Marine Litter Legislation:

A Toolkit for Policymakers

UNEP

Acknowledgments

This report was developed by the Environmental Law Institute (ELI) for the United Nations Environment Programme (UNEP). It was researched, drafted, and produced by Carl Bruch, Kathryn Mengerink, Elana Harrison, Davonne Flanagan, Isabel Carey, Thomas Casey, Meggan Davis, Elizabeth Hessami, Joyce Lombardi, Norka Michelen, Colin Parts, Lucas Rhodes, Nikita West, and Sofia Yazykova. Within UNEP, Heidi Savelli, Arnold Kreilhuber, and Petter Malvik oversaw the development of the report. The authors express their appreciation to the peer reviewers, including Catherine Ayres, Patricia Beneke, Angela Howe, Ileana Lopez, Lara Ognibene, David Vander Zwaag, and Judith Wehrli.

Cover photo: Plastics floating in the ocean

The views expressed in this report do not necessarily reflect those of the United Nations Environment Programme.

Marine Litter Legislation:
A Toolkit for Policymakers

Contents

Foreword

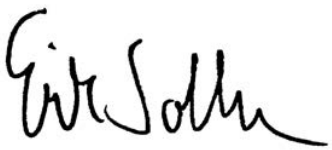
A Preventable Problem

Far too much of the 300 million tonnes of plastic produced in every year finds its way into our oceans, food chains and ecosystems, damaging our health in the process. The scale of the problem is clear when you consider that a small group of volunteers collected over a million kilograms of waste from Versova beach in India in just 40 weekends. Yet well-designed laws can reverse this global trend. That is why this toolkit provides an overview of existing marine litter legislation and case studies to help policymakers change the habits of producers and consumers.

The toolkit shows why most legislation targets marine litter at source, rather than the resulting waste. For example, Ireland used a levy to cut the number of plastic bags people use each year, from 328 to 14, in just over a decade. It's an example that a growing number of places around the world are following.

Some countries tackle marine litter through comprehensive legislation, while others prefer to use a combination of several different laws. In either case, there are a wide range of important measures to consider. This toolkit includes recommendations on mapping and reviewing regulatory frameworks, documenting and sharing experience, and providing grace periods when introducing legislation.

Well-crafted laws alone cannot solve the problem of marine litter, but they are an important piece of the puzzle. I hope this toolkit will inspire policymakers and lawmakers to work together in strengthening legislation for one of the most pressing and preventable problems of our time.



Erik Solheim
UN Environment Executive Director

List of Acronyms

ALDFG	abandoned, lost, and discarded fishing gear
APC	armored personnel carrier
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
COP	Conference of the Parties
CWA	Clean Water Act (U.S.)
DDE	dichloro-diphenyl-dichloroethylene
DFG	derelict fishing gear
EAC	East African Community
EEA	European Environment Agency
EIA	environmental impact assessment
EPA	Environmental Protection Agency (U.S.)
EPS	expanded polystyrene
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
GATT	General Agreement on Tariffs and Trade
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GOMMDP	Gulf of Mexico Marine Debris Project
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GPS	global positioning system
IOC	Intergovernmental Oceanographic Commission
ITLOS	International Tribunal on the Law of the Sea
LPMLD	Law for the Promotion of Marine Litter Disposal (Japan)
MARPOL	International Convention for the Prevention of Pollution from Ships
MDRPRA	Marine Debris Research, Prevention and Reduction Act
MEM	Marine Environmental Management (South Korea)
MLW	Marine LitterWatch (EU)
MPPRCA	Marine Plastic Pollution Research and Control Act (U.S.)
MSFD	Marine Strategy Framework Directive (EU)
NGO	nongovernmental organization
NOAA	National Oceanic and Atmospheric Administration (U.S.)
NDRMS	National Disaster Risk Management System
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PCBs	polychlorinated biphenyls
PPSA	Prevention of Pollution of the Sea Act (Singapore)
PRF	Port Reception Facilities (EU)
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
TAP	Threat Abatement Plan (Australia)
TMDL	total maximum daily load
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNGA	UN General Assembly
U.S.	United States
USACE	U.S. Army Corps of Engineers
WtE	waste-to-energy
WTO	World Trade Organization

Executive Summary

Marine litter poses serious environmental, health, and economic threats to oceans and coastal ecosystems. It also presents a unique legal and regulatory challenge for many nation States (hereinafter States), as it can originate from diverse land-based and sea-based sources both within and outside of a State. While the full magnitude of the problem can be difficult to ascertain, some estimates suggest that an average of 8 million tons of plastic waste entered the ocean in 2010, and this figure has been projected to increase.

The prevalence of marine litter is the result of many different factors, including changing production and consumption patterns, inadequate waste management, and gaps in regulation of waste materials. The diverse sources require a comprehensive response. Accordingly, countries frequently utilize a variety of laws and policies to prevent, manage, and reduce the proliferation of marine litter. Many of these approaches are part of the general frameworks to reduce the generation and spread of solid waste, rather than being part of frameworks specifically designed to address marine litter. That said, a growing number of countries are developing targeted laws and policies to address marine litter—from laws mandating more research (e.g., in the United States) to laws banning certain types of products (e.g., plastic bags in Bangladesh and Rwanda), to overarching frameworks to address the growing problem (e.g., in Japan and Singapore).

Policies and laws need to address not only the removal of litter but are generally more successful when they govern the production, use, and disposal of products that would otherwise become marine litter. To this end, using a circular economy approach to prevent the generation of waste products can reduce the overall production of marine litter.

The following recommendations build upon the laws and policies reviewed in this Toolkit and address approaches States can take to reduce and minimize marine litter:

Recommendations:

States that elect to adopt a comprehensive, holistic approach to marine litter management may:

- **Adopt legislation providing an overarching framework for preventing, reducing, and otherwise managing marine litter.** This legislation should consider the relationship between the marine litter legislation and other relevant laws (for example, on waste management), and particularly whether the new overarching legislation

supplements or replaces the existing laws. It should also provide for periodic review of the enacted legislation and its implementation.

- **Establish an inter-agency mechanism for coordinating among the diverse sectors with a role in addressing marine litter.** This inter-agency coordination should address the development, implementation, and review of the marine litter legislation and implementing regulations. It should also engage key stakeholders from the private sector and civil society.

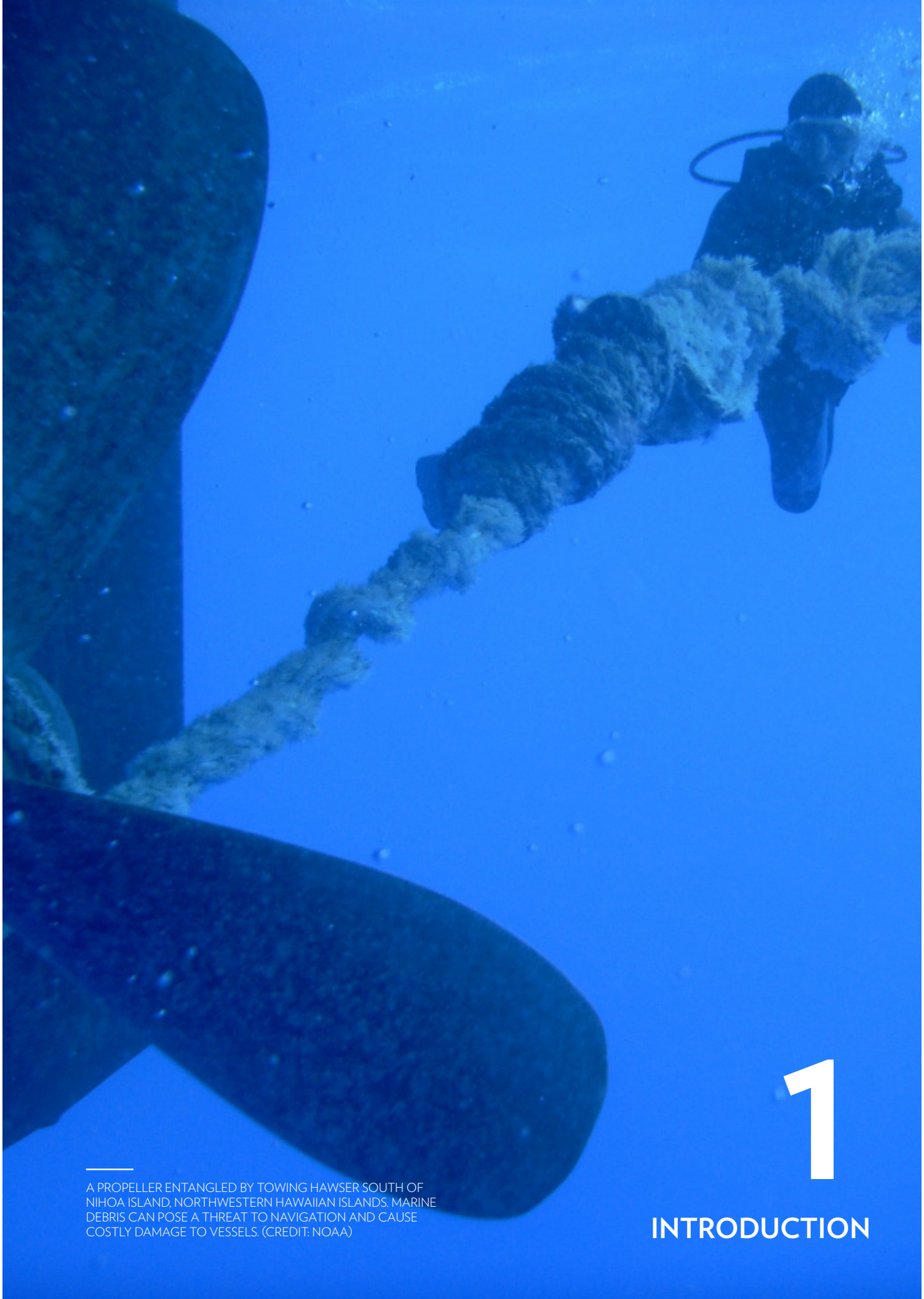
States that adopt a more piecemeal approach to marine litter may:

- **Develop and implement laws to ban or diminish the production of single-use trash items and other waste that is commonly found in marine litter.** Single-use plastics, such as bottles, cups, and bags, are often found on beaches and are pervasive in the marine environment. Therefore, many countries and sub-national governments have banned certain types of single-use items (especially plastic bags).
- **Regulate non-recoverable items, such as plastic microbeads in personal care and cosmetics products.** These are impossible to remove from an aquatic environment. By preventing their introduction into the marine environment, States can eliminate a source of marine plastic pollution.
- **Develop and implement legislation to prevent the waste, once created, from entering the marine environment.** Preventing waste from entering the marine environment is a key approach, as once it has entered the marine environment, it is difficult or impossible to remove. Therefore establishing programs and practices, such as covered landfills near aquatic bodies, may help minimize waste. Approaches such as the circular economy model of economic development can be used to reduce the creation of items that easily become marine litter.
- **Support marine litter cleanup efforts.** Through policy measures and government programs, States can support regional and local marine debris monitoring and cleanup programs, engage in education and awareness-raising initiatives, and extend producer responsibility.

Regardless of whether a State adopts a comprehensive or piecemeal approach to marine litter, there are a wide range of legal and policy approaches that are important for addressing marine litter—including collecting and accessing data and information; requiring agencies to report on progress; conducting baseline assessments; setting goals for litter reduction; addressing prevention, remediation, coordination, and planning; creating incentives through market-based instruments; and public participation and awareness-raising.

Specific measures include:

- **Map and review national regulatory frameworks and other instruments to identify gaps in addressing the issue.** This may include laws and policies related to export of certain plastics products to countries where no recycling or recovery for these items exist; prohibit production of disposable items that lack an adequate end-of-life plan and cost contribution to deal with the problem; or impose requirements on port reception facilities. From this assessment, States can make an informed decision about priorities for preventing marine litter.
- **When introducing new regulatory frameworks (such as bans, fees, or phase outs) plan for a grace period in which to educate the public.** Securing support from key stakeholders who are affected by or contributing to the production of marine litter (i.e. regulated businesses, local authorities, and the public) can improve compliance with the regulation and enforcement. During the grace period, it is critical to increase public understanding of the initiative, the reason for it, its benefits, and what is required to comply with the requirements.
- **Document and share approaches.** Countries and subnational authorities are encouraged to document the process of developing legislation to address marine litter (including for example, any cost-benefit analyses that are conducted, which stakeholders were engaged, and how, and the policy debate around particular options). Sharing information on the process as well as the final legislation can then inform other jurisdictions that are considering similar legislation. Online databases, such as ECOLEX, are one tool for sharing relevant laws and policies, although it may be advisable to develop new keywords focused on marine litter to facilitate identification of relevant legislation.



A PROPELLER ENTANGLED BY TOWING HAWSER SOUTH OF NIHOA ISLAND, NORTHWESTERN HAWAIIAN ISLANDS. MARINE DEBRIS CAN POSE A THREAT TO NAVIGATION AND CAUSE COSTLY DAMAGE TO VESSELS. (CREDIT: NOAA)

1

INTRODUCTION

1. INTRODUCTION

Solid waste that enters the ocean and becomes marine litter presents unique legal and regulatory challenges. ***Marine litter***, sometimes referred to as marine debris, is defined as "any persistent, manufactured, or processed solid material that is discarded, disposed of or abandoned in the marine and coastal environment."[1] This definition includes items originating from land or sea-based sources. Major land-based sources of marine litter include waste from landfills sited near coastal areas, storm water runoff, ineffective sewage treatment, industrial outfalls, littering, ship-breaking yards, and natural disasters and storms.[2] Sea-based waste is often the result of dumping from vessels at sea, fishing, shipping, and lost or abandoned fishing gear.[3]

The full magnitude of marine litter is difficult to determine. While it is commonly estimated, for example, that 80 percent of marine litter comes from land-based sources, this figure may not account for all litter entering the marine environment.[4] The prevalence of marine litter is caused by many different factors, including changing production patterns, poor waste management, and gaps in regulation of waste materials.

The amount and composition of marine litter can vary between regions, due to differences in waste management and in economic activities such as tourism, fisheries and shipping. It also varies by location due, in part, to currents that can carry marine litter to accumulation sites.[5] Data from the 2014 International Coastal Cleanup Day, coordinated by the Ocean Conservancy, found that the most commonly collected items from beaches included cigarette butts, food wrappers, plastic bottles, bottle caps, straws and stirrers, plastic bags, glass bottles, beverage cans, and plastic cups and plates.[6] A 2014 study of litter on South Korean beaches from 2008 to 2009 found that fisheries and marine aquaculture accounted for approximately 35 percent of marine litter, household items made up 20 percent, and beach recreation items made up 12 percent.[7] Marine litter is not just on the sea's surface and on the beaches: a study of European waters found litter at depths ranging from 35 to 4500 meters, with plastic bags, glass bottles, and derelict fishing gear being the most prevalent.[8]

Plastics are estimated to make up as much as 95 percent of the marine litter found on coastlines, sea surface, and the ocean floor.[9] An estimated 4.8 to 12.7 million metric tonnes of plastic entered the ocean from land-based sources in 2010, and about another 8 metric tonnes has entered the oceans each year since then.[10] Microplastics

1 UNEP, 2009.
2 Leous and Parry, 2005; UNEP, 2009.
3 National Research Council of the National Academies, 2005.
4 Jambeck et al., 2015.
5 UNEP, 2005a.
6 Ocean Conservancy, 2015a.
7 Hong, Lee, and Kang, 2014.
8 Pham et al., 2014.
9 Galgani, Hanke, and Maes, 2015.
10 Jambeck et al., 2015.

also present a significant problem for marine litter management. They can be found, for example, in personal care and industrial products (primary microplastics); they can also come from larger pieces of plastic that have degraded (secondary microplastics). Microplastics pose a significant problem as they can pass through wastewater filters with ease, making it impossible to recover them once in the ocean. Microplastics range in size, but are commonly defined as plastic particles of less than 5mm.[11]

11 GESAMP, 2015.

A BEACH WITH A HIGH CONCENTRATION OF MARINE LITTER (CREDIT: JASON KARN, CC VIA FLICKR)

Marine litter negatively impacts the environment, economy, and public health. Marine life can become tangled in abandoned nets and fishing gear, leading to death and injury.[12] Several studies have found that ingested microplastics can potentially disrupt cellular processes and degrade tissue[13] as well as concentrate toxins across the food chain, leading to a biomagnification effect.[14] Marine litter can also lead to economic losses, due to the cost of coastal cleanup and lost tourism revenue. The Asia-Pacific region is reported to lose US$1.265 billion annually due to damage to its fishing, shipping, and marine tourism industries caused by marine litter.[15] Marine litter presents a serious nonpoint pollution problem to Scotland, costing the state at least £16.8 million or US$24.3 million annually (when calculating consumptive uses, non-consumptive uses, and indirect uses of Scottish coasts and waters).[16]

Marine litter cannot be traced back to a single source. Rather, it is the result of many types of inputs and actions (or inactions). Policies and laws need to address not only the removal of litter but more importantly govern the production, use, and disposal of products. A circular economy approach can reduce the quantity of waste by stopping it at its source. By designing products that are durable, can be repaired, and are recovered and recycled at the end of their productive use, circular economy approaches can prevent

12 Ocean Conservancy, 2015a.
13 Rochman et al., 2013.
14 Wright et al., 2013.
15 APEC Marine Resource Conservation Working Group, 2009.
16 Potts and Hastings, 2011.

the generation of waste in the first place, and thereby prevent the entry of marine litter into the environment.

Related to the circular economy, the concept of a waste hierarchy (sometimes referred to as a "waste management hierarchy") indicates a preferred order of action to prevent, reduce, and manage waste. Thus, prevention is the most favored option, then minimization, then reuse, then recycling, then energy recovery, then disposal.[17] Waste management legislation, policies, and strategies of the EU and its Member States utilize the circular economy and the concept of a waste hierarchy to address marine litter and related waste challenges.[18]

Laws and policies can provide a mandate, procedures, and standards to prevent, reduce, and manage marine litter. For example, Ireland's plastic bag levy was introduced to reduce the consumption of disposable plastic bags by influencing consumer behavior.[19] Prior to the implementation of the levy, the Irish Government first secured support from key stakeholders, including the retail industry, Ministry of Finance, local authorities, and consumers. The cost of the implementation of the levy was estimated at approximately €1.8 million, including one-time setup costs, annual administration costs, and an initial publicity campaign—a relatively modest amount.[20] Revenue collection and reporting required little additional work on behalf of retail firms, which integrated the levy into their Value Added Tax (VAT) collection systems. The levy took effect in 2002 with a rate of 15 cents per bag; in 2007 the rate was increased to 22 cents per bag. All levies are remitted into the Environment Fund. It had an immediate effect on consumer behavior with a decrease in plastic bag usage from an estimated 328 bags per capita to 21 bags per capita.[21] This has continued to fall to an estimated 14 bags per capita in 2014. According to the Department of Environment, Community, and Local Government, the bag levy raised €3.5 million in revenue during the first year after it was implemented.[22] The National Littering Monitoring System found in its 2013 survey that plastic items made up only 0.26 percent of Ireland's litter, down from about 1 percent according to the 2003 results.

Recently, a number of other countries have begun to implement bans on materials that can contribute to marine litter. Mauritius banned the "import, manufacture, sale, or supply of a plastic bag … that is designed to carry goods purchased at points of sale."[23] The regulation allows 11 types of plastic bags to be exempted for essential use and hygienic and sanitary purposes. Antigua and Barbuda has indicated that it intends to ban the importation of all plastic bags except

17 UNEP, 2013.
18 European Commission, n.d.
19 Waste Management (Environmental Levy) (Plastic Bag) Regulations 2001 (Ir.), http://www.irishstatutebook.ie/eli/2001/si/605/made/en/print.
20 Convery, McDonnell, and Ferreira, 2007.
21 Department of the Environment, Community and Local Government, n.d.
22 Waste Management (Energy Levy) (Plastic Bag) Regulations 2001 (SI 605/2001) (Ir.).
23 Regulations Made by the Minister under Section 96 of the Environment Protection Act (Mauritius), Government Notice No. 233 of 2015, http://www.qb.mu/files/Environment_Protection_Banning_of_Plastic_Bags_Amendment.pdf.

for those used in garbage collection and disposal.[24] The ban took effect in July 2016. Effective April 1, 2016, Guyana banned the importation, manufacture, and sale of polystyrene containers, focusing on "food serve establishments."[25]

Local Law 142 amended the New York City administrative code to restrict the sale or use of certain expanded polystyrene items (EPS). Section 16-329 stipulates that if the Commissioner determines that EPS single-service items are not recyclable, then on July 1, 2015 "no food service establishment … shall possess, sell, or offer for use single service articles that consist of expanded polystyrene." On October 26, 2015, the Supreme Court of New York overturned the law, stating city ban was incongruent with the City Council law.[26] New York City is currently appealing the ruling.

While there are many approaches to address the different aspects of marine litter, few countries or regions have an overarching legal framework to tackle the problem. Drawing upon examples from countries around the world, this report considers broad international frameworks for addressing marine litter and then examines more targeted legislative approaches.

1.1 This Report

The following Report examines legislation that States have adopted to prevent and manage marine litter. Each section provides overarching information about the challenge and legislative approaches to addressing it as well as specific examples. The remainder of this section focuses on international law relevant to marine litter. Section two reviews overarching national legislation and policies, while section three considers laws governing the production and use of materials that contribute to marine litter. Section four discusses legislative approaches to managing waste disposal into the marine environment from land-based and marine sources. Section five examines legislation governing waste in the marine environment. Finally, section six reviews alternative and complementary means of addressing marine litter. The Report concludes with a summary of key approaches used to address the issue, as well as legal trends and future directions.

In addition to the options explored in this Report representing existing legislation in various jurisdictions, States may consider options for addressing marine litter through

24 Gordon, 2016.

25 Regulations Made under the Environmental Protection Act Cap 20:05 (10 Dec. 2015) (Guyana), 240 Official Gazette of Guy. 2593, http://faolex.fao.org/docs/pdf/guy152293.pdf.

26 Restaurant Action Alliance, NYC v. Department of Consumer Affairs, New York County Index No. 100734/15, http://www.capitalnewyork.com/sites/default/files/CITY%20APPEAL%20NOTICE%20.PDF.

innovative approaches (such as labeling) and through non-legislative approaches (such as education).

1.2 The International Legal Framework

This section briefly summarizes key international legal instruments and provisions that address marine litter. Relevant international law governing marine litter can roughly be categorized as multilateral environmental agreements, soft law, and international legal principles and customary international law. These are discussed in more detail in the relevant sections of the report.

Multilateral environmental agreements are binding international agreements. As with other international agreements, multilateral environmental agreements bind only those States who commit to be bound by them via ratification or accession. Three multilateral environmental agreements are particularly relevant to marine litter:

- **United Nations Convention on the Law of the Sea (UNCLOS), 1982**: UNCLOS came into force in 1994 and 167 States are party to it. The Convention provides a broad legal framework for ocean-related issues, placing a general obligation on States to protect and preserve the marine environment. It calls on States to address land-based sources of pollution as well as pollution from ships, cooperate with other states on marine issues, and work to address marine issues beyond national jurisdiction.
- **International Convention for the Prevention of Pollution from Ships (MARPOL), 1973/1978**: Ratified by 153 States,[27] the International Convention for the Prevention of Pollution from Ships (MARPOL) was developed under the auspices of the International Maritime Organization (IMO). It was adopted in 1973 and amended in 1978. MARPOL includes regulations aimed at preventing and minimizing pollution from ships, both accidental pollution and that occurring during routine operations. Annex V of MARPOL, which came into force in 2013, addresses ocean-based litter pollution and prohibits the discharge of all plastics from ships.
- **Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 1972**: The London Convention aims to prevent marine pollution by regulating the dumping of wastes and other matter at sea. The convention has been in force since 1975, with 87 States Party. The 1996 London Protocol revised the London Convention, which allowed some dumping, prohibiting all dumping from ships except for materials listed on the so-called "reverse list." The 1996 Protocol does not include plastics on the reverse list; thus, dumping of plastics is prohibited. It entered into force in 2006, and 45 States are party to the Protocol.

Other global and regional multilateral environmental agreements also have relevant provisions or are working to reduce marine

27 Ratification information in this report reflects the status as of October 2015.

litter. These include, among others, the Convention on Biological Diversity (CBD) and the Convention on Migratory Species (CMS). See Appendix A for a more complete list. States are also bound by resolutions that are agreed upon by the Conferences of the Parties (COPs). COP resolutions from a wide range of agreements have addressed marine litter.

In addition to multilateral environmental agreements, international trade agreements are important as they establish the conditions under which States may adopt laws and other measures that affect trade (including bans, taxes, and subsidies). At the global level, the most important instruments are the General Agreement on Tariffs and Trade (GATT) and the 1995 Marrakech Agreement that established the World Trade Organization (WTO), and their accompanying protocols and related instruments. In addition, there are numerous bilateral and regional trade agreements. As a general matter, trade agreements seek to limit measures that distort or limit trade. There are exceptions—such as GATT Article XX—that allow measures that restrict trade to protect public health and the environment, but these have often been narrowly interpreted.[28]

Soft law instruments are international declarations, guidelines, and other efforts that are non-binding, but are often persuasive, inspire and inform national legislation, and may reflect emerging international law. Soft law instruments relevant to marine litter include:

- **Declaration on Environment and Development**: Adopted at the 1992 UN Conference on Environment and Development (popularly referred to as the "Rio Earth Summit"), this declaration sets forth 27 principles, many of which are now considered to constitute principles of international environmental law. Relevant principles are discussed below.
- **Agenda 21**: Also adopted at the Rio Earth Summit, Agenda 21 was a 350-page blueprint for sustainable development, setting forth detailed guidance on a wide range of issues. Section II calls for the Conservation and Management of Resources for Development, and includes the conservation of biological diversity and control of pollution as two goals; chapter 17 of section II addresses protection of the ocean and coastal areas, and notes threats posed by marine litter.
- **Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-based Activities**: Established in 1995, the GPA is a global intergovernmental mechanism that advises national and regional authorities on how to prevent and reduce marine degradation from land-based pollution and activities. The GPA framework calls for countries to adopt national programs of action to address land-based sources of pollution.[29]

28 Wold, Gaines, and Block, 2011; Bernasconi-Osterwalder et al., 2014.

29 Relevant GPA declarations include those from Washington (1995), Montreal (2001), Beijing (2006), and Manila (2012). These and related documents are available at http://unep.org/gpa/resources/MeetingDocuments.asp.

