment for a full or partial waiver of the requirements of this Section, for a period of up to one year, if the owner or operator can (1) demonstrate that application of this Section would create undue hardship or practical difficulty for the Store not generally applicable to other stores in similar circumstances, or (2) establish that the business as a whole cannot, under the terms of this Section, generate a return that is commensurate with returns on investments in other enterprises having corresponding risks and is sufficient to attract capital.
- [*Information: Labels or placards*]; Carry bags and plastic packaging shall either be in natural shade which is without any added pigments or made using only those pigments and colorants which are in conformity with Indian Standard: IS 9833:1981 … Each plastic carry bag and multi-layered packaging shall have the following information printed in English namely: a. name, registration number of the manufacturer and thickness in case of carry bag; b. name and registration number of the manufacturer in case of multi-layered packaging; and c. name and certificate number [Rule 4(h)] in case of carry bags made from compostable plastic … Each recycled carry bag shall bear a label or a mark "recycled" as shown below and shall conform to the Indian Standard: IS 14534: 1998 titled as "Guidelines for Recycling of Plastics"

APPENDIX VII. NATIONAL POLICIES TO ADDRESS LAND-BASED SOURCES OF PLASTIC POLLUTION FROM THE PLASTICS POLICY INVENTORY, IN EACH OF THE TOP 20 COASTAL COUNTRIES PRODUCING MISMANAGED PLASTIC WASTE

Country	National Policies in the Inventory	National Policies Referenced in Literature, but Document Not Located for Analysis
China	2005 law for excessive product packaging restrictions 2008 administrative measures for the paid use of plastic bags at commodity retailing places	2001 SETC ban on production and use of plastic tableware 2012 Prevention and Control of Waste Plastic Processing and Utilization N/A Plastic limit order?
Indonesia	0	2008 act on extended producer responsibility 2018 excise tax law on plastic bags
Philippines	0	0
Vietnam	2009 Approval of National Strategy for Integrated Management of Solid Waste up to 2025 2012 amendment to articles for law on environmental protection tax	0
Sri Lanka	2017 National Environmental Act	2017 plastic bag ban 2019 National Environmental Act
Thailand	0	0
Egypt	0	0
Malaysia	2018 Roadmap Towards Zero Single-Use Plastics 2018–2030	2016 Promotion of Investment Act 2017 Ban on nonbiodegradable plastic bags N/A plastic bag levy?
Nigeria	2019 Plastic Bags Prohibition Bill	0
Bangladesh	0	2002 National plastic bag ban 2007 Plastic bag ban?
South Africa	2002 Regulation of plastic bags 2003 Regulation on plastic carrier bags and plastic flat bags	0
India	2003 Notification of the Ministry of Env. and Forests: Matheran and surrounding region as an ecosensitive zone 2016 Plastic waste management rules	2002, 2009 Plastic bag bans 2005, 2017 Bans? 2017 Bureau of Indian Standards classification of microbeads as unsafe
Algeria	0	0

Turkey	0	2017 Regulation on packaging wastes 2019 Ban on free plastic bags
Pakistan	2013 Prohibition of nondegradable plastic products 2014 Sindh environmental protection act	2015 Amendment of Environmental Protection Act
Brazil	0	0
Myanmar	0	0
Morocco	2015 Law prohibiting manufacturing, import, export, marketing, and use of plastic bags	0
North Korea	0	0
United States	2006 Marine debris research, prevention and reduction act and 2012, 2018 amendments 2015 Microbead-Free Waters Act	0

Note: Countries shaded in red have no policies or references to policies in the inventory; Source for top 20 countries: Jambeck et al. (2015).

APPENDIX VIII. PLASTIC POLLUTANTS FROM LAND-BASED SOURCES BANNED IN THE POLICIES ANALYZED

National Policies Analyzed

Country	2018 Population (millions)*	Policy Document	Year Agreed	Type of Plastic Products Banned	Exemptions
Burkina Faso	19.751	Law No. 017-2014/AN	2014	Nonbiodegradable plastic packaging	Plastic packaging intended directly for sanitary activities, scientific and experimental research or for the purpose of security
Cameroon	25.216	Joint Ministerial Order relating to the manufacture, import and sale of nonbiodegradable packages	2012	Nonbiodegradable plastic packaging < 60 micrometers thick	
Democratic Republic of the Congo	84.068	Inter-Ministerial decree prohibiting the manufacture, import and marketing of nonbiodegradable packaging	2013	Nonbiodegradable packaging	
Djibouti	0.958	Decree No. 2016-284/PRE	2016	Nonbiodegradable plastic packaging not produced domestically	
Dominica	0.076	Budget Address 2018–2019	2019	Plastic straws, plastic plates, plastic forks, plastic knives, Styrofoam cups and containers	
Guyana	0.779	Environmental Protection	2015	Expanded polystyrene products	Prepackaged food in polystyrene containers filled and sealed prior to receipt by the food service establishment

Country	2018 Population (millions)*	Policy Document	Year Agreed	Type of Plastic Products Banned	Exemptions
Haiti	11.123	Prohibition of food packaging and disposable polystyrene dishes	2012	Import of food packaging and disposable and polystyrene dishes, plastic containers	
India	1,352.617	Plastic Waste Management Rules	2016	Commodities in plastic sheet or multilayered packaging < 50 micrometers thick	Where the thickness of such plastic sheets impairs the functionality of the product
Jamaica	2.935	Plastic packaging materials prohibition	2018	Single-use plastic in commercial quantities	Single-use plastics used to maintain public health and for compliance with food safety standards, single-use plastics imported or distributed by the Ministry responsible for health
Korea	51.635	Decree No. 202	2006	Manufacturers should not laminate or shrink-wrap with PVC or use coated packaging materials	Petroleum products, drugs, animal-based and plant-based oil, chemical products and pesticides, products needing refrigeration
Mauritania	4.403	Decree No. 2012-157	2012	Flexible plastic bags for packaging	
Pakistan	212.215	Prohibition of non-degradable plastic products	2013	Non-biodegradable plastic products on the schedule	
Palau	0.017	Executive Order No. 417	2018	Disposable plastic and polystyrene beverage containers in government offices	
Panama	4.177	Regulating the reduction and progressive replacement of single-use plastics	2019	Plastic car swabs, plastic covers for laundry clothes, disposal plastic utensils, disposable plastic revolvers, plastic balloons, disposable plastic containers, plastic reeds, disposable plastic caps for glasses, and disposable plastic packaging for products	

Country	2018 Population (millions)*	Policy Document	Year Agreed	Type of Plastic Products Banned	Exemptions
Republic of the Marshall Islands	0.058	Styrofoam and Plastic Products Prohibition Act	2016	Styrofoam cups and plates, disposable plastic cups and plates	
Rwanda	12.301	Prohibition of manufacture, sale, import, and use of polyethylene bags and single-use plastic items	2019	Single-use plastic items	Home compostable plastic items or woven polypropylene
Seychelles	0.097	Environment Protection	2013	PVC labels for beverage containers	
Seychelles		Environment Protection	2017	Plastic utensils and polystyrene boxes	
Sri Lanka	21.670	Order no. 2034/37	2017	Any polythene product < 20 micrometers	
St. Lucia	0.182	Environmental Health	2017	Expanded polystyrene food service products	
Tanzania	56.318	Environmental Management	2019	Beverages or other commodities wrapped in plastic	If the nature of the commodity requires wrappings by plastics; Plastic or plastic packaging for medical services or industrial products or construction industry or agricultural sector or food processing or sanitary and waste management
Togo	7.889	Decree no. 2011-003-PR	2011	Plastic packaging	