- **Food and Agricultural Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries**: In 1995, more than 170 States adopted the Code of Conduct. Section 7.2.2 states that management measures must be undertaken to minimize the impact of pollution and lost or abandoned gear on fish and non-fish species; section 8.3.2 asserts that port states also have a responsibility to prevent pollution, for example providing adequate disposal systems; and section 8.9.1 states that harbors have the same responsibilities as ports.
- **Johannesburg Plan of Implementation**: Adopted at the 2002 World Summit on Sustainable Development, the Johannesburg Plan of Implementation provides targets and timetables for specific measures; it calls for the reduction of pollution and waste and reinforces the polluter-pays principle articulated at the Earth Summit.
- **The Future We Want**: Adopted at the 2012 UN Conference on Sustainable Development (also known as "Rio+20"), The Future We Want identified a series of measures to improve sustainable development. Paragraph 163 noted the harm caused by marine litter from marine and land-based sources and committed countries to implement relevant conventions and programs, with the aim of achieving "significant reductions in marine debris" by 2025.[30]
- **SAMOA Pathway**: On September 4, 2014, representatives from States participating in the third International Conference on Small Island Developing States adopted the SIDS Accelerated Modalities of Action (SAMOA) Pathway, calling for efforts "to strengthen national, regional and international mechanisms for the management of waste, including … marine plastic litter."
- **Sustainable Development Goals**: On October 21, 2015, the UN General Assembly adopted resolution 70/1 and endorsed the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs).[31] Goal 14 seeks to conserve and sustainably use the oceans, seas, and marine resources for sustainable development, and explicitly addresses marine debris.
- **United Nations General Assembly Resolution 235**: On December 23, 2015, the UN General Assembly adopted Resolution 235 on Oceans and the Law of the Sea, which addressed marine debris in many ways, including urging States to adopt national and regional strategies, incentives, and infrastructure.[32]

Principles of international law and rules of customary international law are additional sources of international law. Rules of customary international law bind all States,

30 UNGA, 2012, para. 163.

31 UNGA, 2015.
32 UNGA, 2016.

except for those that persistently object. The key principles and rules relevant to marine litter are:

- **Prevention of Environmental Harm:** The principle calls for States to prevent pollution and minimize damage. Both Principle 21 of the 1972 Stockholm Declaration and Principle 2 of the 1992 Rio Declaration provide that States have the responsibility to ensure that activities under their jurisdiction or control do not cause damage to the environment of other states or areas beyond national jurisdiction. This principle is also reflected throughout UNCLOS, including article 194 requiring states to take "all measures ... that are necessary to prevent, reduce and control pollution of the marine environment from any source ...."[33] The International Court of Justice (ICJ) recognized this principle as a norm of customary international law.[34]
- **Precautionary Principle:** The precautionary principle encourages legislators and regulators to enact laws, regulations, and policies that to prevent environmental harm even in the absence of scientific certainty. Principle 15 of the 1992 Rio Declaration articulated the principle, and a 2011 advisory opinion of the International Tribunal on the Law of the Sea (ITLOS) addressing deep seabed mining indicated there is a trend toward making the precautionary approach part of customary international law, but they did not explicitly rule on its customary status.[35]
- **Polluter Pays:** Principle 16 of the 1992 Rio Declaration calls upon national authorities to take the approach that polluters bear the cost of environmental pollution. The polluter pays principle has informed taxes and fees that seek to internalize the cost of pollution.[36]
- **Duty to Cooperate:** Principle 24 of the 1992 Rio Declaration emphasizes the importance of multilateral and bilateral cooperation to "effectively control, prevent, reduce and eliminate adverse environmental effects resulting in all spheres, in such a way that due account is taken of the sovereignty and interests of all States." In its MOX Plant decision, ITLOS held that the duty to cooperate is "a fundamental principle in the prevention of pollution of the marine environment under [...] the Convention [on the Law of the Sea] and general international law."[37] Decisions in the Lac Lanoux arbitration,

33 Other UNCLOS articles addressing prevention of harm include articles 195, 196, 199, 201-203, 207-217, 220, 222, 228, 230, and 234.

34 Corfu Channel (U.K. v. Alb.), Merits, 1949 I.C.J. 4, 22 (April 9); Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226, paras. 29-30 (July 8); Gabcikovo-Nagymaros Project (Hung. v. Slovk.), 1997 I.C.J. 7, para. 53 (Sept. 25); Concerning Pulp Mills on the River Uruguay (Arg. v. Uru.), 2010 I.C.J., para. 193 (Apr. 20). See also Trail Smelter Arbitration (U.S. v. Can.), 3 R.I.A.A. 1905-81 (1941); In the Arbitration Regarding the Iron Rhine Railway (Belg. v. Neth), 23 R.I.A.A. 35 (Perm. Ct. Arb. 2005).

35 Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area (Advisory Opinion) ITLOS Case No. 17, February 1, 2011, para. 135.

36 O'Riordan, 2013.

37 The MOX Plant case (Ireland v. United Kingdom) (Provisional Measures), ITLOS Case No. 10, Order of December 3, 2001, para. 82.

FLOATING PLASTIC DEBRIS

Pulp Mills case, and the Nuclear Test cases further confirm its binding status in international law.[38]

- **Environmental Impact Assessment:** Principle 17 of the 1992 Rio Declaration calls for environmental impact assessments (EIA) to be undertaken for "proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority." Article 206 of UNCLOS has a similar requirement for assessment of potential activities when those activities may have significant effects on the marine environment. In its Pulp Mills decision, the International Court of Justice held that there is a "requirement under general international law" for States to undertake an EIA where there is a risk of significant adverse impact on a shared resource.[39]
- **Sustainable Development:** The principle of sustainable development—as articulated in the Rio Declaration—requires an integrated consideration of economic, environmental, and social concerns, taking into account the needs of future generations and intragenerational equity.[40] For example, for waste disposal this means that marine litter issues should be taken into account along with other environmental concerns (emissions, leachate, habitat degradation) and social concerns (land-use, health risks), as well as economic costs.

Only those principles that are part of customary international law are binding. The principles related to prevention of harm, the duty to cooperate, and environmental impact assessment have recognized by the International Court of Justice as binding principles of international law, but the status of other principles—especially precaution—is still debated and uncertain.[41]

In addition to global agreements and soft-law instruments, there are a number of regional agreements and instruments that address marine litter. Examples include: Annex IV

38 McIntyre, 2006; Harrison, 2015.

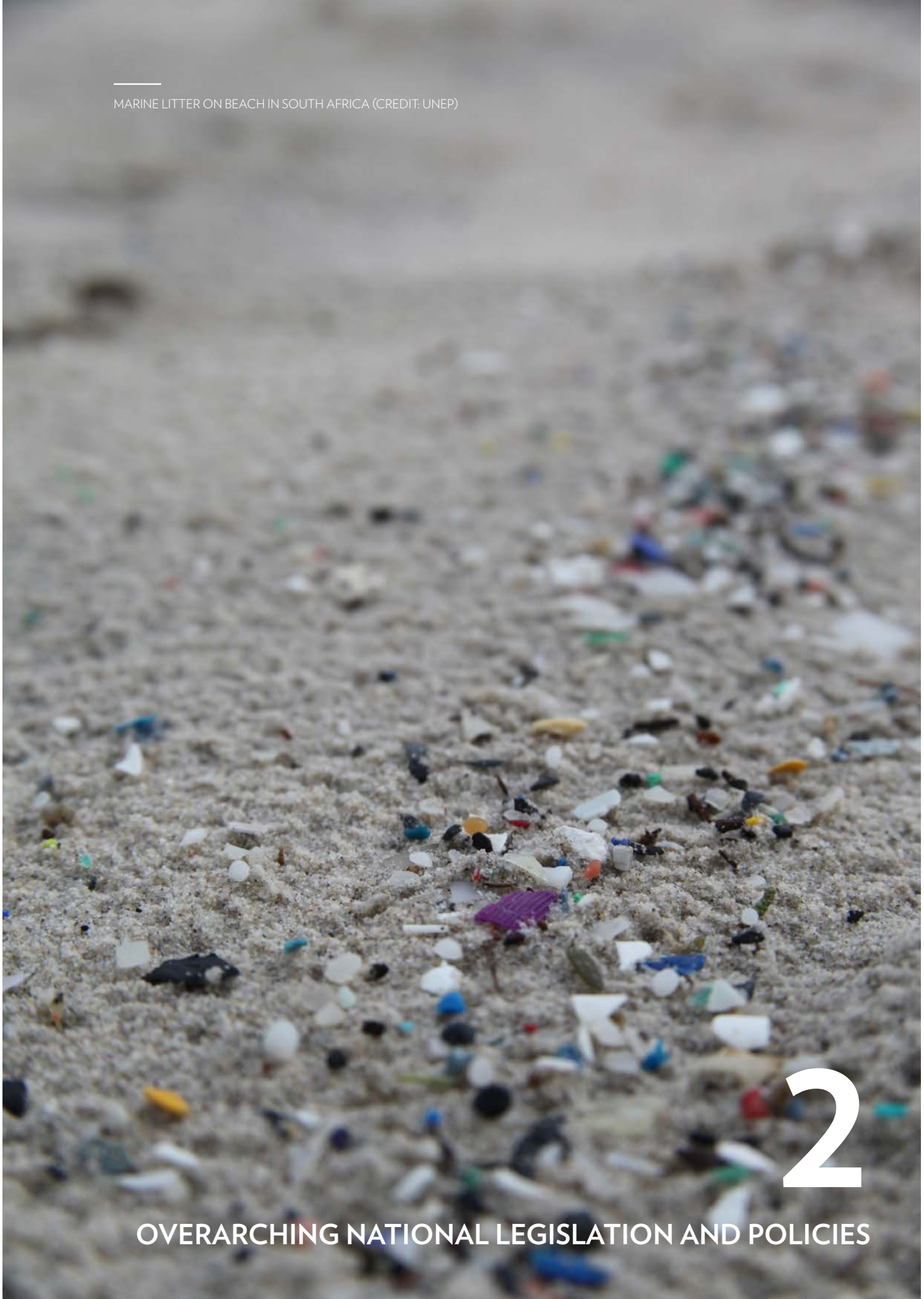
39 Concerning Pulp Mills on the River Uruguay (Arg. v. Uru.), 2010 I.C.J., para. 204 (Apr. 20).

40 Brunnée and Toope, 1994.

41 Ivone, 2015; Foster, 2013.

of the Helsinki Convention, the European Union (EU) Port Reception Facilities (PRF) Directive, the Regional Sea Conventions and Action Plans, and the EU Marine Strategy Framework Directive, among others. These instruments provide regional approaches to global instrument and otherwise enable regional coordination to address marine litter. More information on these regional agreements and instruments is available in Appendix A.

On the national and subnational level, there are a number of states with regulations that address marine litter. These are illustrated throughout the body of this Report.



MARINE LITTER ON BEACH IN SOUTH AFRICA (CREDIT: UNEP)

2

OVERARCHING NATIONAL LEGISLATION AND POLICIES

2. OVERARCHING NATIONAL LEGISLATION AND POLICIES

While marine litter often manifests as aggregated debris in specific locations (for example, litter on a beach or in a gyre), it has many diverse sources. In order to address these sources, it is often necessary to consider legislation governing manufacturing and use of certain products (such as plastic bags, beverage containers, and cigarettes), waste disposal and collection, fishing gear, cruise ships, and more.

As a result, at the national level, marine litter is usually addressed in a piecemeal manner across a variety of statutes, including by laws governing solid waste more broadly. Indeed, the authors identified only a few countries that have specific overarching legislation to address marine litter. This section provides a brief overview of some existing national frameworks that set forth overarching approaches to addressing marine litter.

Japan, for example, adopted the Law for the Promotion of Marine Litter Disposal (LPMLD), enacted on July 8, 2009. The purpose of this law is to control and reduce generation of marine litter. It mandates the central Government to formulate a marine litter policy, which led to the creation of the Basic Policy for Comprehensively and Effectively Promoting Measures against Marine Litter, adopted in 2010.[42] The law also mandates that the prefectural governments formulate regional plans, and prefectural governments have established councils to undertake their mandated activities. In addition, the law emphasizes cooperation among private, public, and international sectors.

The LPMLD is limited to litter washed ashore. It sets forth six basic principles, including the principle to clarify responsibilities for marine litter disposal among coastal administrators, prefectures, and other parties.[43] The LPMLD also calls for national and international cooperation. To this end, the law encouraged the creation of the Japan Action Network and the National Cleanup Secretariat. The Japan Action Network established a network of local governments and citizens with the aim to enhance cooperation in addressing marine litter. The network cooperates with government ministries and agencies in the implementation of their policies. It also identifies common issues in managing marine litter issues around the different regions of Japan and designs and proposes possible solutions.[44]

Article 30 of the LPMLD requires the Japanese Government to establish the Council for Promoting Countermeasures against Marine Litter. This council is charged with coordinating a comprehensive and effective response to marine litter.

42 NOWPAP, n.d.
43 Go, 2010.
44 Ibid.

PLASTIC PELLETS USED IN PLASTIC PRODUCTION WASHED UP ON BEACH. (CREDIT: SUSTAINABLE COASTLINES)

Article 30 also requires the creation of an Expert Council and the establishment of an Expert Conference to give advice and make proposals concerning promotion of countermeasures against marine litter.[45]

Other countries address marine litter through the inclusion of relevant provisions within broader legislation. In such situations, while a country does not have a law focusing specifically on marine litter, it does have a section of a broader law (e.g., on waste management) that provides an overarching mandate and framework for addressing the particular problem of marine litter. South Korea provides an example this approach. The South Korean Marine Environmental Management Act of 2009 (MEM Act) includes a mandate to develop a Marine Litter Management Plan. This statute defines the obligations of the State, local governments, and people to prevent marine pollution. The polluter pays principle is adopted in Chapter I, Article 7, stating that the polluter shall restore and bear expenses for remedying any damage or pollution of the marine environment.

South Korea builds its marine pollution governance structure on science, technology, and information. The MEM Act provides for the promotion of science and technology, and international cooperation in the marine environment.[46] The law mandates the creation of a marine environment information

45 Japanese Government, Office of Marine Environment, 2015.

46 Marine Environmental Management Act, Act. No. 8260, Jan. 19, 2007, art. 6 (S. Kor.).

network and the public dissemination of information on the marine environment.[47] The Act also calls for the Establishment of Marine Environment Management Master Plan, which includes measures for the prevention of marine pollution and improvement of marine environments.[48]

The plan was put in place in 2009,[49] with the second phase implemented in 2014. The Second Basic Plan to Manage Marine Debris benefitted from the information provided by a pioneering national study estimating the annual flow and stock of marine litter.[50] In 2011, South Korea centralized the management of information with the creation of the Marine Litter Management Center and Marine Litter Integrated Information System.[51] Under the Plan, several projects on management and technology development have been implemented.[52]

Singapore adopted a different approach to create its legal framework on marine litter management, combining partial implementation of international mandates with prior national legislation. The main national legislation on marine litter in Singapore is the Prevention of Pollution of the Sea Act (August 1990) (PPSA), enacted to give effect to the MARPOL 73/78 Convention.[53] The PPSA also contains domestic provisions on land-based pollution based on its previous Prevention of Pollution of the Sea Act which goes beyond MARPOL in scope.

Instead of establishing specific marine litter legislation, several countries have developed and implemented a comprehensive national policy framework to address marine litter challenges. In such instances, a country adopts a national policy that provides an overarching strategy that guides national law but is ultimately nonbinding; that strategy is then pursued through the adoption and revision of various sectoral laws and regulations. This is the case with the Netherlands,[54] which established its marine litter policy based on European Union (EU) regional policy as well as other regional and international frameworks. For the Netherlands (as for other European countries), the key legal framework shaping the policy is the EU Marine Strategy Framework Directive (MSFD).[55] Moreover, the Dutch policy and strategies in the area of microplastics is based on this regional legal instrument.[56]

The EU adopted the MSFD in 2008 to guide EU Member States in protecting the marine environment. The MSFD seeks to achieve "Good Environmental Status" of EU marine waters by 2020, while also protecting the resource base for economic and social purposes. The MSFD articulates four broad marine regions to which it applies: the Baltic Sea, the Black Sea, the Mediterranean Sea,

47 Ibid., art. 11.
48 Ibid., art. 14.
49 Ibid.
50 Jang et al., 2014.
51 NOWPAP, n.d.
52 Ibid.
53 Singapore acceded to the MARPOL 73/78 Convention in November 1990.
54 Busschbach, 2013.
55 Directive 2008/56/EC of the European Parliament and of the Council Establishing a Framework for Community Action in the Field of Marine Environmental Policy, 2008 O.J. L 164/19.
56 Leslie et al., 2011.

and the North East Atlantic Ocean. Each Member State must adopt a marine strategy, which is to be reviewed and updated every six years using an adaptive management approach. Marine litter considerations are to be addressed through the marine strategy. They are also addressed through the EU's waste regulations, including the Waste Framework Directive, regulations on packaging waste (including provisions on plastic bags), and the circular economy approach.

The Dutch marine litter policy covers waste management, material chain management, innovative materials managements, and producer responsibility, in an effort to move from a waste challenge to managing the source. The prevailing approach in the implementation of measures and strategies is cooperation with stakeholders (so-called "green deals"). This cooperation aims to (a) reduce solid waste by regulating products and improving waste management; (b) give more attention to microplastics; (c) undertake cleanup projects; and (d) increase communication and awareness.[57] The Netherlands established targets for 2020 to reduce visible litter on the beach, and decrease the amount of litter found in marine organisms.[58]

In June 2010, the Scottish Government launched Scotland's Zero Waste Plan, which sets out a vision for a zero waste society. The plan seeks to minimize wastes and maximize reuse of resources, leaving only limited amounts of wastes to be treated. By 2025, 70 percent of all wastes should be recycled, while no more than 5 percent will go to a landfill.

Implementing the MSFD, the Scottish Government adopted a national litter strategy and a marine litter strategy in 2014. Based on broad consultations and environmental assessments, both strategies cover the period up to 2020. The national litter strategy identifies ways to encourage people to take personal responsibility. Actions include awareness-raising measures, improvement of product and service design through a close collaboration with the business sector, the provision of opportunities for recycling, and the establishment of a strong enforcement system. In order for people to change their behavior and stop littering, the Scottish Government has developed a communications toolkit, launched a marketing campaign and adapted legislation to increase the fixed penalties for litter. In 2014, a charging scheme for single-use carrier bags was introduced.

Scotland's marine litter strategy provides a framework for controlling and managing marine and coastal litter, as well as to develop current and future measures to ensure that the amount of litter entering the marine and coastal environment is minimized. It articulates five strategic directions:

- Improve public and business attitudes and behaviors around marine and coastal litter;
- Reduce marine and coastal based sources of litter;

57 Busschbach, 2013.
58 Ibid.

- Contribute to a low carbon economy by treating "waste as a resource";
- Improve monitoring; and
- Maintain and strengthen stakeholder coordination at the UK, EU, and international scales.

The strategy aims at contributing to the implementation of the MSFD and other commitments of the country, including under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention). Reviews of the strategy are planned for 2016 and 2018, and a monitoring framework will be developed to evaluate its effectiveness. The policies are supported by a regulatory framework, which includes:

- Fixed penalties for littering: Based on the Environmental Protection Act 1990, the Scottish Government introduced a fixed penalty of £80 for anyone who drops litter. The fixed penalty notice for fly tipping is £200.
- A charging scheme for single-use carrier bags: Scotland introduced a minimum 5p charge for single use carrier bags on October 20, 2014 through the Single Use Carrier Charge (Scotland) Regulations.
- Scottish Landfill Tax: The Scotland Act 2012 came into force on May 1, 2012. It gives Scottish Government a range of tax raising powers, based upon which the Scottish Landfill Tax was introduced in

PLASTIC POLLUTION WASHED ASHORE NEXT TO THE PANAMA CANAL

April 2015. The tax is a disincentive for wastes to landfill and provides a source of public revenue.

- Under the Packaging (Essential Requirements) Regulations 2015, packaging volume and weight must be the minimum amount to maintain the necessary amount of safety, hygiene, and acceptance for the packed product and the consumer; the packaging must be manufactured so as to permit reuse or recovery in accordance with specific requirements; and noxious or hazardous substances in packaging must be minimized in emissions, ash, or leachate from incineration or landfill.

At the global level there are numerous initiatives and frameworks such as the Global Partnership on Marine Litter (GPML) and the Honolulu Strategy.[59] Similarly, on the regional and national levels, there are a diversity of marine litter projects and initiatives.

For example, the Gulf of Mexico Marine Debris Project was established in 2006 under U.S. law. This project created debris maps and was implemented to address the marine litter left behind by Hurricane Katrina. The National Oceanic and Atmospheric Administration (NOAA) Office of Coast Survey and Office of Response and Restoration surveyed and mapped the Gulf coast area and posted the results on the project website that were used by boaters and for marine litter removal activities. The interactive maps showed the location, size, and depth of litter identified. The project was extended to areas in Louisiana. While this project ended in 2009, the data developed are still available online.[60]

Increasing efforts to address and improve marine litter management have been seen worldwide. Overarching national legislation is found in some countries but remains uncommon. To date, the more common practice is to adopt overarching policy, strategies, plans, and programs under international or regional cooperation frameworks, and to adopt or amend targeted provisions in multiple laws. For those countries that have overarching legislation, it often serves as a coordinating and planning mechanism to help integrate the existing laws and programs already in place and design strategies for priority actions.

59 For more information on the Honolulu Strategy, see UNEP and NOAA, 2011.

60 NOAA, 2016a.

MUNICIPAL WORKERS COLLECTING DEBRIS ON A BEACH IN DURBAN, SOUTH AFRICA (CREDIT: LCSWART / SHUTTERSTOCK)

3

LAWS GOVERNING THE PRODUCTION AND USE OF LAND-BASED MATERIALS CAUSING MARINE LITTER

3. LAWS GOVERNING THE PRODUCTION AND USE OF LAND-BASED MATERIALS CAUSING MARINE LITTER

Land-based trash is the largest source of marine litter.[61] Marine litter made of plastics, polystyrene foam, metal, glass, and other materials from land-based sources has been found in all the world's oceans. The top ten items found during coastal cleanups around the world include: cigarettes and cigarette butts; food wrappers and food packaging; beverage bottles made of plastic, glass, and aluminum; plastic bags; paper bags; caps and lids; plastic stirrers and drinking straws; and single-use utensils like cups, forks, and spoons.[62] Once such items find their way into the oceans, they often stay for decades or longer.

Given the practical challenges of removing decades of accumulated plastics from the oceans, it is clear that prevention, rather than remediation, is critical. In recognition of this simple fact, several countries have endeavored to control the manufacture and use of the relevant materials at their source: on land. This section focuses on national laws that address production and consumer use of a variety of items that end up as marine litter. Laws discussed in this section address the most abundant type of marine litter, plastic, from its incipient "nurdle" or pre-manufacturing resin stage to ubiquitous and persistent consumer goods such as single-use plastic bags and utensils. While it comprises a great majority of marine litter, plastic is not alone in polluting the oceans.

3.1 Prohibiting and Disincentivizing Manufacturing

While many countries have laws that address the use of consumer goods at the retail level, several countries have taken the more difficult step of legislating what goods may be manufactured. Manufacturing bans and restrictions generally face strong opposition from industrial lobbies.[63] Once the laws are enacted, penalties are generally higher for manufacturers than retailers. This section addresses a few representative national and subnational laws that prohibit the manufacture of:

- nurdles, or pre-production plastic (California)
- plastic bags (Bangladesh, China, Rwanda, and South Africa)

61 Jambeck et al., 2015; UNGA, 2004, para. 97.
62 Ocean Conservancy, 2015a.
63 Digital Journal, 2014; Masina, 2014; Toloken, 2013.

- microbeads in personal care products (Canada, United Kingdom, and United States)

Although plastics are not the only source of litter in the sea, they are the most significant and one of the most persistent. In some regions, plastics account for 90 to 95 percent of marine litter and about 60 to 80 percent globally.[64] Accordingly, this section focuses on bans on plastic products.

3.1.1. Prohibiting Manufacture of Nurdles (Pre-Production Plastic)

An estimated 311 million metric tonnes of plastic are produced each year, the majority of which are single-use plastics that are discarded within a year of use.[65] The plastic comes from every stage of the production process—from pre-production powders and resins to consumer use to waste disposal. It includes, for example, plastic from single-use containers, large manufactured goods, and tiny microbeads from cleansers and cosmetics that wash down drains.

Through the interaction of heat, ultraviolet light, wind, and waves, plastic eventually breaks down into smaller and smaller pieces. Some plastics break down into tiny plastic particles known as microplastics and are found at various depths throughout the world's oceans. Plastic does not, however, biodegrade or disappear completely. Instead, it persists in the marine environment for decades.[66]

One source of marine litter that has come to legislators' attention is plastic in its nascent form—nurdles. Nurdles are tiny pellets of plastic resin, the raw materials that are melted or melded to produce plastic goods. They are the most common form in which plastic is shipped prior to manufacturing.[67] Their light weight and small size lead to losses during production, as well as during land and sea transport. Nurdles are blown from factories or washed into storm drains and other waterways during manufacturing; are blown off or leaked from trucks, trains, and cargo ships during loading and unloading or transit; or leaked into the environment from spills during transit. Whatever the source, nurdles are now found en masse in oceans and on beaches around the world.[68]

Nurdles are inexpensive to produce, which contributes to their presence in the marine environment, as well as to the explosion of plastic manufacturing all over the globe. In addition to the abundance of nurdles in the marine environment, nurdles are also a concern given their composition: nurdles have been found to contain organic micropollutants, such as polychlorinated biphenyls (PCBs), dichloro-diphenyl-dichloroethylene (DDE), and nonylphenol.[69] Moreover, plastics absorb contaminants from the surrounding seawater, so that the concentration of contaminants on the surface of plastic fragments is much higher than in the surrounding seawater.[70] Pellets and

64 UNEP and SEPA, n.d.
65 PlasticsEurope, 2105.
66 Thompson, 2015.
67 Coulter, 2010; Ellison, 2007.
68 International Pellet Watch, n.d.
69 Mato et al., 2001.
70 Rochman et al., 2013.

microbeads thus pose an additional threat to ingestion, as they collect and concentrate toxins.

Few countries have adopted legislation addressing the potential of nurdles to become marine litter. Companies in the United States, Spain, Portugal, Mexico and Japan, have undertaken voluntary nurdle management efforts,[71] but few legislative bodies have passed laws to govern nurdle manufacture or handling.

In 2007, California passed a law requiring best management practices for companies that manufacture, handle, and transport nurdles.[72] The law governs "preproduction plastic," which "includes plastic resin pellets and powdered coloring for plastics."[73] It provides that "all permits issued under the national pollutant discharge elimination system (NPDES) program that regulate plastic manufacturing, handling, or transportation facilities" shall require the following minimum best practices:

(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 ... containment system that is ... 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'

(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

MARINE PLASTIC DEBRIS ON A BEACH IN MALTA (CREDIT: ALAIN BACHELLIER)

71 See, e.g., Marine Litter Solutions, 2015, joint resolutions by trade groups in the United States, Portugal, Spain, and Mexico; Operation Clean Sweep, 2015, a voluntary education program run by the Society of Plastics Industries and, more recently, the American Chemistry Council to reduce pellet, flake, and powder loss by resin producers; and JPIF, n.d.

72 Cal. Water Code § 13367(b)(1). http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13367.

73 Ibid.

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.[74]

3.1.2 Prohibiting the Manufacture of Plastic Bags

Several jurisdictions prohibit the manufacture or otherwise regulate the production and use of plastic bags for various reasons. Plastic bags harm sea turtles, birds, porpoises and other animals that mistake the bags for jellyfish. The European Commission has noted that "[a]t least 267 different species have suffered from entanglement or ingestion of marine litter."[75]In addition, plastic bags have clogged municipal drains, exacerbating flooding. Other reasons for regulation of single-use plastic bags include tourism, cleanliness and social development, harm to livestock such as cows, and curbing marine litter.

Bangladesh was the first country to ban plastic bags.[76] Its ban arose from concerns over flooding due to clogged drains and to a loss of arable land due to lingering plastic in the soil.[77] Under the broad auspices of Bangladesh's Environmental Conservation Act, Bangladesh's ban provides that:

> if, on the advice of the Director General [of the Department of the Environment] otherwise, the Government is satisfied that all kinds or any kind of polythene shopping bag, or any other article made of polyethylene or polypropylene, or any other article is injurious to the environment, the Government may, by notification in the official Gazette, issue a direction imposing absolute ban on the manufacture, import, marketing, sale, demonstration for sale, stock, distribution, commercial carriage or commercial use, or allow the operation or management of such activities under conditions specified in the notification, and every person shall be bound to comply with such direction.[78]

Bangladesh's ban applies to all "'polythene shopping bag[s]' which means a bag ... or other container which is made of polyethylene or polypropylene or any compound or mixture thereof and is used for purchasing, selling, keeping or carrying another article."[79] Bags manufactured for export are exempt from the ban. The law imposes a fine and up to ten years imprisonment for those who "manufacture, market or import" plastic bags, compared to up to six months imprisonment

74 Ibid.
75 European Commission, 2013.
76 Onyanga-Omara, 2013.
77 IRIN, 2011; Clapp and Swanston, 2009.
78 Bangladesh Environment Conservation Act of 1995, as amended 2002, http://faolex.fao.org/docs/pdf/bgd42272.pdf.
79 Ibid.

for those who "sell, exhibit for sale, stock, commercially transport or commercially use" them.

South Africa banned plastic bags under 30 microns and imposed a 46-rand cents levy on thicker bags. Under the law, "[t]he 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... is hereby prohibited."[80] Violators are subject to a fine and imprisonment up to 10 years.[81] The legislature carved out exceptions for plastic bags used to package meats and hold newspapers, among other items.

In 2008, China banned the "production, use and sale of ultrathin shopping bags", defined as bags less than 25 microns in thickness, and mandated that retailers impose fees on thicker bags.[82] One source reported that the regulation caused a 49 percent reduction in the use of new bags.[83] Other evidence suggests a 66 percent drop in plastic bag use, equivalent to 40 billion bags and saving an estimated 1.6 million tons of petroleum.[84] Plastic bag use in supermarkets in Guangzou City in the south of China dropped by almost 50 percent and by 90 percent in Beijing.[85]

Mauritania also passed a manufacturing ban that imposes fines and up to a year in prison for anyone using, manufacturing, or importing plastic bags. [86]

Rwanda may have gone the farthest. Legislators not only banned the manufacture and sale of all polythene bags within its borders in 2008, but also banned the import of all such bags.[87] Violators face stiff penalties and fines. There are reports of manufacturers being raided and travelers' bags seized at the airport before entering the country.[88] Rwanda's law defines polythene bags as "a synthetic industrial product with a low density composed of numerous chemical molecules ethene with a chemical formula; (CH2=CH2). In most cases the bag is used in packaging of various products." The law requires anyone wishing to "manufacture, import, use and sell" polythene bags to send a written request to the Rwanda Environment Management Authority, along with the "reasons for the request and the ways through which he or she will manage the polythene waste."[89] To address manufacturers' concerns, the law

80 Government Notice (GN) R625/2003 (S. Afr.). http://faolex.fao.org/docs/pdf/saf73211.pdf.
81 Ibid.
82 The law was issued June 1, 2008. Notice of Office of State Council on Restricting the Production, Sale and Use of Plastic Shopping Bags (SC GO G [2008] No.72).
83 He, 2010.
84 Romer and Foley, 2012; Jierui, 2009.
85 Liu, 2013.
86 BBC, 2013.
87 Law N°57/2008 of 10/09/2008, Law Relating to the Prohibition of Manufacturing, Importation, Use and Sale of Polythene Bags, Rwanda Management Authority, at p. 78. http://rema.gov.rw/rema_doc/Laws/Plastic%20bags%20law.pdf.
88 Kardish, 2014; BBC, 2004.
89 Rwanda Law N°57/2008 of 10/09/2008, at 78.

provides tax incentives for manufacturers to recycle plastic bags and to companies to produce reusable bags.

3.1.3 Prohibiting the Manufacture of Microplastics (Microbeads)

Though one source of microplastics is the gradual fragmentation of larger pieces of plastic trash, another is more deliberate. Microbeads are mild abrasive plastic particles that have been intentionally added to home and personal care products such as facial cleansers, shampoos, and toothpastes since the 1990s. Like most plastics, microbeads do not biodegrade. Instead, they persist in the environment. There is some evidence that plastic microbeads cannot be captured or otherwise treated by conventional wastewater treatment plants, resulting in their discharge into waterways. Once in the waterways, these microbeads are ingested by fish and other marine and freshwater animals.[90]

In June 2016, the Canadian government added microbeads to the List of Toxic Substances under the Canadian Environmental Protection Act. As such, the government now has the ability to develop regulations that would prohibit the manufacture, import, sale, and offer for sale of personal care products containing microbeads to exfoliate or cleanse.

In the United States, seven states have adopted legislation restricting the use of microbeads in personal care products: Maryland, Illinois, Maine, New Jersey, Colorado, Indiana, and California. Maryland's ban, for example, prohibits the manufacture and sale of any product containing non-biodegradable microbeads. In so doing, Maryland's legislature defined "biodegradable" to mean "capable of decomposing (1) in a marine environment; and (2) in wastewater treatment plant processes in accordance with relevant established guidelines identified by the department, such as (I) ASTM International; (II) Organisation for Economic Co-operation and Development; (III) International Organization for Standardization; or (IV) other comparable organizations or authorities."[91] Maryland's law requires the Maryland's Department of the Environment to develop regulations on biodegradability in wastewater treatment plants and periodically review the relevant science to "ensure that the most scientifically effective methods are being utilized to prevent, to the maximum extent practicable, the entrance of synthetic plastic microbeads in the natural aquatic environment of the state."[92] Maryland's law defines microbeads as "any intentionally added solid plastic particle that is not biodegradeable that: (1) measures less than 5 millimeters in size; and (2) is used in a rinse-off personal care product for exfoliation or cleansing purposes."[93] California's law, which goes into effect in 2020 and imposes fines on manufacturers up to US$2500, states that "plastic pollution is the dominant type of anthropogenic debris

90 Goldstein, Rosenberg, and Cheng, 2012; Derraik, 2002.

91 MD. Code Ann., Envir. § 9–2001 to 9–2003. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0216E.pdf.

92 Ibid.

93 Ibid.

found throughout the marine environment."[94] Microbead measures in many countries, such as the Netherlands, appear thus far to be voluntary efforts on the part of industry.[95]

In 2015, the United States enacted the Microbead-Free Waters Act, which bans rinse-off cosmetics that contain intentionally added plastic microbeads as of January 1, 2018, and bans manufacturing of these cosmetics effective July 1, 2017.[96] These bans are delayed by one year for cosmetics that are over-the-counter drugs.[97] This national legislation will preempt state bans on microbeads.

Other countries are exploring options for phasing out microbeads. For example, the United Kingdom has announced that it plans ban microbeads from cosmetics by the end of 2017.[98]

3.2 Prohibiting and Disincentivizing Use at the Retail Level

Several national, sub-national, and local governments have passed laws regulating the use of land-based sources of trash, including single-use plastics and foam products. Experiences in places like Ireland and South Africa, discussed below, show that consumers often adjust well to bans and levies.

94 Cal. Pub. Res. Code § 42360. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB888.
95 UNEP, 2015a.
96 Microbead-Free Waters Act of 2015, 21 U.S.C. 331 (2015). https://www.congress.gov/bill/114th-congress/house-bill/1321.
97 Ibid.
98 BBC, 2016.

This section addresses a few examples of retail-level laws that prohibit or provide disincentives to using plastics, foams, and other products. Such measures include:

- Plastic bag bans (Bangladesh, Eritrea, Somaliland, Bhutan, Haiti, Tanzania, Macedonia, and numerous subnational laws in, for example, India and the United States)
- Laws governing the thickness of plastic bags (Botswana, China, Ethiopia, Kenya, South Africa, and Uganda)
- Bans on stirrers, utensils, cups (India)
- Taxes or levies on plastic bags (Ireland, South Africa, Belgium, Denmark, and Taiwan)
- Banning so-called "biodegradable" plastics (United States)
- Bans on expanded polystyrene (Haiti, Vanuatu, and various municipalities)
- Mandating "re-usable" products such as beverage containers and shopping bags (India, Hawai'i, and Barbados)
- Cigarette bans on beaches (United States, Canada, and the United Kingdom)

3.2.1 Plastic Bag Bans

One of the most common legal mechanisms to address plastic litter is to regulate or ban plastic bag usage at the retail and consumer end user level. More than 100 national and subnational governments have banned

or otherwise regulated plastic bags.[99] The regulations include bans on plastic bags, regulations regarding the thickness of the bags, taxes or levies on end-user bags, or some combination thereof.

As noted above, Bangladesh was the first country to ban the manufacture and use of plastic bags. The law imposes a fine of US$71 and six months of imprisonment for using polythene bags.[100] Other countries that have banned the use of all plastic bags include: Eritrea, Somaliland, Bhutan, Haiti, Tanzania (which banned bags under 100 microns after finding that its previous ban on bags under 30 microns was too difficult to enforce), Taiwan, and Macedonia.[101]

A number of subnational jurisdictions have also adopted a total ban on plastic bags. The widespread ban in the Indian state of Tamil Nadu, for example, covers all plastic bags, newspaper wrappers, and utensils. It provides that "[n]o 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" and that "[n]o person shall sell, store, distribute or transport any magazine or periodical packed in plastic wrapper."[102]

Other subnational jurisdictions that have enacted plastic bag bans at the retail level include: Maharashtra, India; Delhi, India; Huskisson and Coles Bay in Australia (both whale-watching tourist towns); County of Hawai'i (whose ordinance specifically mentions the harm caused by plastic bags to the marine environment);[103] San Francisco, California;[104] and both the city and county of Los Angeles, California.[105] Adopted in 2006 and taking effect in 2007, San Francisco's ordinance applied only to pharmacies and supermarkets with gross annual sales of more than US$2 million; even so, it is estimated that this led to a 5 to 10 percent reduction in the number of plastic bags reaching the land fill.[106] The Los Angeles ban applied initially to large stores, and was later extended to convenience stores and other smaller stores.

As jurisdictions across the United States have adopted plastic bag levies and bans, they have measured the impacts on behavior and the environment. This has enabled the public and policymakers to better understand the benefits of the legislation. In San Jose, California, which prohibited single-use shopping bags, except for recycled paper

99 Florida DEP, 2010. A map of such jurisdictions is available at http://www.earth-policy.org/plan_b_updates/2013/update123; Californians Against Waste, n.d.

100 IRIN, 2011.

101 Florida DEP, 2010; ENS, 2012a; Kazoka, 2013; Pflanz, 2004; Chen, 2011; TEPA, 2011.

102 Tamil Nadu Plastic Articles (Prohibition of Sale, Storage, Transport and Use) Act, 2002. FAOLex. http://faolex.fao.org/docs/texts/ind52632.doc.

103 County of Hawai'i Ordinance 12-1. http://www.hawaiizerowaste.org/site-content/uploads/PLASTIC-BAG-REDUCTION-ORDINANCE-12-001-2010-2012.pdf. Every county in the state of Hawai'i has banned single-use plastic bags; as a result, there is a de facto statewide ban, although the state legislature has not adopted such a ban.

104 S.F., Cal., Envir. Code ch. 17 § 1702-4. http://plasticbaglaws.org/wordpress/wp-content/uploads/2010/05/leg_CA_SF-ordinance-final-2012-02-071.pdf.

105 Florida DEP, 2010; Herreria, 2015; LA DPW, 2015.

106 Florida DEP, 2010.

bags which have a 10-cent fee, the city experienced reductions in the presence of single-use plastic bags in the street (by 59 percent), storm drains (89 percent reduction), and creeks (60 percent reduction), and an increase in the use of reusable bags (from 4 percent to 62 percent).[107] In Washington, D.C., a 5-cent fee on single-use bags resulted in the reduction of bags used annually from 270 million bags to 55 million bags within the first year, and 50 percent fewer bags were found in an annual local river cleanup.[108] After Los Angeles County enacted a bag ban ordinance, it experienced a 95 percent reduction of all single-use bags, with a 30 percent reduction of single-use paper bags.[109] San Mateo County, California reported that their reusable bag ordinance resulted in an increase in 162 percent of the number of people who bring their own reusable bags and 130 percent more people carrying out items without a bag.[110] And the County of Alameda, California reported that its bag ban resulted in 85 percent fewer bag purchases overall, with twice as many customers bringing their own bag after the ordinance was enacted or are not using a bag at all.[111]

3.2.2 Regulation of Bag Thickness

More common than outright bans are laws that regulate the thickness of the bag. Thin bags are more likely to be caught by wind and end up as litter. They also clog drains, are difficult to recycle, and are easily ingested by marine and land animals. In Botswana, after the country imposed a ban on bags under 24 microns or 0.24 mm and a levy on heavier bags, consumer usage fell by 50 percent.[112] Botswana's law outlawed the manufacture and import of plastic bags thinner than 24 microns; imposed a jail sentence of up to three years and a fine of BWP25,000 for violations; and mandated that the cost of plastic shopping bags be transparent and publicly disclosed. Moreover, it required that individual bags had to indicate clearly in English and/or Setswana the name and country of origin of the producer, importer, or distributor. The law applies only to food and retail establishments (but not clothing) and excludes plastic refuse bags and plastic packaging.

In 2008, China banned the "production, use and sale of ultrathin shopping bags", defined as under 25 microns, and mandated that retailers impose fees on thicker bags. Other countries adopting laws governing bag thickness include: Ethiopia (banning bags less than 33 microns thick); Kenya (banning bags under 30 microns thick); South Africa (thickness ban plus levy on thicker bags); and Uganda (30 micron ban).[113] Sub-national laws governing thickness of plastic bags are also numerous. Thicknesses vary, with jurisdictions in India banning bags less than 20 microns, while other jurisdictions regulate bags from 40 to 50 microns.[114]

107 Romanow, 2012.
108 Associated Press, 2011.
109 Los Angeles County Department of Public Works, 2012.
110 City of San Mateo, 2014.
111 StopWaste, 2014.
112 Dikgang and Visser, 2010.
113 Florida DEP, 2010; AFP, 2011; ENS, 2012b.
114 Florida DEP, 2010; Tembhekar, 2015; Ong, 2010.

There are also regional efforts to govern bag thickness. In 2015, European Union Directive 2015/720/UE entered into force. The Directive requires Member States to reduce the use of plastic bags under 50 microns by either taking measures to reduce annual average consumption to 90 per person by the end of 2019, and to 40 bags by 2025, or by ensuring that by the end of 2018, no more lightweight plastic carrier bags are distributed free at the retail level. The Directive does allow oxo-degradable bags to continue to be used in Europe.[115]

In 2012, the East African Community (EAC) adopted the Polythene Materials Control Bill. If it is ultimately endorsed by EAC Member States, it would ban the manufacture, import, sale, and use of polythene bags, and establish penalties of up to 12 months in prison and a fine of up to US$5,000.[116]

3.2.3 Bans on Plastic Stirrers, Utensils, and Cups

Food wrappers, plastic bottles, coffee stirrers, straws, plastic utensils, and take-out food packaging frequently land in the top five categories of marine litter collected on beaches.[117] Several legal systems that address plastic bags also address other types of plastic: the wide-reaching plastics ban in Tamil Nadu, India, for example, extends to "plastic articles" distributed in food establishments, and covers "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."[118] Bangladesh's plastic bag ban also is broadly written and applies to "any other article made of polyethylene or polypropylene, or any other article" that is "injurious to the environment."[119] At the subnational level, especially in places where beaches are important for the tourism and hospitality industry, there are laws to curb plastic litter on the beach. For example, Miami Beach (in the U.S. state of Florida) passed a city ordinance in 2012 prohibiting beachfront hotels from serving drinks with straws.[120] Similarly, the City of Manhattan Beach also enacted a sweeping polystyrene ban that encompasses straws and other carryout materials.[121]

Other jurisdictions use voluntary campaigns to provide disincentives to using materials that lead to marine litter. In London for example, environmentalists initiated a "Straw Wars" campaign to rid London's Soho district of drinking straws and cited marine litter as a primary motivation for doing so. Businesses promise not to give out straws to customers

115 Zero Waste Europe, 2015. Oxo-degradable or oxo-biodegradable products rely on degradation through oxidation.

116 Full text of the East African Community Polythene Materials Control Bill, 2011 is available at http://www.kenyalaw.org/kl/fileadmin/pdfdownloads/EALA_Legislation/BILLSUPPLEMENT12thAugust20116.pdf.

117 Ocean Conservancy, 2015a.

118 Tamil Nadu Plastic Articles (Prohibition of Sale, Storage, Transport and Use) Act, 2002, supra note 103.

119 Bangladesh Environment Conservation Act of 1995, as amended, supra note 80.

120 Miami Beach, Florida, Municipal Code § 46-92.

121 Manhattan Beach, California, Municipal Code § 5.80.010.

unless straws are requested. It is reported that 31 bars and clubs joined the anti-straw campaign after its inception.[122]

3.2.4 Taxes and Other Levies

Taxes and other market-based approaches can also reduce marine litter.[123] However, there is some evidence that consumers eventually adjust to levies, and they may lose some of their effectiveness.[124]

In 2002, Ireland passed the first charge on plastic bags provided at checkout in retail establishments. The 22 Euro cent levy caused a 90 percent reduction in plastic bag consumption.[125] Funds generated by this levy on plastic bags are used for recycling facilities, enforcement of waste management laws, and other environmental purposes.

Several other countries have followed suit. South Africa enacted a levy in 2003 of 46 rand cents per 24 liter bag. There is some evidence that South Africa's reduced levy on plastic bags was too low to affect long-term consumer change, and that reduction in plastic bag usage went from a 90 percent reduction to a 44 percent reduction after retailers dropped the price per bag from an original levy of 24 rand cents to lower amounts.[126] Botswana banned bags under 24 microns thick but also allowed retailers impose their own per bag fee, which they set at between 20 and 35 thebe (about US$0.02-0.03).[127]

Other countries impose levies on various plastic items provided by stores. For example, Belgium's tax passed in 2007 included a tax on plastic films (such as dry cleaning bags), aluminum foil, and disposable cutlery.[128] Denmark's 1994 tax on plastics includes bags and all packaging materials, as well as a tax on sending waste to a landfill or incinerating it.[129] In Germany, stores providing plastic bags are charged a recycling fee.[130] In Taiwan, a bag ban prevented the store and restaurant owners from providing free plastic bags to their customers—a customer must pay NT$1 to NT$2 for a bag (due to sanitary concerns over reused bags, the ban was later lifted for food establishments).[131] Israel imposed a levy on plastic bags in 2008.[132] China's order governing fees on plastic bags provided that:

> [a] commodity retailing place may determine the price of plastic bags independently, but any of the following behaviors shall be prohibited: 1. selling plastic bags at a price lower than the cost; 2. selling plastic bags without marking a price thereon or without marking the required information or in the required way; 3. 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

122 Straw Wars, n.d.
123 Dikgang and Visser, 2010.
124 Ibid.
125 Waste Management (Environmental Levy) (Plastic Bag) Regulations, 2001 (S.I. No. 605/2001) (Ir.), http://www.irishstatutebook.ie/2001/en/si/0605.html.
126 Dikgang, Leiman, and Visser, 2010.
127 Dikgang and Visser, 2010.
128 Florida DEP, 2010.
129 Ibid.
130 Ibid.
131 Shan, 2006.
132 Florida DEP, 2010.

> or in any disguised form. Commodity retailing places shall separately list the quantity, unit price and item of the plastic bags bought by consumers in the sales voucher. Trade markets operated in the form of leasing stalls, if it is really difficult for them to issue sales vouchers, shall be exempted from the preceding requirement.[133]

3.2.5 Banning "Biodegradable" Products

Biodegradable plastic, as defined in most of the world, requires specific conditions such as heat and soil-dwelling microbes and bacteria to fully biodegrade. Such conditions do not exist in many ocean environments, and therefore plastic that might otherwise be biodegradable in industrial composters does not biodegrade once it enters the marine environment.[134]

Recognizing that biodegradable plastic bags are not in fact biodegradable once they enter the marine environment, some jurisdictions are beginning to ban such bags. For example, Los Angeles, California imposed a total ban on plastic bags that includes biodegradable bags below 2.5 mm thick, reasoning that such bags cannot be reused.[135]

More commonly, though, jurisdictions that ban plastic bags either exempt biodegradable bags or mandate their use. This has been done, for example, in Italy, Tasmania, Buenos Aires, Mexico City, and Paris.[136]

Some jurisdictions have adopted legislation requiring biodegradable food packaging (in lieu of foam or polystyrene products). For example, in its ban on polystyrene food packaging, the city of Alameda, California mandates the use of biodegradable or compostable products. Its law states that "'Biodegradable' means the entire product or package will completely break down and return to nature, i.e. , decompose into elements found in nature within a reasonably short period of time after customary disposal."[137] The law also references land-based disposal (not marine) and provides exemptions for to food vendors who "can show a biodegradable or compostable product is not available for a specific application or does not exist."[138]

The challenge remains in ensuring that products are biodegradable in a marine environment, where there may not be heat, microbes and bacteria, or oxygen necessary for decomposition. Efforts to establish reliable standards for biodegradable plastic have struggled. ASTM D7081-05 was the sole performance specification standard referring to the biodegradation of plastic materials in marine environments. It was withdrawn

133 Administrative Measures for the Paid Use of Plastic Bags at Commodity Retailing Places (promulgated by the Ministry of Commerce, May 15, 2008, effective June 1, 2008) (China). Translation available at http://en.pkulaw.cn.proxy.uchicago.edu/Print/Print.aspx?Lib=law&Cgid=105054&Id=6822&SearchKeyword=plastic%20bag&SearchCKeyword=&paycode=&LookT...5/5k.

134 Thompson, 2015.

135 LA DPW, n.d.

136 Florida DEP, 2010.

137 City of Alameda (California) Code. Environmentally acceptable packaging materials. § 8.36.020.C. http://www.codepublishing.com/CA/Capitola/html/Capitola08/Capitola0836.html.

138 Ibid., § 8.36.040.A.

in 2014.[139] Consequently, labelling an item as biodegradable in marine environments is currently not possible due to a lack of internationally agreed-upon according standards.

3.2.6 Bans on Expanded Polystyrene (Foam)

Bans on polystyrene, or foam packaging, as with other plastics, range from prohibitions on importing and manufacturing to requirements related to retail use. Haiti, for example, banned the use of polystyrene containers and cups. Haiti bans the production, import, commercialization, and use in any form of plastic bags and objects made of styrofoam for food purposes, such as trays, bottles, bags, cups, and plates.[140]

In Vanuatu, the Ozone Layer Protection Act prohibits the importation of extruded polystyrene foam as well as "thermoformed plastic packaging such as supermarket meat or produce trays, egg cartons, fast-food containers, disposable plates and cups, horticultural packaging trays and packaging netting."[141] It also prohibits, within the country, the manufacture of "plastic foam, or any goods that contain plastic foam, that is or are manufactured using any controlled substance specified in Part I or Part II of the Schedule (including any of the goods referred to in paragraph 5(1)(b))."

Numerous jurisdictions in the United States have banned polystyrene packaging at the manufacturing and retail levels. Within California alone, more than 60 cities have banned polystyrene in a variety of contexts. For example, the law in Alameda, California prohibits food vendors from providing food to customers in disposable polystyrene foam containers.[142] Also, in California, the City of Capitola passed a local law that prohibits retail vendors or special event promoters "from selling, renting or otherwise providing any polystyrene foam product that's not completely encapsulated or encased within a more durable, non-EPS [non-expanded polystyrene] product. In addition to foodservice ware such as cups, plates, bowls and clamshells, the law also affects coolers, containers, ice chests, pool or beach toys, packing peanuts or other packaging materials made of EPS."[143] In Watsonville, California "[t]he city extended its existing EPS ban to cover all plastic (not just polystyrene) foam products, such as coolers, ice chests, cups, bowls, plates, clamshells, shipping boxes, containers, packaging peanuts, pool or beach toys and other unencapsulated products."[144]

In July, 2015, New York City banned certain polystyrene foam items such as: polystyrene foam single-service items including cups,

139 ASTM, n.d.; UNEP, 2015b.
140 IPS, 2013.
141 Vanuatu Ozone Protection Act 2010, http://www.ecolex.org/ecolex/ledge/view/RecordDetails;-DIDPFDSIjsessionid=B4F37C03B789B0223982DC5F222121AB?id=LEX-FAOC110179&index=documents.
142 Alameda, Cal., Code ch. 4, art. I § 4-4; Alameda, Cal., Code ch. 1 § 1-5.6. http://www.planetalameda.com/images/pdf/StyrofoamOrdinance.pdf.
143 Melucci, 2014.
144 Ibid.

MARINE PLASTIC DEBRIS ON BEACH (CREDIT: SHUTTERSTOCK)

bowls, plates, takeout containers, and trays; and polystyrene loose fill packaging, commonly known as packing peanuts.[145] The law exempted 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, as well as expanded polystyrene containers used to store raw meat, pork, fish, seafood or poultry sold from a butcher case or similar retail appliance. The ban was overturned later that year.[146]

3.2.7 Requiring or Encouraging Reusable Products

Laws that mandate or encourage reusable products tend to be less problematic than mandating biodegradable or compostable products. For example, the widespread ban on plastic bags, newspaper wrappers, plates, and other items in Tamil Nadu, India (described above in sections 3.2.1 and 3.2.3) applies to nonrenewable items.