Country	2018 Population (millions)*	Policy Document	Year Agreed	Type of Plastic Products Banned	Exemptions
Tuvalu	0.012	Waste Management (Prohibition on the Importation of Single-Use Plastics)	2019	Plastic water bottles less than 1.5 liters, plastic beverage bottles less than 1.5 liters, plastic water pouches and plastic bags used to produce ice blocks, plastic straws, single-use plastic polystyrene plates, cups and take-away containers, single-use plastic cutlery, plastic sheet or cling film glad wrap used for food wrapping, plastic sheet used for spreading dining tables, and plastic flags	Plastic straws attached to packaging
Uruguay	3.449	Sustainable use of plastic bags	2018	Delivery in plastic wrappings of newspapers, magazines, invoices, receipts and other similar objects	
Uzbekistan	32.955	Measures to further improve household waste management	2018	Polymer film packages < 40 micrometers	
Zimbabwe	14.439	Plastic Packaging and Plastic Bottles Regulation	2010	Packaging with thickness < 30 micrometers	Plastic bread packaging and clingy film used as plastic barrier packaging with thickness > 25 micrometers and < 30 micrometers; biodegradable packaging

*Population data from World Bank (https://data.worldbank.org/indicator/SP.POP.TOTL).

Subnational Policies Analyzed

Country	Area of Jurisdiction	Year Enacted	Plastic Pollutant Banned
Canada	Manitoba	2008	Plastic packaging (outside of a packaging and printed paper stewardship program)
Canada	New Brunswick	2011	Beverage containers connected by plastic rings
Chad	N'Djamena	2010	Plastic packaging ("leyda") for mineral water
India	Tamil Nadu	2002	Nonreusable plastic cups, tumblers or plates; plastic magazine wrappers; single-use plastics in food establishments
India	Punjab	2016	Plastic containers and single-use plastics
India	Sikkim	2016	Disposable items from Styrofoam; packaged drinking water bottles at government meetings or functions
India	Punjab	2018	Plastic sheet or multi-layered packaging
Kenya	Baringo County	2014	Plastic or polythene packaging material
Philip-pines	Muntinlupa	2011	Styrofoam containers
Philip-pines	San Carlos City	2014	Styrofoam or expanded polystyrene containers
United States	Washington, DC	2013	Expanded polystyrene food service products
United States	Portland	2017	Plastic serviceware at retail food and beverage establishments and cafeterias
United States	Oregon	2017	Metal beverage containers connected by plastic rings or other material which will not decompose by photo-biodegradation, chemical degradation, or biodegradation within 120 days of disposal
United States	California	2018	Single-use plastic straws at full-service restaurants
United States	Malibu	2018	Plastic beverage straws, stirrers, or cutlery at restaurants
United States	New York city	2018	Nonrecyclable expanded polystyrene single service articles at food service establishments, mobile food commissaries or stores
United States	Berkeley	2019	Disposable foodware (purchased by the city government)

APPENDIX IX. POLICIES TO BAN, TAX OR EFFECT LEVIES ON PLASTIC BAGS IN THE SAMPLE ANALYZED

Table 1. National Policies Analyzed

Country or Territory	2018 Population (millions)**	Policy Document in the Inventory	Year Agreed	Type of Plastic Products for which Policy introduces a Ban, Tax or Levy
Antigua & Barbuda	0.096	Antigua Plastic Bag Ban	2016	Plastic shopping bags
Australia	24.992	Waste reduction and recycling act	2011	Plastic carrier bags with handles < 35 micrometers thick
Benin	11.485	Law no. 2017-39	2017	Nonbiodegradable plastic bags
Burkina Faso	19.751	Law no. 017-2014	2014	Nonbiodegradable plastic bags
China*	1,392.730	Administrative measures for the paid use of plastic bags	2007	Plastic bags (must have a price)
Colombia*	48.649	Regulation of plastic bags	2016	Plastic bags prohibited unless charged at market prices
Colombia*	48.649	Consumption tax on plastic bags	2017	Plastic bags that offer environmental solutions will have reduced rates from market prices
Congo, Republic of	5.244	Decree no. 2011-185	2011	Plastic bags for the sale of food, water, and any other drink, also oxo-biodegradable bags
Cook Islands		Environment regulations	2008	Nonbiodegradable plastic shopping bags
Cote d'Ivoire	25.069	Decree no. 2013-327	2013	All production, import, and sale of plastic bags
Djibouti	0.959	Decree no. 2016-284	2016	Nonbiodegradable plastic bags not produced domestically
Ethiopia*	109.225	Solid Waste Management Proclamation no. 513/2007	2007	Plastic bags with a thickness of < 0.03 millimeters
Fiji*	0.883	Environmental Levy Act	2017	Plastic bags ($0.10c per bag)
Gabon	2.119	Decree no. 1489/ MECIT	2010	Nonrecyclable plastic bags are banned