145 NYC, 2015.

146 Mueller, 2015.

The definition of "reusable" can have its challenges. Thick plastic bags are often defined as "reusable," even if there are other environmental concerns associated with the bags. In 2015, for example, the Big Island of Hawai'i passed a law prohibiting businesses from providing plastic checkout bags (all counties in Hawai'i now ban plastic bags).[147] The law exempted "reusable bags, compostable plastic bags, or recyclable paper bags," and defined reusable as being greater than 2.25 mm. That thickness has raised concerns among environmentalists due to the amount of petroleum used to make the bags and the environmental effects if they are improperly discarded.[148]

Several jurisdictions prohibit the manufacture or distribution of non-returnable beverage containers. For example, Barbados's beverage law provides that: "no distributor or dealer shall sell or offer for sale, at wholesale or retail in Barbados, any beverage that is contained in a beverage container without government permission."[149] Distributors and dealers who have "an adequate system for the recycling of beverage container" may be exempted. The law imposes a fine of up to $500 and three months imprisonment for violations.

3.2.8 Cigarette-Free Beaches

Cigarette butts are among the most common types of marine litter found on the world's beaches.[150] Cigarette butts are composed of cellulose acetate, a form of plastic that can take decades to decompose, introducing toxic chemicals into waterways.[151]

As part of a global recognition of the dangers of smoking, and the aesthetic and environmental harm from litter, several jurisdictions have banned smoking on beaches. Littering laws in Dominica, Malta, and many other countries explicitly apply to cigarette butts.[152] Such laws have proven difficult to enforce, and many jurisdictions have prohibited smoking on beaches altogether.

As of 2012, 100 local U.S. governments had banned smoking on beaches.[153] Honolulu passed a smoke-free ordinance in 1993, reportedly the first in the United States and one that continues to be enforced. Australia banned smoking on certain section of beaches in 2010, and amended its 1987 Tobacco Act in 2012 to prohibit smoking on patrolled beaches within an area on public land or in the

147 Honolulu, Haw., Code ch. 9, art. 9 § 9-9.1 to 9-9.4. http://www.opala.org/solid_waste/pdfs/Article%209%20-%20Plastic%20Bag%20Ban.pdf.
148 Herreria, 2015.
149 Laws of Barbados, Chapter 395A, Returnable Containers. http://www.bottlebill.org/assets/pdfs/legis/world/Barbados1986-RCA.pdf.
150 Ocean Conservancy, 2015a.
151 Ariza and Leatherman, 2012.
152 Litter Act, Act No. 4 of 1990, as amended by Act No. 6 of 1991 (Dominica). http://faolex.fao.org/faolex/. Litter Act (Malta). http://faolex.fao.org/docs/pdf/mlt41758.pdf.
153 Ariza and Leatherman, 2012.

sea.[154] Puerto Rico also has banned smoking on beaches, and the province of Winnipeg, Canada banned smoking on its freshwater beaches in 2013.[155]

3.3 Extended Producer Responsibility

In Canada, EU, Japan, Australia, and New Zealand, among other jurisdictions, the prohibition on manufacturing or importing single-use plastics and other potential marine litter hazards includes extended producer responsibility for cleanup, recycling, or alternatives. The Organision for Economic Co-operation and Development defines extended producer responsibility as a "policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle."[156] This concept of extended producer responsibility appears in many sections throughout this Report.

While not targeted to marine environments or single-use plastics, Estonia's law on packaging requires all packaging in the country to be reusable and recyclable, and mandates that manufacturers bear some responsibility in recovery of package waste.[157] The Act covers "[p]ackaging materials of any manufactured product, which is used for the containment, protection, handling, delivery or presentation of the product life cycle: from raw materials to processed goods from the producer and the consumer. The container used for the same purposes shall also be considered packaging." The Act sets targets for recovery of plastic packaging waste at up to 55 percent, 45 percent of which is to be recycled.

In 2004, the Government of Ghana created a Recycling Taskforce to hire waste collectors to collect and deliver plastic bags to warehouses for recycling. Plastics manufacturers are required to help fund the project.[158] In 2007, Uruguay adopted Ordinance No. 260/2007, requiring merchants to take actions to minimize waste and generation of plastic bags, and to develop management plans for their rational use, reuse, and recycling.[159]

3.4 Summary

Laws governing consumer-level use of items that end up as marine litter—such as bans or taxes on single-use plastic bags or food utensils and laws promoting smoke-free beaches—have been shown to reduce consumer litter. A jurisdiction considering whether to ban an item such as a bag, or impose a fee for its use, may want to consider whether it has the resources to implement and enforce the law. Those considering imposing a levy or tax may want to consider the experience of many jurisdictions, such as Ireland and South Africa, that have found

154 Tobacco Amendment (Smoking at Patrolled Beaches) Act 2012 (Australia). http://docs2.health.vic.gov.au/docs/doc/9258387DE57BA30ACA257ABE0082545F/$FILE/Tobacco%20Amendment%20(Smoking%20at%20Patrolled%20Beaches)%20Act%202012.pdf.

155 Owen, 2013.

156 OECD, n.d.

157 Packaging Act, 2004 (Estonia). https://www.riigiteataja.ee/akt/12964621 (translation into English by Google).

158 Florida DEP, 2010.

159 Ibid.

that fees need to be set high enough to shape consumer use. A number of studies on the impact of bans and fees show that bans and fees can greatly reduce the usage of targeted bags, which greatly reduces their use in the environment, and increases the use of other bags (including both reusable bags and disposable bags made with alternative materials that may have a substantial environmental footprint).[160] The most effective approaches have tended to combine measures, for example banning thin disposable plastic bags and a fee on alternative bags.

Jurisdictions considering targeting the sources of marine litter farther up the production chain such as laws banning the manufacture of nurdles, microbeads, and plastic bags might also consider that such laws have more impact if consistently enforced. Rather than discouraging industry participation, manufacturing bans and regulations can reinforce and strengthen industry's nascent efforts to regulate themselves. Along the same lines, extended producer responsibility initiatives also provide incentives manufacturers to do more to prevent marine litter. The importance of well-crafted laws preventing marine litter cannot be overstated.

160 Taylor and Villas-Boas, 2016; Muthu et al. 2011.

A SEAGULL PERCHED ON A PUBLIC GARBAGE BIN PULLING OUT LITTER WITH ITS BEAK

4

MANAGING WASTE DISPOSAL INTO MARINE ENVIRONMENT

4. MANAGING WASTE DISPOSAL INTO THE MARINE ENVIRONMENT

In addition to laws governing the production and use of materials causing marine litter, many countries have adopted legislation governing waste disposal into the marine environment. Such legislation addresses four categories of disposal: (1) land-based disposal; (2) cleanup of land-based waste; (3) abandoned, lost, and discarded fishing gear; and (4) litter from ships.

4.1 Land-Based Waste Disposal Requirements

Legislation can seek to reduce land-based sources of marine litter associated with waste disposal by setting particular requirements for siting and operation of landfills, planning for and responding to disasters (and particularly addressing disaster debris), reducing waste via recycling, and incineration. These are discussed in turn.

4.1.1 Landfill Siting and Operation

There are three categories of landfills: open dumps, controlled systems, and engineered or sanitary systems.[161] A sanitary landfill is a facility that isolates "landfilled wastes from the environment until the wastes are rendered innocuous through the biological, chemical, and physical processes of nature."[162] Among other standard practices, sanitary landfills should compact wastes, be covered daily with soil, and prevent odors from emanating from the site. Unlike sanitary landfills, where there are some guidelines to disposing solid waste, open dumps do not address solid waste storing or removal.[163] This section provides examples of solid waste disposal requirements that are essential for preventing waste from entering the marine environment.

In 1976, the United States adopted the Resource Conservation and Recovery Act to protect human health and establish guidelines for proper solid waste disposal.[164] Implementing regulations restrict the siting of landfill facilities, prohibiting them from being built in flood plains and wetland areas, where floods could transport garbage into rivers and eventually into the marine environment.[165]

Legislation often addresses the establishment and operation of landfills and land-based waste management generally. The Philippines governs landfills through Act 9003, the

161 ISWA, 2011. The definition of landfill goes on to state that "[m]ajor differences between the various definitions are in the degree of isolation and means of accomplishing it, as well as in the requirements for monitoring and closing the fill and in maintaining the fill after its active life."
162 UNEP, 2005b.
163 Ibid.
164 EPA, 2015a.
165 40 U.S.C. § 257.8 to 257.9. http://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol26/xml/CFR-2012-title40-vol26-part257.xml.

TANGLED MESS OF NETS AND ROPES WASHED UP ON THE OREGON BEACH

Ecological Solid Waste Management Act of 2000.[166] The Act prohibits open dumps and states that:

> No open dumps shall be established and operated, nor any practice or disposal of solid waste by any person, including LGUs [local government units], which constitutes the use of open dumps for solid waste, be allowed after the effectivity of this Act: Provided, That within three (3) years after the effectivity of this Act, every LGU shall convert its open dumps into controlled dumps, in accordance with the guidelines set in Section 41 of this Act: Provided, further, That no controlled dumps shall be allowed five (5) years following effectivity of this Act.[167]

To provide incentives for local governments to reduce litter, the Metropolitan Manila Development Authority began offering monetary awards in 2012 for the cleanest and healthiest barangay (the smallest administrative division in the Philippines). These awards were done pursuant to regulations implementing Act 9003.[168]

Brazil's 2010 solid waste management law requires all solid wastes to be disposed in modern landfills.[169]

In addition to addressing landfills generally, some nations create specific ocean and coastal restrictions. For example, under New Zealand's Resource Management Act (1991), landfills cannot be built near the coast without a coastal permit. The Act requires that regional councils oversee the permit process. In determining landfill siting, New

166 Ecological Solid Waste Management Act, Rep. Act No. 9003 (December 20, 2000) (Phil.), http://emb.gov.ph/wp-content/uploads/2015/12/RA-9003.pdf.
167 Ibid.
168 Metropolitan Manila Development Authority, 2015.
169 The Economist, 2015.

Zealand recognizes environmentally sensitive areas as a key consideration in siting landfills. Government guidelines provide that,

"Landfills should generally be located to avoid areas where sensitive natural ecosystems would be adversely affected, such as: significant wetlands; inter-tidal areas; significant areas of native bush including the Forest Park and areas able to comply with the requirements for QEII Trust status; recognised wildlife habitats; national/regional and local parks and reserve lands (for example, cemeteries); and any areas where release of contaminants from the site could severely affect fish/wildlife/aquatic re- sources."[170]

Proper landfill design and siting involve extensive research of the proposed site. Often countries require environmental impact assessments (EIAs) to be developed when considering a proposed landfill site. An EIA typically includes consideration of the site location, air quality, gas management, site description, and social-cultural concerns, including coastal impacts where relevant.[171] Further discussion of EIAs is found in section 6.3 of this Report.

4.1.2 Planning and Disaster Preparedness

Natural disasters, such as earthquakes, tsunamis, and typhoons, can create substantial amounts of marine litter. It is estimated that the 2011 earthquake in Japan produced 5 million tons of debris.[172] Similarly, the 2010 earthquake in Haiti produced 20 to 25 million cubic yards of debris.[173] A 2009 World Bank report on Disaster Risk Management Programs for Priority Countries listed 20 high-risk countries prone to natural disasters. Of the 20 countries listed, fourteen were coastal countries.[174] Many states implement disaster debris management plans to help prevent debris from entering waterways and to assist in the cleanup efforts after a natural disaster. The United States, Japan, and Haiti have all taken measures to prevent additional marine debris from impacted waterways after a major disaster.

This section surveys legal approaches that countries take to address marine debris caused by natural disaster.

United States: Following hurricanes Katrina and Rita, NOAA established the Gulf of Mexico Marine Debris Project (GOMMDP). GOMMDP researchers examined the Alabama, Mississippi, and Eastern Louisiana coastlines from 2006–2009 and discovered over 7,100 submerged items.[175] Five thousand items were discovered following Hurricane Katrina, of which, 40 percent were submerged less than five feet. As part of the GOMMDP, NOAA developed the Marine Debris Emergency Response Plan to help the region with disaster preparedness and provided guidelines for proper disposal methods of disaster debris.[176]

170 Centre for Advanced Engineering, 2000.
171 See a sample EIA report for a landfill proposal in Hong Kong: Hong Kong Environmental Protection Department, 2007.
172 NOAA, 2015a.
173 Desvarieux, 2010.
174 World Bank, 2009a.
175 NOAA, 2012.
176 Barnea et al., 2009.

Alaska and Japan: There were various marine debris removal programs established following the Great East Japan Earthquake and subsequent tsunami of March 2011. The State of Alaska Department of Community and Economic Development provided funding to remove approximately 115,000 pounds of debris from the Kodiak Archipelago.[177] Furthermore, in 2012, Alaska implemented an administrative order, which states that Alaskan residents, "and the State of Alaska have a keen interest in seeing that marine debris risks are appropriately addressed. Alaskans' economic interests and quality of life could be impacted. The State of Alaska owns tidelands and some of the uplands near the coastline that could suffer impacts, and significant federal lands, including national forests, parks, and monuments, also border the southern and southeastern coasts of Alaska."[178]

The 2011 earthquake in Japan created approximately 20 million tons of disaster debris, much of it in coastal areas. Before the 2011 earthquake, Japan already had four waste management laws: the Basic Environment Act (1993); the Basic Environment Plan (1994); the Basic Act for Establishing a Sound Material Cycle Society (Basic Framework Act, 2000); and the Waste Management and Public Cleansing Act (1970). Guidelines on Disaster Waste Disposition Management were established in 1998 and provided local governments with an emergency system for waste management after a disaster.[179] After the earthquake—and in light of the substantial volume of disaster debris that Japan was coping with—Japan amended its legal regime governing waste management. One change was to relax the 30-day notice requirement that applied "when an industrial waste management facility deals with nonindustrial waste."[180] The Ministry of Environment also allowed spoiled seafood to be dumped into the ocean despite anti-dumping legislation. Furthermore, the government implemented the Comprehensive Disaster Waste Management Act, which allowed the national government, instead of local governments, to process disaster waste.

Haiti: Like Japan, Haiti is susceptible to natural disasters such as hurricanes and earthquakes. Indeed, a 2009 World Bank report listed Haiti as one of the most vulnerable countries for multiple hazards.[181] Moreover, at the time of the report, environmental laws were ambiguous and storm damage, not earthquakes, was the primary concern.

In 2001, Haiti established the National Disaster Risk Management System (NDRMS). In response to the 2010 earthquake, the United Nations Development Programme (UNDP) and Haiti developed technical guidance to address disaster debris.[182] To handle the 10 million cubic meters of debris, UNDP used the already-

177 Island Trails Network, 2015.

178 Administrative Order No. 263. Office of the Governor, State of Alaska. July 30, 2012. http://gov.state.ak.us/admin-orders/263.html. On similar efforts in Oregon, see https://omdt.org.

179 Umeda, 2013.

180 Ibid.

181 World Bank, 2009b.

182 de Caen, 2013.

established Truitier landfill as the disposal site for most of the debris and worked with municipalities to establish small- to medium-sized lots for additional debris.[183] In the absence of a debris management plan, UNDP and Haiti focused on the recycling capabilities of the debris. Furthermore, lacking clear environmental laws or policies on the issue of disasters and debris, Haiti has continued to work with UNDP in preparing coastal communities for disasters.[184]

4.1.3 Mandatory Recycling and Separation

To reduce marine litter from land-based sources—and to advance other environmental objectives—countries and subnational authorities have introduced mandatory recycling and separation.

An estimated 54 percent of marine debris on the West Coast of the United States comes from land-based sources.[185] With a population of close to 40 million and a coastline of over 800 miles, California has introduced mandatory recycling policies for consumers and commercial businesses. The State of California enacted requirements for mandatory recycling of commercial solid waste by businesses.[186] The Act states that:

> a business shall take at least one of the following actions in order to reuse, recycle, compost, or otherwise divert commercial solid waste from disposal:
>
> (1) Source separating recyclable and/or compostable materials from the solid waste they are discarding and either self-hauling, subscribing to a hauler, and/or otherwise arranging for the pick-up of the recyclable and/or compostable materials separately from the solid waste to divert them from disposal.
>
> (2) Subscribing to a recycling service that may include mixed waste processing that yields diversion results comparable to source separation.[187]

At the local level, the City of San Francisco, as part of the California Waste Management Act of 1989, mandated recycling and composting.[188] With a goal of having zero waste by 2020, the City requires residents and businesses in San Francisco to separate recyclables and landfill trash.[189] According to the ordinance, in addition to providing color coded bins for recyclables, compost, and trash, business and property owners must educate residents and employees about how to properly use the recycle bins.

With limited land and a substantial tourism industry, the Maldives has struggled with how to manage its solid waste in ways that

183 Barenstein and Pittet, 2010.
184 UNDP, 2015.
185 EPA, 2011. The California Ocean Protection Council estimated that approximately 80 percent of marine debris derived from land-based sources. State of California Ocean Protection Council, n.d.
186 Cal. Code Regs. tit. 14, § 18837. http://www.calrecycle.ca.gov/laws/regulations/Title14/Chap09pt1/default.htm.
187 Ibid.
188 S.F., Cal., Envir. Code ch. 19 § 1902 to 1912. http://www.sfenvironment.org/article/recycling-and-composting/mandatory-recycling-and-composting-ordinance.
189 Ibid.

do not generate marine litter, which could impact the tourism industry. The capital city of Male uses a former lagoon, Thilafishi, as its solid waste disposal site. According to the World Bank, the amount of waste generated exceeds available land for disposal.[190] In 2008, the Maldives developed a solid waste management framework, which implemented 11 policies to establish better waste management legislation, improve infrastructure, and educate consumers and producers on better waste management practices.[191]

4.1.4 Incineration

In addition to reusing, recycling, landfill disposal, and composting, the practice of burning, incinerating (with energy recovery and emission control, allowing potentially harmful substances to be captured or destroyed to the largest extent possible), and waste-to-energy (WtE) is sometimes used to deal with waste as a last resort. Due to cost and pollution, open burning and incineration (without energy recovery) are not encouraged. Moreover, it is an unsustainable way to deal with waste. Nevertheless, new WtE technology has proven a viable option for developed countries with limited land availability.

There are more than 1200 WtE facilities in over 40 countries around the world. In order to have a viable WtE facility and plan, a country must already have a well-organized waste management system in place. For example, the EU's landfill directive has decreased landfill use by 65 percent in order to implement more WtE facilities. Austria, Germany, Singapore, Taiwan, Switzerland, and Japan all depend more on WtE facilities than on landfills and recycling.

Due to the lack of landfill space, Japan has primarily relied on incinerating its waste. Although Japan relies on incinerators, many facilities did not recover energy from waste. To address this issue, Japan's Waste Management and Public Cleansing Law (2001), while not mandating energy recovery, provided incentivizes for facilities to use WtE methods. The WtE regulatory framework was established in 2010 and set guidelines for types of solid waste for incineration and air emission limits.

In 2008, Chile enacted the renewable electricity law that obliges "electricity providing companies, withdrawing electricity to supply their contract commitments, to demonstrate that a certain percentage of their total energy committed was injected in the system by non-conventional energy sources. The energy can be produced by their own plants, or by contracting from third-parties." Between 2010 and 2014, 5 percent of electricity had to come from non-conventional energy sources, such as landfills. The percentage is expected to increase annually by 0.5 percent starting in 2015, and will cap at 10 percent by 2024.

The International Solid Waste Association provides guidelines for WtE facilities in low-

190 World Bank, 2012.

191 National Solid Waste Management Policy for the Republic of Maldives. 2008. http://www.mvlaw.gov.mv/pdf/gavaid/minHousing/28.pdf.

to middle-income countries.[192] The legislative and policy frameworks of many Small Island Developing States (SIDS) focus on end-of-life waste solutions, although landfills are not a viable option for many SIDS. Starting in 2014, the Cayman Islands implemented a 50-year Solid Waste Management System and Plan to address the increased waste and marine litter issues.[193] Instead of focusing on end-of-life solutions, the Cayman Islands used Europe as its model and adopted the waste hierarchy (discussed below), which focuses on waste prevention.

For many SIDS, where tourism is important for many economies, WtE facilities are still novel in that many SIDS rely on incinerating without energy recovery due to efficiency, cost, and lack of infrastructure and technology.[194] There is some movement in SIDS toward WtE: in 2014, Jamaica was in the final stages of implementing policies to build WtE facilities.[195]

4.2 Land-Based Waste Cleanup

Numerous global programs take voluntary measures to address marine litter through cleanup. Other programs are regulatory and use government funding to reduce marine litter and increase community involvement. In 2013, the United States agency NOAA allocated US$250,000 to the State of Washington to assist with marine debris cleanup from the 2011 tsunami in Japan.[196] The City of San Francisco and Los Angeles County spent US$6 million and US$18 million respectively on debris removal affecting marine life.[197]

South Korea has implemented various programs to reward marine litter cleanup. Since 2003, fishermen receive a small fee for delivering marine litter to ports.[198] South Korea's central and local governments established the buyback program to preserve marine environments and to educate fisherman and local residents about the dangers of marine litter.[199] According to the report, the buyback program proved to be more cost-effective by engaging fishermen and the community rather than the central and local government collecting and removing marine debris.

In 2009, South Korea financed a US$9 million coastal cleanup which focused on community involvement and economic incentives for residents living along the coast.[200] The program's aim was to remove marine litter along the coast and provide jobs for elderly residents living in the area. While some of South Korea's coastal cleanup programs included voluntary participation without incentives, the buyback program and pay-to-clean coastal environments

192 ISWA, 2013.
193 Integrated Solid Waste Management System, 24 April 2014 (Cayman Islands). http://www.gov.ky/pls/portal/docs/page/cighome/newcighome/publications/waste-management-strategic-outline-case-now-approved/strategic-outline-case-integrated-solid-waste-management-system.pdf.
194 UNEP, UN DESA, and FAO, 2012.
195 Linton, 2015.
196 Washington State Marine Debris Task Force, 2013.
197 Kier Associates, 2012.
198 Morishige, 2010.
199 Ibid.
200 Ibid.

demonstrate two marine litter removal methods that involve community and government collaboration.

Despite the aforementioned programs, many countries are focused on preventative measures to reduce the amount of marine litter. The European Union and the United States both use a waste hierarchy, which focuses on waste prevention versus reactive measures of waste production. The European Commission's, for example, incorporates the polluter pays principle into its waste framework directive.[201]

The last two sections (4.1 and 4.2) address the broad category of land-based waste. Most of the programs identified are not specific to addressing marine litter. That said, they do make up essential components of the marine litter management framework. These components include landfills siting and management, recycling programs, incineration programs, disaster response, and more. In addition, an environmental impact assessment when siting landfills provides an important mechanism to evaluate the ability of landfills to prevent marine litter, especially when siting along coasts prone to natural disasters. Proper planning in disaster-prone areas and recycling programs for disaster debris will reduce marine litter and help maintain ecosystems.

4.3 Abandoned, Lost, and Discarded Fishing Gear (ALDFG)

Abandoned, lost, and discarded fishing gear (ALDFG) is fishing gear such as crab pots, nets, or fishing line that are lost or intentionally discarded by fishers while at sea. ALDFG's contribution to global marine litter is significant. UNEP estimates that some 6.4 million tons of gear is abandoned, lost, or discarded in our oceans each year.[202] The derelict gear causes significant impacts to marine life and habitats. Seabirds and other marine animals may become entangled in the gear and in the process become wounded or killed. In addition, the derelict gear can cause significant navigation hazards and damage to vessels.[203] Gill nets, fish pots, and traps often "ghost fish" (or continue to fish after loss). Fishing lines entangle marine life and damage the ocean floor.[204] For example, 870 ghost nets were recovered off the coast of Washington State; these nets had caught more than 32,000 marine animals and 500 birds and mammals.[205] Crab pots are particularly dangerous, and it is estimated that 10-30 percent of the millions of crab pots cast out into the Chesapeake Bay annually are lost.[206]

201 Directive 2008/98 EC of the European Parliament and of the Council. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098.

202 Macfadyen and Huntington, 2009; World Society for the Protection of Animals, 2014.
203 NOAA, 2015b.
204 Dutch Shark Society, 2014.
205 Register, Rhett, 2014.
206 Humboldt State University, 2015.

International frameworks call upon the fishing industry and governmental managers to implement policies and procedures to minimize the effects of ALDFG on marine life. The Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fishing states that fishers must try to minimize their impacts on species and habitats "through measures including, to the extent practicable the development and use of selective, environmentally safe and cost-effective fishing gear and techniques."[207] The United Nations General Assembly has adopted resolutions (Resolutions 44/225, 45/197, and 46/215) to address the impacts of open water drift-net fishing on marine habitats.[208] In addition, MARPOL Annex V prohibits the discharge of all garbage into the sea, including fishing gear.[209]

At the national level, several countries have regulations regarding ALDFG. For example the Government of St. Kitts and Nevis has enacted a Marine Pollution Management Act. Under this Act, prohibited fishing gear includes "any plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags."[210] The Government of Namibia also has set forth prohibitions on abandoning fishing gear in its Regulations Relating to the Exploitation of Marine Resources.[211] A fisher in Namibia "may not, without a written authorization by the Minister, leave any fishing gear or any other non-biodegradable object utilized for harvesting marine resources on or in the sea or on the sea shore on the termination of harvesting."[212] If a fisher does lose or abandon their fishing gear, they will incur all costs relating to the collection of the gear and if the State recovers the gear, the fisher will then be indebted to the State.[213] In the United States, legislative initiatives aim to prevent ALDFG and focus on reporting and recovering ALDFG as quickly as possible.

In addition to reporting, countries have adopted many strategies in their laws to minimize the loss of fishing gear, including creating biodegradable components, marking gear, and attaching it to structures to enable retrieval. For example, the Washington State Department of Fish and Wildlife has established guidelines to minimize the likelihood of lost crab pots: each pot must be clearly marked, attached to a buoy, and have a biodegradable panel to allow marine life to escape if it does become abandoned.[214] Improved gear marking systems such as global positioning system (GPS) tags are widely used in the EU. Providing adequate

207 Macfadyen and Huntington, 2009.
208 UNGA, 1991.
209 IMO, 2015a.
210 The Marine Pollution Management Act, 2002 (St. Christopher and Nevis). http://faolex.fao.org/docs/pdf/stk63654.pdf.
211 Regulations No. 241 of 2001. December 7. http://www.mfmr.gov.na/documents/53305/832050/MarineRegulations/e2e0a7fb-a6db-45fd-9b14-1a26a6c3d3b4.
212 Government Gazette of the Republic of Namibia, Regulations Relating to the Exploitation of Marine Resources, Part Five-Protection of the Environment, Waste. http://faolex.fao.org/.
213 Ibid.
214 Washington State Department of Fish and Wildlife, 2015.

port disposal access and limiting spatial fishing zones are two other strategies to combat the impacts of ALDFG.[215]

Once gear has been lost or abandoned, recovery is the key approach to addressing the problem. In 2002, the Washington State legislature passed State Senate Bill 6313, establishing the Derelict Fishing Gear Removal Program, which is responsible for removing derelict gear from Puget Sound.[216] The program includes a popular method of reporting which takes a no-fault approach. A "no-fault" approach focuses on cleaning up the gear rather than focusing on who is responsible for losing it.[217] The amount of ghost fishing nets which have been recovered from Puget Sound to date would cover more than 400 football fields. The Northwest Straits Foundation has also removed, as of June 2015, more than 5,660 derelict fishing nets and 3,800 shellfish pots from Puget Sound, restoring 329 hectares of seabed.[218]

4.4 Regulation of Marine Litter from Ships

Marine litter may be accidently lost from a vessel or intentionally discarded. An estimated 20 percent of the litter found in the ocean can be linked to ocean-based sources, including commercial fishing vessels, cargo ships which discharge garbage, and cruise ships.[219] The issue of marine litter is particularly evident in the North Sea, one of the world's most active shipping zones. It is estimated that 40 percent of marine litter in the North Sea area comes from vessels, an estimated 20,000 metric tonnes of waste. In the Netherlands, an area of heavy vessel activity, 90 percent of the plastic found on beaches is estimated to have come from maritime activities.[220]

4.4.1 The International Convention for the Prevention of Pollution from Ships (MARPOL), 1973

MARPOL sets forth international regulations to prevent pollution from ships. Annex V includes regulations relating to vessel-borne garbage and its disposal. It establishes limits on what may be disposed at sea and imposes a complete ban on the at-sea disposal of plastics.[221] Annex V entered into force in 1988, and was amended in 2013. The amendments came into force in January of 2013. The amendments address a broad spectrum of marine pollution and prohibit most discharge of garbage into the sea from vessels, with some specific exceptions.[222] The amendments address specific types of waste such as animal carcasses, cleaning agents, and additive substances. The amendments include the potential to designate special areas which have specific ecological vulnerabilities

215 On legislation relating port disposal generally, see section 4.4.1 of this overview.
216 Northwest Straights Initiative, 2015.
217 McConnon, 2016.
218 Ibid.
219 California Coastal Commission, 2016.
220 Seas at Risk, 2015.
221 IMO, Regulations for the Prevention of Pollution by Garbage from Ships. http://www.imo.org/en/OurWork/Environment/PollutionPrevention/Garbage/Documents/201(62).pdf.
222 Gard, 2013.

or characteristics, or heavier vessel traffic, allowing for heightened regulations to prevent damage to sensitive marine environments.[223]

The ability of vessels to comply with MARPOL Annex V garbage regulations relates directly to the ability of port reception facilities to accept garbage and wastes accumulated onboard vessels. The Annex also provides guidance on this topic, stating that each party must provide adequate port reception facilities for the discharge of garbage and waste, and these port reception facilities must not cause ships to be unnecessarily delayed.[224] Annex V states that port State control officers can conduct operational inspections upon a foreign-flagged vessel at a port or an offshore terminal "where there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the prevention of pollution by garbage."[225] Port reception facilities are particularly important in designated special areas that have particular environmental concerns or particularly high sea traffic. In special areas, rules are stricter and port reception facilities have increased importance.[226] The European Union establishes port reception facility requirements in EU Directive 2000/59/EC, requiring adequate port reception facilities of its member States. The Directive states that these facilities "should meet the needs of the marine environment and every ship, largest to smallest."[227] The Directive also requires vessels to discharge their garbage at a port reception facility before leaving port.

In addition to adequate port reception facilities, MARPOL sets forth guidelines on signage onboard vessels, garbage record books, and garbage management plans. Regulation 10.1 requires "every ship of 12 meters in length or over and every fixed or floating platform to display placards notifying passengers and crew of the disposal requirements of the Annex."[228] These signs must clearly state the restriction on discharging garbage from ships according to MARPOL. The signs should also warn of applicable penalties if garbage is discarded overboard. Under MARPOL, ships of more than 100 gross tonnage and certified to carry more than 15 people should have a clear garbage record book and a garbage management plan, which includes clearly written procedures for "minimizing, collecting, storing, processing and disposing of garbage, including the use of the equipment on board."[229] The plan should designate which crew member will be in charge of garbage management and should include records of

223 IMO, 2016.
224 Ibid.
225 Ibid.
226 Ibid.
227 Directive 2000/59/EC (European Union). http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0059:EN:HTML.
228 IMO, 2012.
229 Regulation 10.2.

all disposals or incinerations of garbage and should be kept for two years after the final entry.[230]

4.4.2 National Legislation Implementing MARPOL

Many countries have adopted national legislation and regulations implementing MARPOL, including the Annex V regulations. In many instances, the national requirements go beyond the requirements of MARPOL, adding nuance and detail.

Namibia is a party to MARPOL,[231] and it has national legislation to combat marine litter,[232] which was developed to ensure that vessels do not discharge garbage into its waters. According to Namibian law, a person may not discharge waste generated on a fishing vessel into the sea except for biodegradable household waste or fish offal.[233] Waste, other than biodegradable household waste or fish offal, must be taken back to port and disposed of in a manner satisfactory to the responsible authority at the landing port.[234]

New Zealand became a party to the Annex V Regulations in 1988.[235] It has passed several national marine protection regulations under the Marine Transport Act and the Resource Management Act. The goal is to "incorporate into New Zealand law the technical standards contained in Annex V."[236] New rules were implemented in 2015 and address almost all ships and private leisure crafts in New Zealand's territorial waters. The rules address discharge of wastes from vessels, restricting most discharges of garbage.[237] The rules

230 Ibid.
231 IMO, 2015b.
232 Government of Namibia, 2013.
233 Regulations Relating to the Exploitation of Marine Resources (Namibia), part 5 (protection of the environment, waste). http://faolex.fao.org/.
234 Ibid.
235 IMO, 2015b.
236 Marine Protection Rules (New Zealand), part 170 (prevention of pollution from garbage from ships). http://www.maritimenz.govt.nz/Rules/Rule-documents/Part170-marine-protection-rule.pdf.
237 Ibid.

FLOATING MARINE DEBRIS (CREDIT: SHUTTERSTOCK)

establish a general prohibition on discharge of garbage from ships into the sea.[238] New Zealand creates limited and specific circumstances when a vessel may discharge wastes into New Zealand waters, such as in order to secure the safety of those onboard the vessel. The regulations also allows for accidental discharge, and there are specific guidelines pertaining to discharge of food wastes and discharge in special areas. [239]

China is a party to MARPOL, including Annex V, and has implemented national legislation in accordance with its regulations. Chinese national legislation focuses on collection, treatment, storage, and discharge of garbage from ships. China has also passed an environmental protection law, which includes anti-dumping provisions.[240] The law prohibits any dumping of garbage from vessels, specifically stating that "[n]o unit is permitted, without approval of the State competent authority being in charge of marine affairs, to dump any wastes into the sea areas under the jurisdiction of the People's Republic of China."[241] Any vessels wanting to dump waste in the Chinese marine environment must obtain a permit.[242]

4.4.3 Cruise Ship Waste

A cruise ship can carry thousands of passengers and produce copious amounts of garbage, contributing to global marine litter if not properly disposed of. The U.S. Government Accounting Office cited 87 confirmed cases of illegal discharges of garbage or other wastes from cruise ships between 1992 and 1998 in U.S. waters.[243] Garbage from a cruise ship may include food packaging materials, waste created by passengers and crew, and food waste.[244] It is estimated that every week a cruise ship generates 6,000 lbs. 5 m^3 of glass, 2.5 m^3 of cans, and 12 m^3 of food waste.[245] In another study, the USEPA estimated waste generated by one cruise ship as "21,000 gallons of sewage, one ton of garbage, 170,000 gallons of wastewater from sinks, showers and laundry, more than 25 pounds of batteries, fluorescent lights, medical wastes and expired chemicals, up to 6,400 gallons of oily bilge water from engines, four plastic bottles per passenger—about 8,500 bottles per day for the one major ship."[246] There have been some notable cases of cruise ship crew members dumping bags of garbage overboard; in response to the outcry over these incidents, some cruise companies have implemented tougher

238 Ibid., § 170.3.
239 Ibid.
240 Marine Environmental Protection Law of the People's Republic of China (Chinese and English text). http://www.cecc.gov/resources/legal-provisions/marine-environmental-protection-law-of-the-peoples-republic-of-china.
241 Ibid., art. 55.
242 Ibid.
243 GAO, 2000.
244 EPA, 2008.
245 Ibid.
246 Ibid.

policies for their ships. On one major cruise line, it is now a policy that all solid waste must either be incinerated onboard or disposed of in a port reception facility.[247]

Grenada: Areas of the Caribbean are at special risk of marine litter from vessel-borne sources of waste due to the region's popularity as a cruise destination. Dumping of waste and garbage from cruise ships has become a major issue in the region, and it often goes unreported as small islands are dependent on tourism-related revenues and hesitant to report or tax major cruise line companies.[248] Grenada attempted to impose a tax of US$1.50 per person arriving via cruise ships to help fund a World Bank-mandated landfill; in protest, a major cruise line company withdrew from Grenada for many years.[249] Grenada has created specially protected marine zones under its Marine Protected Areas Law.[250] The law prohibits the discharge of waste in marine protected areas, including the discharge of "any refuse...or any other item harmful to animals or plants, or any unsightly item, or substance which does or is likely to destroy or reduce amenities of the area."[251] Organic waste also is subject to legislation, and it is "prohibited to bring organic waste into Grenada. Organic waste may be dumped at least 12 nautical miles offshore. Small organic waste (pieces less than 25 mm) may be dumped at least three nautical miles offshore."[252] The island has port reception facilities for organic waste.

4.4.4 Penalties for Violations of Dumping Garbage into the Marine Environment

MARPOL does not impose penalties—that is left up to States and their implementing legislation. Some countries do impose criminal penalties for illegal dumping in their waters. In the United States, national laws governing discharge of waste into U.S. waters include the Clean Water Act and the Act to Prevent Pollution from Ships.

4.4.5 Summary

The issue of marine litter emanating from vessels is one which requires both international action through treaties such as MARPOL, and national laws and policies implementing (and sometimes going beyond) such treaties. Key aspects of the legal requirements include prohibitions on dumping, requirements for port reception facilities, designation of special areas, institutional capacity, and legislation specifically addressing waste from cruise ships.

4.5 Artificial Reefs

Artificial reefs may prove to be an effective method of improving fisheries and marine habitats, however, significant concerns exist regarding their functional role in

247 Princess Cruise Lines, 2015.
248 Tampa Tribune, 2009.
249 Melia, 2009.
250 Laws of Grenada. http://laws.gov.gd/.
251 Ibid.
252 Ibid.

the ecosystem and possible pollution of the marine environment (including its contribution to marine litter) by the materials used in their creation. Modern artificial reefs were first used in Japan, and by the 17th century their usage spread to the U.S. and Europe.[253] Artificial reefs are created to serve two main purposes: (1) fish stock enhancement and fishery management, and (2) conservation, research, recreation, and restoration of the marine habitat.[254] Artificial reefs may be created in underwater areas that require a hard structure to support a habitat for reef organisms, including many types of corals and the fishes and invertebrates that live among them.[255] There is also significant interest in using artificial reefs as an impediment to illegal trawling.[256]

Many different structures have been used to create artificial reefs. When building an artificial reef, decommissioned military and commercial vessels are often used to create reefs, but many environmental groups have voiced concern over pollution from: "fuels and oil, asbestos, polychlorinated biphenyls (PCBs), paint, debris (e.g., vessel debris, floatables, and introduced material), and other materials (e.g. mercury, refrigerants)." There are also concerns that areas where artificial reefs are created may become dumping grounds for polluted or unsuitable materials which may harm the environment.[257] In New Jersey, a program called "Reef-Ex" was a collaboration between the Department of Defense, environmental groups, and the State of New Jersey to use several types of obsolete tanks to create an artificial reef.[258] They were first cleaned, then transported on a ship and rolled into the ocean. The most common were Vietnam-era Armored Personnel Carriers or APCs. Oil rigs have been used to create artificial reefs and have also sparked controversy. In Orange County, CA, obsolete oil rigs attract barnacles and many other forms of sea life. While some want to simply leave the rigs to create an artificial reef, others feel oil companies simply want to shirk their responsibilities in cleaning up the rigs.[259]

There is no comprehensive international legislation to address development and management of artificial reefs, and most international legislation touching on artificial reefs concerns protection of government-created reefs, permitting, or the prohibition of the creation of artificial reefs. There are many legal issues surrounding the production and management of an artificial reef, including ownership of the reef and its fish, management of marine fishing gear used in the area, and shipping and maritime activities allowed around the reefs.[260] A number of countries have adopted legislation regulating artificial reefs, including through anti-dumping provisions in environmental and marine protection laws.[261]

United States: The U.S. Army Corps of Engineers (USACE) regulates the

253 Fabi et al., 2011.
254 Ibid.
255 NOAA, 2014.
256 Fabi et al., 2011.
257 Ibid.

258 Weitzman, 1994.
259 Mehta, 1999.
260 FAO, 2015.
261 UNEP and IMO, 2009.

construction and maintenance of fishing reefs and fishing attractors in waters of the United States. Some U.S. states (such as New York) have USACE permits for artificial reefs in the Atlantic Ocean. Sec. 33 U.S. Code § 2103 sets out parameters for the National Artificial Reef Plan. This plan mandates the development of a long-term artificial reef plan which shall include amongst other specifications; "(1) geographic, hydrographic, geologic, biological, ecological, social, economic, and other criteria for siting artificial reefs; (2) design, material, and other criteria for constructing artificial reefs...."[262]

Australia: In Australia, the Commonwealth Environment Protection (Sea Dumping) Act 1981 (the Sea Dumping Act) oversees the construction and permitting of artificial reefs. Permits for construction of artificial reefs must be obtained from the Department of the Environment and Heritage or the Great Barrier Reef Marine Park Authority.[263] If one does not obtain a permit and constructs a reef, penalties can be up to "$220 000, imprisonment, or both."[264] Permits are necessary to ensure that the sites for the reef are appropriate. According to the Australian Government, concerns about artificial reefs include the reduction of negative or harmful impacts to marine life and habitat and the safety of seafaring vessels operating in the area. The permit applications are reviewed by several Australian governmental agencies to assure the necessity of the reef as well as reviewing the purpose it will serve. Once an appropriate permit is issued, the reef may be charted on maritime maps.[265]

Oman: The Sultanate of Oman has been proactive in establishing projects to improve fish stocks and marine habitats through the usage of artificial reefs in the Al-Batainah region and training personnel to manage them.[266] Fisheries in Oman face difficulties due to Oman's geographic particularities such as narrow coastal zones. Artificial reefs are being developed to support these fisheries. The artificial reefs in a manmade reef project known as "The Wave" in Muscat seek to provide habitats that will bring marine life to areas devoid of marine life and improve fishery production. The reefs are made from man-made "60 triangular concrete modules to 2km of seabed between Seeb and Bausher to create an artificial reef effect."[267]

Oman has issued several Ministerial Decisions concerning artificial reefs and the current preference in Oman seems to be use structures specifically designed and built for the purpose of constructing an artificial reef. A 2004 Ministerial Decision (No. 55) addresses the establishment of artificial reefs. There is concern about pollution as specific substances are forbidden in the construction of artificial reefs such as engines, barrels, old boats and ships, glass, and plastic (art.

262 National Artificial Reef Plan, 33 U.S. Code § 2103. https://www.law.cornell.edu/uscode/text/33/2103.
263 Australian Government, Department of the Environment, 2008.
264 Ibid.
265 Ibid.
266 Sultanate of Oman, 2010.
267 Times of Oman, 2014.

13).[268] Article 7 provides specifications in the construction of reefs: "only permitted materials may be used; they must not exceed 30 square meters; they must be more than 1000m from shore; reefs must not be closer than 500m from each other, and they must not exceed 1/3 of the depth of the sea where located; etc."[269]

Manmade artificial reefs can create marine habitats where there were none, revitalize areas where biodiversity and fisheries have been depleted, but they may also raise significant environmental concerns. Dumping spent heavy equipment such as army tanks or decommissioned military ships may seem to be an efficient recycling technique once this equipment is no longer used, but it may come at a high cost. Many of the ships or vehicles that are dumped into the ocean need significant decontamination before they can be safely submerged. Moreover, management of the reefs needs to be improved after the reefs have been created, and national plans for management of the reefs are necessary.[270] The use of pre-fabricated materials created for the purpose of building an artificial reef may be a preferred choice as this would eliminate many concerns regarding contamination from prior usage. Artificial reefs can bestow many benefits, but the costs to the environment must be weighed as well.

268 Ministerial Decision No. 55 of 2004 Issuing Regulations Managing the Establishment of Artificial Reefs (Alshuduud) (Oman). http://www.ecolex.org/ecolex/ledge/view/RecordDetails;DID-PFDSIjsessionid=6C805C89DB5ED00F57C06F-27B9A2010E?id=LEX-FAOC097361&index=documents.

269 Ibid.

270 Fabi et al., 2011.

MARINE PLASTIC DEBRIS ON BEACH

5

MANAGING WASTE IN THE MARINE ENVIRONMENT

5. MANAGING WASTE IN THE MARINE ENVIRONMENT

While marine litter is more difficult to address once it has entered the environment, countries have adopted legislation to manage it in the environment. This legislation generally addresses three dimensions: assessing the status of marine litter and its impacts on the environment; developing and implementing plans addressing litter in the marine environment; and cleaning up marine litter.

5.1 Assessing the Status and Impacts

Some countries have adopted legislation empowering agencies to assess the status of marine litter and its impacts. For example, the U.S. Clean Water Act (CWA) and its 1972 amendments established regulations setting water pollution standards, programs to assess and monitor polluted bodies of water, and processes to design management plans to address water pollution.[271] States are required to maintain a list of polluted waters and establish a plan to manage and restore the polluted water. Section 303(d) of the CWA states that for polluted waters, each state must determine the total maximum daily load (TMDL) of pollutants that can be found in a water body and still achieve the stated water quality objectives.[272] In response to an environmental organization lawsuit to address pollution in Los Angeles, California, Los Angeles County began to categorize trash as a pollutant.[273] The lawsuit required the county to reduce the 4.5 million pounds of trash that flowed into Californian watersheds yearly, to zero by 2016.[274]

The Marine Plastic Pollution Research and Control Act (MPPRCA) (33 U.S.C. § 1914 - 33 U.S.C. § 1915) requires the Environmental Protection Agency (EPA), in consultation with the National Oceanic and Atmospheric Administration (NOAA), to study the adverse effects of improper disposal of plastics on the environment and on waste disposal, and various methods to reduce or eliminate such adverse effects. Section 1954 of the Act provides for an interagency marine debris coordinating committee, including membership requirements for the committee, meeting schedules, monitoring, and progress reports. The interagency committee coordinates marine debris research between federal agencies and non-governmental entities, such as universities. The reports should include the Committee's recommendations, marine debris inventory, a review of marine debris reduction projects, a review of Coast Guard programs, and estimates of federal and non-federal funding for marine debris.

271 EPA, 2015b.

272 Ibid.
273 Hohnjune, 2008.
274 Ibid.

The U.S. Marine Debris Research, Prevention and Reduction Act (MDRPRA) established programs within NOAA and the U.S. Coast Guard to help identify, determine sources of, assess, reduce, and prevent marine debris and its adverse impacts on the marine environment and navigation safety. MDRPRA also re-authorized the Interagency Marine Debris Coordinating Committee.[275]

An EU directive on the criteria and methodological standards on good environment status of marine waters provides another approach to assessment.[276] The directive issues 11 descriptors for Member States to assess whether they are practicing sound environmental practices. Descriptor 10 provides a guideline for the quantities of litter to coastal and marine environments and provides that "[t]he distribution of litter is highly variable, which needs to be taken into consideration for monitoring programmes. It is necessary to identify the activity to which it is linked including, where possible, its origin. There is still a need for further development of several indicators, notably those relating to biological impacts and to micro-particles, as well as for the enhanced assessment of their potential toxicity."[277]

Assessing marine litter requires legislation and a proactive government that not only implements viable regulations for marine litter reduction, but practical solutions that are preventative. U.S. laws and the EU directive for the environmental status of marine waters illustrate two regulatory approaches for assessing the status of marine litter affecting waters, and then using that assessment to inform proactive measures to reduce and control marine litter.

5.2 Planning

In order to develop a holistic approach to preventing, reducing, and cleaning up marine litter, countries have provided legislative mandates to develop broad plans for managing marine litter.

In 2008, the European Union adopted the Marine Strategy Framework Directive. The directive focuses on four European marine regions (the Baltic Sea, the Black Sea, the Mediterranean Sea, and the North East Atlantic Ocean) and sets goals with a two-year incremental timeframe to assess the current state of the sea. Additionally, the directive sets environmental targets and associated indicators to establish metrics to achieve "good environmental status" for their waters and monitoring.[278]

In 2009, the Government of Australia established the Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life (TAP) plan. TAP has four objectives: long-term prevention of harmful marine debris; remove existing harmful marine debris; mitigate impacts of harmful marine debris on ecological communities; and monitoring and managing marine debris. TAP incorporates a monitoring and management

275 EPA, 2016.
276 Directive 2010/477/EU. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX-:32010D0477(01).
277 Ibid.
278 EC, 2016.

component, which include communities and schools conducting impact surveys and educational and wildlife rescue programs.[279]

To support countries and others in planning for marine litter, UNEP, the U.S. Government, and others developed the Honolulu Strategy in 2011. The Strategy is a planning framework for a comprehensive and global effort to reduce the ecological, human health, and economic impacts of marine debris and to reduce the amount and impact of accumulated marine debris in pelagic waters.[280] Part of the Honolulu Strategy planning process involves specific goals to reduce marine litter. Goal A is to reduce the amount and impact of land-based sources of marine debris into the sea; goal B is to reduce the amount and impact of sea-based sources of marine debris; and goal C will reduce the amount of marine debris on shorelines.[281] With these three goals and various strategies to achieve those goals, the Honolulu Strategy involves governments, the private sector, and nongovernmental organizations (NGOs).

5.3 Cleanup

As has been made abundantly clear throughout this report, when it comes to marine litter, prevention is more effective and efficient than response. This is why the vast majority of the legislative measure seek to prevent marine litter from being generated (through restrictions on manufacturing and use) and from being introduced into the marine environment. That said, countries and partners have sought approaches to capture and remove marine litter in the environment. Legislation can, for example, provide a mandate for government bodies to empower and work with local entities in organizing beach cleanups.

Australia has implemented various marine litter cleanup initiatives. The Caring for our Country initiative jointly administered by the Department of the Environment, Water, Heritage and the Arts and the Department of Agriculture, Fisheries and Forestry, Projects include: "ghost net" cleanup projects across northern Australia; regional and local marine debris monitoring and cleanup, including education and awareness raising; and industry initiatives.[282]

In January 2015, the U.S. EPA set new mandates for litter and debris removal from the Baltimore harbor and its tributaries for Baltimore city and Baltimore County Maryland.[283] A 2014 Baltimore City TMDL draft listed various programs to assist in the restoration and TMDL compliance of Back River, Baltimore Harbor, Jones Falls, Gwynns Falls, and Lower Patapsco River. Engaging the community to participate in cleanups was also part of the draft plan.[284]

279 Australian Government, Department of the Environment, Water, Heritage and the Arts, 2009.
280 UNEP and NOAA, 2011.
281 Ibid.
282 Australian Government, Department of the Environment, Water, Heritage and the Arts, n.d.
283 Lawson, 2015.
284 Baltimore City, 2014. In 2008, Baltimore became the third urban "stream system" which required regulatory intervention due to the amount of litter and trash found in the harbor. Wheeler, 2015.

MUNICIPAL WORKERS COLLECTING DEBRIS ON A BEACH IN DURBAN, SOUTH AFRICA (CREDIT: LCSWART /SHUTTERSTOCK)

6

OTHER CONSIDERATIONS

6. OTHER CONSIDERATIONS

In addition to the various approaches laid out above for combatting and responding to marine litter, legislation can provide mandates for research programs, advisory bodies, environmental impact assessments, public participation, and private engagement.

6.1 Research Programs

Recognition of the impacts of marine debris has led to coordinated research efforts at various scales into the magnitude, impacts, and sources of marine debris. While citizens, local organizations, universities, and government agencies conduct monitoring and research activities at site-specific, statewide, or watershed-specific scales, these programs are often coordinated and funded in part by national research programs, such as the Marine Debris Monitoring and Assessment Project described below. Further, there are also global initiatives to combat this problem through coordination of regional efforts, resulting in the global dissemination of research results.

In 2006, the United States adopted the Marine Debris Research, Prevention, and Reduction Act (MDRPR), which directs NOAA and the Coast Guard to conduct research in order to "identify, determine sources of, assess, prevent, reduce, and remove marine debris..." in marine environments.[285] Accordingly, NOAA has implemented the Marine Debris Monitoring and Assessment Project, which utilizes shoreline marine debris surveys to collect baseline data on the amount of debris present in marine environments.[286] NOAA also coordinates with and provides funding to state agencies, educational institutions, and NGOs. Examples of current projects include a study by the University of Maryland's Wye Research and Education Center Aquatic Toxicology Group into the distribution of microplastics debris in the Chesapeake Bay watershed, and a study by Sea Education Association into the impacts of microplastics on feeding behavior of copepods.[287]

Prior to 2012, the Marine Plastic Pollution Research and Control Act (MPPRCA)[288] directed the U.S. EPA to study the impacts of improper disposal of plastics on the environment. These sections, however, were repealed in 2012, and MDRPR now authorizes the creation of the Interagency Marine Debris Coordinating Committee. This committee is authorized to coordinate a comprehensive marine debris research program, and includes EPA, NOAA, the Coast Guard, and the Navy, as well as any other agencies which may be interested in pollution prevention.[289]

285 33 U.S.C.A. § 1952(a) (2015).
286 NOAA, 2016b.
287 These studies, among other current projects, can be found at http://marinedebris.noaa.gov/current-efforts/research.
288 33 U.S.C.A. §§ 1914-1915.
289 33 U.S.C.A. § 1954.