Country or Territory	2018 Population (millions)**	Policy Document in the Inventory	Year Agreed	Type of Plastic Products for which Policy introduces a Ban, Tax or Levy
India*	1,352.617	Plastic waste management rules	2016	Carry bags made of virgin or recycled plastic < 50 micrometers
Ireland*	4.853	Waste Management (Amendment) Act (nos. 36 and 605)	2001	Plastic bags [for carry of goods or products]—levy initially of 15p/bag, except plastic bags: solely used to contain fresh meat, fish or poultry, fruit, nuts or vegetables, confectionary, dairy products, cooked food; used to contain products sold on board a passenger ship or aircraft; or designed for re-use
Kenya	51.393	Supplement to the Finance Act	2008	Plastic bags < 20 micrometers for industrial use may not be licensed for manufacture
Kenya	51.393	Environmental management and coordination act (Notice no. 2356)	2017	All plastic bags used for commercial and household packaging
Lesotho	2.108	Customs and Excise Tariff	2018	Plastic carrier bags with a thickness > 24 micrometers
Madagascar*	26.262	Decree no. 2017-010	2017	Plastic bags with a thickness < 50 micrometers, except for bags made of plastic packaging for pharmaceutical products and bags used for sampling for analysis at the research laboratory or medical laboratory
Mali	19.078	Law 2014-024	2014	Nonbiodegradable plastic bags
Malta	0.485	Eco-contribution act	2004	Producer of plastic bags is liable for payment of an ecocontribution
Malta*	0.485	Waste management regulations	2017	Lightweight plastic carrier bags shall not be provided free of charge at the point of sale
Mauritius	1.265	Environment Protection	2015	Plastic bags
Morocco	36.029	Law no. 77-15	2015	Plastic bags, except for industrial or agricultural use, Isothermal plastic bags, bags made of plastic freezing or deep-freezing plastics and those used for collection of waste
New Zealand	4.886	Waste minimization regulations	2018	Plastic shopping bags
Nigeria	195.875	Plastic bags (prohibition) bill	2019	Plastic bags
Palau*	0.018	Plastic bag use reduction act	2017	Nonbiodegradable plastic bags
Panama*	4.177	Law to promote use of reusable bags	2018	Polyethylene bags in supermarkets, self-service checkout, warehouses or shops in general for the transport of products or merchandise

Country or Territory	2018 Population (millions)**	Policy Document in the Inventory	Year Agreed	Type of Plastic Products for which Policy introduces a Ban, Tax or Levy
Republic of the Marshall Islands	0.058	Styrofoam and plastic products prohibition act	2016	Plastic shopping bags
Romania*	19.474	Law no. 87/2018	2018	Lightweight and very lightweight plastic carrier bags with a handle
Rwanda	12.302	Law relating to the prohibition of polyethylene bags and single-use plastic items	2019	Polythene bags, except for home compostable items
Samoa	0.196	Public notice plastic prohibition	2019	Plastic shopping bags, except those used exclusively to pack or repack frozen goods sold at retailers
Seychelles	0.097	Environment protection act	2012	Plastic bags with a thickness < 30 micrometers
Seychelles	0.097	Customs Management	2014	Vest type plastic bags < 30 micrometers
Seychelles	0.097	Environment Protection	2017	Plastic bags, unless exempted as specified in the First Schedule
Somalia	15.008	JSL/M/XERM/249-3178	2015	Importing and trading plastic bags
South Africa	37.780	Regulations under section 24 (D) of the Environmental Conservation Act	2002	Plastic bags with a thickness < 80 micrometers
Spain*	46.724	Royal Decree no. 293/2018	2018	Plastic bags that have a thickness < 50 micrometers and < 70% recycled plastic; As of January 1, 2021, light and very light plastic bags are prohibited
Tanzania (Mainland)*	56.318	Environmental Management Regulations	2019	All plastic bags "regardless of their thickness"
The Gambia	2.280	Ban on Plastic Bags Order	2015	Plastic bags
Togo*	7.889	Decree no. 2011-003-PR	2011	Nonbiodegradable plastic bags
Tonga*	0.103	Waste management regulations	2013	Plastic bags (levy = 10% of bag value)
Tuvalu	0.012	Waste management regulations	2019	Shopping bag that is wholly or predominantly made of or lined with plastic or plastic blend, and designed to be given to consumers
Uganda	42.723	Finance regulations	2010	Polythene bags