The Marine Debris Act Amendments of 2012 updates the Marine Debris Research, Prevention and Reduction Act of 2006. The amendments provide additional research and assistance to the U.S. Coast Guard and NOAA to identify, determine sources of, remove marine debris, and determine the impacts on the marine environment.[290]

There is a dearth of national research programs on marine litter in the southern hemisphere, and an even greater shortage of legislation mandating such research programs.[291] The Commonwealth Scientific and Industrial Research Organization, Australia's national science agency, has coordinated one of the largest coastal assessments of marine litter by surveying sites at 100 km intervals around the entire coastline of the country.[292] This study coordinated the efforts of thousands of students, teachers, and corporate employees throughout the country using a common survey methodology to assess the extent of marine litter accumulation.[293]

The European Environment Agency (EEA) has similarly utilized a citizen-based approach to researching marine litter. In order to inform policy decisions in the European Union, the EEA developed the Marine LitterWatch Program, which includes a mobile app, a web portal, and a public database to collect and

290 Howe, 2012.
291 Hidalgo-Ruz and Thiel, 2015.
292 CSIRO, 2015.
293 Ibid.

SINGLE-USE PLASTIC ON BEACH (CREDIT: SHUTTERSTOCK)

share coastal litter data.[294] As demonstrated by these examples, national research programs often focus on coordinating citizen-scientists.[295]

On the international scale, the United Nations Environment Programme (UNEP) coordinated efforts to reduce marine litter. While UNEP does not itself conduct research, it has developed Regional Seas Programs, the Global Partnership on Marine Litter (discussed earlier), and Action Areas through which UNEP supports the development of regional and national action plans on marine litter.[296] UNEP then uses these regional actions to publish best practices for monitoring and research.[297] UNEP also publishes guidelines (for example, on monitoring of marine litter) and lists research needs and priority areas for action.[298]

6.2 Advisory Bodies

Advisory bodies are used in a number of capacities to monitor and provide advice on regulating marine litter. They provide scientific advice to states to inform regulations, can help coordinate implementation of national and subnational policies on marine litter, and assist with public education and outreach.

The Marine Strategy Framework Directive (MSFD) serves as the EU Directorate-General for the Environment's policy framework for the protection of the marine environment. Descriptor 10 in Annex I of the MSFD calls for the monitoring and assessment of marine litter. To support the MSFD implementation process, Task Groups of independent scientific experts were called in to prepare criteria and methodological standards for each of the eleven Framework descriptors, so that Member States might assess the state of marine and coastal waters and achieve Good Environmental Status. The Marine Litter Task Group consists of a team of eleven researchers and six observers.[299]

While it does not specifically address marine litter, Article 29 under Japan's Basic Act on Ocean Policy (2007) established the Headquarter for Ocean Policy to coordinate conservation and pollution prevention in the marine environment among relevant national and local administrative bodies.[300]

Other examples of advisory bodies addressing aspects of marine litter include: the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), which advises the United Nations (UN) system on the scientific aspects of marine environmental protection, and the United States Interagency Marine Debris Coordinating Committee, a multi-agency body that coordinates federal programs and makes recommendations for research priorities, monitoring activities, and regulatory actions;

294 European Environment Agency, 2015a.
295 Hidalgo-Ruz and Thiel, 2015.
296 UNEP, n.d.
297 UNEP and IOC, 2009.
298 UNEP and IOC, 2009; UNEP, 2016.
299 Galgani et al., 2010.
300 Basic Act on Ocean Policy, Act No. 33 of April 27, 2007 (Japan). http://faolex.fao.org/docs/pdf/jap75593.pdf.

On a subnational level in the United States, the states of Virginia, California, and Hawai'i all have marine litter management plans. Virginia developed the first statewide marine litter plan on the East Coast of the U.S., coordinating efforts between state agencies, local governments, nongovernmental organizations, researchers, educators, and members of the public. The VMDRP Leadership Team consists primarily of agency and organization representatives who identified potential policies and strategies to prevent litter from reaching coastal and freshwaters in the state.[301]

6.3 Environmental Impact Assessment

Environmental impact assessments (EIAs) are a legal tool used to evaluate the environmental impacts of a proposed project or development prior to decision making in order to prevent or reduce adverse impacts.[302] EIAs are used nearly universally: one study has found that 191 of the 193 member States of the United Nations have either adopted national EIA legislation or signed an international legal instrument that refers to the use of EIA.[303]

In the context of marine litter, EIAs can be used to assess the potential for waste and debris to enter the marine environment, identify preventive and mitigating measures, and create legally binding obligations to prevent and reduce marine litter from the project.

301 Register, Katie, 2014.
302 Convention on Biological Diversity, n.d.
303 Morgan, 2012.

The United Kingdom's Marine Works (Environmental Impact Assessment) Regulations Act of 2007[304] applies to works related to deposits in the sea, works related to navigational safety, and harbor works. Under the Marine Works Regulations Act, EIAs have been conducted in cases of dredging operations to ensure that debris is disposed of properly and not released into the sea.[305]

In addition to general EIA requirements, some countries have adopted specific protocols, procedures, and standards for EIAs in specific contexts. For example, when conducting EIAs for projects related to artificial reefs, the United Kingdom, Malta, and Brazil all have legal provisions that take marine litter into consideration.[306] The Caribbean Island of Bonaire has specifically cited concerns in an EIA that tropical storms and wind gusts could spread debris from fishing vessels and litter related to tourism activities.[307]

UNCLOS article 206 and a number of regional conventions and programs have highlighted the potential of EIA to reduce effects of activities on the marine environment. These include,

- Article 6 of the OSPAR Convention calls upon contracting parties to undertake joint assessments of the quality of the marine environment and its

304 Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2011 (United Kingdom). http://www.legislation.gov.uk/uksi/2011/735/pdfs/uksi_20110735_en.pdf.
305 See MMO, 2011a; MMO, 2011b.
306 Guerra et al., 2015.
307 Vermeij, 2012.

development, including an evaluation of the effectiveness of planned and enacted protection measures.[308]

- The MED POL Programme (the marine pollution assessment and control component of Mediterranean Action Plan) includes a principle that contracting parties shall undertake environmental impact assessments for proposed activities that are likely to have an adverse impact on the marine environment.[309]
- Article 7 of the Helsinki Convention calls for an environmental impact assessment of any proposed activities that may cause significant harm to the marine environment of the Baltic Sea Area.[310]

While these provisions all address marine protection generally, and not only marine litter, they illustrate the fact that countries have recognized the potential of EIAs to prevent and reduce the environmental effects of projects and activities on the marine environment.

6.4 Public Engagement

Addressing the global problem of marine litter requires public engagement through a variety of means in order to accomplish several distinct goals. For one, marine litter is largely the result of individual behavioral patterns related to production, consumption, waste disposal, and littering.[311] As such, policies and approaches that engage citizens can more effectively educate the citizens and change such behavior, stemming one of the major sources of marine litter.[312]

The public is not only a contributor of marine litter, but also an invaluable resource for the collection of data on the distribution and intensity of marine litter. A variety of programs, such as Marine LitterWatch (MLW) in the European Union, rely on public involvement to better understand the causes of marine litter, constraints to preventing it, and opportunities to better manage it.[313] The EU created the MLW network in 2015 to address existing data gaps in marine litter management and to integrate citizen engagement. The MLW system was developed by the Technical Group on Marine Litter, an expert group established to support implementation of the EU's Marine Strategy Framework Directive (MSFD), collect data on relevant MSFD beaches, and support official monitoring.[314] The project was based on the MSFD monitoring guidelines and is built on three core elements: a database, a mobile application available for android and iPhone devices, and organized citizen groups. A web

308 For text of the OSPAR Convention, see http://www.ospar.org/convention/text.

309 For text of the MED POL Programme, see http://195.97.36.231/acrobatfiles/MTSAcrobatfiles/mts119eng.pdf.

310 For text of the Helsinki Convention, see http://helcom.fi/PublishingImages/about-us/convention/Helsinki%20Convention_July%202014.pdf.

311 Topping, 2000.

312 Many comprehensive national approaches focus on public education in order to reduce this source of pollution. Ibid. See also Marine Environment Protection Act, supra Section 2; Basic Plan on Ocean Policy, Act No. 33 of 2007, Art. 11 (Japan) (establishing the Marine Environment Information Network to educate the public).

313 See, e.g. European Environment Agency, 2015a; Morishige, 2009.

314 European Environment Agency, 2015b.

portal helps citizens to create a community and facilitates community management of events and data.

In addition to data collection, the public can serve as a volunteer labor force for otherwise underfunded and understaffed organizations and government agencies, enabling these groups to conduct coastal cleanups on a large scale.[315]

Public engagement serves not only as a goal of public policy, but also as an important means of improving and legitimizing the process for developing national litter management legislation, policies, strategies, and projects. For instance, the Netherlands has ensured public participation in the implementation of the MSFD by granting to all stakeholders, including organizations, companies, and individuals, the opportunity to participate at different stages of a three phase process:

- Stakeholder engagement phase: The Consultative Committee of Infrastructure and the Environment is convened, which allows stakeholders the opportunity to discusses policy proposals. The MSFD process uses this committee as a consultation platform. At this stage, stakeholder interests are assessed and stakeholders can be asked for advice on participation and other relevant issues. Among the parties involved are representatives of the State Secretary, environmental and recreational organizations, and representatives of the oil, gas, fishing, and shipping industries.
- Project development phase: Specific stakeholder projects are established, which focus on issues pertaining to marine litter and the protection of seabed areas such as the Central Oystergrounds and the Frisian Front.
- Public consultation phase: The documents related to the MSFD products are made available at the Ministry of Infrastructure and the Environment, at the houses of province, and published online on the Direction Participation website. Public reactions are collected, and subsequently addressed in the Note of Answers, which in turn can result in amendments of the document. The final MSFD Products, including the Note of Answers piece, are submitted to the Council of Ministers.[316]

Public engagement plays a major role throughout the MSFD product development process in the Netherlands. Stakeholders are assembled at the outset in order to identify points of concern and potential strategies, and the public is again brought to the table after the planning stage to ensure that their input has been considered and incorporated into the final plans and products.

6.5 Private Sector Engagement

Engagement of the private sector is one of the top priorities in the global effort to combat marine litter.[317] In addition to the educational and behavioral elements discussed above, private industries have influence over product design and initial use,

315 E.g. Ocean Conservancy, 2015b.

316 Noordzeeloket, n.d.a.

317 See NOAA, 2011.

which may have enormous impacts on marine litter production.[318] For instance, microplastics from larger items have become contributors to the litter found in the different gyres and are ubiquitous on beaches.[319] Since this information came to light, some cosmetic companies have begun to phase out the use of microbeads—these efforts preceding a new U.S. law requiring such actions.[320]

Disposal practices of industries can also be a significant source of marine litter. Studies suggest that discarded fishing nets and buoys account for the greatest share of the total mass of litter found in the world's oceans.[321] This source presents a unique opportunity for engagement with the fishing industry, which discards such materials both intentionally and inadvertently. In the East Asian Seas Region, South Korea is attempting to address the problems presented by such "derelict fishing gear" (DFG). South Korea has been addressing this problem by implementing specific programs, including implementing a DFG buyback program.[322]

Coordinated by the Ministry of Maritime Affairs and Fisheries and implemented initially through memoranda of understanding among cities and regions,[323] the buyback program's purpose is to incentivize fishermen to bring back long-lasting DFG (plastic nets, lines, traps, and other fishing equipment) collected during fishing operations. Funds are provided 4:1 by the South Korean central government and the local governments, respectively.[324] The program is applicable beyond 12 miles from the coastline (i.e., beyond the territorial sea as defined by the UN Convention on the Law of the Sea).[325] The annual average budget for the 2009-2012 period was US$4.4 million for payments based on a fixed rate per type of debris, excluding garbage produced on board. During this period, fishermen collected 7,700 tons of DFG nationwide.[326]

SINGLE-USE PLASTIC CUP ON BEACH (CREDIT: SHUTTERSTOCK)

In the United States, a similar program run by NOAA encourages commercial fishermen to

318 Duncan Bury Consulting, 2012.
319 New York Times, 2015.
320 Putrich, 2015.
321 Eriksen et al., 2014.
322 Hong, Kang, and Lee, n.d.
323 Cho, 2009.
324 Ibid.
325 Cho, 2004.
326 Ibid.

dispose of old, lost, or unusable fishing gear by providing funding to offset costs.[327] The gear is then recycled and used to produce electricity at Covanta Energy-from-Waste Facilities.

Many programs that engage the private sector rely on voluntary agreements among governments and organizations involved in a particular activity. The Netherlands has worked on a voluntary approach by negotiating the so-called Green Deals in order to implement its marine litter policy in various industry sectors. Among recently enacted measures is the Clean Beaches Green Deal, which was entered into by the national government, municipalities, and private and non-governmental organizations, among others. Its main purpose is to reduce marine litter that originates on beaches.[328] One element of the Clean Beaches Green Deal involves engagement with beach pavilion operators and facilitation of "Green Key" certification among these private operators. Green Key is an international certification for sustainable operators in the leisure industry. Certification takes into account many contributions toward sustainable industry practice, and includes elements such as waste separation and waste prevention.[329] In addition, the Green Deal on Ship Generated Waste is an agreement among Dutch Port Authorities, the National Government of the Netherlands, and private shipping organizations, through which signees agree to certain practices that reduce waste and marine litter during shipment and delivery.[330] Finally, the Fishery for a Clean Sea Green Deal is an agreement among the fishing industry, the national government, fishing ports, municipalities, and other private organizations.[331] Ports and municipalities that are party to this agreement provide waste streams[332] for disposal of waste collected by fishing operations as part of the Fishing for Litter Program.[333] Each of these Green Deals demonstrates how government and industry can work together to implement best management practices and address major sources of marine litter.

327 Specific projects can be found on the NOAA website. NOAA Marine Debris Program, 2015.
328 Noordzeloket, n.d.b.
329 Noordzeeloket, 2014b.
330 Noordzeeloket, 2014a.
331 Noordzeeloket, 2014c.
332 Ibid.
333 The Fishing for Litter program is a multinational program in the North Sea region which encourages fishermen to bring ashore any litter that is caught in fishing nets, so that it can be disposed of properly once on land. KIMO, 2015.

SEVERAL COUNTRIES HAVE INTRODUCED LEVIES ON PLASTIC BAGS (CREDIT: SHUTTERSTOCK)

7

CONCLUSIONS

7. CONCLUSIONS

This Report provides an overview of the challenges of marine litter and options for legal frameworks designed to prevent, reduce, and manage marine litter. While not comprehensive, it seeks to identify the primary policy drivers and legal mechanisms for action and provide a range of examples—largely from States, and supplemented by examples from sub-national institutions and intergovernmental bodies.

To date, most States build from existing frameworks for solid waste management to address the problem, as well as continuing longer-standing specific marine litter prevention efforts such as regulating waste disposal from ships. Recognizing that existing approaches have not gone far enough to halt the expansion of marine litter, such frameworks have been bolstered by new laws that address specific aspects of marine litter. Thus, States that adopt a more piecemeal approach to marine litter may:

Develop and implement laws to ban or reduce the production of single-use items and other waste that is commonly found in marine litter. Single-use plastics, such as bottles, cups, and bags, are often found on beaches and in the marine environment. Therefore, many countries and sub-national governments have banned certain types of single-use items that are easily replaced by reusable items (especially plastic bags).

Regulate non-recoverable items, such as plastic microbeads in personal care and cosmetics products. Microbeads are difficult to remove from an aquatic environment, due to their small size and the length of time needed to biodegrade. By preventing their introduction into the environment, States can eliminate a major source of marine pollution.

Develop and implement legislation to prevent the waste, once created, from entering the marine environment. Preventing waste from entering the marine environment is key, as it is difficult if not impossible to remove. Therefore establishing programs and practices, such as covered landfills near aquatic bodies, may help minimize waste. Approaches such as the circular economy model of economic development can be used to prevent the creation of marine litter.

Support marine litter cleanup efforts. Through policy measures and government programs, States can support regional and local marine debris monitoring and cleanup programs, engage in education and awareness-raising initiatives, and extend producer responsibility. While beach cleanups and other activities are often undertaken by voluntary programs, some States provide incentives for clean-up. State support is especially important in addressing abandoned, lost or discarded fishing gear.

Some States have passed overarching laws aimed at development and implementation of a marine litter plan, support of science and technology development, and creation of overarching marine litter policies. States that elect to adopt a comprehensive, holistic approach to marine litter management may:

MARINE LITTER ON BEACH (CREDIT: HILLARY DANIELS)

Adopt legislation providing an overarching framework for preventing, reducing, and otherwise managing marine litter. This legislation should consider the relationship between the marine litter legislation and other relevant legislation (for example, on waste management), and particularly whether the new overarching legislation supplements or replaces the existing legislation. It should also provide for periodic review of the legislation and its implementation.

Establish an inter-agency mechanism for coordinating among the diverse sectors with a role in addressing marine litter. This inter-agency coordination should address the development, implementation, and review of the marine litter legislation and implementing regulations. It should also engage key stakeholders from the private sector and civil society.

As evidence mounts on the growing impacts of marine litter, it will be important for States to learn from each other and work collaboratively to address this transboundary and international challenge. One of the first needs is to design appropriate legal frameworks to regulate and incentivize change. Beyond that it will take political will, funding and capacity to implement and enforce the marine litter legislation. It will also likely require engagement both with civil society and industry stakeholders to design systems that achieve marine litter objectives and address social and

economic needs. Regardless of whether a State adopts a comprehensive or piecemeal approach to marine litter, there are a wide range of legal and policy approaches that are important for addressing marine litter—including collecting and accessing data and information; requiring agencies to report on progress; conducting baseline assessments; setting goals for litter reduction; addressing prevention, remediation, coordination, and planning; and public participation and awareness-raising. Specific measures may include:

- **Map and review national regulatory frameworks and other instruments to identify gaps in addressing the issue.** This may include laws and policies related to imports of certain plastics products to countries where no recycling or recovery for these items exist; prohibit production of disposable items that lack an adequate end-of-life plan and cost contribution to deal with the problem; or impose requirements on port reception facilities. From this assessment, States can make an informed decision about priorities for preventing marine litter.
- **When introducing new instruments (such as bans, fees, or phase outs) plan for a grace period in which to educate the public.** Securing support from key stakeholders who are affected by or contributing to the production of marine litter (i.e. regulated businesses, local authorities, and the public) can improve compliance with the regulation and enforcement. During the grace period, it is critical to increase public understanding of the initiative, the reason for it, its benefits, and what is required to comply with the requirements.
- **Document and share approaches.** Countries and subnational authorities are encouraged to document the process of developing legislation to address marine litter (including for example, any cost-benefit analyses that are conducted, which stakeholders were engaged, and how, and the policy debate around particular options). Sharing information on the process as well as the final legislation can then inform other jurisdictions that are considering similar measures. Online databases, such as ECOLEX, are one tool for sharing relevant laws and policies, although it may be advisable to develop new keywords focused on marine litter to facilitate identification of relevant legislation.

This Toolkit is designed to assist States in considering options for improving their national legal frameworks to better address marine litter by providing examples of existing legal approaches to address various aspects of the problem. The challenge now is to support States as they adopt and adapt legislation and work to implement the legal requirements.

APPENDIX A: LEGAL AND POLICY INSTRUMENTS RELATED TO MARINE LITTER

This appendix lists a range of multilateral and regional agreements that are relevant to marine litter. Some include provisions expressly addressing marine litter, others are less explicit but still relevant. Section 1 lists the relevant multilateral agreements, resolutions, and other instruments. Section 2 lists regional agreements, resolutions, and other instruments by region, and then generally. Section 3 lists selected national instruments.

1. Multilateral Agreements, Resolutions, and Other Instruments

International Convention for the Prevention of Pollution from Ships (**MARPOL**) 73/78: Annex V, The MARPOL Convention, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997 (MARPOL), adopted on 2 November 1973, available at: http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx.

London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (**London Dumping Convention**), adopted 1996, available at: http://www.imo.org/en/OurWork/Environment/LCLP/Documents/LC1972.pdf (Article IV bans on the dumping of wastes or other matter from ships).

UN Convention on the Law of the Sea (**UNCLOS**) (also called the "Law of the Sea Convention"), adopted 1982, available at: http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, adopted 1989, available at: http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConvention-Text-e.pdf.

UN General Assembly (UNGA) Resolution A/RES/60/30: Oceans and the Law of the

Sea, adopted 2005, available at: https://www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm.

UNGA Resolution A/RES/63/111: Oceans and the Law of the Sea, adopted 2008, available at: https://www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm.

UNGA Resolution A/RES/60/31: Sustainable Fisheries, adopted 2005, available at: https://www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm.

UNGA Resolution A/RES/63/112: Sustainable Fisheries, adopted 2008, available at: https://www.un.org/depts/los/general_assembly/general_assembly_resolutions.htm.

UNGA Resolution A/RES/70/235: Oceans and the Law of the Sea, adopted 2015, available at: http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/235.

FAO Code of Conduct for Responsible Fisheries, adopted 1995, available at: http://www.fao.org/docrep/005/v9878e/v9878e00.htm (General principles 6.8 states that critical habitats should be protected from pollution; 7.2.2 states that management measures to minimize the impact of pollution and waste on fish and non-fish species must be undertaken; 8.3.2 asserts that port states also have a responsibility to prevent pollution; 8.9.1 also states that harbors have the same responsibilities as ports; This code is voluntary but based on principals taken from international law, including those reflected in the United Nations Convention on the Law of the Sea).

UNEP/IOC Guidelines on the Survey and Monitoring of Marine Litter: adopted 2009, available at http://www.unep.org/regionalseas/marinelitter/publications/docs/Marine_Litter_Survey_and_Monitoring_Guidelines.pdf.

Honolulu Strategy: developed at the Fifth International Marine Debris Conference, held in Hawai'i, March 2011, available at: http://unep.org/gpa/documents/publications/honolulustrategy.pdf.

2. Regional Agreements, Resolutions, and Other Instruments

2.1 Mediterranean Instruments

Barcelona Convention (The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterra-

nean): adopted 1976, revised 1995 (not yet ratified by all), available at: http://www.unep.ch/regionalseas/regions/med/t_barcel.htm.

Signature Status for Convention and Protocols available at: http://195.97.36.231/dbases/webdocs/BCP/StatusOfSignaturesAndRatifications.doc.

Dumping Protocol (Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft): adopted 1976, revised 1995 (not yet ratified by all), original available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolDumping76_Eng.pdf; amendments available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolDumping95amendments_Eng.pdf.

Emergency Protocol (Protocol Concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea): adopted 2002, replacing protocol adopted 1976, available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolEmergency02_eng.pdf.

LBS Protocol (Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources): adopted 1980, amended 1996; original available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolLBS80_eng.pdf; amendments available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolLBS96amendments_Eng.pdf.

SPA Protocol (Protocol Concerning Specially Protected Areas and Biodiversity in the Mediterranean): adopted 1995, replacing protocol adopted 1982; annexes adopted 1996 and amended 2013; available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolSPA95_eng.pdf; annexes available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolSPA96annexes_eng.pdf; amendments available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolSPA96annexesAmendmentsCoP18_Eng.pdf.

Offshore Protocol (The Protocol for the Protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil): adopted 1994, available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolOffshore94_eng.pdf.

Hazardous Wastes Protocol (The Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal): adopted 1996, available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolHazardousWastes96_eng.pdf.

ICZM Protocol (Protocol on Integrated Coastal Zone Management in the Med-

iterranean): adopted 2008, available at: http://195.97.36.231/dbases/webdocs/BCP/ProtocolICZM08_eng.pdf.

2.2 Persian Gulf Instruments

Kuwait Convention (Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution): adopted 1978; available at: http://ropme.org/uploads/protocols/kuwait_convention.pdf.

Emergency Protocol (Protocol Concerning Regional Cooperation in Combating Pollution by Oil and other Harmful Substances in Cases of Emergency): adopted 1978, available at: http://ropme.org/uploads/protocols/emergency_protocol.pdf.

Offshore Protocol (Protocol Concerning Marine Pollution Resulting from Exploration and Exploitation of the Continental Shelf): adopted 1989, available at: http://ropme.org/uploads/protocols/continental_shelf_protocol.pdf.

LBS Protocol (Protocol for the Protection of the Marine Environment against Pollution from Land-Based Sources): adopted 1990, available at: http://ropme.org/uploads/protocols/land_based_protocol.pdf.

Hazardous Waste Protocol (Protocol on the Control of Marine Transboundary Movements and Disposal of Hazardous Wastes and Other Wastes): adopted 1998, available at: http://ropme.org/uploads/protocols/hazardous_wastes_protocol.pdf.

Protected Area Protocol (Protocol Concerning the Conservation of Biological Diversity and the Establishment of Protected Areas): under development.

2.3 West and Central Africa Instruments

Abidjan Convention (Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region and Protocol): adopted 1981, available at: http://abidjanconvention.org/index.php?option=com_content&view=article&id=100&Itemid=200&lang=en.

Emergency Protocol (Protocol Concerning Cooperation in Combating Pollution in Cases of Emergency in the Western and Central African Region): adopted 1985, available at: http://sedac.ciesin.columbia.edu/entri/texts/combating.pollution.emergency.protocol.1981.html.

LBS Protocol (Additional Protocol to the Abidjan Convention Concerning Cooperation in the Protection and Development of Marine and Coastal Environment from Land-Based Sources and Activities in the Western, Central and Southern African Region): ad-

opted 2012, available at: http://abidjanconvention.org/media/documents/protocols/LBSA%20Protocol-Adopted.pdf.

2.4 South-East Pacific Instruments

Lima Convention (Convention for the Protection of the Marine Environment and Coastal Area of the South-East Pacific): adopted 1981, available at: http://sedac.ciesin.org/entri/texts/marine.environment.coastal.south.east.pacific.1981.html.

Emergency Protocol (Agreement on Regional Cooperation in Combating Pollution of the South-East Pacific by Hydrocarbons or Other Harmful Substances in Case of Emergency): adopted 1981, available at: http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention lima/agreement_re_coop.pdf.

Supplementary Emergency Protocol (Supplementary Protocol to the Agreement on Regional Co-Operation in Combating Pollution of the South-East Pacific by Hydrocarbons or Other Harmful Substances in Cases of Emergency): adopted 1983, available at: http://sedac.ciesin.org/entri/texts/acrc/suppSEP.txt.html.

LBS Protocol (Protocol for the Protection of the South-East Pacific against Pollution from Land-Based Sources): adopted 1983, available at: http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_lima/protocol_land.pdf.

SPA Protocol (Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the South-East Pacific): adopted 1989, available at: http://www.ecolex.org/ecolex/ledge/view/RecordDetails?index=treaties&id=TRE-001085.

2.5 Red Sea and Gulf of Aden Instruments

Jeddah Convention (Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment): adopted 1982, available at: http://www.unep.ch/regionalseas/main/persga/convtext.html.

Emergency Protocol (Protocol Concerning Regional Co-Operation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency): adopted 1982, available at: http://www.unep.ch/regionalseas/main/persga/redemer.html.

2.6 Wider Caribbean Instruments

Cartagena Convention (Convention for the Protection and Development of the Marine Environment of the Wider Caribbean

Region): adopted 1983, available at: http://www.cep.unep.org/cartagena-convention/text-of-the-cartagena-convention.

SPAW Protocol (Protocol Concerning Protected Areas and Wildlife): adopted 1985, available at: http://www.cep.unep.org/cartagena-convention/spaw-protocol/spaw-protocol-en.pdf/at_download/file.

LBS Protocol (Protocol on the Prevention, Reduction and Control of Land-Based Sources and Activities): adopted 1985, available at: http://www.cep.unep.org/cartagena-convention/lbs-protocol/lbs-protocol-english/at_download/file.

2.7 East Africa Instruments

Nairobi Convention (Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region): adopted 1996, amended 2010, available at: http://www.unep.org/NairobiConvention/docs/Final_Act_Nairobi_Amended_Convention&Text_Amended_Nairobi_Convention.pdf.

SPA Protocol (Protocol Concerning Protected Areas and Wild Fauna and Flora in the Eastern African Region): adopted 1985, available at: http://www.unep.org/NairobiConvention/The_Convention/Protocols/Protocol_Protected_Areas.asp.

Emergency Protocol (Protocol Concerning Co-operation in Combating Marine Pollution in Cases of Emergency in the Eastern African Region): adopted 1985, available at: http://www.unep.org/NairobiConvention/The_Convention/Protocols/Protocol_CooperationMarine_Pollution.asp.

LBS Protocol (Protocol for the Protection of the Marine and Coastal Environment of the Western Indian Ocean from Land-Based Sources and Activities): adopted 2010, available at: http://www.unep.org/NairobiConvention/docs/Final_Act_Protocol&Text_Protocol_Nairobi_Convention.pdf.

2.8 Black Sea Instruments

Bucharest Convention (Convention on the Protection of the Black Sea against Pollution): adopted 1992, available at: http://www.unep.ch/regionalseas/main/blacksea/bsconv.html.

LBS Protocol (Protocol on Protection of the Black Sea Marine Environment Against Pollution from Land-Based Sources): adopted 1992, available at: http://www2.unitar.

org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_bucharest_prots/protocol_lbs.pdf.

Emergency Protocol (Protocols on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations): adopted 1992, available at: http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_bucharest_prots/protocol_emergency.pdf.

Dumping Protocol (Protocol on the Protection of the Black Sea Marine Environment against Pollution by Dumping): adopted 1992, available at: http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_bucharest_prots/protocol_dumping.pdf.

2.9 South Pacific Instruments

Noumea Convention (Convention for the Protection of Natural Resources and Environment of the South Pacific Region): adopted 1986, available at: http://www.ecolex.org/server2.php/libcat/docs/TRE/Full/En/TRE-000892.txt.

Dumping Protocol (Protocol for the Prevention of Pollution of the South Pacific Region by Dumping): adopted 1986, available at: http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_noumea/protocol_prev_pollut.pdf.

Emergency Protocol (Protocol Concerning Co-operation in Combating Pollution Emergencies in the South Pacific Region): adopted 1986, available at: http://www2.unitar.org/cwm/publications/cbl/synergy/pdf/cat3/UNEP_regional_seas/convention_noumea/protocol_coop.pdf.

2.10 North-East Pacific Instruments

Antigua Convention (The Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the Northeast Pacific): adopted 2002, available at: http://www.ecolex.org/server2.php/libcat/docs/TRE/Full/En/TRE001350.txt.

2.11 Other Instruments

Convention for the Conservation of Antarctic Marine Living Resources (**CCAMLR**): adopted 1982, available at: http://www.ats.aq/documents/ats/ccamlr_e.pdf.

European Union (EU) Marine Strategy Framework Directive: Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field

of marine environmental policy, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056.

HELCOM Baltic: Convention on the Protection of the Marine Environment of the Baltic Sea Area, adopted 1974, revised 1992, available at: http://helcom.fi/Documents/About%20us/Convention%20and%20commitments/Helsinki%20Convention/1992_Convention_1108.pdf.

Caspian Sea (Framework Convention for the Protection of the Marine Environment of the Caspian Sea): adopted 2003, available at: http://www.tehranconvention.org/IMG/pdf/Tehran_Convention_text_final_pdf.pdf.

OSPAR (North-East Atlantic: The Convention for the Protection of the Marine Environment of the North-East Atlantic–Oslo and Paris convention): adopted 1974, available at: http://sedac.ciesin.columbia.edu/entri/texts/acrc/MEofNE.txt.html.

3. National Instruments (Selected)

Australian Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Marine Life: adopted 2009, available at: http://www.environment.gov.au/system/files/resources/d945695b-a3b9-4010-91b4-914efcdbae2f/files/marine-debris-threat-abatement-plan.pdf.

Tasmanian Plastic Shopping Bags Ban Act of 2013, http://www.thelaw.tas.gov.au/tocview/index.w3p;cond=ALL;doc_id=14%2B%2B2013%2BAT%40EN%2B20150805130000;histon=;prompt=;rec=;term=plastic%20bag.

Bangladesh Environment Conservation Act of 1995: amended 2002 to include a ban on plastic bags, binding. Available at: http://faolex.fao.org/docs/pdf/bgd42272.pdf.

Estonia Packaging Act: adopted 2004, available at: https://www.riigiteataja.ee/akt/12964621

Ethiopia Proclamation 513 (2008) (banning the manufacture and import of plastic bags less than 0.33mm in thickness)

Grenada Marine Protected Areas Law: adopted 2009, available at: http://laws.gov.gd/

Guyana Regulations Made Under the Environmental Protection Act Cap 20:05 (10

Dec. 2015) 240 Official Gazette of Guy. 2593. Available at: http://faolex.fao.org/docs/pdf/guy152293.pdf

Haiti Polystyrene Ban: adopted 2013, available at: http://www.ipsnews.net/2013/08/despite-two-bans-styrofoam-trash-still-plagues-haiti.

Ireland Waste Management (Energy Levy) (Plastic Bag) Regulations 2001 (SI 605/2001) (Ir.), available at: http://www.irishstatutebook.ie/eli/2001/si/605/made/en/print.

India: Tamil Nadu Plastic Articles (Prohibition of Sale, Storage, Transportation, Use) Act: adopted 2002, available at: http://faolex.fao.org/docs/texts/ind52632.doc

Ireland S.I. No. 605/2001 - Waste Management (Environmental Levy) (Plastic Bag) Regulations, 2001, available at: http://www.irishstatutebook.ie/2001/en/si/0605.html.

Japan Law for the Promotion of Marine Litter Disposal: adopted 2009, available at: http://www.env.go.jp/en/

Waste Management and Public Cleansing Law: adopted 2001, available at: http://www.env.go.jp/en/

Namibia Regulations Relating to the Exploitation of Marine Resources: adopted 2001, available at: http://www.mfmr.gov.na/documents/53305/832050/Marine-Regulations/e2e0a7fb-a6db-45fd-9b14-1a26a6c3d3b4.

Philippines Ecological Solid Waste Management Act of 2000: adopted 2000, available at: http://emb.gov.ph/wp-content/uploads/2015/12/RA-9003.pdf

Rwanda Law Relating to the Prohibition of Manufacturing, Importation, Use, and Sale of Polythene Bags: adopted 2008, a vailable at: http://rema.gov.rw/rema_doc/Laws/Plastic%20bags%20law.pdf.

Singapore Prevention of Pollution of the Sea Act: adopted 1990, available at: http://statutes.agc.gov.sg/aol/search/display/view.w3p;page=0;query=DocId%3A%2294f8349f-9c2f-4581-ad17-b651f14b0f0d%22%20Status%3Ainforce%20Depth%3A0;rec=0

South Korea Marine Environmental Management Act: adopted 2009, available at: http://www.moleg.go.kr/FileDownload.mo?flSeq=31422

United Kingdom Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008: adopted

2008, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/440578/1807.pdf.

United States Marine Plastic Pollution Research and Control Act: adopted 1987, available at: https://www.gpo.gov/fdsys/pkg/PLAW-109publ449/html/PLAW-109publ449.htm.

An Ordinance of the County of Alameda to Prohibit Polystyrene Food Service Ware: adopted 2008, available at: https://www.acgov.org/aceh/documents/4-24-15-FinalOrdResPolystyreneBan.pdf

California Water Code § 13367(b)(1) (requiring manufacturers to adopt BMPs when making nurdles): adopted 2007, available at: http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13367.

California Mandatory Recycling of Commercial Solid Waste by Businesses: adopted 2012, available at: http://www.calrecycle.ca.gov/laws/regulations/Title14/Chap09pt1/default.htm

Maryland Act on the Prohibition or Sale of Microbeads: adopted 2015, available at: http://mgaleg.maryland.gov/2015RS/bills/hb/hb0216E.pdf.

New York: Meeting Minutes, Thursday, December 19, 2013, New York City Council 48, available at: http://legistar.council.nyc.gov/View.ashx?M=M&ID=281888&GUID=EE09D489-D364-4975-A994-D500C1A88AB9.

APPENDIX B: REFERENCES

AFP. 2011. "Kenya bans plastic bags." The Independent UK, January 9. http://www.independent.co.uk/environment/kenya-bans-plastic-bags-2179928.html.

APEC Marine Resource Conservation Working Group. 2009. "Understanding the economic benefits and costs of controlling marine debris in the APEC region." http://www.nowpap.org/data/ML%20ref/APEC'ML-control...Cost-vs-Benefit.pdf.

Associated Press. 2011. "Nickel bag tax dissuades D.C. shoppers." The Washington Times, January 5. http://webcache.googleusercontent.com/search?q=cache:e-Cry9jBNxI8J:www.washingtontimes.com/news/2011/jan/5/nickel-bag-tax-dissuades-dc-shoppers/+&cd=2&hl=en&ct=-clnk&gl=jp.

Australian Government, Department of the Environment, Water, Heritage and the Arts. 2008. "Artificial reefs." http://www.environment.gov.au/marine/publications/factsheet-artificial-reefs.

-------. 2009."Background paper for the threat abatement plan for the impacts of marine debris on vertebrate marine life." https://www.environment.gov.au/system/files/resources/d945695b-a3b9-4010-91b4-914efcdbae2f/files/marine-debris-background-paper.pdf.

------. n.d. "Marine debris." https://www.environment.gov.au/marine/marine-pollution/marine-debris.

Ariza, Eduard, and Stephen P. Leatherman. 2012. "No-smoking policies and their outcomes on U.S. beaches." *Journal of Coastal Research* 28 (1A): 143–147. doi: 10.2112/JCOASTRES-D-10-00137.1.

ASTM. n.d. "ASTM D8071-05. Standard specification for non-floating biodegradable plastics in the marine environment (Withdrawn 2014)." http://www.astm.org/Standards/D7081.htm.

Baltimore City. 2014. "Baltimore City: MS4 restoration and TMDL WP." http://dpwapps.baltimorecity.gov/cleanwaterbaltimore/wp-content/uploads/2015/08/MS4-WIP-12-19-14-Final-1.pdf

Barenstein, Jennifer Duyne, and Daniel Pittet. 2010. "Baseline environmental site assessment report for the truitier landfill Port-au-Prince, Haiti." World Bank. http://documents.worldbank.org/curated/en/2010/12/14101788/haiti-infrastructure-institutions-emergency-recovery-project-environmental-social-management-framework-vol-8-8-baseline-environmental-site-assessment-report-truitier-landfill-port-au-prince-haiti.

Barnea, Nir, Jacqui Michel, Brendan Bray,

Zachary Nixon, Gretchen Imahori, and Crescent Moegling. 2009. "Marine debris emergency response planning in the north-central Gulf of Mexico." NOAA. http://gulfofmexico.marinedebris.noaa.gov/MDERP.pdf.

BBC. 2004. "Rwanda's war on plastic bags." *BBC World News,* October 4. http://news.bbc.co.uk/2/hi/africa/3714126.stm.

------. 2013. "Mauritania has banned the use of plastic bags to protect the environment and the lives of land and sea animals." *BBC World News*, January 2. http://www.bbc.com/news/world-africa-20891539.

------. 2016. "Plastic microbeads to be banned by 2017, UK government pledges." BBC News, September 3. http://www.bbc.com/news/uk-37263087.

Bernasconi-Osterwalder, Natalie, Daniel Magraw, Maria Julia Oliva, Elisabeth Tuerk, and Marcos Orellana. 2014. *Environment and trade: A guide to WTO jurisprudence*. Routledge.

Brunée, Jutta, and Stephen J. Toope. 1994. "Environmental security and freshwater resources: A case for international ecosystem law. *Yearbook of International Environmental Law* 5:41-76.

Busschbach, Hermien. 2013. "Marine litter policy in the Netherlands." Presented at the 2nd Global Conference on Land-Ocean Connections, Montego Bay, Jamaica, October 6. http://unep.org/gpa/documents/meetings/GLOCII/GLOCIIPresentation-Busschbach.pdf.

California Coastal Commission. 2016. "The problem with marine debris," January. http://www.coastal.ca.gov/publiced/marinedebris.html.

Californians Against Waste. N.d. "National list of local plast bag ordinances." http://www.cawrecycles.org/list-of-national-bans.

Centre for Advanced Engineering, University of Canterbury. 2000. "Landfill guidelines: Towards sustainable waste management in New Zealand." Christchurch, New Zealand. http://www.mfe.govt.nz/sites/default/files/4139_landfill.pdf.

Chen, Chung-Ling. 2015. "Regulation and management of marine litter." In *Marine anthropogenic litter*, edited by Melanie Bergmann, Lars Gutow, and Michael Klages, 395-428. Cham, Switzerland: Springer International Publishing.

City of San Mateo. 2014. "San Mateo County reusable bag ordinance survey and reporting report." http://www.cawrecycles.org/files/San%20Mateo%20County%20Bag%20Report%202014.pdf.

Cho, Dong-Oh. 2009. "The incentive program for fishermen to collect marine debris in Korea." *Marine Pollution Bulletin* 58: 415-417. doi: 10.1016/j.marpolbul.2008.10.004.

------. 2004. "Marine debris: Case of Korea." Presented at the Derelict Fishing Gear and Related Marine Debris Seminar, Asia Pacific Economic Cooperation, University of Hawaii, Manoa, January 13-16. http://www.

wpcouncil.org/documents/APECSeminar/Regional%20Case%20Studies/Presentation%20by%20Capt.%20Dong-Oh%20Cho.pdf.

Clapp, Jennifer, and Linda Swanston. 2009. "Doing away with plastic shopping bags: International patterns of norm emergence and policy implementation." *Environmental Politics* 18(3): 315-332. doi: 10.1080/09644010902823717.

Convention on Biological Diversity, n.d. "Impact assessment." https://www.cbd.int/impact/whatis.shtml.

Convery, Frank, Simon McDonnell, and Susanna Ferreira. 2007. "The most popular tax in Europe? Lessons from the Irish plastic bags levy." *Environmental Resource Economics* 38:1-11. http://plasticbaglaws.org/wordpress/wp-content/uploads/2010/02/study_the-most-popular-tax-in-Europe-2007.pdf.

Coulter, Jessica R. 2010. "A sea change to change the sea: Stopping the spread of the Pacific garbage patch with small-scale environmental legislation." *William and Mary Law Review* 51: 1959-1995. http://wmlawreview.org/sites/default/files/Coulter-Note_final.pdf.

CSIRO (Commonwealth Scientific and Industrial Research Organisation). 2015. "Sources, distribution and fate of marine debris." http://www.csiro.au/en/Research/OandA/Areas/Marine-resources-and-industries/Marine-debris.

de Caen, Sophie. 2013. "Technical guide for debris management: The Haitian experience 2010-2012." September 5. http://reliefweb.int/report/haiti/technical-guide-debris-management-haitian-experience-2010-2012.

Department of the Environment, Community and Local Government (Ireland). n.d. "Plastic bag levy." http://www.environ.ie/environment/waste/plastic-bags/plastic-bag-levy.

Derraik, José G.B. 2002. "The pollution of the marine environment by plastic debris: A review." *Marine Pollution Bulletin* 44 (9): 842–852.

Desvarieux, Jessica. 2010. "Haiti's latest problem: Clearing away the rubble." Time, June 6. http://content.time.com/time/world/article/0,8599,1994544,00.html.

Digital Journal. 2014. "Statement from the American Progressive Bag Alliance on intent to repeal Senate Bill 270 through referendum." September 30. http://www.digitaljournal.com/pr/2224561.

Dikgang, Johane, and Martine Visser. 2010. "Behavioral response to plastic bag legislation in Botswana." *Environment for Development: Discussion Paper Series* (University of Cape Town, May). http://www.rff.org/rff/documents/EfD-DP-10-13.pdf.

Dikgang, Johane, Anthony Leiman, and Martine Visser. 2010. "Analysis of the plastic bag levy in South Africa." Policy paper (University of Cape Town, July 8). http://

www.econrsa.org/papers/p_papers/pp18.pdf.

Duncan Bury Consulting. 2012. "Analytical Summary: Marine litter workshop for North America." Prepared for UNEP, December 3. http://www.rona.unep.org/sites/default/files/Regional%20Priorities/Marine%20Debris/Workshop%20Report%202012.pdf.

Dutch Shark Society. 2014. "Discarded fishing gear keeps ghostfishing forever..." October 30. http://www.dutchsharksociety.org/discard-fishing-gear-keeps-ghostfishing-for-ever/.

EC (European Commission). 2016. "Legislation: The Marine Directive." http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm.

The Economist. 2015. "Rubbish in Brazil: Legislative landfill," August 8. http://www.economist.com/news/americas/21661050-why-so-many-laws-end-up-bin-legislative-landfill.

Ellison, Katherine. 2007. "The trouble with nurdles." Frontiers Ecology & Environment 5 (7): 396. ENS (Environmental News Service). 2012a. "Haiti bans plastic bags and foam containers." Environmental News Service, October 3. http://ens-newswire.com/2012/10/03/haiti-bans-plastic-bags-and-foam-containers/.

------. 2012b. "Uganda High Court rules in favor of plastic bag ban." Environment News Service, November 12. http://ens-newswire.com/2012/11/12/uganda-high-court-rules-in-favor-of-plastic-bag-ban/.

EPA (Environmental Protection Agency). 2008. "Cruise ship discharge assessment report." Washington, D.C. https://owpubauthor.epa.gov/polwaste/vwd/cruise_ship_disch_assess_report.cfm.

------. 2011. "Marine debris in the North Pacific: A summary of existing information and identification of data gaps." San Francisco, CA. http://www.epa.gov/region9/marine-debris/pdf/MarineDebris-NPacFinalAprvd.pdf.

------. 2015a. "Solid waste: Laws and regulations." http://www.epa.gov/region9/waste/solid/laws.html#3.

------. 2015b. "History of the Clean Water Act," June 1. http://www2.epa.gov/laws-regulations/history-clean-water-act.

------. 2016. "Marine debris." http://www3.epa.gov/region9/marine-debris/.

Eriksen, Marcus, Laurent C. M. Lebreton, Henry S. Carson, Martin Thiel, Charles J. Moore, Jose C. Borrero, Francois Galgani, Peter G. Ryan, and Julia Reisser. 2014. "Plastic pollution in the world's oceans: More than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea." *PLoS ONE* 9 (12). doi: 10.1371/journal.pone.0111913.

European Commission. 2013. "Questions and answers on the proposal to reduce the consumption of plastic bags," November 4. Press Release. http://europa.eu/rapid/press-release_MEMO-13-945_en.htm.

------. n.d. "Circular economy strategy." http://ec.europa.eu/environment/circular-economy/index_en.htm.

European Environment Agency. 2015a. "Marine LitterWatch in a nutshell," March 23. http://www.eea.europa.eu/themes/coast_sea/marine-litterwatch/at-a-glance/marine-litterwatch-in-a-nutshell.

------. 2015b. "Marine LitterWatch." http://www.eea.europa.eu/themes/coast_sea/marine-litterwatch.

Fabi, Gianni, Alessandra Spagnolo, Denise Bellan-Santini, Eric Charbonnel, Burak Ali Çiçek, Juan J. Goutayer García, Antony C. Jensen, Argiris Kallianiotis, and Miguel Neves dos Santos. 2011. "Overview on artificial reefs in Europe." *Brazilian Journal of Oceanography* 59 (special issue CARAH): 155-166. http://www.scielo.br/pdf/bjoce/v59nspe1/17.pdf.

FAO (Food and Agriculture Organization of the United Nations). 2015. "Artificial reefs." http://www.fao.org/fishery/topic/14861/en.

Florida DEP (Department of Environmental Protection). 2010. "Retail bags report for the legislature." February 1. http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/retailbags/Retail-Bag-Report_01Feb10.pdf.

Foster, Caroline. 2013. *Science and the precautionary principle in international courts and tribunals: Expert evidence, burden of proof and finality.* Cambridge University Press.

Galgani, F., D. Fleet, J. Van Franeker, S. Katsanevakis, T. Maes, J. Mouat, L. Oosterbaan, I. Poitou, G. Hanke, R. Thompson, E. Amato, A. Birkun, and C. Janssen. 2010. "Marine Strategy Framework Directive Task Group 10 Report—Marine litter." http://publications.jrc.ec.europa.eu/repository/bitstream/JRC58104/tg10final.pdf.

Galgani, Francois, Georg Hanke, and Thomas Maes. 2015. "Global distribution, composition, and abundance of marine litter." In *Marine anthropogenic litter*, edited by Melanie Bergmann, Lars Gutow, and Michael Klages, 29-56. Cham, Switzerland: Springer International Publishing.

GAO (General Accounting Office). 2000. "Marine pollution: Progress made to reduce marine pollution by cruise ships, but important issues remain." http://www.gao.gov/assets/230/228813.pdf.

Gard, 2013. "MARPOL Annex V - Revised garbage disposal regulations." http://www.gard.no/ikbViewer/Content/20733795/Gard%20Alert%20MARPOL%20Annex%20V%20-%20Revised%20garbage%20disposal%20regulations.pdf.

GESAMP (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection). 2015. "Sources, fate and effects of microplastics in the marine environment: A global assessment." #90. Rep. Stud. GESAMP. http://www.gesamp.org/data/gesamp/files/media/Publications/Reports_and_studies_90/gallery_2230/

object_2500_large.pdf.

Go, Naohiro. 2010. "New developments regarding the marine litter problem on occasion of the enactment of the Law for the Promotion of Marine Litter Disposal." *Ship and Ocean Newsletter*. http://www.sof.or.jp/en/news/pdf/ssp13.pdf.

Goldstein, Miriam C., Marci Rosenberg, and Lanna Cheng. 2012. "Increased oceanic microplastic debris enhances oviposition in an endemic pelagic insect." *Biology Letters* 8(5): 817-820. doi: 10.1098/rsbl.2012.0298.

Gordon, Theresa. 2016. "Plastic ban law not complete." *The Daily Observer*, January 6. http://antiguaobserver.com/plastic-ban-law-not-complete/.

Government of Namibia. 2013. "Environmental law and policy in Namibia—Namibian Constitution." http://www.environment-namibia.net/constitution.html.

Guerra, Flavia, Catarina Grilo, Nuno M. Pedroso, and Henrique Cabral. 2015. "Environmental impact assessment in the marine environment: A comparison of legal frameworks." *Environmental Impact Assessment Review* 55: 182-194. doi: 10.1016/j.eiar.2015.08.003.

Harrison, James. 2015. "Actors and institutions for the protection of the marine environment." In *Research handbook on international marine environmental law*, ed. Rosemary Rayfuse. Cheltenham, UK: Edward Elgar Publishing Limited.

He, Haoran. 2010. "The effects of an environmental policy on consumers: Lessons from the Chinese plastic bag regulation." Working Papers in Economics Report No. 453 (University of Gothenburg, Department of Economics, June 3).

Herreria, Carla. 2015. "Loophole undermines Hawaii's historic plastic bag ban." Huffington Post.com, July 10. http://www.huffingtonpost.com/2015/07/10/loophole-hawaii-plastic-bags_n_7750112.html.

Hidalgo-Ruz, Valeria, and Martin Thiel. 2015. "The contribution of citizen scientists to the monitoring of marine litter." In *Marine anthropogenic litter*, edited by Melanie Bergmann, Lars Gutow, and Michael Klages, 429-447. Cham, Switzerland: Springer International Publishing.

Hohnjune, Donovan. 2008. "Sea of trash." *New York Times*, June 22. http://www.nytimes.com/2008/06/22/magazine/22Plastics-t.html?pagewanted=all&_r=0.

Hong Kong Environmental Protection Department. 2007. "North East New Territories (NENT) landfill extension: Environmental impact assessment report." http://www.epd.gov.hk/eia/register/report/eiareport/eia_1332007/html%20format/049-04%20Final%20EIA.htm#_Toc169492066.

Hong, Sunwook, Jongmyoung Lee, and

Daeseok Kang. 2014. "Quantities, composition, and sources of beach debris in Korea from the results of nationwide monitoring." *Marine Pollution Bulletin* 84: 27-34. http://www.researchgate.net/publication/263391896_Quantities_composition_and_sources_of_beach_debris_in_Korea_from_the_results_of_nationwide_monitoring.

------. n.d. "Emergy evaluation of governmental policies on derelict fishing gear in South Korea." http://www.cep.ees.ufl.edu/emergy/documents/conferences/ERC07_2012/32_Hong.pdf.

Howe, Angela. 2012. "Federal marine debris legislation signed by the President." Surfrider Foundation, *Legal, Plastic Pollution, Tsunami Debris* (blog), December 21. http://www.surfrider.org/coastal-blog/entry/federal-marine-debris-legislation-signed-by-the-president.

Humboldt State University. 2015. "Dissolve ghost fishing: Biodegradable panels can reduce mortality caused by abandoned crab pots." *Marine Ecology @ HSU*, March 3. https://marineecologyhsu.wordpress.com/2015/03/03/dissolve-ghost-fishing-biodegradable-panels-can-reduce-mortality-caused-by-abandoned-crab-pots/.

IMO (International Maritime Organization). 2012. "Guidelines for the implementation of MARPOL Annex V." http://www.imo.org/en/OurWork/Environment/PollutionPrevention/Garbage/Documents/2014%20revision/RESOLUTION%20MEPC.219(63)%20Guidelines%20for%20the%20Implementation%20of%20MARPOL%20Annex%20V.pdf.