Country or Territory	2018 Population (millions)**	Policy Document in the Inventory	Year Agreed	Type of Plastic Products for which Policy introduces a Ban, Tax or Levy
Uruguay*	3.449	Sustainable use of plastic bags; Law no. 19655	2018, 2019	Nonbiodegradable or compostable plastic bags (all plastic bags used to contain or transport products are goods that are delivered a consumer)
Vietnam	95.540	Circular No. 159/2012/TT-BTC	2012	Multilayer plastic bags produced or processed from HDPE, LDPE, LLDPE or other plastic membranes shall be declared
Zambia*	17.352	Issuance of Statutory Instrument No. 65	2018	Plastic carrier bags < 30 micrometers in thickness

Note: Instruments shaded in blue are economic, typically as a tax or levy on plastic bags; *Packaged with at least one information instrument; **Population data from World Bank database: https://data.worldbank.org/indicator/SP.POP.TOTL

Table 2. Subnational Policies Analyzed

Country	Area of Jurisdiction	Year Enacted	Plastic Pollutant Targeted
Australia	Canberra	2010	Plastic shopping bags
Australia	Northern Territory	2011	Plastic bags
Australia	Tasmania	2013	Plastic shopping bags for the purpose of enabling goods sold to be carried from the premises
Australia	Queensland	2018	Plastic shopping bags < 30 micrometers thick
Australia	Western Australia	2018	Plastic bags
Australia	Victoria	2019	Plastic bags
Brazil	Rio di Janeiro	2018	Disposable plastic bags
Canada	Thompson, Manitoba	2010	Single-use plastic bags (free of charge)
Canada	Leaf Rapids, Manitoba	2011	Plastic shopping bags intended for single use
Canada	Montreal	2016	Plastic shopping bags < 50 micrometers thick; or oxo-degradable, oxo-fragmentable or biodegradable plastic bags of any thickness
China	Jilin Province	2014	Nondegradable plastic shopping bags
India	Punjab	2018	Carry bags made of virgin plastic < 50 micrometers thick
Kenya	Nairobi	2015	Carry bags from virgin plastic with thickness < 30 micrometers and a size > 8 x 12 inches
Philippines	Muntinlupa	2011	Plastic bags as secondary packaging
Philippines	San Carlos City	2014	Plastic cellophanes and sando bags

Country	Area of Jurisdiction	Year Enacted	Plastic Pollutant Targeted
United Kingdom	Wales	2010	Single use carrier bag (> 5 pence charge/bag)
United Kingdom	Northern Ireland	2013	Single use carrier bag (> 5 pence charge/bag)
United Kingdom	Scotland	2014	Single use carrier bag (> 5 pence charge/bag)
United States	Maui	2008	Plastic bags
United States	Washington, DC	2009	Disposable carryout bags, 100% recyclable and made of HDPE with SPI resin identification code 2 or LDPE with SPI resin identification code 4 ($0.05 charge/bag)
United States	Los Angeles	2010	Plastic carryout bag
United States	American Samoa	2011	Plastic shopping bags
United States	Seattle	2011	Single-use plastic carryout bags
United States	Boulder	2012	Disposable bags ($0.10 charge/bag)
United States	Maryland County	2012	Carryout bags ($0.05 tax/bag)
United States	Kaua'I County	2012	Checkout bags that are not recyclable, biodegradable, and/or reusable
United States	Austin, Texas	2013	Single-use carryout bags
United States	Hawaii County	2013	Plastic checkout bags
United States	California	2014	Grocery bags that are not reusable and has a handle and is designed for at least 125 uses, has a volume capacity of at least 15 liters, and is machine washable or made from a material that can be cleaned and disinfected
United States	Chicago	2015	Checkout bags ($0.07 tax)
United States	Boston	2017	Checkout bags ($0.05/bag levy)
United States	Honolulu	2017	Plastic checkout bags
United States	Portland	2017	Non-reusable checkout bags