------. 2015a. "Prevention of pollution by garbage from ships." http://www.imo.org/en/OurWork/Environment/PollutionPrevention/Garbage/Pages/Default.aspx.

------. 2015b. "Contracting States to MARPOL." https://imo.amsa.gov.au/public/parties/marpolv.html.

------. 2016. "Special areas under MARPOL." http://www.imo.org/en/OurWork/Environment/SpecialAreasUnderMARPOL/Pages/Default.aspx.

IPS. 2013. "Despite two bans, styrofoam trash still plagues Haiti." IPS News.org, August 16. http://www.ipsnews.net/2013/08/despite-two-bans-styrofoam-trash-still-plagues-haiti.

IRIN. 2011. "Bangladesh: Plastics proliferate despite ban," March 2. http://www.irinnews.org/report/92072/bangladesh-plastics-proliferate-despite-bans.

Island Trails Network. 2015. "Japan tsunami marine debris removal." http://www.islandtrails.org/japan-tsunami-debris-removal.html.

ISWA (International Solid Waste Association). 2011. "International guidelines for landfill evaluation." http://www.iswa.org/index.php?eID=tx_bee4mememberships_download&fileUid=156.

------. 2013. "ISWA guidelines: Waste to energy in low and middle income countries." https://www.iswa.org/index.php?eID=tx_iswaknowledgebase_download&documen-

tUid=3252.

Ivone, Massimo. 2015. *Evolution of the precautionary principle*. Lambert Academic Publishing.

Jambeck, Jenna R., Roland Geyer, Chris Wilcox, Theodore R. Siegler, Miriam Perryman, Anthony Andrady, Ramani Narayan, and Kara Lavender Law. 2015. "Plastic waste inputs from land into the ocean." *Science* 347 (6223): 768-771. http://www.sciencemag.org/content/347/6223/768.

Jang, Yong Chang, Jongmyoung Lee, Sunwook Hong, Jin Yong Mok, Kyoung Shin Kim, Yun Jeong Lee, Hyun-Woo Choi, Hongmook Kang, and Sukhui Lee. 2014. "Estimation of the annual flow and stock of marine litter in South Korea for management purposes." *Marine Pollution Bulletin* 86: 505-511. http://www.researchgate.net/profile/Jongmyoung_Lee2/publication/264054588

Japanese Government, Office of Marine Environment, Ministry of the Environment. 2015. "Priority actions to address land-based sources." Presented at G7 workshop, Berlin, August 3-5.

JPIF (Japan Plastics Industry Federation). n.d. "Activities of JPIF." http://www.jpif.gr.jp/english/profile/activities.html.

Jierui, Shi. 2009. "China's bag ban, one year later." *China Dialogue*, July 10. https://www.chinadialogue.net/article/show/single/en/3158.

Kardish, Chris. 2014. "How Rwanda became the world's unlikely leader in plastic bag bans." *Governing.com*, May. http://www.governing.com/topics/transportation-infrastructure/gov-rwanda-plastic-bag-ban.html.

Kazoka, Ludovick. 2013. "Tanzania: State imposes fresh ban on plastic bags." AllAfrica.com, July. http://allafrica.com/stories/201308160058.html.

Kier Associates. 2012. "The cost to West Coast communities of dealing with trash, reducing marine debris." Prepared for the EPA. http://www3.epa.gov/region09/marine-debris/pdf/WestCoastComms-Cost-MngMarineDebris.pdf.

KIMO (Kommunenes Internasjonale Miljøorganisasjon). 2015. "Fishing for litter." http://www.kimointernational.org/FishingforLitter.aspx.

LA DPW (Department of Public Works). 2015. "Ordinance basics." http://dpw.lacounty.gov/epd/aboutthebag/faq_stores.cfm.

Lawson, Julie. 2015. "State and federal agencies mandate trash cleanup in Baltimore." *Trash Free Maryland* (blog), January 9. http://www.trashfreemaryland.org/2015/01/state-and-federal-agencies-mandate.html.

Leous, Justin P., and Neal B. Parry. 2005. "Who is responsible for marine debris? The international politics of cleaning our

oceans." *Journal of International Affairs* 9 (1): 257-269.

Leslie, H.A., M.D. van der Meulen, F.M. Kleissen, and A.D. Vethaak. 2011. "Microplastic litter in the Dutch marine environment." Prepared for the Dutch Ministry of Infrastructure and Environment. https://www.noordzeeloket.nl/images/Microplastic%20Litter%20in%20the%20Dutch%20Marine%20Environment_851.pdf.

Linton, Latonya. 2014. "Government finalising waste to energy service." *Jamaica Information Service*, March 15. http://jis.gov.jm/government-finalising-waste-energy-policy/.

Liu, Yingling. 2015. "China Watch: Plastic bag ban trumps market and consumer efforts." World Watch Institute. http://www.worldwatch.org/node/5808.

Los Angeles County Department of Public Works. 2012. "Implementation of the County of Los Angeles plastic and paper carryout bag ordinance." http://ladpw.org/epd/aboutthebag/PDF/Bag%20Ban%20Status%20Nov%202012.pdf.

Macfadyen, Graeme, and Tim Huntington. 2009. "Abandoned, lost or otherwise discarded fishing gear." Food and Agriculture Organization of the United Nations (FAO) and United Nations Environment Programme (UNEP): Rome. http://www.fao.org/docrep/011/i0620e/i0620e00.HTM.

Marine Litter Solutions. 2015. "Joint declaration." http://www.marinelittersolutions.com/who-we-are/joint-declaration.aspx.

Masina, Lameck. 2014. "Plastic bag ban stalls in Malawi." *Voice of America*, November 11. http://www.voanews.com/content/plastic-bag-ban-stalls-in-malawi-amid-manufacturers-opposition/2515953.html.

Mato, Yukie, Tomohiko Isobe, Hideshige Takada, Haruyuki Kanehiro, Chiyoko Ohtake, and Tsuguchika Kaminuma. 2001. "Plastic resin pellets as a transport medium of toxic chemicals in the marine environment." *Environmental Science & Technology* 35 (2): 318-324.

McConnon, Amanda Jane. 2016. "Ghost fishing: When lost gear keeps fishing." *M Mag*, January 6. http://millennialmagazine.com/ghost-fishing-when-lost-gear-keeps-fishing/.

McIntyre, Owen. 2006. "The role of customary rules and principles in the environmental protection of shared international freshwater resources." *Natural Resources Journal* 46: 157-210.

Mehta, Seema. 1999. "Plan to turn oil rigs into reefs fuels controversy." *L.A. Times,* October 25. http://articles.latimes.com/1999/oct/25/local/me-25976.

Melia, Mike. "Caribbean a dumping ground for garbage from cruise ships." *Los Angeles Times*, March 9. http://articles.latimes.com/2009/mar/01/news/ad-

fg-cruise-dumping1.

Melucci, Lauren. 2014. "A few states set the stage for the future of EPS at retail." Packaging Digest.com, April 1. http://www.packagingdigest.com/regulatory/few-states-set-stage-future-eps-retail.

Metropolitan Manila Development Authority. 2015. "MMDA announces Barangay 2014 winners on Thursday; launches Barangay Power 2015, too," February 26. http://www.mmda.gov.ph/index.php/35-news/news-2015/1523-mmda-announces-barangay-2014-winners-on-thursday-launches-barangay-power-2015-too.

MMO (Marine Management Organisation, UK). 2011a. "Environmental impact assessment consent decision: Capital dredge and quay wall construction, berths 201-202," February 22. MMO reference DC 8590 and DC 8591. http://webarchive.nationalarchives.gov.uk/20140108121958/http://www.marinemanagement.org.uk/licensing/public_register/cases/documents/abp_southampton/eia_consent_decision.pdf.

------. 2011b. "Environmental impact assessment consent decision: Capital dredge, Portsmouth Harbour, south of Whale Island," March 17. MMO reference DC 9275. http://webarchive.nationalarchives.gov.uk/20140108121958/http://www.marinemanagement.org.uk/licensing/public_register/eia/documents/consent/portsmouth_eia.pdf.

Morgan, Richard K. 2012. "Environmental impact assessment: the state of the art." *Impact Assessment and Project Appraisal* 30 (1): 5-14. doi:10.1080/14615517.2012.661557.

Morishige, Carey. 2009. "Campaigns that teach: Diving deeper into marine debris education." Paper presented at "Strategies and Activities for the Prevention of Nearshore Marine Debris," Honolulu, HI, August 12-13, 2009.

------. (ed.). 2010. "Marine debris prevention projects and activities in the Republic of Korea and United States: A compilation of project summary reports." National Oceanic and Atmospheric Administration. http://marinedebris.noaa.gov/sites/default/files/publications-files/TM_NOS-ORR_36.pdf.

Mueller, Benjamin. 2015. "Judge strikes down New York City's ban on foam food containers." *New York Times*, September 22. http://www.nytimes.com/2015/09/23/nyregion/judge-strikes-down-new-york-citys-ban-on-foam-food-containers.html?_r=0.

Muthu, Subramanian S., Y. Li, Junyan Hu, and Tracy P.Y. Mok. 2011. "Carbon footprint of shopping (grocery) bags in China, Hong Kong and India." *Atmospheric Environment* 45:469-475.

National Research Council of the National Academies. 2005. *Tackling marine debris in the 21st century.* Washington, D.C.: National Academies Press. http://www.nap.edu/catalog.php?record_id=12486.

New York Times. 2015. "Microbeads, the

tiny orbs threatening our water." Editorial, August 21. http://www.nytimes.com/2015/08/22/opinion/microbeads-the-tiny-orbs-threatening-our-water.html.

NOAA (National Oceanic and Atmospheric Administration). 2011. "Summary proceedings of the 5th International Marine Debris Conference, March 20-25, 2011." http://marinedebris.noaa.gov/sites/default/files/summaryproceedings.pdf.

------. 2012. "Gulf of Mexico Marine Debris Project web site." September 2. http://gulfofmexico.marinedebris.noaa.gov.

------. 2014. "What is an artificial reef?" *National Ocean Service*, January 23. http://oceanservice.noaa.gov/facts/artificial-reef.html.

------. 2015a. "How do natural disasters contribute to marine debris?" March 11. http://oceanservice.noaa.gov/facts/disaster-debris.html.

------. 2015b. "What is ghostfishing?" *National Ocean Service*. http://oceanservice.noaa.gov/facts/ghostfishing.html.

------. 2016. "Gulf of Mexico Marine Debris Project – historical." February 24. http://www.ncddc.noaa.gov/interactive-maps/commerce-transportation/marine-debris/.

------. 2016b. "Marine Debris Monitoring and Assessment Project." March 4. http://marinedebris.noaa.gov/research/marine-debris-monitoring-and-assessment-project.

NOAA Marine Debris Program. 2015. "Fishing for Energy Partnership announces grants to support Marine Debris Prevention." *NOAA's Marine Debris Blog*, September 15. https://marinedebrisblog.wordpress.com/2015/09/15/nfwf-announces-fishing-for-energy-grants-to-support-marine-debris-prevention.

Noordzeeloket. 2014a. "Green deal on ship generated waste." September 10. https://www.noordzeeloket.nl/en/Images/Green%20deal%20ship%20generated%20waste_4647.pdf.

------. 2014b. "Clean beaches green deal C-172." November 20. https://www.noordzeeloket.nl/en/Images/Clean%20Beaches%20Green%20Deal_4739.pdf.

------. 2014c. "Fishery for a clean sea green deal." November 20. https://www.noordzeeloket.nl/en/Images/Green%20Deal%20Fishery%20for%20a%20Green%20Deal_4721.pdf.

------. n.d.a. "Public participation." https://www.noordzeeloket.nl/en/projects/european-marine-strategy-framework-directive/implementation-process/Public_participation/.

------. n.d.b. "Litter on the North Sea." http://www.noordzeeloket.nl/en/functions-and-use/water-quality/Zwerfvuil/index.aspx.

Northwest Straights Initiative. 2015. "The derelict fishing gear program." http://www.derelictgear.org/Our-Program.aspx.

NOWPAP (Northwest Pacific Action Plan). n.d. "National efforts of NOWPAP member states to address the marine litter problem." http://www.nowpap.org/MLon_national-level.php.

NYC. 2015. "De Blasio administration bans single-use styrofoam products in New York

City beginning July 1, 2015." January 8. http://www1.nyc.gov/office-of-the-mayor/news/016-15/de-blasio-administration-bans-single-use-styrofoam-products-new-york-city-beginning-july-1-2015.

Ocean Conservancy. 2015a. "International coastal cleanup 2015 report." http://www.oceanconservancy.org/our-work/international-coastal-cleanup/.

------. 2015b. "Take the pledge." http://www.oceanconservancy.org/our-work/international-coastal-cleanup/sign-up-to-clean-up.html.

OECD (Organisation for Economic Co-operation and Development). n.d. "Extended producer responsibility." http://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm.

Ong, Czarina Nicole. 2010. "Manila seeks to ban thin plastic bags." Manila Bulletin, October 2. www.mb.com.ph/node/280155/manila.

Onyanga-Omara, Jane. 2013. "Plastic bag backlash gains momentum." *BBC*, September 14. http://www.bbc.com/news/uk-24090603.

Operation Clean Sweep. 2015. "Plastic pellets in the environment." http://www.opcleansweep.org/Manual/Plastic-Pellets-in-the-Environment.html.

O'Riordan, Timothy (ed.). 2013. *Ecotaxation*. Oxon: Earthscan.

Owen, Bruce. 2013. "Butts banned at the beach." *Winnipeg Free Press*, March 9. http://www.winnipegfreepress.com/local/butts-banned-at-the-beach-196257211.html.

Pham, Christopher K., Eva Ramirez-Llodra, Claudia H. S. Alt, Teresa Amaro, Melanie Bergmann, Miquel Canals, Joan B. Company, Jaime Davies, Gerard Duineveld, Francois Galgani, Kerry L. Howell, Veerle A. I. Huvenne, Eduardo Isidro, Daniel O. B. Jones, Galderic Lastras, Telmo Morato, José Nuno Gomes-Pereira, Autun Purser, Heather Stewart, Inês Tojeira, Xavier Tubau, David Van Rooij, and Paul A. Tyler. 2014. "Marine litter distribution and density in European seas, from the shelves to deep basins." *PLoS ONE* 9 (4). doi: 10.1371/journal.pone.0095839.

Pflanz, Mike. "Tanzania to ban all plastic bags." Telegraph.co.uk., April 4. http://www.telegraph.co.uk/news/worldnews/africaandindianocean/tanzania/1514793/Tanzania-to-ban-all-plastic-bags.html.

PlasticsEurope. 2015. "Plastics - the facts 2015." http://www.plasticseurope.org/Document/plastics---the-facts-2015.aspx.

Princess Cruise Lines. 2015. "Environmental responsibility." *http://www.princess.com/news/backgrounders_and_fact_sheets/factsheet/Princess-Cruises'-Commitment-to-the-Environment.html#.VeRLG-Jc1pko*.

Putrich, Gayle S. 2015. "US microbead ban

moves forward." *Plastics News*, November 19. http://www.plasticsnews.com/article/20151119/NEWS/151119844/us-microbead-ban-moves-forward.

Register, Katie. 2014. "Developing a marine debris reduction plan for Virginia." Prepared for the Virginia Coastal Zone Management Program. http://www.longwood.edu/cleanva/MarineDebrisPlan.html.

Register, Rhett. 2014. "TRAPPED? Partners tackle derelict fishing gear." *Coastwatch*. http://ncseagrant.ncsu.edu/coastwatch/previous-issues/2014-2/holiday-2014/trapped-partners-tackle-derelict-fishing-gear/.

Rochman, C. M., Mark Anthony Browne, Benjamin S. Halpern, Brian T. Hentschel, Eunha Hoh, Hrissi K. Karapanagioti, Lorena M. Rios-Mendoza, Hideshige Takada, Swee Teh, and Richard C. Thompson. 2013. "Policy: Classify plastic waste as hazardous." *Nature* 494: 169-171. http://www.nature.com/nature/journal/v494/n7436/full/494169a.html.

Romanow, Kerrie. 2012. "Bring your own bag ordinance implementation results and actions to reduce EPS foam food ware," November 20. Memorandum to the San Jose Transportation and Environment Committee. http://www3.sanjoseca.gov/clerk/CommitteeAgenda/TE/20121203/TE20121203_d5.pdf.

Romer, Jennie R., and Shanna Foley. 2012. "A wolf in sheep's clothing: The plastics industry's 'public interest' role in legislation and litigation of plastic bag laws in California." *Golden Gate University Environmental Law Journal* 5 (2): 377-437. http://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1082&context=gguelj.

Potts, Tavis, and Emily Hastings. 2011. "Marine litter issues, impacts and actions." The Scottish Government. www.gov.scot/Resource/0040/00402421.pdf.

Seas at Risk. 2015. "Waste from ships." http://www.seas-at-risk.org/issues/marine-litter/waste-from-ships.html.

Shan, Shelly. 2006. "Many support EPA ban on throw-away utensils." Taipei Times, December 18. http://www.taipeitimes.com/News/taiwan/archives/2006/12/18/2003340889.

State of California Ocean Protection Council. n.d. "Prevening ocean litter." http://www.opc.ca.gov/2010/04/preventing-ocean-litter-3/.

StopWaste. 2014. "Successful results from bag ordinance." Press release, September 10. http://www.stopwaste.org/about/news/successful-results-bag-ordinance.

Straw Wars. 2015. http://strawwars.org.

Sultanate of Oman. 2010. "Fourth national report to the Convention on Biological Diversity." https://www.cbd.int/doc/world/om/om-nr-04-en.pdf.

Tampa Tribune. 2009. "Cruise ships use Caribbean as solid waste dump." February 28. http://tbo.com/news/florida/cruise-ships-use-caribbean-as-solid-waste-dump-115612.

Taylor, Rebecca L., and Sofia B. Villas-Boas. 2016. "Bans vs. fees: Disposable carryout bag policies and bag usage." *Applied Economic Perspectives and Policy* 38 (2): 351-372.

Tembhekar, Chittaranjan. 2015. "Units making plastic bags below 50 microns face heat." *Times of India,* February 24. http://timesofindia.indiatimes.com/city/mumbai/Units-making-plastic-bags-below-50-microns-face-heat/articleshow/46349733.cms.

TEPA (Taiwan Environmental Protection Administration). 2011. "Three Rs: Resource recycling and sustainable reuse."

Thompson, Richard C. 2015. "Microplastics in the marine environment: Sources, consequences and solutions." In *Marine anthropogenic litter*, edited by Melanie Bergmann, Lars Gutow, and Michael Klages, 185-200. Cham, Switzerland: Springer International Publishing.

Times of Oman. 2014. "Artificial reefs at The Wave, Muscat attract new marine species," June 10. http://timesofoman.com/article/35826/Oman/Artificial-reefs-at-The-Wave-Muscat-attract-new-marine-species.

Toloken, Steve. 2013. "Asia's plastics associations see progress in bag ban battles." *Plastic News*, September 27. http://www.plasticsnews.com/article/20130927/NEWS/130929926/asias-plastics-associations-see-progress-in-bag-ban-battles.

Topping, Paul. 2000. "Marine debris: A focus for community engagement." Presented at the Coastal Zone Canada Conference, Saint John, New Brunswick, Canada, September. http://www.unep.org/regionalseas/marinelitter/publications/docs/czc2000_paper.pdf.

International Pellet Watch. n.d. "Global pollution map." http://www.tuat.ac.jp/~gaia/ipw/en/map.html.

Umeda, Sayuri. 2013. "Japan: Legal responses to the Great East Japan Earthquake of 2011." The Law Library of Congress. http://www.loc.gov/law/help/japan-earthquake/Great-East-Japan-Earthquake.pdf.

UNDP (United Nations Development Programme). 2015. "Haiti – strengthening adaptive capacity of coastal communities." http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/focus_areas/ecosystems_and_biodiversity/projects/haiti---strengthening-the-adaptive-capacity-of-coastal-communiti.html.

UNEP (United Nations Environment Programme). 2005a. "Marine litter: An analytical overview." Nairobi. www.unep.org/regionalseas/marinelitter/publications/docs/anl_oview.pdf.

------. 2005b. "Sanitary landfill." In Solid

Waste Management. http://www.unep.org/ietc/Portals/136/SWM-Vol1-Part3.pdf.
------. 2009. "Marine litter: A global challenge." Nairobi. www.unep.org/pdf/unep_marine_litter-a_global_challenge.pdf.
------. 2013. *Guidelines for national waste management strategies: Moving from challenges to opportunities*. http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/UNEP%20NWMS%20English.pdf.
------. 2015a. "Dutch rally support for a Europe wide microplastic ban in a bid to keep mussels on the menu," January. http://unep.org/gpa/news/MicroplasticBan.asp.
------. 2015b. *Biodegradable plastics & marine litter: Misconceptions, concerns and impacts on marine environments*. Nairobi. http://www.unep.org/gpa/documents/publications/BiodegradablePlastics.pdf.
------. n.d. "UNEP regional activities." http://www.unep.org/regionalseas/marinelitter/initiatives/unepregions/regionsA.asp.
------. 2016. *Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change*. Nairobi. http://www.unep.org/about/sgb/Portals/50153/UNEA/Marine%20Plastic%20Debris%20and%20Microplastic%20Technical%20Report%20Advance%20Copy.pdf.

UNEP (United Nations Environment Programme) and IMO (International Maritime Organization). 2009. "London Convention and Protocol/UNEP guidelines for the placement of artificial reefs." http://www.unep.org/regionalseas/publications/reports/RSRS/pdfs/rsrs_187.pdf.

UNEP (United Nations Environment Programme) and IOC (Intergovernmental Oceanographic Commission). 2009. "UNEP/IOC guidelines on survey and monitoring of marine litter." http://www.unep.org/regionalseas/marinelitter/publications/docs/Marine_Litter_Survey_and_Monitoring_Guidelines.pdf.

UNEP (United Nations Environment Programme) and NOAA (National Oceanic and Atmospheric Administration). 2011. "Honolulu strategy." http://marinedebris.noaa.gov/solutions/honolulu-strategy.

UNEP (United Nations Environment Programme) and SEPA (Swedish Environmental Protection Agency). n.d. "Marine litter, trash that kills." http://www.unep.org/regionalseas/marinelitter/publications/docs/trash_that_kills.pdf.

UNEP (United Nations Environment Programme), UN DESA (Department of Economic and Social Affairs) and FAO (Food and Agriculture Organization of the UN). 2012 "SIDS-focused green economy: An analysis of challenges and opportunities." http://www.unep.org/pdf/Green_Economy_in_SIDS.pdf.

UNGA (United Nations General Assembly). Resolution 46/215. Large-scale pelagic drift-net fishing and its impact on the living marine resources of the world's oceans and seas. A/RES/46/215. December 20. http://www.un.org/documents/ga/res/46/a46r215.
------. 2004. Oceans and the law of the sea: Report of the Secretary-General—Adden-

dum. August 18. A/59/62/Add.1. http://www.un.org/ga/59/documentation/list0.html.
------. 2012. The future we want. September 11. A/RES/66/288*. http://www.uncsd2012.org/thefuturewewant.html.
------. 2015. Resolution 70/1. Transforming our world: The 2030 Agenda for Sustainable Development. October 21. A/RES/70/1. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.
------. 2016. Resolution 70/235. Oceans and the law of the sea. March 15. A/RES/70/235*. http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/235.

UN Habitat. 2010. "WTE industry in Latin America." http://mirror.unhabitat.org/downloads/docs/10740_1_594319.pdf.

Vermeij, Mark J. A. 2012. "Environmental impact assessment of the construction of a pier and its future usages near Karel's Bar, Bonaire." Carmabi Foundation, August 20. https://www.rijksoverheid.nl/documenten/brochures/2012/05/20/environmental-impact-assessment-of-the-construction-of-a-pier-and-its-future-usages-near-karel-s-bar-bonaire.

Washington State Marine Debris Task Force. 2013. "Washington receives $250,000 allocation to address marine debris." May 17. http://www.ecy.wa.gov/news/2013/13-007-MDNR.html.

Washington State Department of Fish and Wildlife. 2015. "Statewide gear rules—Crab, shrimp & crawfish." http://wdfw.wa.gov/fishing/shellfish/gear_rules.html.

Weitzman, Jennifer. 1994. "Tanks take on new role as artificial reefs to attract fish." *New York Times,* December 4. http://www.nytimes.com/1994/12/04/nyregion/tanks-take-on-new-role-as-artificial-reefs-to-attract-fish.html.

Wheeler, Timothy. 2015. "Trash cleanup ordered for Baltimore harbor, streams." *Baltimore Sun*, January 6. http://www.baltimoresun.com/features/green/blog/bs-md-trash-harbor-20150106-story.html?track=rss.

Wold, Chris, Sanford Gaines, and Greg Block. 2011. *Trade and the environment: Law and policy.* Carolina Academic Press.

World Bank. 2009a. "Disaster risk management programs for priority countries." http://www.unisdr.org/files/14757_6thCGCountryProgramSummaries1.pdf.
------. 2009b. "Disaster risk management in Latin America and the Caribbean region: GFDRR country notes—Haiti." http://reliefweb.int/sites/reliefweb.int/files/resources/Situation_Report_204.pdf.
------. 2012. "Ari Atoll solid waste management pilot project." http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/09/13/000020953_20120913094958/Rendered/PDF/724590PID0MV0A00Management0Project.pdf.

World Society for the Protection of Animals.

2014. "Fishing's phantom menace: How ghost fishing gear is endangering our sea life." https://www.worldanimalprotection.us.org/sites/default/files/us_files/ghost_gear_exec_summary_us2.pdf.

Wright, Stephanie L., Richard C. Thompson, and Tamara S. Galloway. 2013. "The physical impacts of microplastics on marine organisms: A review." *Environmental Pollution* 178: 483-492. http://resodema.org/publications/publication9.pdf.

WSP Environmental. 2013. "An investigation into the performance (environmental and health) of waste to energy technologies internationally." Prepared for the Government of Western Australia Department of Environment and Conservation. http://www.wtert.com.br/home2010/arquivo/noticias_eventos/W2E_Summary_Report_20123.pdf.

Zero Waste Europe. 2015. "International Bag Free Day—New EU Directive paves the way for a Europe without plastic bags." July 3. http://www.zerowasteeurope.eu/2015/07/press-release-international-bag-free-day-new-eu-directive-paves-the-way-for-a-europe-without-plastic-bags.

United Nations Environment Programme
United Nations Avenue, Gigiri
PO Box 30552, 00100
Nairobi, Kenya

Tel: (254-20) 7621234
Web: www.unep.org
E-mail: publications@unep.org