Note: Taxes or levies are shaded blue, all other rows are regulatory bans.

APPENDIX X. THE PLASTIC POLLUTION PREVENTION AND COLLECTION TECHNOLOGY INVENTORY

		Name	Year[27]	Description	Used?	Location Invented
Prevention: Macroplastics	Storm and wastewater filters	In-line Litter Separator (ILLS)	1999	Trap attached to the drainage system downstream of shopping areas removes litter from passing stormwater	Yes	Australia
		StormTrap's TrashTrap	2018	Mesh net system uses water flow to capture and remove trash, floatables and solids from the waterway	Yes	United States
		PumpGuard	2016	Mesh nets remove debris from wastewater and stormwater systems	Yes	United States
		Watergoat Trash Traps	2006[28]	Floating boom and net attached to embankments, stormwater outfalls, canals or creeks, to collect floating debris	Yes	United States
		Trashmaster Netting and Trash Trap System	1999	Mesh nets capture and remove trash from stormwater and discharge	Yes	United States
	Storm and wastewater filters	StormX Netting Trash Trap	1995	Commercial grade, reusable nets provide full capture of gross pollutants as small as 5 mm in stormwater runoff, including organic materials (such as leaves) that could reduce the levels of phosphorous and nitrogen in our water	Yes	Australia
	Miscellaneous macroplastic prevention	Stow it, Don't Throw It	2012	Tennis ball containers repurposed into fishing line recycling bins for anglers	Yes	United States
		Clever-Volume	2019	Sensors allow port authorities to certify the amount of ship waste reported, in comparison to the volume reported to MARPOL inspectors	No	Portugal

27. Year designates the year invented; if the year invented was unavailable, the year that the article was published was used.
28. This date was found on the personal website of the inventor.

		Name	Year[27]	Description	Used?	Location Invented
Prevention: microplastics	General removal from wastewater	Unnamed Invention by Students at Gering High School	2017	Gravity-fed, three-stage attachable filter catches microplastics (e.g., microfibers shed from laundry) before they enter the wastewater	No	United States
		GoJelly Project	2018	Jellyfish mucus (secreted when they reproduce or become stressed) captures and binds to nano-sized particles, removing microplastic from wastewater	No	Unknown (Funded by European Union)
	Laundry balls	Cora Ball	2019	Balls placed in the laundry machine captures microfibers created from washing synthetic fibers	Yes	United States
		Fibre Free	2017	Balls placed in the laundry machine captures microfibers created from washing synthetic fibers	No	United States
	Residential water treatment	Lint LUV-R	2019	Water filter on laundry machines captures microfibers as water is drained through the machine	Yes	Canada
		Showerloop	2012	Filter removes microplastics while primarily filtering water for reuse	Unknown	Finland

		Name	Year[27]	Description	Used?	Location Invented
Collection: macroplastics	Large-scale booms	Ocean Cleanup System	2013	Float and net uses waves to collect plastic	Yes[29]	Netherlands
		Holy Turtle	2018	1,000-foot-long floating unit is towed by two marine vessels and captures floating waste; large vent hole protects marine life	Yes	United States
	Drones and robots	FRED (Floating Robot for Eliminating Debris)	2019	Multi-sized forks collect macroplastics	Yes[30]	United States
		WasteShark	2018	Drone modeled after a whale shark skims the water and filters for plastic	Yes	Netherlands
		Seabin	2013	Automated bucket catches floating debris, including plastic	Yes	Australia
		Jellyfishbot	2018	Remote-controlled robot collects garbage from waterways	Yes	France
	Boats and wheels	SeaVax	2015	Solar and wind-powered ship collects plastic and other debris; sensors detect waste and sonar protects fish and other animals from being collected	Yes	United Kingdom
		Inner Harbor Water Wheel	2008	Wheel collects trash in the river before it can flow into the harbor	Yes	United States
		Versi-Cat Trash Skimmer Boat	2009	Skimmer collects plastic from the surface and places it into a removable basket for later disposal	Yes	United Kingdom
		Mighty Tidy	2003	Trash skimming boat scoops plastic from the surface, and a conveyor belt moves it to a rear bin	Yes	United States

29. Currently in pilot tests.
30. In testing phases.

		Name	Year[27]	Description	Used?	Location Invented
Collection: macroplastics	Boats and wheels	ERVIS	2016	Ship with saucers uses centripetal force to capture and separate waste into five size classes for later disposal	No	India
	Detection aids	Malolo I	2017	Unmanned robot detects marine debris in the open ocean, especially fishing gear for later collection or satellite tagging by a team	Yes	United States
		GPS Device on Ghost Nets	2019	Vessels place GPS units on ghost nets to mark them for collection	Yes	United States
	Waterway litter traps	Bandalong Litter Traps	2009	Traps designed to float in waterways in order to capture litter before it flows farther downstream by using the current to guide debris into the trap (this performance floatable control technology continuously operates 365 days a year without any mechanical assistance to capture floating litter)	Yes	Australia
		Clear River Litter Traps	2014	Floating device uses the waterway current to capture and guide litter into the trap before it flows downstream	Yes	Various (United States; Nether-lands Switzer-land;; Thailand)

		Name	Year[27]	Description	Used?	Location Invented
Collection: macroplastics	Waterway litter traps	SCG Litter Traps	2019	Floating litter trap possesses unique functions of bypass flap leveraging natural water flow and pressure that can efficiently capture floating trash (the litter trap's maximum collection capacity is 700 kilograms, and its functionality can ensure that the trapped debris will not be carried away to downstream by tidal movement. In the testing phase, t5 floating litter traps will be installed in Rayong estuaries and some canals in Samut Sakhon province)	Yes	Thailand
	River booms	Clean River Project River Booms	2005	Floating beams create a barrier that collects surface trash and debris along rivers	Yes	United States
		Bandalong Booms	2015	Floating boom sections are coupled together and spanned across a weir, waterway or dam to capture litter and prevent it from floating farther downstream	Yes	Australia
	Miscellaneous macroplasitc capture	The Great Bubble Barrier	2019	Tubes on the bottom of the waterway create a bubble barrier by pumping air, which catches floating debris at the surface for collection	Yes	Netherlands

		Name	Year[27]	Description	Used?	Location Invented
Collection: microplastics	Miscellaneous microplastic capture	Unnamed Invention by Anna Du	2018	Remotely operated vehicle uses infrared light to detect, photograph, and help remove microplastics from waterways by speeding up the identification process	No	United States
		Unnamed Invention by Fionn Ferreira	2019	Combination of oil and magnetite powder binds microplastics for extraction with a magnet	No	Ireland
	Sand filter	Marine Microplastic Removal Tool	2013	Dirty sand is piled on a sheet of fine mesh stretched between two long poles, and the mesh catches plastic and other foreign material while allowing the sand to fall through	Yes	United States
Collection: all	Boats	OC-Tech	2013	Boat collects oil, microplastics, and other debris using a system of nets and baskets; clean water then flows back into ocean	Unknown	Spain
	Skimmers	Clean Ocean Access Trash Skimmers	2016	Pump in a partially submerged plastic box draws in and catches surface trash	Yes	USA
	Vacuums	Hoola One	2019	Vacuums ~3 gallons of sand and debris per minute into a tank that separates particles by weight, allowing for plastic separation and removal	Yes	Canada

APPENDIX XI. LIBRARY OF SCIENTIFIC LITERATURE ON PLASTICS POLICY

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